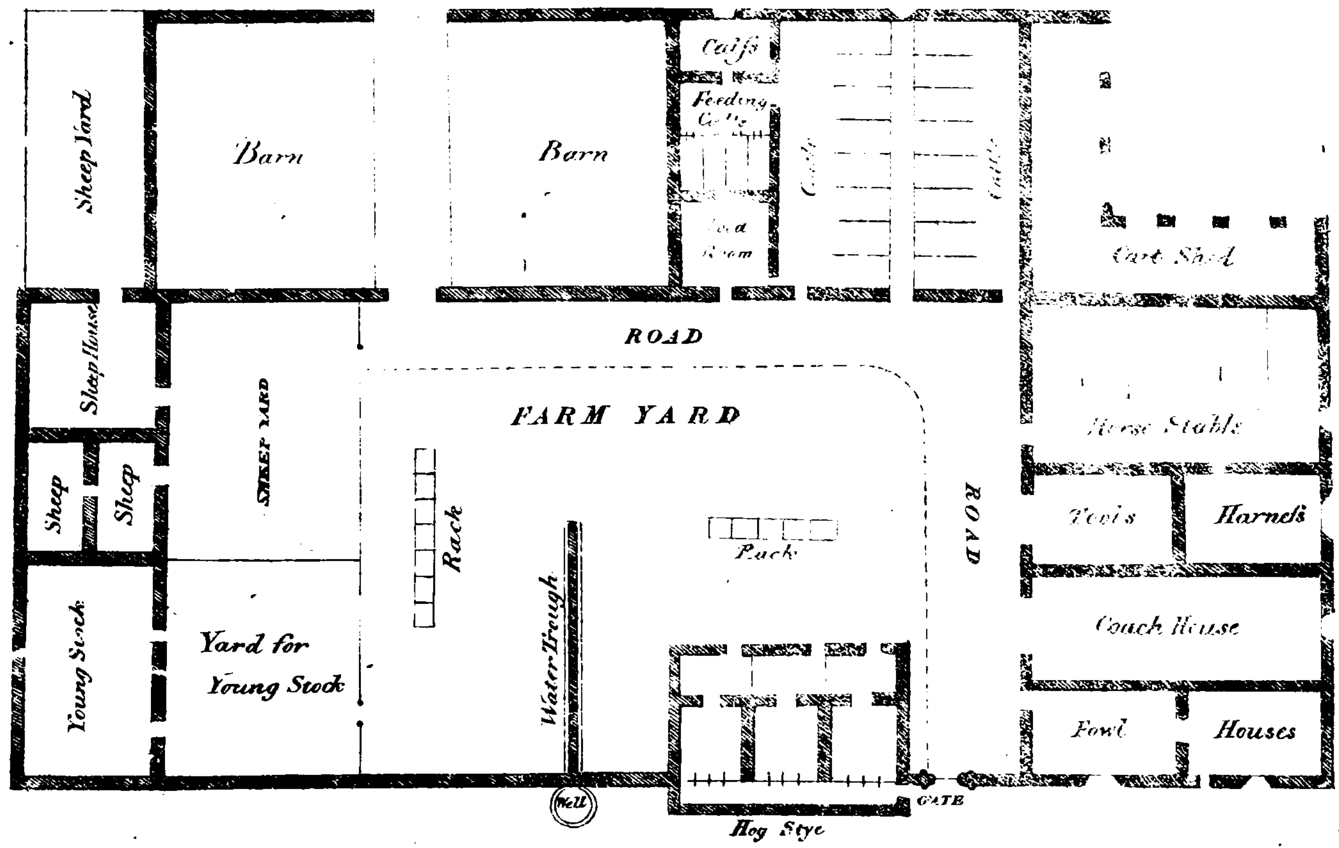

PLAN OF A FARM-YARD AND BUILDINGS.

A

TREATISE

ON THE

THEORY AND PRACTICE

OF

AGRICULTURE,

ADAPTED TO THE

CULTIVATION AND ECONOMY OF THE ANIMAL AND VEGETABLE PRODUCTIONS OF AGRICULTURE

IN CANADA;

WITH A CONCISE HISTORY OF AGRICULTURE; AND A VIEW OF ITS PRESENT STATE IN SOME OF THE PRINCIPAL COUNTRIES OF THE EARTH, AND PARTICULARLY IN THE BRITISH ISLES, AND IN CANADA.

BY

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PREFACE.

A BOUNTIFUL Providence has furnished Canada with inexhaustible sources of wealth, in her most fertile soil, and climate that is by no means unfavorable for Agriculture. The due improvement of these and other natural advantages, is capable of giving riches and every reasonable enjoyment to her present, and a vastly increased population. A majority of the population of Canada, in the proportion of more than twenty to one, derive their subsistance from agricultural employment, and it is that alone that must afford the direct supply of all their greatest wants; therefore, the importance of agriculture must be obvious to every one who is capable of forming a correct opinion in such matters, and, however despised and neglected, by the wealthy and educated, trade and commerce are only to be regarded as they promote the prosperity of agriculture, and have no other public importance than their subserviency to this end, in this or any other country.

The author hopes he shall be excused for expressing his opinion so decidedly on this subject. It is not a new doctrine. The same opinion has been entertained by many more competent to form a correct judgment than he has any pretensions to.

With the most enlightened nations of the ancients, Agriculture appears to have been in the highest esteem, particularly with the Romans. The elder CATO, thought it not beneath him to write a treatise concerning agriculture, wherein he speaks of its importance in the most favorable terms. VARO, likewise, esteemed to be the most learned of the Romans, employed his pen on the same subject. CICERO bestowed the highest encomiums on agriculture, and seemed to think it *the only occupation suited to a freeman.* COLUMELLA professed to be of the same opinion. The polished VIRGIL, the favorite of a splendid court, did not think it beneath him to employ his talents on the subject of agriculture, and can it be recommended more strongly to the people of Canada, than by reminding them that wherever agriculture has been particularly encouraged in a country, it has ever been considered favorable to a free and liberal form of government—indeed, agriculture cannot thrive under any other than a liberal form of government.

From the acknowledged importance of agriculture, and the great interest that is consequently felt on the subject, in the British Isles, and other countries of Europe, a varied and voluminous mass of knowledge has been accumulated, that would be most useful to every one who would wish to practice the art with success himself, or understand when it was well practiced for him by others. To combine as far as practicable the portion of this knowledge that the author conceives will be most useful and necessary for the study of the Canadian Agriculturist, is the object of the treatise which is now submitted with great deference to the consideration of all those engaged in the art. The sources from which he has made selections, are the modern British and French Authors, of decided reputation and merit, with his own observations and experience, during his early years in the occupancy of extensive farms in Ireland, chiefly as a grazier, and for a period of nearly seventeen years that he has been a farmer in Canada. Several years of the latter period he has had the honor to be Secretary to the District and County of Montreal Agricultural Society.

Not at all anxious about the merit of book-making, any more than personal emolument, the author has selected from a large mass of materials such articles as he thought would be most likely to prove generally useful to Canadian Farmers. Though he may submit the practice and management of agriculture in other countries, he will be cautious in recommending any innovations to farmers here, except those which his own experience in the old Country and in Canada, will warrant him in recommending. It is his earnest desire to induce all who may take the trouble to read his book, to reflect on the subjects submitted for their consideration, and that they will join heartily in adopting and promoting every reasonable and necessary improvement, and thus increase the wealth and resources of the land of their birth, and of their choice.

Convinced as he feels that the produce of agriculture is the only riches that the people of this country can call their own, and which they can never be deprived of, it has often astonished him that men of liberal education should, in general, appear so little to regard its improvement or prosperity ; in fact, it is treated as a subject quite remote from common life, by nearly all who are not engaged in it ; they, perhaps, cannot allow themselves to believe that agriculture alone can furnish the means by which trade and commerce can be carried on successfully in Canada.

If the author is so fortunate as to interest his fellow-countrymen—the people of Canada of every denomination—in the improvement of agriculture, and the encouragement of all such manufactures as can be directly and profitably made from its produce, he will not regret the time he has devoted to this work.

The Author has given a list of the books referred to in this work, the titles of which he did not think it necessary to give in the text. He has also given a table of the agricultural weights and measures of the British Isles, and some of those of France and Canada.

Montreal, January, 1835.

INTRODUCTION.

AGRICULTURE, *in an improved state*, is the judicious cultivation and management of territorial surface, by manual and animal labour, for the production of objects and materials used for the food and service of man, and for various important purposes in the arts, manufactures, and civilized life.

TO A COUNTRY SUCH AS CANADA, possessing fertile lands of almost boundless extent, agriculture is all-important, and, practiced on the most approved system, would abundantly supply all the wants of an industrious population, many fold as numerous as the present, and afford the larger population fully as much of the comforts and enjoyments of life, as the lesser population. AGRICULTURE, *in every country*, and more particularly in this, must be the parent of manufactures and commerce, and the best means of promoting civilization and population,—(witness the present state of savage nations in all parts of the world who have no agriculture.) Hence it is the most universal and useful of arts; and in all countries the most powerful individuals derive their wealth and consequence from their property in land, cultivated by the husbandman.

The recent discoveries in chemistry, the veterinary art, and vegetable physiology, have led to most important improvements in the culture of plants, and breeding and rearing of animals; agriculture is in consequence, no longer an art of labour only, but of science; and, as Marshall observes, "is a subject which viewed in all its branches, and to their fullest extent, is not only the most important and most difficult in rural economies, but in the circle of human arts and sciences."

To promote agricultural improvement, societies have been established in most countries of Europe, and, I believe, in every county of Britain, who, to stimulate cultivators and breeders to exertion, offer premiums, and other honorary rewards. Numerous books on the subject of agricultural improvements have also been published, and have had extensive circulation, offering to every farmer the means of information on every subject connected with his art. The operations of soils and manures—the influence of water—the atmosphere, and the functions of plants and animals, clearly explained—the most improved implements submitted to his judgment, and always to be purchased at a fair price. These advantages must necessarily have had a most beneficial influence on the agriculture of Britain—whether rent-paying farmers were gainers or not.

IN CANADA, *the farmers are generally proprietors*, or may be so, by going on new land, and all the benefits arising from the most improved agriculture, will go to provide comforts or accumulate riches for themselves. This fact ought to be a sufficient stimulant to exertion on the part of Canadian farmers to introduce every improvement that is reasonable and expedient. *It requires more means to live comfortably in Canada now than it did fifty years back.* The artificial wants of the farmer are increased—(and I am far from regretting that they are so)—and his means diminished, in the diminished fertility of the soil of all old cultivated farms. This fertility requires to be restored, which is possible only, by introducing an improved system of husbandry. And, though a farmer should be able to provide means to supply all his actual and artificial wants, his ambition and his duty ought to urge him forward to attain something more. A farmer who systematically consumes annually the produce of his farm, without accumulating some part of the production in stock, in useful improvements, or in money, contributes nothing towards individual or national riches. If our inclinations and endeavors to produce are only equal to our disposition to consume, we can make no saving—no accumulation for settling our families—no capital—no fund for the maintenance of labour.

Accumulation, *applied judiciously to the encouragement of production*, is capable of producing profit. The farmer it enables to employ labour, and extend the quantity of what he produces ; it is, therefore, his duty to use all possible industry to accumulate capital from his savings of production over consumption. But while the accumulation of industry, judiciously employed in productive consumption, or in labour that will pay and yield a profit, is every way desirable, as increasing the individual and national wealth, accumulations, or capital brought into the country, injudiciously or unproductively employed, is exceedingly injurious in a country like this—diminishing capital, and the funds for the employment of productive labour—and, according to Adam Smith, " must necessarily diminish the quantity of that labour, which adds value to the subject on which it is bestowed, and, consequently, the annual produce of the land and labour of the whole country—the *real* wealth and revenue of its inhabitants." Though there may be some instances of accumulations or capital being so employed here, it is well there are not many—and, unlike the countries of Europe, there are few of the inhabitants of Canada who, strictly speaking, are unproductive consumers, or, such as consume for the support and enjoyment of existence, without adding anything to the gross produce of society.

In England, *accumulations created chiefly by her industry*, could not be purchased by several times the amount of all the bullion that existed in the world. They are exhibited in various improvements throughout the country—in her cities, towns and villages—her manufactures, commerce and shipping, and more particularly in her judicious expenditure upon great public objects that afford facilities for cheap and expeditious intercourse, and for individual accumulations, that are not to be found in any other country—and truly the industry of her people must be great, that could accomplish such vast accumulations under a heavy pressure of taxation, to pay the interest of the National Debt, that is almost beyond calculation, and support an unemployed pauper population at an expense of many millions annually.

Here *we possess ample resources for production*, that would afford great savings to be made over the necessary consumption, for accumulation. The best means to facilitate national or individual accumulations, is to enlighten the great body of the people, to teach them " what they are, what they are able to do, and what they ought to do," in order that they may apply their labour and skill in the most proper and efficient way to production. We may assure ourselves, that the more professional skill of every sort is based upon real knowledge, the more productive will be the industry of every class.

It is therefore, through education first, and then the diffusion of useful and practical knowledge among the people, that the power of labour can be most effectually exerted, and our natural circumstances most completely taken advantage of; it is this that would enable every man to apply the best powers of his mind and body, to improve the condition of himself and his family.

The industry of an enlightened people, left free, is all that ought to be necessary to secure the comfort and true happiness of a community so circumstanced; but a people uninstructed, are incapable of applying their labour or industry in the most judicious and effectual manner, to insure individual or general happiness and prosperity.

In *this country, where capital is wanted*, how desirable it would be, that we should exert ourselves to make accumulations from our own industry, and improved management in agriculture; to produce this capital, not to remain unemployed, but to be again applied, to new productions for new accumulations. How delightful it would be to see this application of the accumulations of our industry, in wide extended improvements of new lands for the settlement of our families, in well cultivated fields, yielding abundant and excellent crops—numerous and well fed flocks and herds—comfortable residences for all classes—increasing towns, villages, trade, manufactures and commerce—rail-roads, and other roads to facilitate intercourse, and *endowments for education*. The means to accomplish all this is in our own power, if we will only make them available. We are not, and I hope we never shall be, overwhelmed with high rents, tithes, taxes, and pauperism, to check our industry, and diminish its produce. The farmers of Canada may become the most independent of their class in the British empire—if they will only introduce such improvements in their system of agriculture, and application of its produce, as reason and experience, interest and policy, will point out.

It is agriculture, and agriculture alone, that can support the inhabitants of such a country as this in plenty and real dignity. If our lands are covered with corn, and cattle—corn and cattle will always purchase what manufactures and delicacies we may require from other countries.

I do not believe that there is a community in the world, all the members of which might enjoy that degree of comparative independence and comfort, necessary to real happiness, more certainly, than the farmers of this country. Such a community, where the extremes of riches and grandeur and the wretchedness of pauperism are never contrasted, will ever be the most desirable for Canada. There is a most commendable trait in the character of Canadian farmers—that they are not addicted to show or extravagance—a quality that it would be well for all farmers who come to settle among them to imitate, so far as would be consistent with the reasonable comforts and enjoyments of life. It is very possible that money may be expended in a manner that does not contribute to the comfort or real happiness of the farmer or his family, that if applied in another way, would give conveniencies and respectability to both. The farmer who is economical in his personal expenses, that he may better secure the comfort and settlement of his family, will ever be useful, and respected in the community of which he is a member.

THOUGH *the science of Agriculture has been greatly improved* within the last forty years and further progress may be possible, yet it is probable that the limit of the highest state of cultivation is not so far distant as we may suppose it to be in arts and manufactures, where new combinations of materials and machinery is adding to the former excellence of the article produced. In articles the produce of agriculture, science and industry have not the same advantage. Climate and soil are the main instruments by which all vegetation is raised—man has no controul over the first, and much less over the last than is generally supposed. There is in every soil a certain power of production, technically termed, the staple of the land, which evidently forms the boundary of attempted improvements.—Over working, even with manures, may, in this country, or in any other country where irrigation is not practiced, be applied to an extent that may be injurious, when employed beyond the measure which the state and strength of the land require—the crops of corn are not increased in quantity, nor do they improve in quality; the ear is thin and short, and the grain inferior. This is peculiarly true as to thin, light soils. Deep ploughing, and turning up gradually new soil, (where it is of sufficient depth to allow it,) and incorporating it with the soil previously cultivated, will greatly improve lands that have been long and constantly cropped—though pasturing of such lands would be certainly the best means of restoring fertility, and the ingredients that are required in a soil to produce profitable crops.

THERE *can be no question that farmers here* have yet much to learn, that would materially contribute to their advantage—but, I am aware of the difficulty that exists at present of properly instructing them, or effecting the improvement of agriculture, that is so desirable. Prejudices, that are perfectly natural, and that are entertained by farmers in a greater degree than any other class of men all over the world, are not easily eradicated, or new practices introduced—particularly where farmers are little in the habit of reading the practices or results of agriculture in other countries. Indeed there are no works published in Canada for the general reading of farmers, that are calculated to instruct them in the theory or practice of an improved and profitable system of agriculture, suitable to the climate and circumstances of the country. I hope I shall be pardoned for presuming *partly* to supply this want, and that I may experience the forbearance and indulgence of all those who may discover the errors and inaccuracies that will, no doubt, appear in the work.

It requires caution in recommending new experiments to farmers.—They should try them upon a small scale, unless they have succeeded in circumstances similar to those under which they are proposed to be introduced; and should I, in the following pages, recommend any changes that farmers cannot reconcile with reason and experience, let them by all means be cautious of adopting them, without first proving them by experiments on a small scale. All experienced farmers must allow, that the power and capacity of a soil for production, the best mode of working it, and extracting the greatest return at the least expense, can only be ascertained by actual trial for many years ; and that the external appearance of the land, and even the growing crops, cannot be relied upon as sufficient indications of its value. Strangers coming to a country, should, therefore, be very cautious in condemning the practice of the country, followed by successive generations, and which may have originated in the nature of the soil, climate, or in local circumstances ; and if new comers will reject the entire system they find in operation, and adopt entirely that of another country, they will find themselves as far wrong as if they had fallen in with the system of the country they come to.

Agriculture must ever be influenced by climate, the character of the earth's surface, and by the form of government which prevails. How the latter may affect the improvement of the agriculture of Canada, I do not feel myself called upon to give an opinion in this place, more than to say that security and rational liberty, at a moderate price, are essential to the prosperity of agriculture in this, and every other country ; but climate, and the character of the earth's surface, have a material effect on cultivation and management, which is scarcely in the power of man to controul.

I shall endeavor to make this treatise useful to the farmers of Canada, or at least to that portion of them who may have had less experience in the theory or practice of agriculture than myself; and those who may feel that it is possible for them yet to learn something useful, however extensive their acquirements may be already, may find something to interest them in my book.

With this purpose in view, I shall, in the first part, give a short view of the origin, progress, and present state of agriculture among some of the ancient and modern nations, particularly Britain, France, Flanders, the United States, &c. I am aware the past state of agriculture can do little more than gratify the curiosity; not so its present state, which is calculated both to excite our curiosity and affect our interests. There is probably no country that I shall refer to that does not possess some animal or vegetable production, or pursue some mode of culture or management, that might be beneficially introduced into Canada ; but with the exception of the countries I have named, and parts of Italy and Switzerland, there are no very interesting reports of Europe with which I am acquainted at present. The second part will exhibit a concise view of the science of agriculture, and the principles on which the operations and results of agriculture are grounded. The third and remaining parts, will apply these principles to the practice of agriculture, adapting them to the climate and local circumstances of Canada, and conclude with a few observations on the portion of the trade and commerce of this country, in which I conceive farmers to be directly or indirectly interested.

When I have copied from the authors I have named, I hope I shall be excused for employing better language than my own. Though my book is partly composed from my own observations and experience, as a practical farmer, yet it is chiefly a compilation from other books, selected to suit the practice of agriculture in Canada.

LIST OF BOOKS REFERRED TO,

The titles of which are not given in the text.

Encyclopædia of Agriculture, by J. C. Loudon, F. L. G. Z. & H. S. &c., 1833, the best work that has been published on Agriculture.
Penny Cyclopædia 1834.
Encyclopædia Britannica, seventh edition.
Edinburgh Encyclopædia, American edition.
Falconer on Climate, &c.—Cully on Live Stock.
Reports of Select Farmers in England and Scotland.
Penny Magazine.—Chaptal, Agriculture of France, &c.
Code of Agriculture.—Curwen's Letters.
Lambert's Rural Affairs of Ireland.
Davy's Elements of Agricultural Chemistry, &c.
Ellis's Practical Farmer.—Complete Grazier, 1830.
Lawson's Farmers' Practical Instructor.—Farmers' Magazine.
Farmers' Journal—Marshall's Rural Economy.
Bridgewater Treatise on Chemistry, &c., by Prout.
Naismith's General View of Agriculture.
Annals of Agriculture.—New England Farmer.
Transactions of the Society of Arts, &c.
Jacob on the Trade of Corn, and on the Agriculture of Northern Europe, 1834.
Transactions of the Highland Society of Scotland.
Forsyth's Treatise on Fruit Trees, &c.
General View of the Agriculture of the county of Ayr.

From some of these works the author has copied largely what he conceived useful, in better language than his own.

AGRICULTURAL WEIGHTS AND MEASURES.

As a source of reference to the readers of agricultural works published in Britain, I think it will be useful to give a comparative view of the land and corn measures of England, Ireland, and Scotland, and of Lower Canada.

Land Measure.

English acre, 4840 square yards—Scotland, 6150 yards—Irish acre, 7840 square yards. Ten English acres make about $7\frac{869}{1000}$ Scotch acres, and $6\frac{173}{1000}$ acres Irish. The arpent of Lower Canada is 3600 square yards French measure, equal to $4083\frac{3}{4}$ English square yards—or 10 English acres are equal to 11 Canadian arpents, and 3479 square yards remaining—or 10 English acres make about $11\frac{7}{8}$th arpents Canadian. One hundred acres English are nearly one hundred and nineteen arpents Canadian.

Road Measure.

English mile - -	1760	yards English—	100 English miles are equal to about 87 Scotch miles, and $78\frac{1}{2}$ Irish miles.
Mile geographical	2025	do. do.	
Scotch mile, - -	1984	do. do.	
Irish mile, - -	2240	do. do.	

French league of 2000 toises, equal to -	4263	English yards—	
League of 25 to a degree equal to	4860	do.	do.
League marine, equal to - - -	6076	do.	do.
German mile, geographical, equal to - -	8101	do.	do.

Long Measure.

The English foot is the same in Ireland and Scotland, and is 12 English inches. The French and Canadian foot is $12\frac{78}{100}$ English inches—100 English feet are equal to $93\frac{9}{10}$ French feet.

Corn Measure.

English Bushel 2150-4 cubic inches, eight of which bushels make an English quarter—Scotch ferlot of wheat, 2193-3 cubic inches, 7-827 are equal to an English quarter—Scotch ferlot of barley 3205-5 cubic inches, 5-389 are equal to an English quarter. In Ireland, corn is sold by weight. The Canadian minot is equal to 2381-184 cubic inches English, or 100 Canadian minots are equal to $110\frac{3}{4}$ Winchester bushels.

By the law of 1826, one measure only was to be adopted, called the Imperial Gallon; this gallon was to measure $277\frac{274}{1000}$ cubic inches, and to weigh 10 lbs. avoirdupois of water, at the temperature of 62 degrees of Fahrenheit's thermometer, the barometer being at thirty inches. The Imperial Bushel is to measure and weigh eight times the above, and all divisions of the same in proportion.

The stone is generally 14lbs. avoirdupois, but for butcher's meat or fish, it is 8lbs.—hence the hundred equals 8 stone of 14 lbs., or 14 stone of 8 lbs A stone of glass is 5 lbs.—a seam of glass 24 stone, or 120 lbs. Hay and straw are sold by the load of 36 trusses. The truss of hay weighs 56 lbs., and of straw 36 lbs.; the truss of new hay 60 lbs. until the 1st September—the hay is by that time become dry, and the same quantity weighs less.

Weights of Cheese and Butter.

8	lbs	1 clove
32	cloves	1 wey in Essex
42	do.	1 do. in Suffolk
56	lbs	1 firkin of butter.
8	lbs	1 stone of beef, mutton, &c
$7\frac{1}{2}$	lbs of oil	1 gallon
8	lbs of vinegar,	1 gallon
36	lbs of straw,	1 truss
60	lbs of new hay,	1 do.
56	lbs of old hay,	1 do.
36	trusses of hay or straw,	one load
7	lbs of salt,	1 gallon
56	lbs or 8 gallons,	1 bushel

Long Measure.

3 barley corns,	1	inch
12 inchs - - -	1	foot
3 feet - - -	1	yard
$5\frac{1}{2}$ yards - - -	1	pole or rod
40 poles - - -	1	furlong
8 furlongs - -	1	mile
3 miles - -	1	league
60 geographichal, or $69\frac{1}{2}$ English miles, one degree.		

Besides the above, there are the palm, which equals 3 inches; the hand, 4 inches; the span, 9 inches, and the fathom 6 feet.

Wool Weight.

7	pounds	one clove
2	cloves	one stone
2	stone	one tod
6½	tods	one wey
2	weys	one sack
12	sacks	one last

Square Measure.

144	inches -	1 square foot
9	square feet	1 square yard
30¼	square yds.	1 square pole
40	square poles	1 square rood
4	roods - -	1 acre.

100 acres was in England called a hide of land, and 640 acres a mile of land.

Cubic or Solid Measure.

1727 cubic inches 1 cubic foot—27 cubic feet, 1 cubic yard.

40 feet of rough timber, or 50 feet hewn timber, one load or ton—42 cubic feet, one ton of shipping.

By cubic measure, marble, stone, timber, masonry, and all artificial works of length, breath and thickness, are measured ; and also the contents of all measures of capacity, both liquid and dry.

Dry Measure.

4 gills	1	pint
2 pints	1	quart
2 quarts	1	pottle
2 pottles	1	gallon
2 gallons	1	peck
4 pecks	1	bushel
4 bushels	1	coom
2 cooms	1	quarter
5 quarters	1	wey or load
2 weys	1	last

Coal Measure.

4 pecks	1	bushel
3 bushels	1	sack
3 sacks	1	vat
4 vats	1	chaldron
21 chaldr's.	1	score.

The Manchester bushel, which is the legal measure in England for corn and seeds, should be 18½ inches wide, and 8 inches deep. Its contents will, therefore, be 2150-42 inches. Corn and seeds are measured in London by striking the bushel from the brim, with a round piece or light wood, of equal thickness from one end to the other—all other dry goods are heaped.

The dimensions of the Imperial standard bushel are as follows :—The outer diameter 19½ inches and in the inner diameter 18½. The depth is 8¼, and the height of the cove, for heaped measures, is 6 inches. Hence the contents of the stricker Imperial bushel are 2218-192 cubic inches, and it is to weigh 80 lbs avoirdupois of water. The contents of the imperial heaped bushel are 2818-4887 cubic inches—the subdivision in the same proportion.

In some markets corn is sold by weight,—throughout Ireland it is the case ; and it is much the fairest mode of dealing. In some markets in England where measures are used, it is customary to weigh certain measures, and regulate the prices accordingly. The average bushel of wheat is generally reckoned at 60 lbs.—of barley 49 lbs.—of oats 38 lbs —peas 64 lbs.—beans 63 lbs.—clover 68 lbs.—rye 53 lbs. A load of corn for a man is reckoned five bushels, and a cart load 40 bushels.—The coal bushel holds one Winchester quart more than the Winchester corn bushel, and is to be heaped in form of a cone, 6 inches above the brim—the outside of the bushel to form the extremity of the base of such cone ; potatoes and all other goods that are commonly sold by heaped measures, are to be measured in the same way.

In Upper Canada, the weights and measures are, I believe, the same as in England. The Canadian quintal is 112 lbs. avoirdupois. The bundle of hay 16 lbs., and of straw 12 lbs. The 100 bundles of hay are equal to 14 cwt. 1 qr. 4 lbs., or about 28 English trusses; 100 bundles of straw are equal to 10 cwt. 2 qrs. 24 lbs., or about 33 English trusses. In France, the common pound equals 1 lb. 1 oz. 10¼ drams avoirdupois, and the French quintal 1 cwt. 3 qrs. 25 lb. nearly equal to 100 kilogrammes, of 2 lb. 3 oz. 4½ drams English, to the kilogramme.

The scale for measuring heat by the thermometer of Fahrenheit, marks the freezing point at 32°, and the boiling point at 180° above or 212°. This is the one employed in England and in this country, and to which reference is always made in this work. In France, what is called the *Cintigrade* thermometer is generally adopted. In this, the freezing point is marked 0°, and the boiling point 100. *Reaumur's* scale is also much adopted—the freezing point, as in the Cintigrade, is 0°, but the boiling point is only 80°. It is to be regretted that the different graduations should exist, as they cause considerable trouble and confusion. It is a remarkable fact that the barometer or weather-glass varies between the tropics only one third of an inch; within temperate climates the changes amount to three inches.

HISTORY OF

AGRICULTURE,

AMONG THE

ANCIENT AND MODERN NATIONS.

PART I.

In the beginning God created the earth ; clothed it with trees, shrubs, plants and flowers ; every plant in a state of perfection, with its seed in itself; stocked the earth with various kinds of animals ; and when all these things were prepared, created MAN, and introduced him into a beautiful world, and everything was pronounced to be very good. The world was made perfect, and all the various parts which composed it. The earth produced its fruits spontaneously ; the soil, without being torn and tormented, would have sufficiently satisfied all the wants and desires of man, and other animals. The happiness and plenty of this golden age, or man's first state in Paradise, must have been beyond our conception. The condition of the full and continued enjoyment of all these blessings was obedience in man ; and failing in this, judgment was pronounced on him ; the ground was cursed for his sake, that henceforth it should bring forth thorns and thistles ; and that man should obtain his bread by the sweat of his brow, till he return to the dust from which he was taken.

The ground cursed by God, lost its original fertility, and produced thorns and thistles, making it necessary for man to cultivate, dress, and dung it, in order to its producing him the means of subsistence. Accordingly Cain, the son of Adam, we are informed, was a tiller of the ground, and the first agriculturist. Though great the change that was made in the earth, at the fall of man, it is supposed to have still more altered for the worse at the general Deluge. The fossil remains of the plants and animals that have been lately discovered, prove beyond a doubt that these plants and animals must have existed in a climate and on a soil materially different from that in which their remains are found.

The number of mankind of the antediluvian world, was supposed to be vastly superior to the present population of the earth, or to what the earth would be capable of sustaining now, not being considered so fruitful or luxuriant as the antediluvian was. From the length of the lives of the inhabitants of the earth before the Deluge, it is extremely probable their number was much greater than at the present day ; and if so, they must have been well acquainted with the art of agriculture ; such a population could not have found sustenance from spontaneous fruits, and the flesh of animals. After the general Deluge, for some ages, until the inhabitants of the earth became numerous, agriculture may not have been thought necessary; and, consequently, not much attended to.—Pasturage of animals, hunting, fishing, fruits and roots, were probably more resorted to than raising of corn. It was the opinion of Sir Isaac Newton, that corn was first cultivated in Egypt, after the Deluge, on the banks of the Nile, the annual inundation of that river carrying down mud and slime, with which it covered the ground, made it exceedingly fruitful, without any other manure. The Egyptians had not the laborious task of ploughing, digging, or breaking the clods, but when the river was retired, they had no more to do than to mingle a little sand with the earth, to abate its strength; after which, they could sow with little pains, and almost without charge. They sowed ordinarily in October and November, as the waters fell; and their harvest was in March and April. The same soil produced in the same year three or four different sorts of garden stuffs. Whether the culture of corn was first invented in Egypt or not, after the Deluge, all testimonies concur that cultivation was carried to a higher degree of perfection there than in any other country of antiquity; other nations derived their means of subsistence from it. Wherever the water of the river could be procured, even by artificial means, the land was never idle, and produced three crops annually; the rice produced eighty for one seed.

Of the history of agriculture we have few records previous to the time of the Romans. That people considerably improved the art, and extended its practice with their conquests. After the fall of the Roman empire, agriculture was neglected, and continued so very generally in Europe till the sixteenth century.

The greatest men among the Romans applied themselves to the study of agriculture; and, though in the knowledge of the theory of agriculture, the Roman cultivators were inferior to our modern improvers; yet in attention to circumstances, exactness of execution and in economical management, they were greatly superior. With the Romans, it was considered that a farmer should be perfectly acquainted with every kind of work proper on his farm, and the season for performing it, and also be a perfect judge how much work, both without and within doors, ought to be performed by any number of servants and cattle in a given time, the knowledge of which is highly useful to a farmer of the present day, and what very few perfectly acquire. The Romans were sensible that good ploughing was the best culture of land, however rude the instrument was that they made use of, compared with the scientifically constructed plough of modern times. Fallowing was invariably practised among the Romans, who well understood that the object was, "to let the earth feel the cold of winter and the sun of summer; to invert the soil and render it free, light, and clear of weeds, so that it could more easily afford nourishment." Manuring the soil was held in high esteem by them. It was collected from every source, and ploughed into the soil, and otherwise judiciously applied. They also ploughed in green herbage as manure, and applied lime for the same purpose. They used a reaping machine worked by a man and an ox, that cut down large fields of corn in a day.

They had a sort of thrashing machine, composed of rollers, which was dragged over the corn on the floor. They well understood and practiced the use of the hoe in weeding ; and the operation of draining was particularly attended to by them. Indeed their agricultural operations appear to differ little from the practice of modern times. The animals raised by the Romans were the same kinds as at present. The care of poultry, which must have been very profitable, was chiefly committed to the wife of the farmer. When Rome was at her greatest height, in the time of the Cæsars, the minor articles of farm produce bore a very high price : pea-fowls were for £1 13s. 4d. ; an egg at 3s. 4d. A farm sometimes produced as many of these fowls as to sell for £500. Lucullus's fish pond, on account of the quality of fish, sold for £33,333 6 8.

The maxims of farm management among the Romans, are well worthy to be observed by farmers of the present day. " To sow less, and plough better," is one which is strongly and frequently recommended : another—" wherever the eyes of the master most frequently approach, there is the greatest increase"—and the Rev. A. Dickson very justly remarks—" though every person knows that the presence and attention of the master is of great importance in every business ; yet every person does not know that in no business are they so important as in farming."

Ostentatious or profuse culture was not less condemned than imperfect culture, and this fact, all farmers coming from the Old Country to Canada, would do well to remember. Consumption of unproductive labour or capital is injurious to individual and general interests, under the present circumstances of this country.

Pliny says—" The ancients assert that nothing turns to less account than to give land a great deal of culture. To cultivate well is necessary ; to cultivate in an extraordinary manner is hurtful." In what manner then, " he asks," are lands to be cultivated to the best advantage ?" to this he answers—" in the cheapest manner, if it be good."

Industry is recommended by numerous maxims. " The ancients considered him a bad husbandman who buys what his farm can produce to him ; a bad master of a family, who does in the day time what he might do at night, except in the time of a storm ; and, a worse than all, who on a good day is employed more within doors than in the field."

Kindness to servants is strongly recommended. Knowledge in matters relative to agriculture is inculcated by all the rustic authors.— " Whoever," says Columella, " would be perfect in the science, must be well acquainted with the qualities of soils and plants ; must not be ignorant of the various climates, that so he may know what is agreeable, and what is repugnant to each ; he must know exactly the succession of the seasons, and the nature of each, lest, beginning his work when showers and wind are just at hand, his labour shall be lost. He must be capable to observe exactly the present temper of the sky and seasons ; for these are not always regular, nor in every year does the summer and winter bring the same kind of weather, nor is the spring always rainy, and the autumn wet. To know these things before they happen without a very good capacity, and the greatest care to acquire knowledge, is, in my opinion, in the power of no man. Virgil adds to this—" Before we plough a field to which we are strangers, we must be careful to attain a knowledge of the winds, from what point they blow at particular seasons, and when and from whence they are most violent; the nature of the climate, which in different places is very different; the customs of our forefathers; the qualities of the different soils, and what are the crops that each country and climate produces and rejects."

Making experiments is very strongly recommended by Varro, who says—"Nature has pointed out to us two paths which lead to the knowledge of agriculture—viz., experience and imitation. The ancient husbandmen, by making experiments, have established many maxims.—Their posterity for the most part, imitate them. We ought to do both, imitate others, and make experiments ourselves, not directed by chance, but reason." All experienced farmers must be aware of the difficulty to discuss satisfactorily the produce and profit of agriculture. The farmer may know the rent the land is worth, and the price of the seed sown, but the quantity of labour required to bring forth the produce, depends so much on seasons, accidents, and other circumstances, to which agriculture is more liable than any other art, that its value or cost price cannot easily be determined. It was a common mode of estimating the profits of farming, by the numerical returns of the seed sown; but this is a most fallacious ground of judgment, since the quantity of seed given to lands of different qualities, and of different conditions, is very different; and the acre, which, properly cultivated and sown with only a bushel of seed, returns from twenty or thirty to one, or perhaps more, yet may yield no more real profit, than land which, being in middling condition, received from two to four bushels of seed to the acre, and yields from five to ten for one.

The returns for seed sown, mentioned by the ancients, are extraordinary. Isaac's sowing and reaping at Gerar, received a hundred for one. In Mark's Gospel, "good seed sown on good ground is said to bring forth in some places thirty, in others forty, in others sixty, and in others even an hundred-fold." Varro informs us that an hundred-fold was reaped about Garada in Syria, and Byzacium, in Africa. Pliny adds, that from the last place, were sent to Augustus by his factor four hundred stalks from one grain, and to Nero, three hundred and forty stalks; he says, that the soil of this field, "when dry, the stoutest oxen could not plough; but after rain I have seen it opened up by a share, drawn by a wretched ass on the one side, and an old woman on the other." According to Herodotus, the soil of Babylon was rich, well cultivated, and yielded three or four hundred for one.

The price of land in the time of Pliny, was twenty-five years' purchase, and it was common to receive four per cent. for capital so invested.

In the ages of anarchy, which succeeded the fall of the Roman power, agriculture was nearly abandoned in Europe. In troublesome times pasturage is always preferred to tillage, because cattle and sheep may be driven away and concealed at the approach of the enemy; but growing crops would be exposed to every plunder. During the Anglo Saxon dynasty in England, the cultivation of land was not much attended to; but the Island abounded in numerous flocks and herds. One of their laws prohibited from ploughing with horses, and restricted to oxen. It was also enacted that no man should guide the plough who could not make one ; and the driver should make the ropes with which it was drawn, with twisted willows.

At the conquest of England by the Normans, many thousands of husbandmen from the fertile and well cultivated plains of Flanders, France and Normandy, settled in the island, and greatly contributed to the improvement of its agriculture. William the Conqueror is said to have been fond of agriculture, and to have conducted his improvements with skill and success. The Norman Barons, on coming to England, were great improvers of the land, and are celebrated in history for their skill in agriculture, enclosing, draining, and banking. The Norman clergy, and particularly the monks, were still greater improvers than the nobility, and their lands were conspicuous for their superior cultivation and management. The monks superintended their cultivation, and frequently assisted with their own hands. The famous St. Thomas Becket, after he was Archbishop of Canterbury, it is said, used to go out to the field, with the monks of the monasteries where he happened to reside, and join with them in reaping their corn, and making their hay.

In the 14th century a law was passed in England prohibiting any stallion under a certain height and description from going at large, for fear of deteriorating the breed of horses ; another law, that horses should be put to grass from the 15th of May to the 15th of October, except those belonging to gentlemen of 1000 marks yearly rent. The vine was cultivated in England for a considerable period, commenced by the monks after the Norman conquest ; the vineyards in the vale of Gloucester are said to have produced wine little inferior to that of France.

In Scotland the cultivation of the land was still more neglected than in England. In 1454, a law was passed that every labourer of "simple estate," dig a piece of ground daily of seven feet square ; another law in 1457, that farmers who had eight oxen, should sow every year a bushel of wheat, half a bushel of peas, and forty beans, under pain of ten shillings, to be paid to the baron ; and if the baron did not do the same thing to the lands in his possession, he should pay the same penalty to the king.

During the fifteenth and sixteenth centuries the agriculture of Scotland continued to languish. The profession of a soldier was regarded as of more importance than that of a culitvator of land : but on the ecclesiastical lands, a better system of agriculture was introduced, and the tenants on these lands were much more comfortably circumstanced than the tenants of the turbulent laymen.

The Reformation rather checked than promoted the improvement of agriculture, as it took husbandry out of the hands of the monks, the only class of people who practiced it on anything near correct principles.—Scotland was much benefited by the soldiers of Cromwell, who were chiefly English yeomen, well acquainted with husbandry ; and, like the Romans of a former period, were studious to improve and enlighten the nations which they had subdued, they introduced considerable improvement in the agriculture of Scotland.

About the middle of the 16th century agriculture began to be studied, as a science, in the principal countries of Europe. The works of Crescenzio, in Italy, Olivier de Serres in France, Heresbach in Germany, Herrera in Spain, and Fitzherbert in England, all published about the same period, supplied the materials of study, and led to improved practices among the reading agriculturists.

About the middle of the century following, Harte observes—"Almost all the European nations, by a sort of tacit consent, applied themselves to the study of agriculture, and continued to do so, more or less, even amidst the universal confusion that soon succeeded." During the 18th century, the march of agriculture has been progressive throughout Europe, with little exception, particularly in some districts in Italy, in the Netherlands, and in Great Britain. In Spain, Hungary, Poland, and Russia, it is still in a very backward state.

AGRICULTURE OF ITALY.

Italy has long been represented as the most interesting country in Europe, in respect to its rural economy. Its climate, soil, and surface, are so various, as to give rise to a greater variety of culture, than is to be found throughout the rest of Europe. The climate of Italy gives it a decided advantage in an agricultural point of view, particularly in the northern districts, where the cool temperature, according to Sismondi, admits of the finest pastures, while, from the warmth of others, the rocky sides of the hills are as productive of grapes and olives, as the plains are in corn. It is the only country in Europe, with the exception of some parts of Spain, where corn, grass, butchers' meat, cheese, butter, rice, silk, cotton, wine, oil, and fruits are produced, all in the highest degree of perfection. Only a fifth of the surface is considered sterile; while only a fifth of the surface of France is considered fertile. The population of Italy is greater in proportion to the surface, than that of either France or Britain.

In Lombardy, the farms are from ten to sixty acres. The landlord pays the taxes, and repairs the buildings; the tenant provides cattle, implements, and seed, and the produce is divided. In some cases the landlord's half is delivered in kind, in others it is valued annually at harvest, and paid in money, or partly in money and partly in produce. Irrigation is the most remarkable feature in the agriculture of Lombardy. The water is not only used for grass lands, which, when fully watered, are mown four, and sometimes five times a year, and in some cases as early as March; but is conducted between the narrow ridges of corn land, in the hollows between drilled crops, among vines, or to flood a foot or more in depth, lands which are sown with rice. It is also used for depositing a surface of mud, in some places where the water is charged with that material, and this is done in the manner they call warping in England. The details of warping for those and other purposes, are given in various works, and collected in those of Professor Re. In general, watered lands let at one third higher than lands unwatered. They plough with two oxen, without a driver or reins. Corn is generally beaten out by a wheel or large fluted cylinder, which is turned in a circular track, somewhat in the manner of a bark-mill.

In Piedmont, the cattle are, in some cases, fed with extraordinary care. They are tied up in stalls—then bled once or twice—cleaned and ubbed with oil—afterwards combed, and brushed twice a day. Their ood in summer is clover, or other green herbage; in winter a mixture of elm leaves, clover-hay, and pulverised walnut cake, over which boiling water is poured, and bran and salt added; where grains can be procured, they are also given. In a short time the cattle cast their hair, grow smooth, round, fat, and so improved as to double their value to the butcher.

Sheep are not common in Lombardy; there are flocks on the mountains, but in the plains only a few are kept, in the manner pigs are kept n England, to eat refuse vegetables. Rice is reckoned the most profitable crop, the next, wheat and millet. The herbage crops cultivated are chiccory, very common in the watered meadows, rib-grass, oat-grass, clovers, lucerne, saintfoin, burnet, and spurry.

In Tuscany, in the arable lands of the plains, the row, and mostly the raised drill culture are generally followed, or the lands are ploughed into beds of three or four feet broad, between which water is introduced in the furrows. Every year a third of the farm is turned over with a spade to double the depth of the plough, so as to bring a new soil tothe surface. The rotation of crops includes a period of three or five years. Wheat, lupines, maize, millet, French beans, turnips, and some other grains, are grown. Lupines are often ploughed in for manure. In Tuscany the cattle are not numerous, but the farmers are assiduous in preserving every particle, both of human and animal manure, and applying it in the most judicious manner. Cattle in the plains are kept constantly in close, warm houses, and fed with weeds, leaves, or whatever can be got. The oxen in Tuscany are all dove coloured. Even those imported from other states, are said to change their coat here.

In the neighbourhood of Vesuvius, in the Neapolitan Territory, or land of ashes, they are said to gather seven ears from one stalk of maize, many of them three palms long.

AGRICULTURE OF SWITZERLAND.

Switzerland is strictly a pastural country. The Swiss cows yield more milk than those of Lombardy, where they are in great demand; but after the third generation their milk falls off. The cows are attracted home from the most distant pastures by a handful of salt, which the shepherd takes from a leathern pouch, hanging over his shoulder. In some parts of Switzerland the cow yields, on an average, twelve English quarts a day; and with forty cows, a cheese of forty-five pounds can be made daily. In the vicinity of Altdorf, they make, in the course of an hundred days, from the 20th of June, two cheeses daily, of twenty-five pounds each, from the milk of eighteen cows. Of the cheese made in Switzerland, and the Parmesan cheese, made in Lombardy, I shall give a particular description under the head, Cheese-making.

At Hofwyl, near Berne, there is an establishment in great part belonging to agriculture, that deserves to be noticed. It was projected by, and is conducted at the sole expense of M. Fellenberg, a proprietor and agriculturist. His object was to apply a sounder system of education for the great body of the people, in order to stop the progress of misery and crime. Fifteen years ago he undertook to systematise domestic education, and to show, on a large scale, how the children of the poor might be best taught, and their labour at the same time most profitably applied.—In short how the first twenty years of a poor man's life might be so employed as to provide both for his support and his education. The peasants in his neighbourhood were at first rather shy of trusting their children for a new experiment ; and, being thus obliged to take his pupils where he could find them, many of the earliest were the sons of vagrants, and literally picked up on the highways ; this is the case with one or two of the most distinguished pupils.

Their treatment is nearly that of children under the paternal roof.—They go out every morning to their work, soon after sun-rise, having first breakfasted, and received a lessson of about an hour ; they return at noon,—dinner takes them half an hour, a lesson of one hour follows, then to work again till six in the evening. On Sunday, the different lessons take six hours instead of two ; and they have butchers' meat on that day only. They are divided into three classes, according to age and strength ; an entry is made in a book every night of the number of hours each class has worked, specifying the sort of labour done, in order that it may be charged to the proper account, each particular crop having an account opened for it, as well as every new building, the live stock, the machines, the schools themselves, &c. &c. In winter, and whenever there is not out-of-door work, the boys plait straw for chairs, make baskets, saw logs with the cross saw, and split them ; thrash and winnow corn, grind colours, knit stockings, or assist the wheel-wrights, and other artificers, of whom there are many employed in the establishment, for all of which different sorts of labour an adequate salary is credited to each boy's class.

The boys scarcely see a newspaper, and seldom a book; they are taught, *viva voce*, a few matters of fact, and rules of practical application. The rest of their education consists chiefly in inculcating habits of industry, frugality, veracity, docility, and mutual kindness, by means of good example, rather than precept, and, above all, by the absence of bad example.

The practicability of this scheme for inculcating individual prudence and practical morality, not only in the agricultural, but in all the operative classes of society, M. Simond considers as demonstrated ; and it only remains to ascertain the extent of its application. Two only of the pupils have left Hofwyl for a place before the end of their time ; and one with M. de Fellenberg's leave, is become chief manager of the immense estates of Count Abaffy, in Hungary, and has, it is said, doubled its proceeds by the improved method of husbandry he has introduced. This young man whose name is Madorly, was originally a beggar boy, and not particularly distinguished at school. Another directs a school at Zurich, and acquits himself to the entire satisfaction of his employers.—M. de Fellenberg has besides a number of pupils of the higher classes, some of whom belong to the first families of Germany, Russia, and Switzerland. They live *en famille* with their master, and are instructed by the different tutors in the theory and practice of agriculture, and in the arts and sciences on which it is founded.

AGRICULTURE OF FRANCE.

That France is the most favourable country in Europe for agriculture, is the opinion of most writers on the subject. For though the country suffered deeply from the wars in which she was engaged, first by a hateful conspiracy of kings, and next by the mad ambition of Bonaparte, the purifying effects of the revolution have indemnified her ten-fold, for all the losses she has sustained. She has come out of the contest with a debt comparatively light, with laws greatly amended, many old abuses destroyed, and with a population more industrious, moral, enlightened, and happy, than she ever had before. The fortunate change which peace has made in her situation, has filled her with a healthy activity which is carrying her forward with rapid strides; she has the most popular, and therefore the most rational, liberal, and beneficial system of government of any state in Europe, Britain not excepted; and, therefore, she is perhaps, in a condition of more sound prosperity than any other state in the old world.

Mr. Jacob's Report of the agriculture of France in 1828, says that "it occupies one of the lowest ranks in that of the northern states of Europe, but the fertility of the soil, the suitableness of the sub-soil and of the surface for aration, and, above all, the excellence of the climate are such as are not united to an equal extent in any other European state. When we consider these circumstances, in connection with the extraordinary exertions now making for the education of the labouring classes, and the no less extraordinary progress that has been made these few years in manufactures, (January, 1829,) it is easy to see that in a few years the territorial riches of France will be augmented to an extraordinary extent.

The climate of France varies. That called the central climate, which admits vines, without being hot enough for maize, Young considers as the finest in the world; and the most eligible part of France or of Europe as to soil. "Here," he says, "you are exempt from the extreme humidity which gives verdure to Normandy and England, and yet equally free from the burning heat which turns verdure itself into a russet brown." This climate however, has its drawbacks, being subject to violent storms of rain and hail, and sometimes to severe spring frosts.—Of the vine and maize climate, an accurate account of the crops and seasons for the district, for twenty years from 1800, was kept, and the result was, that twelve years were fair average crops, four years most abundant, and four years attended with total loss. In the olive climate, insects are incredibly numerous and troublesome, and the locust injurious to corn crops. The olive and maize districts have the advantage of two crops in the year, or at least three crops in two years. The climate of Picardy and Normandy, is nearest that of England, but rather superior; and she possesses great agricultural advantage over England, by means of the vine and olive, which, owing to the climate, may be raised on rocky wastes, and give as valuable produce as the richest soils; and in all the soils of France, weeds may be destroyed without a summer fallow, easily and effectually.

In the 17th century, in the reign of Henry the 4th, French agriculture began to flourish. By a wise ordinance of Sully, permitting a free commerce in corn, great quantities were exported to England in 1621. In 1641, the draining of fens and bogs was encouraged; in 1756, the land tax was taken off newly broken uplands for a space of twenty years.—Mazarine prohibited the exportation of corn, and checked the progress of its culture, and the wars of Louis the 14th, greatly discouraged agriculture, and produced several dearths. Fleury, under Lewis 15th, was no friend to agriculture; but, in 1754, a free trade in corn revived it. About this time agricultural societies were first established in France under the patronage and at the expense of government. In 1761, there were thirteen such societies in France, and nineteen co-operating societies. Du Hamel and Buffon gave eclat to the study of rural economy, and many other writers contributed to its improvement. Some of the English breeds of sheep were introduced by Baron de Mortemart.

The agriculture of France in 1819, as compared with what it was in 1789, presents, Chaptal observes, astonishing improvements. Crops of every kind cover the soil, numerous and robust animals are employed in labouring it, and they also enrich it by their manure. The country population are lodged in commodious habitations, decently clothed, and abundantly nourished with wholesome food. The misery which existed in France, in former times, when properties of immense extent supported little more than a single family, is banished, and its place supplied by ease and liberty. We are not to suppose, however, the same author observes, that the agriculture of France has arrived at perfection; much still remains to be done; new plans of improvement should be more generally introduced; and a greater quantity of live stock is wanted for every province of France, except two or three which abound in natural meadows. Few domains have more than half the requisite number of labouring cattle, the necessary result of which is a deficiency of labour, of manure, and of crop. The only mode of remedying these evils is, to multiply the artificial pastures, and to increase the cultivation of plants of forage.—Abundance of forage is, indeed, the foundation of every good system of agriculture, as a proper succession of crops is the foundation of abundance of forage. The rich inhabitants of France have already adopted these principles, but they have not yet found their way among the lower class of cultivators. According to M. Dupin, four-fifths of the peasantry of France are proprietors of land, which they cultivate themselves; and, though they are at present very ignorant, yet knowledge of every kind is rapidly advancing. The wages of labour in France, compared with the price of corn, is calculated to be higher than the wages paid to labourers in England.

The system of letting land to *métayers*, who give the landlord one half of the produce, is said to be too deeply rooted in France to be easily or speedily altered, and is considered one of the greatest impediments to the improvement of French agriculture. The *Revue Trimestrielle*, or French Quarterly Review, for April, 1828, observes, "that in a large part of the kingdom, in all the central provinces, regular farmers are hardly known; that a large proportion of this part of the soil of France is cultivated by *métayers* who engage to occupy the land for a period of three years, and to cultivate it, paying half the produce to the proprietor as rent. The proprietor supplies the stock, indispensable to its petty farming and the grain required for the first sowing, as also the support of the *métayer* and his family until the first harvest. The *métayer* works, sows, and reaps, and he and his family feed on the produce, after which the proprietor gets the remainder. Sometimes even a middleman, under the name of a farmer, is interposed between the landlord and the *métayer*." The introduction of these middlemen has, of course, a tendency to increase the obstructionsto improvement, which appears to be a necessary condition of the *métayer* system in its best form. Even in those provinces where leases are in practice, their duration is considered too short to enable the farmer to indemnify himself for the outlay which the introduction of new methods of cultivation would require.

The lands in France are not generally enclosed and subdivided by hedges or other fences—some fences are to be seen near towns and the northern parts of the kingdom, but in general, the whole country is open, the boundaries of estates being marked by slight ditches or ridges, occasionally stones, heaps of earth, rows of trees, or occasional trees. Depredations from passengers on the highways, are prevented by *gardes champêtres*, which are established throughout all France. Farms are sometimes compact and distinct, but generally scattered, and often alternating in the common field-manner of England, or run-rig of Scotland The farm houses of large farms are generally placed on the lands ; those of smaller ones in villages, often at some distance. The value of landed property is generally lower than in England. At present, (1829), it is sold at from twenty-two to twenty-six years purchase.

The farming land in France, naturally divides itself into three kinds, first, the grand culture, in which from two to twelve ploughs are employed, and corn chiefly cultivated ; second, the middle culture, who also grow corn, but more frequently rear live stock, maintain a dairy, or produce silk, wine, cider, or oil, according to the climate in which they are situated ; and the third, the minor culture, or that which is done by manual labour, and into which live stock or cows do not enter. The middle culture is by far the most common. There are few farms of six or eight ploughs in France, and equally few farmers who do not labour in person, at all times of the year.

The corn farming of France is carried on in the best manner in French Flanders, Picardy, and Brie. The first may be considered as equally well cultivated with Suffolk. The crops of these districts are wheat, maize, beans, turnips and buckwheat. The most frequent rotations are, two corn crops and a fallow, or an alternation of corn and green, or pulse crops, without a naked fallow. After lands have borne crops, it is usual to let them rest a year or two, during which they produce nothing but grass and weeds, and they are afterwards broken up with a naked fallow. Potatoes enter more or less into the field culture of the greater part of France, and especially of the northern districts, but in Provence, and some parts of Languedoc, they are still little known. Irrigation, both of arable and grass lands, is adopted wherever it is practicable. It is common in the Vosges, and remarkably well conducted in the lands round Avignon, formerly for many miles the property of the church.

The meadows of France contain nearly the same herbage, plants, and grasses as those of England ; but, though clovers and lucernes are cultivated in many places, yet rye-grass and other grasses, either for hay crops or temporary or permanent pasture, are not generally resorted to. During summer, in the hottest districts, sheep are fed in the night, and housed in the heat of the day. Hay is the general winter food, in parts of Picardy climate, turnips. A great part of the sheep of France are said to be black. Bonaparte monopolized the breeding of merinos. This breed is now much on the increase.

Beasts of labour are chiefly the ox, on small farms, and the horse on the larger. Both are kept under cover the greater part of the year; oxen are generally cream coloured. Normandy furnishes the best breed of working horses, as Limosin does of those for the saddle. A royal stud of Arabians have been kept in Limosin, for a century, and another was lately formed near Nismes. Studs of English horses and mixed breeds of high blood, have been established by government in several departments.

The best dairies are in Normandy; but in this department France does not excel. In the southern districts, olive, almond, and poppy oil supply the place of butter, and goats' milk is that used in cooking.

The goats of Thibet, have been imported by M. Ternaux, who has been successful in multiplying them, and in manufacturing the hair.

Poultry is an important article of French husbandry, and well understood as far as breeding and feeding. The breed of swine are in general not good. The plough of Normandy resembles the large wheel plough of Kent; farther south, they are mostly without wheels. Iron mould boards are rare. Harrows are generally of wood. Large farmers in Normandy plough with four or six oxen; small ones with two; but where stiff soils are to be worked, they join together and form a team of four or six cattle. The corn is threshed out with the flail, or by the tread of horses. Farmers, as was already observed, perform most of their operations without extra labourers, and their wives and daughters reap, thresh, and perform almost every part of the farm and garden work indifferently. From small farmers residing together in villages, a traveller in France may pass through ten or twenty miles of corn fields, without seeing a single farm house. The labourers and tradesmen employed on large farms are frequently paid in kind.

All plants cultivated by the British farmer, are also grown in France. The turnip not generally; in the warm districts scarcely at all, as they do not bulb; but it is questionable if it did bulb, whether, in these districts it would be so valuable as the lucerne or clover, which grows all winter, or the potatoe, from which flour is now made extensively. Of plants not usually cultivated on British farms, chiccory is cultivated in France, for green food, and a hardy kind of red wheat, called *spelt*, which grows in the worst soil and climate. They grow millet, the dura or douro of Egypt.

A remarkable feature in the agriculture of France and in most warm countries, is the use of leaves of trees as food for cattle; mulberry, olive, poplar, vine, and other leaves, are gathered in autumn, when they begin to change colour, and acquire a sweetness of taste; spray is cut green in July, and dried in the sun or in the shade of trees in the woods, faggoted, and stacked for winter use. During the season they are given to sheep and cattle like hay, and sometimes, boiled with grains or bran, to cows.

The astringency of some sorts of leaves, such as the oak, is esteemed medicinal, especially for sheep.

In the warm climate of France, beans are the grain of the poor, and are mixed with wheat for bread ; maize, however, is the principal food of the people. The chick pea is cultivated, and is used as food. Such is an outline of the agriculture of France.

The agriculture of the low countries, especially Flanders, has been celebrated by the rest of Europe for upwards of 600 years ; Holland, for its pasturage, and the Netherlands for tillage. The climate of Holland is cold and moist. The surface of the country towards the sea is low and marshy, and of the interior sandy, and naturally barren. The soil in the low districts is a rich, deep, sandy mud, sometimes alluvial, but more frequently silicious, and mixed with rotten shells. The soil of the inland provinces is, in general, a brown or black sand, naturally poor, and, for whatever it is productive, is indebted entirely to art.

The landed property of Holland is in moderate, or rather small divisions ; in the richer parts, generally in farms of from twenty to one hundred and fifty or two hundred acres ; often farmed by the proprietor. In the interior provinces, both estates and farms are much larger, some farms from five to seven hundred acres, partly in tillage, wood, and pasture.

The agriculture of Holland is chiefly a system of pasturage and dairy management, for the production of butter and cheese, the latter well known in every part of the world. Almost the only objects of tillage are, some madder, tobacco, and herbage plants and roots, for stall feeding the cattle. The pastures, and especially the lower meadows, produce a coarse grass, but in great abundance. The cows are allowed to graze at least a part of the day throughout the greater part of the year, but are generally fed in sheds once a day or oftener, with rape-cake and grains, and a great variety of other preparations. Their manure is preserved with the greatest care, and the animals themselves are kept perfectly clean. The breed is large, small legged, generally red and white, with long slender horns ; they are well known in England as the Dutch breed. The ashes of towns are collected and sold at high prices, chiefly to the Flemings. The field implements and operations of Holland, are more ingeniously contrived, and better executed than those of any other country on the continent. The farmeries, cow-houses, and stables are remarkable for arrangements which facilitate and economise manual labour, and ensure comfort to the animals, and general cleanliness. Even the fences and gates are generally found in a better state than in most other countries. So early as the thirteenth century, the culture of the low countries, both agricultural and horticultural, has been looked up to by the rest of Europe.

The Flemings have ever dealt more in the practice of husbandry than in publishing books upon the subject ; so that, doubtless, their intention was to carry on a private lucrative trade without instructing their neighbours ; and hence it happened that whoever wanted to copy their agriculture, was obliged to travel into their country, and make his own remarks.

To make a farm resemble a garden as nearly as possible was their principal idea of husbandry. Such an excellent principle, at first setting out led them of course to cultivate small estates only, which they kept free from weeds, continually turning the ground, and manuring it plentifully and judiciously. Having thus brought the soil to a just degree of cleanliness, health and sweetness, they ventured chiefly upon the culture of the most delicate grasses, as the surest means of acquiring wealth in husbandry upon a small scale, without the expense of keeping many draught horses, or servants. After a few years' experience, they found that ten acres of the best vegetables for feeding cattle, properly cultivated, would maintain a larger stock of grazing animals than forty acres of common farm grass ; and the vegetables they chiefly cultivated for the purpose were, lucerne, saintfoin, trefoils of most denominations, sweet fenngreek, buck and cow wheat, field turnips and spurry, by them called marian grass.

The political secret of Flemish husbandry was, letting farms on improvement. Add to this, they discovered eight or ten new sorts of manures. They were the first among the moderns who ploughed in living crops for the purpose of fertilising the earth, and confined their sheep at night in large sheds, built on purpose, the floors of which were covered with sand or earth, &c. which the shepherd carted away every morning to the compost dunghill. Such was the chief mystery of the Flemish husbandry.

The present state of agriculture in the Netherlands, is probably nearly the same it has been for a thousand years. Sir John Sinclair visited the country with a view to its rural economy ; so has the Rev. Thomas Radcliff. I shall select the leading features of Flemish farming, for such Canadian farmers as wish to receive a most valuable lecture on the importance of a proper frugality and economy in farming, as well as judicious modes of culture.

The climate of Flanders may be considered the same as that of Holland, and not very different from that of the low parts on the opposite coast of England. The surface of the country is everywhere flat, or very gently elevated, and extensive tracts have been recovered from the sea. The soil is in most parts poor, generally sandy ; but, in various parts, of a loamy or clayey nature. The best soil is near Ostend, the worst between Bruges and Ghent, being little better than pure sand.

Landed property inFlanders is not in very large estates. Few amount to 2,000 acres, and proprietors very frequently cultivate their own estates. Estates are everywhere enclosed with hedges, and fields are generally small.

Farmeries are convenient, and generally more ample, in proportion to the extent of the farm, than in England. On the large farms, a distillery, oil-mill, and sometimes a flour-mill is added to the usual accommodations. The farm house, with an arched dairy, an apartment for churning, with an adjoining one for a horse to turn the churning machinery. A small building for the use of extra labourers, with a fire place for cooking, and other buildings in proportion to the farm. Urine cisterns are found in the field, to receive the purchased liquid manure ; but for that made in the farm yard, generally under the stables or in the yard. In the first case the urine is conducted from each stall to a common grating, through which it descends into the vault, whence it is taken up by a pump. In the best regulated farmeries, there is a partition in the cistern, with a valve to admit the contents of the first space into the second, to be preserved there from the more recent additions, age rendering it considerably more efficacious. This species of manure is relied on beyond any other, upon all the light soils throughout Flanders ; and, even upon the strong lands, (originally so rich as to preclude the necessity of manure,) it is now coming into great esteem, being considered applicable to most crops, and to all the varieties of soil.

Fallows, according to Sir John Sinclair, are in a great measure abolished, even on strong land, by means of which, produce is increased, and the expense of cultivation, on the crops raised in the course of a rotation, necessarily diminished ; and by the great profit they derive from their flax and rape, they can afford to sell all their crops of grain at a lower rate. The Flemish farmers, however, understand their interest too well to abolish naked fallows on strong clayey soils, in a humid climate.

The Flemish farmers carefully adopt the succession and distribution of crops to the quality of the soil. Upon the first quality of the soil, the succession is as follows :—First year, barley ; second, beans ; third, wheat ; fourth, oats, and the fifth, fallow. For the second quality of soil, the succession is as follows :—First year, wheat ; second, beans or tares ; third, wheat or oats ; fourth, fallow. For the third quality of soil, the succession is as follows :—First year, wheat ; second, fallow ; third, wheat ; fourth, fallow.

The polders, or embanked lands of Flanders, are not included in the three qualities of soil before mentioned, but are of a still better quality. They are lands reclaimed from the sea, and once secured from the influx of the tide, become the most productive soil, without requiring the assistance of any description of manure. The polders near Ostend, containing about 1,300 acres, let for about £2 15s. the English acre ; the usual rotation on these lands are rape, winter barley, and beans, and occasionally peas and tares are introduced. Sometimes beans and peas are sowed mixed. A most excellent plan.

On a good loam of a yellowish colour, mixed with some sand, the produce is wheat, barley, oats, hops, tobacco, meadow, rape seed, and flax, as primary crops ; and, as secondary, buck-wheat, beans, turnips, potatoes, carrots, and clover.

Another soil, a good sandy loam, of a light colour, and in a superior state of cultivation, is relied on to give a sure and profitable return. Succession as follows :—1st, wheat, with dung ; 2d, clover, with ashes, and sometimes sand ; 3d, flax, with urine and rape cake ; 4th, wheat, with dung and sweepings ; 5th, potatoes, with farm-yard dung ; 6th rye, with urine ; 7th, rape, with urine and rape-cake ; 8th, potatoes with dung ; 9th, wheat, with manure of divers kinds.

There are other parts of the country where the poverty of soil, and abundance of produce bear ample testimony to the skill and perseverance of the Flemish farmers. In the fifteenth century, this soil consisted of poor light sand, and barren gravel and heaths. This soil produces now, rye, flax, potatoes, oats, buck-wheat, rape-seed, clover, carrots and turnips, generally, and wheat in favorable spots.

Where the soil is capable of yielding wheat, there are two modes of rotation : one comprising a nine years' course, in which wheat is but once introduced ; and the other a ten years' course, in which they contrive to produce the crop a second time; but in neither instance without manure, which, indeed, is never omitted in these divisions, except for buck-wheat, and occasionally for rye. The course alluded to above, is as follows :—

1. Potatoes or carrots, with four ploughings, and dung.
2. Flax, with two ploughings, and 105 Winchester bushels of ashes, and 48 hogsheads, beer measure, urine per acre.
3. Wheat, two ploughings, 10½ tons farm yard dung the acre.
4. Rye and turnips, two ploughings, same quantity of dung as the last, the English acre.
5. Oats, with clover, same ploughings and quantity of dung.
6. Clover, top dressed, with 105 bushels of ashes the acre.
7. Rye, one ploughing, with 52 hogsheads of night soil and urine, the acre.
8. Oats, two ploughings, dressing, same as the last.
9. Buck-wheat, four ploughings, without any manure.

The drill husbandry has never been very generally introduced in the low countries.

Wheat is not often diseased in Flanders. Most farmers change their seed, and others in several places steep it in salt water or urine, and copperas, or verdigris. The proportion of verdigris is half a pound to every six bushels of seed ; and the time which the latter remains in the mixture is three hours, or one hour if cows' urine be used, because of its ammonia, which is considered injurious. The ripest and plumpest seed is always preferred.

Rye is grown both as a bread corn, and for the distillery. In Flanders, frequently, and in Brabant generally, the farmer upon a scale of from one hundred to two hundred acres of light soil, is also a distiller, purely for the manure of the beasts for the improvement of the land, the beasts being fed upon the straw of the rye, and the grains of the distillery.

Rape is much cultivated in Flanders, for seed, and feed for stock ; but the climate of Canada is unsuitable, from the severe winters.

The frequent manuring given by the Flemish farmer astonishes a stranger ; the sources whence it is obtained in sufficient quantity form the difficulty, and this can only be resolved by referring to the practice of *soiling*, &c. the numerous towns and villages, and to the care with which every particle of vegetable or animal refuse is saved for this purpose. Manure in Flanders, as in China, is an article of trade. The selling price of each description is easily ascertained. The towns let the cleaning of the streets, and the public retiring places, at great rents. Chaptal says there are in every town sworn brokers, expressly for the purpose of valuing night soil ; and that these brokers know the exact degree of fermentation in that manure which suits every kind of vegetable at the different periods of growth.

Every substance that constitutes, or is convertible to manure, is sought after with avidity, which accounts for the extreme cleanliness of the Flemish towns and pavements, hourly resorted to with brooms and barrows, as a source of profit. Even the chips which accumulate in the formation of the wooden shoes, worn by the peasantry, are made to constitute a part of the compost dung heap; and trees are frequently cultivated in barren lands, merely to remain till their deciduous leaves shall, in course of time, have formed an artificial surface for the purpose of cultivation. The manures in general use are—the farm yard dung, which is a mixture of every matter that the farm yard produces, formed into a compost, which consists of dung and litter from the stables, chaff, sweepings, straw, sludge, and rubbish, all collected in a hollow part of the yard, so prepared as to prevent the juices from being wasted; and the value of this, by the cart load of 1500 lbs. of Ghent, is estimated at five francs. The dung of sheep, pigeons, or poultry, by the same cart load, five francs and a half. Sweeping of streets and roads, same quantity, three francs. Ashes of peat and wood, mixed, same quantity, eight francs. Privy manure and urine, same quantity, seven francs. Lime, same quantity, twenty-four francs. Rape cake, per hundred cakes, fifteen francs.

Gypsum, sea weed, and the sediments of the canals, have been all tried experimentally, and with fair results; but the two former have been merely tried; the latter has been used successfully in the vicinity of Bruges.

Bone manure was altogether unknown in Flanders; but, at the suggestion of Radcliff, is now under experiment in that country The agricultural implements of Flanders, are by no means such as the excellence of the Flemish culture would lead us to expect. They are generally rudely constructed.

Agricultural operations of every kind are performed with particular care in Flanders. The soils are frequently ploughed for sake of pulverization as well as cleanliness, in strong soil, and in the lighter, for the destruction of weeds, and blending the manure with the soil. But, considering that but one pair of horses is, in general, allowed to about thirty acres, it is surprising how, (with the execution of all the other farming work,) time can be found for the number of ploughings which is universally given.—Very generally the number, for the various crops, respectively, is as follows:—

For wheat, two ploughings, with two harrowings.

Rye, two or three	do.	do.	Barley,	three	do. do.
Oats, three -	- do.	do.	Tobacco,	four, two harrowings.	
Potatoes, four	- do.	do.	Hemp,	four, two	do.
Carrots, four	- do.	do.	Turnips,	three, three do.	
Flax, two	- do.	do.	Spurry,	do.	do.
Buck-wheat, four	do.	do.	Beans,	two,	two do.
Rape, three	- do.	do,	Fallow,	four or five, and same of harrowing.	

Trenching with the spade, as practiced in Tuscany, is a feature peculiar to that country and Flanders. The depth of the operation varies with the soil, but is generally nearly two feet.

The live stock of Flanders, are not managed or improved as well as might be expected, from their extraordinary attention to the tillage culture. The working breed of horses is excellent. The shoeing of horses in Flanders is attended to with particular care, and in that country has long been practiced the mode of preserving the bars of the hoof, and of letting the frog come in contact with the ground, recommended in England, by Freeman, and Professor Colman. To prevent ripping, the hoofs of the fore feet are pared away toward the toe, and the shoes so fitted that the fore part shall not touch, (within three-fourths of an inch,) the same level surface, upon which the heel and middle of the shoe shall rest. This preparation of the foot is in general use, and the horses are not thereby in any degree injured, and are particularly sure footed. The other point of difference is, that the shoe is nailed on flat and close to the foot, which, in depriving the iron of all spring, and all unequal pressure against the nails, may be, in part, the cause of the durability of the shoeing.

The food for one cow in winter, for twenty-four hours, is, straw, eighteen pounds, turnips, sixty pounds ; some farmers boil the turnips for them, others give them raw, chopping them with the spade ; in lieu of turnips, potatoes, carrots, and grains are occasionally used. Bean straw is likewise given, and uniformly a white drink, prepared both for cows and horses, consisting of water, in which some oil cake has been dissolved, whitened with rye meal, oatmeal, or the flour of buckwheat. For the sake of cleanliness, the tails of the cows are tied to the roof of the cow house with a cord, during the time of milking. The cow houses, both in Flanders and Holland, are kept remarkably clean and warm. The Dutch are particularly averse to unfolding the secrets of their dairy management ; and, notwithstanding the pointed queries of Sir John Sinclair on the subject, no satisfactory idea was given him of their mode of manufacturing butter or cheese.

At a certain season of the year, catterpillars attack the trees, and every farmer is obliged to destroy them, upon his own premises, to the satisfaction of the mayor of his particular commune, or to pay the cost of having it done for him.

The domestic circumstances of the Flemish farmer and his servants, are depicted by Radcliff, in a favorable point of view. "Nothing," he says "tends more to the uniform advancement of good farming than a certain degree of ease and comfort, in those who occupy the soil, and in the labouring classes whom they employ. Without it, an irregular, speculative, and anticipatory extraction of produce, always followed by eventual loss, is resorted to, in order to meet the emergencies and difficulties of the moment ; whereas, under different circumstances, the successive returns of a well regulated course becomes the farmer's object, rather than the forced profit of a single year ; and whilst he himself is thus intrinsically served, his landlord is secured, and his ground ameliorated. The laborious industry of the Flemish farmer, is recruited by intervals of decent and comfortable refreshment, and the farm servants are treated with kindness and respect ; they partake of their master's fare, except in his refreshments of tea, coffee and beer.

The Flemish farmer seldom amasses riches, but he is rarely afflicted by poverty. Industry and frugality are his characteristics. He never looks beyond the enjoyment of moderate comforts ; abstains from spirituous liquors, however easily to be procured. Beggars are scarcely to be seen except in towns, and few even there; industry saves them from this.

The want of a sufficient supply of manure must make it necessary to lay down arable land to pasture for a time, and then break it up again. This was first practiced in a regular rotation, in Holstein, and Macklenburg, and raised these countries rapidly amongst agricultural nations.

In Holstein, on moderately good soil, they adopt the following course: 1st, oats, on newly broken up grass land. 2nd, a fallow, to destroy grasses and weeds, and accelerate the decomposition of their roots.—3rd, wheat, with or without manure, according to the state of the land. 4th, beans, barley, or oats. 5th, wheat, manured, unless it has been done for the beans the year before. 6th, grass seeds, pastured for three years or more, when the rotation begins again.

A Macklenburg rotation consists of—1st, beans, with manure, or potatoes. 2nd, wheat or oats. 3rd, barley or oats, unless sown the year before. 4th, peas or tares, manured. 5th, wheat. 6th, white clover, and grass seeds, which were sown among the wheat the year before, and are kept in pasture the 7th and 8th. There is no fallow, and in a moist climate, it will be difficult to keep the land clear. It might, however, be easily introduced, as in the Holstein rotation.

Another rotation is—1st, oats; 2nd, beans, well manured; 3rd, wheat; 4th, tares, manured; 5th, barley; 6th, clover and grass seeds, mown for hay and green fodder; 7th and 8th, ditto, fed. All these are excellent for a moderately good soil, well managed. If the soil is very rich, the following is the most profitable rotation of any:—1st, rape seed, well manured; 2nd, wheat; 3rd, beans or potatoes, manured and hoed; 4th, barley; 5th, clover; 6th, wheat; 7th, oats, with white clover and grass seeds, pastured two or three years. The principal object in this convertible system is, to lay the lands down in good heart, and as clear of weeds as possible; the grass will then be abundant, and continue good for several years. Liquid manure carried upon it in spring, will so enrich it as to admit of making the crop into hay, or cutting it green for the cattle in the stables. In light soils, the tread of sheep and cattle is of great use; in heavy, wet soils, they do much harm. This rotation is not suitable for wet land.

In Prussia, until very lately, agriculture was in a backward state. The present government have, however, done much for its improvement. About twenty-four years ago, the Agricultural Institution of *Moegelin* on the Oder, conducted by the late Von Thaer, justly celebrated in Germany, as an agricultural writer, was founded. This institution was visited by Jacob, in 1819. From his *Travels*, the following account is taken.

The agricultural institution of *Moegelin*, is situated in the country or march of Brandenburg, about forty-five miles from Berlin. The chief professor, Von Thaer, was formerly a medical practitioner at Celle, near Luneburg, in the kingdom of Hanover, and had distinguished himself by the translation of various agricultural works from the French and English, and by editing a magazine of Rural Economy. About the year 1804, the king of Prussia invited him to settle in his dominions, and gave him the estate of Moegelin to improve and manage as a pattern farm. The estate consists of 1200 acres. Thaer began by erecting extensive buildings for himself, three professors, a variety of tradesmen, the requisite agricultural buildings, and a distillery. The three professors are: one for mathematics, chemistry, and geology; one for veterinary knowledge, and a third for botany, and the use of the different vegetable productions in the materia medica, as well as for entomology. Besides these, an experienced agriculturist is engaged, whose office it is to point out to the pupils the mode of applying the sciences to the practical business of husbandry. The course commences in September. During the winter months, the time is occupied in mathematics, and the first six books of Euclid are studied; and in the summer, the geometrical knowledge is practically applied to the measurement of land, timber, buildings, and other objects. The first principles of chemistry are unfolded. By a good, but economical apparatus, various experiments are made, both on a large and a small scale. For the larger experiments, the brew-house and still-house, with their respective fixtures, are found highly useful. Much attention is paid to the analyzation of various soils, and the different kinds, with the native quality of their component parts, are arranged with great order and regularity.

The classification is made with neatness, by having the specimens of soil arranged in order, and distinguished by different colours. This classification of Von Thaer is as much adopted, and as commonly used on the large estates of Germany, where exact statistical accounts are kept, as the classification of Linnæus in natural history, is throughout the civilized world.

There is a large botanic garden, kept in excellent order, a herbarium of dried plants, skeletons of the different animals, and casts of their several parts, which are open to the examination of the pupils, models of agricultural implements, as well as those of common use in Germany, in England, and in other countries.

The various implements used on the farm, are all made by tradesmen residing round the institution, in workshops open to the pupils, who are encouraged to inspect them attentively.

The sum paid by each pupil is four hundred rix-dollars annually, besides which, they provide their own beds and breakfast. This expense precludes the admission of all but youths of good fortune. Each pupil has a separate apartment. Jacob's opinion of the institution was, that an attempt is made to crowd too much instruction into too short a compass, as many of the pupils spend only one year in the institution, a period by no means sufficient.

The soil of the farm at Moegelin, is light and sandy, and the climate cold. The wheat is put in the ground with a drill of Thaer's invention, which sows and covers nine rows at once, and is drawn by two horses. The saving of seed, Thaer considered the only circumstance which makes drilling preferable to sowing broadcast, as far as respects wheat, rye, barley, or oats. The average produce of wheat is sixteen bushels to the acre; but not much is sown in Prussia, as rye is the bread corn of the country, and produces with Thaer, twenty two bushels and a half to the acre. The usual rotation of crops is: potatoes or peas, rye, clover, and wheat. Winter tares are killed by the frost; and the summer species come to nothing, owing to the dry soil and drought. Potatoes are a favorite crop. The small tubered, common in France and Germany, are preferred, as they contain more starch, in proportion to bulk, than the large kinds. Thaer maintains, that beyond a certain size, the increase of the the potatoe is only water, and not nutriment. The produce per acre, is 300 bushels, or 5 tons, which Thaer contends, contain more nutriment than twenty tons of turnips, because the proportion of starch in potatoes to that in turnips, is more than four to one. The soil is excellent for turnips; but the long series of dry weather, common on the Continent in the beginning of summer, renders them one of the most uncertain of crops.

A brewery and distillery, are the necessary accompaniments of every large farming establishment in Germany. The result of many experiments in the latter, proved that the same quantity of alcohol is produced from one hundred bushels of potatoes, as from twenty-four bushels of wheat, or thirty-three of barley. As the produce of grain or of pota'oes, are relatively greater, the distillery is regulated by that proportion. Von Thaer found, after many trials, that the most profitable vegetable from which sugar could be made, was the common garden turnip, which produced sugar, equal in strength of sweetness, and those refined, in colour and hardness, to any produced from the sugar cane of the tropics.

Von Thaer has brought the wool of his sheep, by various crosses from selected merinos, to greater fineness than any clipped in Spain; but, improvement in the carcass has been neglected, and the mutton, like most in Germany, is but indifferent. The celebrity of the Moegelin sheep is so widely diffused, that the ewes and rams are sold at enormous prices. The cows kept on the farm, are fed on potatoes and chopped straw, and are in good condition, when in full milk, yielding from five to six pounds of butter weekly; but the farm not being suitable for cattle, no more are kept than is necessary for the instruction of the pupils.

The land is ploughed with a well constructed plough, cleanly and straightly, from six to seven inches deep, with a pair of oxen, whose usual work is about one acre and a quarter per day.

The threshing machine is rarely used, except to show the pupils the principle on which it is constructed, and the effect it produces; but, having neither wind or water to work it, the flail is almost exclusively used. The threshers receive the sixteenth bushel for their labour. The rate of wages is four groschen a day to labourers, winter and summer, besides which, they are provided with habitations and fuel. The women receive from two to three groschens according to their strength and skill.

The present king of Prussia has done much for agriculture, and is said to design more by lessening the feudal claims of the lords; by permitting the estates, even of kingly tenure, to be purchased by burghers and non-nobles; by simplifying the modes of conveyance and investiture; by setting an example of renouncing most of the feudal dues on his vast patrimonial estates; and by making good communications by roads, rivers, and canals through his extensive territories.—[*Jacob's Travels.*]

I believe it is not necessary to give any more of the history of agriculture on the Continent of Europe, than I have done. The practice of agriculture in most of the remaining European states, even at the present day, could not be very interesting or instructive to the farmers of Canada. Throughout the vast empire of Russia, agriculture is in a backward state, though the soil of many of its provinces is of the very best description; so fertile as to produce thirty-fold, cultivated in the most imperfect manner.

The climate of a part of Russia is very similar to that of Lower Canada; and the winters have the same ameliorating effects upon the cultivation soil in both countries. The Russian farmer is described as sowing his oats, his rye, or his millet, in wastes which have never been dunged; he throws down the seed as if he meant it for the birds to pick up; he then takes a plough and scratches the earth, and a second horse following with a harrow, terminates the work; the bounty of nature supplies the want of skill, and an abundant crop is produced. This applies to to the greater part of Russia and Siberia.

In no other part of Europe are the field operations performed with so much facility as in Russia; not only from the light nature of the soil, but from the severity and long continuance of the winters, which both pulverizes the surface, fertilizes the soil, and destroys weeds. In no country of Europe, can corn crops be raised at so little expense of labour as in Russia; and as no more than one crop can be got in the year, in almost any country, so Russia may be said to be, and actually is, even with her imperfect cultivation, better able to raise immense quantities of corn than any part of the world, except perhaps, similar parts of North America.

ACRICULTURE OF ASIA.

The agriculture of Asia is of a very different character from that of Europe, owing chiefly to the great difference of climate. Agriculture in this division of the globe is chiefly of two kinds, water culture, and pasturage. Very little can be done without artificial watering, except in the northern and mountainous parts, where the climate resembles that of Europe. Even the palm and other fruit trees are watered and regularly irrigated in India. The grand bread corn of Asia is rice, a watered grain; and the most valuable fruits, those of the palm family; the most useful agricultural labourer is the ox, and his species are also the most valuable as pasturage animals.

In Persia, Arabia, and Hindooston, no arable culture is carried on without artificial watering. Rice, wheat, barley, maize, millet, beans, and lentils, the cotton plant, sugar cane, and indigo, are cultivated with great industry and success. They have two harvests in the year, the first in April, the other in September.

AGRICULTURE OF CHINA.

In the Chinese Empire, agricultural improvement has, in all ages, been encouraged and *honored*. The husbandman is considered an honorable as well as a useful member of society; he ranks next to men of letters or officers of state, of whom he is frequently the progenitor. The soldier in China, cultivates the ground. The priests also are agriculturists, whenever their convents are endowed with land.

China produces almost every useful vegetable of Europe, or the rest of the world; and it has some peculiar to itself. The chief articles of diet are vegetables. Rice is the common grain of the country; swine the most abundant live stock; and tea the chief plant of export. They cultivate a species of white cabbage called, *petsai*, which is consumed as human food, to an immense extent over the whole empire; and Dr. Abel thinks it may be considered to the Chinese, what the potatoe is to the Irish. Boiled, it has the flavour of asparagus; and raw, it eats like lettuce, and is not inferior. It often weighs from fifteen to twenty pounds, and reaches the height of two or three feet. It is kept fresh during the winter by burying it in the earth. Almost all vegetables used in medicine, as well as indigo, sugar cane, and tobacco, are cultivated. Tobacco is in universal use, by all ages, and both sexes. The Chinese are sparing in the use of animal food. The broad-tailed sheep, kept in the hilly parts of the country, the hog, and the duck, are the animals most esteemed, perhaps because they can be kept at the cheapest rate.

In Chinese agriculture, the great objects to be procured are water and manure. The former is raised from wells by chain-pumps, worked by oxen, and by buckets worked by long levers, exactly similar to those in use for the same purpose in Canada, and distributed over the cultivated surface in the usual manner. Manure is obtained from every conceivable source.

The object of their tillage, Livingstone observes, "appears to be, in the first instance, to expose the soil as extensively as possible; and this is best effected by throwing it up in large masses, in which state it is allowed to remain till it is finally prepared for planting. When sufficient rain has fallen to allow the husbandman to flood his fields, they are all laid under water, in which state they are commonly ploughed again, in the same manner as for fallow, and then a rake, or rather a sort of harrow, about three feet by four, with one row of teeth, is drawn by the same animal that draws the plough through the soil to break the lumps, and to convert it into a kind of ooze; and as the teeth of the harrow are set at only from two to three inches apart, it serves, at the same time, very effectually to remove roots, and otherwise to clean the ground. For some purposes the ground thus prepared is allowed to dry; it is then formed into beds or trenches; the beds are made of a convenient size for watering and laying in munure. The intermediate trenches are commonly about nine inches deep, and of the necessary breadth to give to the beds the required elevation; but when the trenches are wanted for the cultivation of water plants, some part of the soil is removed, so that the trenches may be formed of the proper dimensions.

The collection of manure is an object of so much attention with the Chinese, that a prodigious number of old men, women and children, incapable of much other labour, are constantly employed about the streets, public roads, banks of canals and rivers, with baskets tied before them, and holding in their hands small wooden rakes, to pick up the dung of animals, and offals of any kind that may answer the purpose of manure; this is mixed sparingly with a portion of stiff loamy earth, and formed in-

› cakes, dried afterwards in the sun. It sometimes becomes an object f commerce, and is sold to farmers, who never employ it in a common ate. Their first care is to construct very large cisterns, for containing, esides those cakes, dung of every kind, all sorts of vegetable matter, as :aves, roots, or stems of plants, with mud from the canals, and offals of nimals, even to the shavings collected by barbers; with all these they nix as much animal water as can be procured, or common water suffi- ient to dilute the whole; and, in this state, generally in the act of putrid ermentation, they apply it to the ploughed earth. In various parts of a arm, and near paths and roads, reservoirs are made to collect all matter hat is capable of producing manure; and the quantity of manure collect- d by every means is still inadequate to the demand.

Wood ashes, and that made from burned weeds, is considered by the Chinese, the very best manure, and is mixed with other matter in forming omposition to spread on fields, or apply to individual plants. The laster of old kitchens is much esteemed as manure; and a farmer will eplaster a cook-house for the old plaster, so that he may employ it to ertilize his fields. Night soil is greatly valued by the Chinese. The ung and urine of animals is collected with great care, and used mixed nd separately. Horns and bones reduced to powder, hemp and other eeds from which oil has been expressed, small crabs, the feathers of owls, soot, sweepings of streets, stagnant contents of common sewers, ll rank as manure, and are carried to a great distance, if water carriage an be obtained. Lime is chiefly employed for destroying insects; the Chinese are however, aware of its fertilizing qualities.

The Chinese often manure the plant rather than the soil. The nature of he climate justifies this laborious but economical practice. Rain com- nonly falls in such quantities and with such force, as to wash away all he soluble parts of the soil, and the manure on which its fertility is sup- osed to depend. It is therefore proper that the Chinese husbandman hould reserve the necessary nourishment of the plant to be applied at he proper time. For this purpose, reservoirs of the requisite dimen- ions are constructed in the corner of every field, or other convenient lace.

The manure applied to plants as they advance to maturity, is often changed. The mixture of soils is said to be a common practice as a ubstitute for manure. They are constantly changing earth from one iece of ground to another; mixing sand with that which appears too ad- hesive, and loam where the soil appears to be too loose, &c. They di- ect their drills and ridges from north to south, if circumstances will al- ow it; certainly a desirable practice. Before they sow, the seeds are tept in liquid manure till they germinate. I shall here notice the nation- l agricultural fete of the Chinese. Every year, on the fifteenth day of he first moon, which generally corresponds to some day in the beginning of our March, the Emperor, in person, goes through the ceremony of opening the ground; he repairs in great state to the field appointed for he ceremony; the princes of the imperial family, the presidents of the ive great tribunals, and an immense number of mandarins attend him. Two sides of the field are lined with the officers of the Emperor's house, he third by the different mandarins, the fourth is reserved for all the labourers of the province, who repair thither to see their art honored and practiced by the head of the empire. The Emperor enters the field alone, prostrates himself, and touches the ground nine times with his head in adoration of *Tien*, the God of Heaven. He pronounces with a loud voice a prayer prepared by the court of ceremonies, in which he invokes the blessing of the Great Being on his labour, and on that of his whole people ; then, in the capacity of chief priest of the empire, he sacrifices an ox, in homage to heaven as the fountain of all good. While the victim is offered on the altar, a plough is brought to the Emperor, to which is yoked a pair of oxen, ornamented in a most magnificent style. The prince lays aside his imperial robes, lays hold of the handle of the plough with his right hand, and opens several furrows in the direction of north and south ; then gives the plough into the hands of the chief mandarii , who, labouring in succession, display their comparative dexterity. The ceremony concludes with a distribution of money and pieces of cloth, as presents among the labourers ; the ablest of whom execute the rest of the work in presence of the Emperor. After the field has received all the necessary work and manure, the Emperor returns to commence the sowing with similar ceremonies, and in presence of the labourers. These ceremonies are performed on the same day by the viceroys of all the provinces.

AGRICULTURE OF AUSTRALIA.

To the Canadian, a short notice of the agriculture of the Australian Isles, may be interesting.

The islands of Australia form a most extensive part of the territorial surface of our globe, and are likely one day to be overspread by the descendants of Britons. The rapid progress of these scarcely known regions to population and cultivation, is almost certain, founded as it is on the great requisites, temperate climate, culturable and extremely fertile soil, ample water inter communications, and favorable on the whole to the health, comfort, and industry of Europeans. The surface of the country is represented to be suited in an extraordinary degree to the purposes of rural economy, the plough and the spade, the dairy and the sheep-walk. A Mr. Evans, who made a journey of 300 miles into the interior in 1818, states, "the farther he advanced the more beautiful the scenery became ; both hill and dale were clothed with fine grass, the whole appearing at a distance as if laid out into fields, divided by hedge rows. Through every valley, meandering trickling streams of water ; many of he hills capped with forest trees, and clumps of these mixed with mimosas and the cassuarina, were interspersed along the declivities of the hills, and in the valleys, so as to wear the appearance of a succession of genlemen's parks.

Their mineral productions are coal of the best description, found often n the hills, and worked from the side like a stone quarry ; limestone, late, and iron, in great abundance. Wheat, barley, and maize, or Indian orn, is raised in great perfection. The colony is particularly suited to naize and sheep. The wool of the sheep of New South Wales is equal to the best of that produced in Saxony, and can be sent to the British narket for about the same expense of transport. According to a calcula-ion made in 1820, making the most liberal allowance for all kinds of expenses, casualties, and deteriorations, the money sunk in the rearing of sheep in this colony will, in the course of three years double itself, be-sides paying an interest of 75 per cent.

Millions of acres of land of the very best description, perfectly free rom timber or underwood, and covered with the most luxuriant herbage, capable of being instantly converted to all the purposes of husbandry, are said to be unappropriated. The colonist is at no expense to clear his farm ; he has only to set fire to the grass to prepare his land for the plough. Everything that can be cultivated in the open air in England, can be cultivated in New South Wales. The fruits of Italy and Spain come to the greatest perfection there, with the exception of he orange, which requires a slight protection in winter.

New South Wales is, perhaps, one of the best countries in the world for an agriculturist to emigrate to, and its advantages are yearly increas-ng by the great number of independent settlers who arrive there from Britain. Settlers, on arrival there, have a grant of land allotted to hem, proportionate to their means of making a proper use of it, with a ertain number of convicts as labourers, who with the settlers' families, are victualled from the public stores for six months. The country is said to be fully adequate to supply itself with every necessary, and almost eve-y luxury. The cotton plant is produced there in perfection.

An Australian Agricultural Society was established in 1823. *The Australian Magazine of Agriculture and Commercial Information*, is a quarterly publication. In June, 1824, an act of parliament was passed reating an " Australian Agricultural Company, for the cultivation and mprovement of waste land, in the colony of New South Wales." This company have an establishment in London, for the purpose of raising a capital of one million of pounds sterling, in shares of one hundred pounds ach.

In the last session of the British Parliament a land company were hartered, on terms somewhat differing from the chartered land compa-ies of Canada.

The natural grasses are said to afford an abundance of pasturage at all easons of the year, and no provision of winter provender, in the shape ither of hay or artificial food, is made by the settler for his cattle.

The native dog of New Holland is a wild animal, that has lately been ery destructive to the sheep of the settlers ; they are the greatest enemy o the agriculturists in that country, and are not easily extirpated.

In the Island of New Zealand, they have a plant which answers all he uses of hemp and flax. There are two kinds of this plant, the leaves f one of which are yellow, and those of the other deep red, and both re-emble the leaves of flags. Of these leaves they make lines and cord-ge, much stronger than anything of the kind in Europe. They likewise plit them into breadths, and tying the slips together, form their fishing ets. Their common apparel, by a simple process, is made from their eaves ; and their finer, by another preparation, is made from the fibres. This plant is found both on high and low grounds, in dry mould, and eep bogs ; but as it grows largest in the latter, that seems to be its proier soil. It has lately been cultivated in Ireland with success, but not to an extent to determine its value.

AGRICULTURE OF AFRICA.

Of all the great divisions of the earth, Africa, in point of agriculture, is the meanest; though in one part of it, (Egypt,) agriculture is supposed to have originated after the Deluge. The climate is extremely hot, and fully one half the continent may be considered desert, or unknown. The British settlement at the Cape of Good Hope, is the only country in Africa the agriculture of which I think it necessary to allude to, having already slightly noticed that of Egypt.

AGRICULTURE OF THE CAPE OF GOOD HOPE.

The climate of the Cape of Good Hope, is not unfavorable to vegetation, though subject to the influence of periodical winds, and torrents of rain during the cold season. In summer, the thermometer generally ranges between 70° and 80°, sometimes between 80° and 90°, but scarcely ever above 95°.

In some parts the soil is good, and very productive, but a great proportion is light and sandy; however, the great scarcity of water in summer, is much more unfavorable to an extended cultivation than either the soil or the climate. The returns of grain and pulse are from ten to seventy, according to the nature of the soil and the supply of water. Barley is very productive, and is used only for feeding horses; rye and oats run much to straw, and are chiefly used as green fodder. Indian corn thrives well, and is very productive; various kinds of millet, kidney-beans, and other peas, are extensively cultivated. The wheat is generally heavier, and yields a finer flour than that of England. It is all spring wheat, being sowed from the month of April to June. Some farmers declare they have reaped sixty and eighty for one; the average may be from twenty to thirty. The crops are very precarious, failing sometimes for three or four years in succession. The *vine* is considered the staple article of culture, and better grapes are not produced in any part of the world; but the art of making wine and brandy from them admits of improvement. The *almond*, is a very productive tree at the Cape, and thrives in the driest and worst soil. The *aloe* species covers large tracts of ground, which affords the juice or raisin of the apothecaries. Tobacco grown at the Cape is equally good as that of Virginia.

The live stock of the Cape are not remarkable for their excellent qualities. The tails of the sheep have more fat than the rest of the carcass, weighing from six to twelve pounds. The *Cape horse*, originally from Java, is a small, active, spirited animal, a mixture of the Spanish and Arabian, capable of undergoing great fatigue; and, as a saddle horse, excellently adapted to the country. *Pigs* are scarce: it is difficult to understand why. They have waggons, which carry about thirty Winchester bushels, or a ton weight, and are generally drawn by sixteen or twenty oxen, of a small size.

The agriculture of the Cape is doubtless capable of great improveent, were the farmers less indolent, and more ambitious of enjoying for emselves and their families more of the comforts and luxuries of exisnce. It is the opinion of Barrow, that there might be produced an undance of corn, cattle, and wine, for exportation; but that to effect this, will be necessary to procure a new race of inhabitants, or to change e nature of the old ones. An attempt was recently made by government to settle a number of British families in the district of the Albany, it the experiment did not succeed well, from the unsuitableness of the nd for arable culture, and the reported unjustifiable partiality of those ho were in power, and who superintended the settlement.

AGRICULTURE IN NORTH AMERICA.

The climate of this region, which extends from the vicinity of the equar to the arctic circle, is naturally extremely various. The heat of sumer, and the cold of winter is more intense, than in most parts of the old orld. In the middle provinces, the weather is remarkably unsteady. now falls plentifully in Virginia, but seldom lies above a day or two. arolina, and Florida are subject to insufferable heat, furious whirlwinds, irricanes, thunder, and fatal lightning. The climate in the western irts, or of California, is said to be moderate and pleasant.

The surface of North America, is diversified with mountains and exnsive plains, generally covered with forest. No part of the world is so ell watered with springs, rivulets, lakes, and rivers.

The agriculture of a part of the United States and of British America, very similar to that of the North of Europe; but in the Southern States, id in all that part of North America near the equator, the culture of the outh of Europe prevails. In the West India Islands, the productions of iy part of the world may be brought to perfection.

AGRICULTURE IN THE UNITED STATES.

In a country of such extent, the climate necessarily must vary consirably. In the north-east, the winters are very cold, and the summers ot, changing as you proceed to the south. South-east, and along the ilf of Mexico, the summers are very hot, and the winters mild and pleant. In the rich valleys of the Ohio, Mississippi, and Missouri, the cliate is delightful. In the neighbourhood of the Rocky Mountains, the inters are very cold. West of these mountains the climate changes, comes temperate and pleasant, and resembles that of the western parts Europe. The prevailing winds are from the west.

The seasons nearly correspond with those of Europe, but not with at equality of temperature that might be expected on a continent; durg the summer heats, days will occur which require the warmth of a fire. he latitude of Canada corresponds with that of France, but the climates e widely different. Humboldt was of opinion that the difference of mperature between the old and new continents, in the same latitude, is tween 4° and 5° in favor of the former; but it is my opinion, that e difference is more than double that estimate.

The surface of the country, and the soil of the United States, presents every variety. Some spots in Kentucky are deemed too rich for wheat. A great proportion of the soil throughout the Union is extremely fertile, though there are many sandy barrens producing only a few pines, and considerable marshes uncultivated.

The inhabitants of the United States being generally of British origin, and the climate adapted for British agriculture, it is the British system that has been introduced, where possible ; however, there are some peculiarities of American agriculture, that it may be well to notice, and I shall do so in the third part, or practice of agriculture.

In all countries, where there is an abundance of fertile land, and a thin population, the price of labour must be high, and the produce of land low in proportion. The cheapness of land affords the possession of independence and comfort at so easy a rate, that strong inducements of profit are required to detain men in the condition of servitude. Hence the high price of commodities not simply agricultural, and the low price of grain, because where three-fourths of the population raise their own grain, the remaining fouth will use only a moderate proportion of the spare produce.

The agricultural produce of the United States, include all those of Britain and France. The greatest quantity of wheat is grown in Pennsylvania, New-York, and New-England. Maize ripens in all the districts in great perfection. Rice is cultivated in the southern states. The vine is indigenous but not extensively cultivated ; some French cultivators are of opinion that the climate and soil are unfavorable for its cultivation. The mulberry, the cotton, the sugar-cane, and tobacco are cultivated in the States, with the greatest success.

The live stock of the United States are generally derived from English stock, and are of a very good description. For neat cattle, the climate is favorable, and the herbage may be provided in abundance. Hogs are of an excellent description, and raised in prodigious numbers. Of their sheep, I am not competent to give an opinion, not having seen any large flocks of them. I believe it is the general opinion that superior mutton is seldom found in very hot climates, though the best of wool may be produced in hot countries.

Agricultural operations are skilfully performed by the farmers of capital, who have the best implements of Europe and America. But this is not the case generally, from many causes, want of stock, of capital, and sometimes from indolence. The American farm labourer is extremely expert in the use of the axe and the scythe, and will do more work with these implements than the generality of labourers from the Old Country. Most of these labourers can build a house, mend a plough, waggon, or harness, and kill and dress an ox, sheep or pig.

Field labour in America requires to be performed much more expeditiously than in England. The winters are long and severe, and the transition to spring is sudden. This season, in many parts, lasts only a few weeks, when summer commences, and the ground becomes too hard and dry for the operations of tillage ; seed sowing must, therefore, be performed with the greatest rapidity. The climate of the State of New-York, may be reckoned as good as any in North America. Snow generally covers the ground in December, and continues until March, or the ginning of April. Ploughing frequently commences early in April, id the sowing of spring wheat at the same time. At the end of May, ain crops are generally as forward as in England at the same period. here is much less rain in summer and harvest, than in England ; and erefore, the crops may be harvested with less expense, and in better ndition, even though higher wages be paid. The produce of agricul-re in the United States, is reported as very great where lands have en well managed. All the cultivated herbage grasses grow in great rfection in the northern states. Root crops are also most abundant. dian corn is very extensively cultivated, and yields astonishing re-rns. Wheat is generally sown in the fall.

The general improvement of the United States, the unprecedented in-ease of her cities and towns, the facilities of intercourse in all direc-n throughout their vast extent of country, is the best possible proof of e healthful, and thriving state of their agriculture.

I shall, in the third part of this work, THE PRACTICE OF AGRICULTURE, ain occasionally refer to the practice of husbandry in the United States, cording to the reports that I have in my possession ; but as I cannot eak from personal observation, never having been in the United States, ould I be found in error in any description I may give of the agricul-re of that country, I hope I shall be excused. I distinctly disavow any sire on my part, to describe the agriculture of any country to which I ay refer, but in the most favorable light, consistent with truth.

AGRICULTURE OF MEXICO.

The climate of Mexico is greatly diversified ; some districts hot and healty, others mild, with some snow in winter ; but no artificial rmth is necessary, and animals may remain unhoused all the year. umboldt found that the vale of Mexico is about 6,960 feet above the el of the sea, and even the inland plains are generally about 3,600 t above the level of the sea. This great elevation tempers the climate th a degree of cold, and causes it to be more healthful. Much of the il is deep clay, very fertile, requiring no stimulus except irrigation. some places the soil is boggy, composed of soft black earth ; there also barren sands, and in elevated situations, the soil is stoney. eir chief grain is maize or Indian corn, which they cultivate well, and great extent. Bullock Travels, (1824,) inform us, they are very cu-us in rearing and feeding swine ; and that an essential requisite in a exican swine-herd is an agreeable voice, in order that he may sing or rm the animals into peace when they quarrel and fight, and lull them sleep at proper times to promote their fatting. Wind, and sounds of ery kind have been long known to have a powerful effect on this genus animals. It is said that there never has been a nation equal in skill the Mexicans in the care of so many different species of animals, o had so much knowledge of their disposition, of the food which was st proper for each, and of all the means necessary for their preserva-n and increase.

In the gardens of the nobles and priests of Mexico, are to be found all fruits of Europe, and most of those of the East and West Indies.

Of the agriculture of South America, as practiced in the greater part of that vast continent, I do not think a description necessary, nor would it be very instructive to Canadian farmers.

The agriculture of the West India Islands, would be equally uninteresting, as the climate, and consequently the management of the soil, and species of crop, in these islands, must ever be different from Canada. Every one however, may not be acquainted with the general fact, that in the tropical countries alone, beneath a vertical sun, we could see vegetation in all its glory, and magnitude. There, the form, the colour, and the odour of plants are developed. There the majestic palm rears its towering stem, and sends forth its gigantic leaves. There the groves are ever blooming and productive. The plumage of the birds, and the variegated adornments of the fishes, and insects are strikingly beautiful. The most splendid exhibition of colours of every description, is displayed on every side. The fruit of the Banana or Plantain, an inhabitant of tropical countries, is often a foot in circumference, and seven or eight inches long; it is produced in bunches, containing usually from 160 to 180 fruit, and each bunch weighs from 66 to 88 pounds. Humboldt remarks, that a small space of 1000 square feet, on which 30 or 40 of these Banana plants may grow, will, on a moderate computation, afford in the course of a year, 4,000 pounds weight of fruit, a produce 133 times greater than could be obtained from the same space, if covered with wheat, and 44 greater than if occupied with potatoes. It is this extreme fruitfulness, that gives sustenance to the immense population of tropical countries in the East.

Let us, then, cast our eyes on man. We see him spread over the world, from the Frozen Ocean to the Equator, and everywhere, by the effects of his industry, and in proportion to his knowledge, assembling round him whatever is useful, and agreeable of his own country, or that of others; and it may be admitted as a general principle, with very few exceptions, that the more difficulties man has to surmount, the more rapidly are developed his moral faculties; and in all agricultural countries, the less fertile the soil, the more cizilized the people who inhabit it; and the more civilized the people, the greater will be the demand for the produce of agriculture, and for all the comforts and conveniences of life.

From the outline given of the field culture of several nations in the different parts of the world, it may be observed that different species of culture, are founded on geographical position or climate, difference of physical circumstances or surface, and difference of civilization or human wants.

The influence of climate extends not only to the kind of plants and animals to be reared, but also to the mode of rearing. A few useful plants are universal, and but a few. Of those belonging to agriculture, we enumerate most of the annual pasture or hay grasses, and of the cereal garsses, the wheat, rye and barley. The oat, the pea, bean, turnip, potatoe, and the pirennial pasture grasses, will neither thrive in very hot, nor in very cold climates; the maize, millet, and rice can only be grown in warm countries, and the oat in temperate regions. The yam, plantain, bread fruit, &c., the mahogany and teak tree, are limited to torrid regions, the oak and pine tree to temperate.

Animals, as plants, are affected by climate.—The ox and swine are iiversal, and found in every region : the horse and ass are nearly so ; e sheep will exist in India, and also in Greenland, but loses its useful aracter in both countries. In Greenland it requires shelter under co-r nine months of the year ; and in India, the wool is changed to hair, d the carcass is too lean for the butcher. The management required for ants and animals depends materially on climate. A person who has not en out of Canada, or in fact, who has not been in countries where aqua- culture is practiced, can have but little idea of what it is. In Arabia, ersia, and India, no culture can be undertaken without water, except in e upper regions of mountains. In these countries, the waters are pro-ired from tanks, and raised from wells or rivers, by machinery ; where-er the surface cannot be irrigated, no regular culture need be attempt-l, nor corn crop expected.

In hot countries, putrescent manures are not neglected, but are much ss necessary than in cold countries, very little is requisite if there is undance of water for irrigation ; there, water, intense heat, and light, consequently moist atmosphere, and a soil well pulverized by art, sup-y everything necessary for luxuriant vegetation.

If, in other parts of the earth, artificial watering is required for the pro-iction of crops, in Canada draining lands of their superfluous water is e most essential part of farming. Irrigation, if applied, must be limit-d to grass lands. In general, the atmosphere supplies Canada with fficient moisture ; and, therefore, the great object of the cultivator is, keep the soil thoroughly drained ; to keep it pulverized for the mois-re to pass through, and for the roots to extend themselves ; well stock- with manure to supply nourishment ; freed from weeds, to prevent iy of this nourishment from being wasted ; and to remove all shade that ould prevent the necessary light, air, and weather to cultivated plants.

The modes of culture suitable to different parts of the earth, cannot be isolutely determined by degrees of latitude, so much depends on physi-l circumstances, as elevation, soil, aspect, island, or continent, &c.; it as an approximation which may impress some general ideas on the ind of the practical farmer, Loudon's Encyclopædia gives the following :

The agriculture of irrigation may be considered as extending 35 de-ees on each side of the equator.

The agriculture of manure and irrigation from the thirty-fifth to the rty-fifth degree, north and south of the equator.

The agriculture of draining and manures from the forty-fifth degree irth and south of the equator, to the sixty-seventh degree, or polar rcle.

Climate must have a powerful influence on the culture of plants, and aring of animals, and this influence is in some measure beyond human introl. Hence it is that plants or animals under the management of the isbandman do not altogether depend on his skill or choice, but on his cal situation. Happily for the farmers of Canada, the geographical or iysical circumstances of the country will not have a prejudicial effect on riculture, provided the husbandman will adopt a proper system of ma-gement, in cultivation, distribution, and rotation of crops, and a judi-ous selection of animals. Annual plants in general will be found to attain a great size, and the highest degree of perfection, where the winters are long, and the summers hot and light; the reason of which seems to be, that the alternate action of heat and cold, rain and ice, meliorates the soil and prepares it in the best manner for the nourishment of annuals. All countries that have long and severe winters, have soft soils. The same description of sub-soil, that would in Ireland require to be worked with the pickaxe, can in Canada be dug with the spade, except in time of extraordinary drought.

Elevation has an absolute influence on agriculture. In Savoy, potatoes and barley are cultivated 4500 feet above the level of the sea; but while the harvest is in that country, over in the plains by the end of June, it is not over in the mountains till the end of September. Elevation lessens temperature in regular gradation, according to the altitude above the sea, and has a corresponding influence on plants and animals. Three hundred feet in height are considered nearly equal to half a degree of latitude, and is thought to occasion a difference of temperature of nearly twelve degrees of Fahrenheit.

PRESENT STATE OF AGRICULTURE IN THE BRITISH ISLES.

From the period of the revolution in 1688, agriculture gradually improved. In the seventeenth century, clover and turnips were introduced into England, and though potatoes had been previously introduced (in 1565) it was only in the seventeenth century that they began to attract notice. At this time hops enough were not planted in England for home consumption, but were imported from the Netherlands. A writer on agriculture, Blyth, says: "It is not many years since the famous city of London petitioned the parliament of England against two nuisances, or offensive commodities, which were likely to come into great use and esteem, and they were Newcastle coal, in regard of its stench, &c., and hops, in regard they would spoil the taste of drink, and endanger the people."

About the time of the revolution, corn-laws were promulgated, and bounties paid, and duties imposed, on corn exported and imported, according to a fixed scale of prices; and it is a remarkble circumstance, that from 1688 to 1765, the price of corn was lower, than it was for the same period previous to 1688. From 1795 to 1821, the price of corn in England was generally double the price it was from 1700 to 1760.

According to the Corn Laws of 1828, foreign wheat is admitted, when the average price in England is 52s per imperial quarter, at a duty of 34s 8d per quarter, and from 52s to 73s at a graduated scale of duties, being admitted at the latter price at 1s per quarter. Barley at 24s, is admitted at a duty of 25s 10d per quarter, and from 24s to 41s on a graduated scale of duties; so that at the latter price it is admitted at 1s per quarter. Oats are admitted at 18s per quarter, at a duty of 19s 9d per quarter, and from 18s to 31s on a graduated scale of duties; so that at the latter price the duty is 1s per quarter. In like manner rye, peas and beans, when at 29s per quarter, are admitted at a duty of 25s 9d per quarter, and when at 46s, at 1s. The duty on Canadian wheat, when the price in England is 67s per quarter, is only 6d sterling per quarter,

1 when the price in England is below 67s the quarter, the duty on Ca-
lian wheat is 7½d the bushel or 5s the quarter.
From 1786 to the peace in 1814, the system of agriculture was great-
mproved in Britain. The gradual advance in the price of land pro-
:e occasioned by the increase of population, and of wealth derived from
nufactures and commerce, gave a most powerful stimulus to rural in-
stry, augmented agricultural capital in a greater degree, and called
th a more skilful and enterprising race of cultivators, than all the laws
regulating the corn trade could ever have effected. Inventions for
reasing produce, and economising labour were introduced, or improv-
and extended, and by these means produce was greatly increased for
ıeral consumption. The gardenlike appearance of the country, gave
most decided proof of the skill and success with which agriculture
s practiced at the close of the War.
Since the period of the general peace in 1815, agriculture sustained a
'ere shock, from the fall in prices of produce occasioned chiefly by the
sened circulation of currency. In this stock, many thousands of far-
rs in the British Isles lost all their capital, and were reduced to insol-
ıcy and pauperism, while some, more fortunate, contrived to retain as
ch of the wreck of their property, as enabled them to emigrate to other
ıntries. Cleghorn, whose pamphlet on the depressed state of agricul-
e, was honoured with the prize of the Highland Society of Scotland,
ıks this loss cannot be less than one year's rental of the whole island.
'he replies sent to the circular letter of the Board of Agriculture re-
ding the agricultural state of the kingdom, in February, March, and
ril, 1816, furnished a body of evidence which cannot be controverted,
l exhibit a picture of widely spread ruin among the agricultural class-
and distress among all that immediately depend upon them, to which
re is probably no parallel."
have been an eye witness to this state of things in Ireland. The total
ı of all farmers who had rented lands during the war, had to pay these
ts with peace prices for produce, and a greatly diminished currency.
ıve seen a statement lately, that appeared to be a correct one, which
:ulated the loss that had been sustained in Scotland alone since 1815,
agricultural capital, at *sixty millions of pounds sterling*, together
ı much of the lands injured by constant cropping, without rest,
ıgh extremely well managed otherwise. A question arises, who has
ıstly profited by these losses ? and to this I answer without hesita-
, that it was generally the landlords, who would not reduce the rents
hat equitable standard that would enable the tenant to preserve his ca-
l untouched, which I think he is ever entitled to do, when he performs
part, as a husbandman should do.
believe, however, a more equitable arrangement as regards rents, is
beginning to be established between landlord and tenant, particular-
ı England.
'he agriculture of Ireland is still in a backward state, except with far-
s who have capital. The Dublin Society was formed in 1731, when
ımber of gentlemen, at the head of whom was Prior, of Rathdowney,
:en's County, associated themselves together for the purpose of im-
'ing the agriculture and husbandry of their country. In 1749, Prior,

through the interest he had with the then lord lieutenant, procured a grant of £10,000 per annum, for the better promotion of the views of the society. Miss Plumtree considers this the first association ever formed in the British dominions, expressly for such purpose. The Farming Society of Ireland was instituted in 1800, and held annual cattle shows in Dublin, and at the great Cattle Fair of Ballinasloe. At these shows, the most superior stock of all descriptions were exhibited, and excited great emulation, but only among farmers of capital, or proprietors who farmed their own estates, no other could compete, with the slighest chance of success.

The climate of Ireland is much more mild than that of England, particularly the southern and western parts of the Island ; in these parts snow seldom lies for any time, and frost does not continue many days together ; indeed ploughing is not often interrupted by frost or snow ; and spade, and other field work is constantly going on. The mildness and humidity of the atmosphere produces a growth in vegetation scarcely to be met with in any other country. This appears most remarkably in the ivy, and other evergreens, with which Ireland abounds. These are not only much more plentiful, but far more luxuriant, and of much quicker growth, than in the most favoured parts of Great Britain. It is to the peculiarity of their climate, that the Irish have to attribute the richness of their pasturage, an advantage which, coupled with the remarkable dryness and friability of the soil, points, in an unequivocal manner, to a rotation of crops, in which grazing should occupy a principal place.

The soil of Ireland, is generally a fertile loam, though there are many other varieties of inferior soil. She possesses a much greater proportion of fertile land, in portion to her extent, than either England or Scotland. Not only is the island blessed with this extent of cultivable ground, but it is almost all of a quality to yield luxuriant crops, with very inferior cultivation. Sand, or tenacious clay is seldom met with. Great part of the land of Ireland throws up a luxuriant herbage, without the aid of the husbandman. There are in some counties, particularly Limerick, a dark, friable, sandy loam, which if preserved in a clean state, will yield crops of corn, several years in succession. I have seen land that gave *seventeen corn crops in succession without manure ;* and the last crop, (oats,) was above an average. These lands are equally well adapted for grazing as for arable crops, and do not often experience a winter too wet, or a summer too dry.

The *bogs* of Ireland are estimated at 2,330,000 acres ; these bogs are supposed to have originated from the decay of woody tracts ; they are capable of amelioration, but, alas ! capital is required.

I have seen farming in Ireland, with proprietors and farmers of capital carried on in as good style, as judiciously, and scientifically as it was possible for it to be in any country ; but with farmers destitute of capital, it must be otherwise. The landlord seldom lays out one shilling upon buildings or repairs. However necessary, or however small the farmer's means of doing so, he must find himself in all these conveniences. According to Wakefield, " The worst features of the rural economy of his island are the entire want of capital in the farmers, and the complete indifference of the landlord, to the character, wealth, and industry of his

ant. Capital is considered of so little importance in Ireland, that ad-
tisements constantly appear in newspapers, in which it is stated, that
preference will certainly be given to the highest bidder. Bargains
constantly made with a beggar as a new tenant, who, offering more
t, invariably turns out the old one, however industrious." From this
ure, coupled with tithes and other taxes, it may well be supposed
it chance there is for a tenant, however industrious and clever he may
to accumulate capital, if he wants it, or to preserve it if he has got it.
n several counties in Ireland, good wheat is produced. I have known
l cultivated fallows to yield from thirty to forty-five bushels the Eng-
acre, or from 1800 lbs. to 2800 lbs.; but the latter was only produced
the best managed fallows where lime was applied. The average pro-
e is much under thirty bushels. Barley is inferior to that grown in
gland. Oats are produced in great abundance, on good land from for-
ive to seventy bushels the English acre ; the average is below forty-
bushels. Potatoes are also produced in great perfection, but not a
ater quantity to the acre than I have seen in Canada. In Ireland,
000 lbs. to 21,000 lbs. of potatoes are raised off the English acre ; the
er quantity is seldom exceeded. Potatoes are cultivated in drills, or
beds ; the latter mode is best suited to heavy, deep soils, from the
at humidity of the climate.

The dairy part of Irish husbandry is well managed. Four good cows
produce 28 lbs. of butter in the week. Chaptal observes, that the
of salting butter is better known in Ireland than in any other country.
Ireland great tracts of country are exclusively devoted to breeding and
ling neat cattle and sheep. Roscommon, Galway, Clare, Limerick,
Tipperary, are the chief breeding counties for sheep ; and Galway,
re, Roscommon, Tipperary, and Meath, are the places where sheep,
the best neat cattle are fattened. The sheep are of the long woolled
d, and very large and well-formed generally.

The fertility of the soil in many parts of Ireland, is greater than in any
er country ; and it is a remarkable circumstance, that while she ex-
ts cattle, sheep, hogs, wheat, oats, and other agricultural produce, to
amount of many millions of pounds sterling, annually, her agricultu-
population, and working class enjoy very few of the comforts of life,
pared to the inhabitants of England, who purchase these articles from
. In 1823, and other years, when a great number of the labouring
sses in Ireland were starving from the failure in the potatoe crop, and
scriptions to a great amount were raising in England, and even on
Continent, for their relief, corn and cattle were constantly exporting
n Cork, and other Irish ports, as if nothing had happened, or no want
by any class. How desirable, that the working classes in Ireland
uld possess a taste for the comforts of life. If they did, their con-
on would soon improve ; they would not be content with straw, pota-
, and milk when they can get it, as their portion of the abundance of
d things which their country produces. I believe when they leave
r own country and come to Canada, they know how to estimate, and
y the comforts of life as well as any other class of people.

The agriculture of Scotland was considered to be far behind that of
gland in improvement, at the middle of the last century, but from that

period it is supposed to have outstripped England in point of arable husbandry. The alternate system of tillage, or course of cropping, is generally adopted; meadows, or what is understood by lands kept under grass permanently for the sake of a hay crop, is little known in the Lowlands of Scotland. On good lands, one half the farm is under different species of corn crops, and the other half under pulse, roots, cultivated herbage, or summer fallow. On the best cultivated farms, grazing is carried on only as subservient to tillage. The general arable culture of the Lowlands, the ploughing, manuring, draining, and agricultural implements are not surpassed in excellence in any country. The high rents that are paid for lands have, however, (it is reported) induced, or more properly compelled, farmers to crop the lands without reposing them in pasture for sufficient intervals, which has considerably reduced the strength or staple of these lands, and caused them to become too incohesive to produce the most profitable crops, particularly those soils that are not of the first quality. In a large portion of Scotland as well as the Lowlands, arable culture is well conducted. The Duke of Sutherland, (late Marquis of Stafford,) has introduced great improvements on his extensive estates in Scotland, in the county of Sutherland. Few proprietors have done more for the improvement of agriculture on their estates, than that nobleman, both in England and in Scotland. The amelioration produced in the lands, and in the inhabitants of his Sutherland property, is almost incredible, and gives a useful example of what can be effected by capital and industry, judiciously applied.

I have not any statistical returns of the produce of agriculture, stock, &c., in Scotland, except the number of acres in superficies, which is estimated to be near 20,000,000 acres, of which 5,265,000 are in a state of cultivation; 5,950,000 are uncultivated, but capable of cultivation; and near 9,000,000 barren, or unprofitable. Some of the land in cultivation is of the most luxuriant fertility. The rents paid for land in Scotland, would surprise the Canadian farmer who has never been out of Canada. Indeed, I think it almost impossible that such rents can be paid, and leave the farmer his equitable share of the produce, unless in very favourable situations near towns; and this may well account for the reported loss sustained in farming capital in Scotland, during the last seventeen years. I have reports of expenditure in preparing some lands in that country for cultivation that, to my mind, would be equal to their purchase, in fee-simple, and from three to five times as great as it would take to clear ordinary forest land here for crop. The only objection that can be made to the agriculture of the most improved districts in Scotland is, that arable culture, and grazing are not carried on conjointly, so much as it would be necessary they should be, to preserve the perpetual fertility of the soil: at least, this is an objection in my humble judgment.

The Transactions of the Highland Society of Scotland observes: "There are modes of rotation in the progress of adoption, by means of pasturage introduced in different order, or for a longer period, or by other crops, or what are called double rotations, which promise materially to promote the amelioration of the soil."

A farm in the county of Perth, consisting of 182 acres, is represented as having only 11 acres pasture; the remainder in six divisions of 28½

:res each, are all, except one in fallow, bearing crops of wheat, oats, ırley, turnips, potatoes and hay : the cattle kept on the farm are soiled ı clover. The average return of crops to the acre, is extremely various Scotland, and I have no general average ; but on good soils, I believe .e returns are fully as great as are obtained in the British Isles, however vourably circumstanced as to soil and climate.

The neat cattle of Scotland are not so large as those of England ; .ey are exported to England in great numbers, where they are very .uch esteemed for fattening, and when fat, the beef sells for a higher ·ice the stone weight, than the large English beef. The Ayreshire breed ' cows are much admired for dairy purposes, and are generally of excelnt form.

STATISTICAL NOTES OF ENGLAND AND WALES.

I think it may be interesting to Canadian farmers to give the leading atures of the statistical returns of England and Wales, as the best eans of laying before them, the results of agriculture in that country, the imate, or soil of which, is not superior to that of Canada, except for ·azing alone.

By the census of 1831, the number of inhabitants was 14,171,689 ›uls. The superficies in statute acres of England and Wales, 37,084,-)0 ; inhabited houses, 2,000,000 ; rental annually 30,000,000 pounds erling. Poor rates in 1830,—8,161,280*l.* ; assessed value of counties, l,874,420*l.* sterling. The imports in 1831, were 46,246,241*l.* ; exports),691,302*l.* ; revenue, 50,056,016*l.* ; expenditure, 47,142,943*l.* ; of is latter, the annual charges in respect to the funded and unfunded :bt is 28,349,754*l.* The population of England and Wales compared the superficies of 37,084,400 statute acres, gives a ratio of one inhabint to every two and a half acres. The number of depositors in savings ınks, 384,120 ; amount invested, 13,440,976*l.* According to returns ade to parliament in 1818, there were then in England 4,167 endowed :hools, with a revenue amounting to 300,525 ; 14,282 unendowed hools ; and 5,162 Sunday schools. By means of these schools 644,282 ıildren, chiefly of the working classes, received instruction, of whom 321-i4 were taught gratuitously, and 321,276 paid for their education. There .ve not been any official returns on this subject since 1818, but from e answers to the circular letters of Mr. Brougham (the late Lord Chan-:llor,) in 1828, it was estimated that in 1829, there could not be less an a million and a half of the children of the humbler classes who were en receiving in England the advantages of education. The number of .ildren of both sexes, between the ages of five and twelve, in England e supposed not to exceed two millions ; and, deducting the number that ıy be presumed to be educated at the higher schools, a reasonable hope ıy be entertained that no large portion of the children of the working ısses are now wanting the means of instruction. I hope I shall be rdoned for this digression from my subject, but I feel that education is necessary to the promotion of the improvement of agriculture, that I all not fail, at every opportunity, to recommend it to those who want it, d to those who have it to promote it by every possible means,that no man in Canada, who is a landed proprietor, but shall be able to read publications on agriculture, and on other subjects, and judge for himself. Then we might expect to see the people of Canada, in the full enjoyment of all the advantages, which Providence has so bountifully placed at their disposal.

A Mr. Comber gives the results of his computation of the extent of land in cultivation in England and Wales. I cannot answer for its exactness, but perhaps it is as nearly correct as estimates of the kind generally are. The extent of hop, nursery, garden, and pleasure grounds, are supposed to be underated :

	acres.
Wheat - - - - -	3,300,000
Barley and rye - - - -	1,000,000
Oats and beans - - - -	3,000,000
Clover, rye-grass, &c. - - -	1,200,000
Roots and cabbages cultivated by the plough -	1,200,000
Fallow - - - - -	2,309,000
Hop grounds - - - -	34,000
Nursery grounds - - - -	9,000
Fruit and kitchen gardens - - -	41,000
Pleasure grounds - - - -	16,000
Land depastured by cattle - - -	17,000,000
Hedge-rows, copses and wood - -	1,600,000
Ways, water, &c. - - -	1,300,000
Commons and waste lands - - -	5,094,000
Total - - -	37,094,000

The quantity of corn raised per acre varies, of course, according to the soil. The produce of wheat on some spots amounts to 6 quarters or 48 bushels, in others to 1½ quarter or 12 bushels the acre ; 2½ quarters or 20 bushels for wheat, 4 quarters or 32 bushels for barley, and 4½ quarters or 34 bushels of oats per acre, is stated by many as a fair average return. The average weight of a bushel of good English wheat is about 58 lbs ; in bad seasons it does not exceed 56 or 57 lbs., but in good years it is found to weigh 60 to 62, and in some spots 64 lbs. It yields 43 lbs. of flour for standard wheaten bread, or 46½ lbs. for household bread. The quantity of hops may be computed at an annual average of 20,000,000 lbs.

The climate of England is subject to rain, but is exempt from the severity of heat or cold that is felt in similar latitudes. The mean temperature for the six winter months, from October to March, is commonly between 40° and 45° of Fahrenheit's thermometer. In July and August from 60° to 65°. The mean annual temperature, noon and night, of the central part of England, is about 50°. The greatest heat seldom exceeds 80°, and the cold rarely below 20° to 25°. The average rain that falls in the kingdom is from 30 to 40 inches ; and the prevalent winds are the west and south-west. The total length of the paved streets and roads in England and Wales, is estimated at 20,000 miles, and that of all other roads, at about 100,000 miles. The average annual expenditure thereupon may be taken at a million and a half sterling, being at 12*l*. 10s per mile. In 1832, the turnpike roads in Great Britain were l,531 miles, whereof the annual income was 1,214,716*l* and the debt as 5,200,000*l*. In the same year the total length of canals in Great Brin was 2,589 miles.

The average price of wheat in England from 1760, when she began to ıport, to 1792, was from 42*s* to 50*s* the quarter, and the annual imports ' corn was from 200,000 to 500,000 quarters. In 1792, the price of heat was 2*l*. 2*s* 11*d*; in 1800, 5*l*. 13*s* 7*d*; in 1812, 6*l* 5*s* 5*d*; in 1822, ' 4*s* 1*d*, and in 1831, 3*l*. 10*s* 3*d*. The annual consumption of wheat in e united kingdom, including seed, has been estimated at 12,000,000 ıarters, or 96,000,000 bushels, and that of other grain at 40,000,000 ıarters, or 320,000,000 bushels, making together 52,000,000 quarters, : 486,000,000, bushels, of which not one-twentieth part has, during any ear, been imported, and in general a far less proportionate quantity.

It is computed that the quantity of corn imported for the three years ıding June, 1831, was 2,263,184 quarters,or near 18,000,000 bushels, : the rate of 6s 1d per quarter, as the mean duty. It is supposed that half ie corn produced in England is not brought to market, but is consumed y the agriculturists themselves, or used for seed, &c. In 1828, Mr. acob's estimate of the wheat produced in that year was 12,500,000 uarters, or 100,000,000 bushels; and that the consumption of the present population was about seven bushels for each person. Contrasting ıis produce with what it was at the Revolution in 1688, recorded as ,800,000 quarters or 14,000,000 bushels of wheat, and 8,000,000 quarrs or 64,000,000 bushels of other grain, making together 9,800,000, or 8,000,000 bushels of grain; and the consumption of wheat by each peron was only three bushels. The present produce is about three times reater than at the former period. The population is increased nearly in ie same proportion: but the lands now cultivated and bearing corn rops, do not, perhaps, exceed the quantity in cultivation bearing corn rops at the Revolution; nor does the population now employed in agrilture, over what was employed in 1688, bear any proportion to the inrease of produce.

The expense to cultivate lands in England has much increased of late ears, as appears by the returns of the Board of Agriculture, which state ıat the average expense of cultivating 100 acres of land was, in 1790, 11*l*.; in 1803, 547*l*.; and in 1813, 771*l*., including labour, rent, and xes. Since the latter year, labour, rent, and taxes, have been considerably reduced. It is calculated by surveyors, that highly cultivated nd ought to produce a three-fold return, viz: one-third of the gross roduce to the landlord for rent, another for the expenses, and the reainder for the farmer's profit; the rent of inferior land, should be only fourth, or even a fifth of the gross produce, by reason of the additional xpense of cultivation. In Scotland the tenants have to give a much larger roportion of the gross produce to the landlord as rent, than in England. 'he consequence is, that they have been obliged to crop the land severe-', without resting it in pasture.

It is computed that England and Wales now contain at least, 5,000,000 eat cattle, and a million and a half of horses, of which about a million are sed in husbandry, two hundred thousand for pleasure, and three hundred ıousand are colts, and breeding mares. The number of sheep are about twenty millions, and eight million of lambs. The number of long wooled sheep, is about five millions, their fleeces averaging from seven to eight pounds; and of short wooled sheep, fifteen millions, the weight of fleece averaging from three to three and a half pounds. The whole quantity of wool annually shorn in England, is from eighty to eight-five million of pounds.

The annual amount of profit from farming is not very susceptible of exact calculation, but was estimated some fifteen years since at 30,000,-000 sterling, being a sum equivalent to the rental of England and Wales. The probable amount of the farming capital of the country was estimated at from two hundred and fifty to three hundred millions sterling. The total annual produce of the land, is necessarily subject to the fluctuations of the seasons, but taking wheat at the medium of 60s the quarter, and other corn in proportion, we will find an average produce of about fifty millions sterling in corn, to which, if a similar value be added for pasturage, and a further allowance for hops, fruit, vegetables, &c. we shall have a total of from one hundred and ten to one hundred and twenty millions sterling. In Scotland the rent bears a higher proportion to the gross produce of the land than in England. These reports conclude by stating, "There are many improvements of which English agriculture is susceptible, such as in the size of farms in many counties, the length of leases, the course of husbandry, the construction of ploughs, and the misapplication of animal strength in labour. With attention to these points, and the application of further capital, not to wastes, but to fertile land already under culture, there is every hope that our agriculture may be yet considerably advanced in productiveness and in national value."

The capital required by a farmer in England is generally estimated according to the amount of rent; on ordinary lands, the farmer should possess capital of from three to five times the amount of the annual rent. On fertile grazing land, that feed the best description of stock, a farmer would require from five to ten times the amount of the annual rent as capital. In 1830, the capital necessary to stock a turnip land arable farm, was from 5*l.* to 6*l.*, and a clay land farm from 7*l.* to 8*l.* the acre, according to circumstances. From the operation of the poor laws, the rate of wages in England for the summer months is, I believe, about one-third less than in Lower Canada.

According to the returns in my possession of the produce of English agriculture in 1831, 7,300,000 acres under crop, to which must be added 2,300,000 acres in summer fallow, making together 9,600,000 acres, produced about 206,000,000 bushels of grain, valued that year at from fifty to sixty millions of pounds sterling, giving on an average six pounds sterling per acre. The land depastured by cattle 17,000,000 acres, clover and other hay grasses, 1,200,000 acres; and allowing 1,000,000 of acres of the root crops for feeding cattle, gives 19,200,000 acres for the support of a stock consisting of 1,500,000 horses, 5,000,000 oxen, and 28,000,000 sheep and lambs. The estimated profit on this stock, together with hops, fruit, and vegetables, is 60,000,000 of pounds sterling, which will give an average of about three pounds sterling per acre. Thus, calculating the land of England and Wales that is occupied in agriculture, at 30,000,000 acres, it yielded in 1831, an average pro-ice equal to four pounds per acre. I have every reason to suppose at this estimation cannot be very incorrect, otherwise the farmers of ngland would be unable to pay for cultivation, rent, taxes, and other arges.

My object in giving these reports of the produce of agriculture in Engnd, (where it is admitted that the practice of the art is still capable of eat improvement,) is to stimulate the farmers of this country to exern and improvement, that they may obtain equally favorable results om their own agriculture.

The Third Part of this work, will give the practice of agriculture that is been most approved of in the British Isles, and that may be successlly introduced into Canada.

TRACTS FROM THE STATISTICAL RETURNS OF THE PROVINCE OF LOWER CANADA IN 1831.

Quantity of land occupied about 4,000,000 of acres, and of improved nd, or that has been cultivated, 2,100,000 acres ; inhabitants 512,000, ving about four acres of improved land for each person ; 86,000 inhated houses ; 60,000 proprietors of real property ; 57,000 families substing by agricultural employment ; 2,500 families subsisting by trade id commerce. Produce of wheat, 3,420,000 minots ; 995,000 minots eas, 3,150,000 minots oats, 395,000 minots barley, 235,000 minots rye, 10,000 minots Indian corn, 106,000 minots buckwheat, making in all of ain, 8,642,000 minots, and of potatoes 7,360,000 minots. Number neat cattle 390,000, horses 118,000, sheep 550,000, and hogs 0,000. The value of the crop of grain and potatoes I have estimated be 2,000,000 pounds currency, or 8,000,000 dollars.

Of this crop, the farmers did not actually sell over one-third or oneurth, as I shall presently demonstrate. Import of wheat and flour from pper-Canada in 1831, was 93,000 barrels of flour ; allowing five bushs of wheat to the barrel of flour, this would be equal to 465,210 bushs ; and of wheat 430,000 bushels, making in all 895,000, from Upper anada. Imported from the United States, same year, 37,000 barrels our, equal to 185,000 bushels of wheat, making the total imports at ontreal 1,080,000 bushels. The export from Montreal and Quebec 1831, was 1,700,000 bushels wheat and flour, affording a surplus to ower-Canada for export of only 620,000 bushels. Of other grain very tle was exported. That year the average price of wheat was about 6s d the minot ; and the average produce of grain did not, I believe, exeed ten minots the arpent, or there about.

The quantity of wheat consumed in Lower-Canada in 1831, exclusive seed, would appear to be 2,500,000 minots, equal to 5 minots for each habitant in the province. I cannot answer for the accuracy of this esmate, but I know it to be correct according to the statistical returns.

The produce of pasturage is difficult to estimate. However, making e calculation as accurately as perhaps it is in my power to do, according the number of animals kept, it would amount to, in milk, butter, cheese, ool, and increase of stock of all description, &c., one million one or o hundred thousand pounds currency, or about five million dollars annually. The gardens, fruit, hops, and hay and straw sold for the supply of towns, I estimate at two hundred and fifty thousand pounds currency, or one million of dollars, making the total annual produce of agriculture in Lower-Canada, about three million five hundred thousand pounds currency, or fourteen million of dollars, equal to about 1*l.* 10s, or six dollars the arpent for the land improved in tillage and pasture. The farming capital in live stock, agricultural implements, and all that may be termed working capital, would amount to from four to five million pounds currency, or eighteen or twenty million dollars. Hence it would appear, that the working capital produces 75 per cent, for the payment of labour, and the maintenance of the farmer and his family. From the statistical returns, there are only 7,602 servants employed in agriculture in Lower Canada, so that the farmer and his family do the greatest part of the work, and have very little wages to pay. In England, the working capital does not produce 50 per cent., for the payment of rent, taxes, labour, and profit. This is to be attributed chiefly to the greater amount of working capital necessary there, from the improved state of the land, and the higher value of stock, and implements of agriculture.

It is right to observe that the greatest part of this produce of agriculture in Lower-Canada, is consumed by the farmer and his family, on his farm. This is a circumstance, however, that few have reason to regret. It is well they are not obliged, like farmers of other countries, to give the largest portion of the produce of their lands to others, and be content with the smallest share for themselves.

The cities of Montreal and Quebec, and other small towns, are supplied with bulky produce, such as hay, straw, and vegetables, by the farmers in their respective neighbourhoods ; they also partly supply these cities with all other necessary articles of agricultural produce, but a very considerable proportion of the butcher's meat, cheese and butter, is supplied from the United States. The horses and cows kept by the citizens, may perhaps, amount to 2700 horses, and the same number of cows. In winter, there are a very considerable number of horses coming occasionally to these cities with produce, &c., which altogether consume a large quantity of hay and oats. There are several breweries that purchase barley and hops to some extent. The number of distilleries are increasing in the neighbourhood of Montreal, which must greatly increase the consumption, and consequently the demand for grain. Hitherto Canada whiskey has not been much used, but it is now coming into use, and will, at no distant period be likely to supersede altogether the use of rum, and other foreign spirits.

Lest these remarks should have a tendency to cause strangers to form an erroneous opinion of the profits that are to be derived from farming here, it may be well to remind them, that *they* cannot expect such returns from capital invested. They will have to purchase land cleared, or if not cleared, to expend capital in clearing it. This will, of course, require a much greater capital to put new settlers on an equal footing with those who have their own farms cleared and built upon already, and consequently, they cannot have the same returns on their capital. Nevertheless, I am far from discouraging any farmer who is industrious, and understands his business, from purchasing in Canada. I believe there are few countries where he can do so with more favorable prospects of success. The farmers already settled in Canada, have their capital chiefly expended in clearing their farms from the forest, and in erecting houses, and other farm buildings. The capital expended in clearing land, cannot be estimated at less than 3*l.* currency, or 12 dollars the arpent. This, on two million three or four hundred thousand arpents, supposed to be now in cultivation or improved, would amount to near 10,000,000 pounds currency, or 40,000,000 dollars. The buildings on 60,000 farms may, I believe, be nearly as much in amount as that expended in clearing the land. Hence the total amount of capital invested by the farmers of Lower-Canada, in lands, buildings, stock, and implements, would appear to be about 25,000,000 pounds currency, or 100,000,000 dollars.

From my calculations, I find that the working capital in stock and implements, is equal to about 2*l.* currency, or 8 dollars the arpent, of the improved land, and as I stated before, gives an annual produce of 1*l.* 10*s* currency, or 6 dollars the arpent, on an average. This produce is capable of being increased two or three times that amount, *with ease and certainty*. Should the farmer require to augment his working capital, which includes his live stock, implements, and the funds for the employment of labour, having no rent or taxes to pay, he surely may accumulate some savings from his produce in favourable seasons, for this purpose, which, if judiciously expended in the improvement of his land, inimproved implements, and if necessary, the increase of his stock, would greatly augment the annual produce of his farm, and afford the means for further improvements, and the education, and respectable settlement of his family. It is from the increased produce of our lands, we must obtain all the funds for educating, and establishing our families on new farms, not on small portions of the old farms; and the farmer who finds his present means insufficient to accomplish this *his bounden duty*, ought to reflect and endeavor to discover, if it would be in his power, by adopting a different system of agriculture, and increased industry, to obtain more favourable results. A farmer possessed of one hundred arpents of improved land, of even middling quality, must cultivate and manage it in a very imperfect manner, if, under ordinary circumstances, he cannot add to his capital, in one year out of two or three, either in stock, improvements, or in money. Comparing, therefore, the relative circumstances of the farmers here, and in England, even as regards capital, they have decidedly the advantage here, if they will only improve, and profit by their favourable circumstances. They are proprietors of the soil, their houses, farm buildings, stock, and implements, are their own, and will, with their improvements, descend to their children. They have scarcely any direct or indirect taxes to pay, consequently, there is no class of farmers in the British Isles, or in Europe, so favourably circumstanced, or who might become so *truly* independent and respectable. Large fortunes are not to be acquired by farming here, or indeed in any other country, at present. The industrious farmer, however, may have the necessaries and conveniences of life in abundance, and occasionally accumulate something for the employment of labour, and the other necessary purposes before enumerated.

By the statistical returns of Lower-Canada, before referred to, it appears there are 38 colleges, 1099 elementary schools, and 48,330 scholars, equal to about half the number of persons between the ages of five and fourteen years, in the province. I have no means of ascertaining whether the number of schools, or of scholars receiving education, have increased since 1831, but there is no doubt that the desire to educate the rising generation is very general throughout the whole province.

The soil of Lower-Canada is generally of excellent quality ; scarcely any part can be called barren. High mountains there are none. The hills are covered with timber, that may be reserved for firewood and fencing, where the soil is unsuitable for cultivation. All the useful species of grain, pulse, and other vegetables, that are raised in England, can be cultivated here, with equal success, with the exception of turnips. It is not so favourable for pasturage, from the great heat of the summer months. When the months of July and August are very dry, the pastures become dried up, and in such seasons, there is scarcely any latermath, or aftergrass. This is a drawback that Canadian husbandry will always be subject to, and over which man has no controul.

The long and severe winters are also complained of ; but all circumstances considered, the winters are as much in favour of the farmer as otherwise ; and probably there is not a farmer who has been long a resident in Canada, who would not prefer the winters as we have them, to the soft open winters of England. The severe frost and snow fertilizes to a great degree, the ploughed soil, and prepares it in the best manner to receive the seed in spring. Without a rigorous winter in the North American provinces, farmers at a great distance could not bring their produce to market : a thin population scattered over a wide extent of country, would, for many years to come, be unable to incur the expense of making roads sufficiently good to travel on in winter, and to accommodate all. Snow and ice, give roads and bridges, without *any* cost, and in the greatest perfection, almost equal to railroads, were it not for the evil of cahots, which it is in our own power to prevent, and surely to our credit and interest, to do so without delay.

The long winters are an objection with some, to the keeping of a large stock of cattle ; but I by no means admit it as a good objection to keeping that sufficient stock of suitable animals, that are necessary in proportion to the size of farms. The rapid vegetation of herbage in summer, is proportioned to the wants created by the length and severity of the winter, and on all farms that are well managed, this proportion may always be preserved, except in adverse seasons. I believe it will be found in all countries, the Creator of all Good, has so ordered the seasons, as to be the most suitable to the situation and circumstances of each particular country and its inhabitants, and if any amelioration is required, from the change of inhabitants, the introduction of a different species of animals, or vegetables, man, by applying the faculties bestowed on him by the Almighty, and improved by education, may produce the requisite amelioration.

It is not sufficient that our lands produce abundant crops, to insure profitable farming ; it is necessary that we understand perfectly, the kind, and quantity, that ought to be cultivated of each, to supply our own wants, and the wants of others, to the required extent, and shut out if possible, all that would participate in supplying the market that is open to us, and which we are fully competent to furnish, by proper management. So long as we shall require goods of foreign growth and manufacture, so long should we endeavor to raise that description of produce that will suit a foreign market; and this trade might be carried on profitably for both countries, to a certain extent, which I shall endeavor to point out in another place. I would wish farmers to be aware that they cannot support themselves as respectably here, as in England, or other populous countries, from the produce of a few acres of land, producing however abundantly, potatoes, onions, cabbage and cucumbers. There are no customers for such production; it appears to be overdone already by the gardners in the neighbourhood of our cities. In England, the people residing in cities and towns, amount to about four-fifths of her population; her cities, towns, and villages, are above one thousand in number, of which London alone has a population of one million five hundred thousand, and thirty other of her principal towns, have altogether about the same number. This makes it necessary that a large proportion of the soil should be cultivated in a garden-like manner. Other populous countries in Europe are similarly circumstanced. In Canada, until our cities and towns increase immensely in number and extent, there will not be much encouragement for small farms of a few acres. If our farms in their present usual extent, are not judiciously cultivated, and that half the quantity of land might be brought to yield more produce, it by no means follows that there is any necessity for such a state of things, or that the farmers are not able to bring their farms, at their present extent, into the best and most profitable state of cultivation. Indeed, I am convinced, that were they of less extent, they could not be profitably cultivated, under the present circumstances of the country. Our agricultural system must embrace corn and cattle, and we should make it an established maxim, that we cannot have the one profitably, without having the other in due proportion. After giving due consideration to the agriculture of Canada, in particular, as it is affected by the climate, the soil, farming capital, and the habits and skill of the farmers, I have come to the conclusion, that there is no insurmountable obstacle to the improvement and success of agriculture, that is not in the power of those most interested to remove. If working capital be required, the farmer has only to exert his skill and industry to obtain it from the soil, where it lies dormant, and his own property. I know what it is to want capital. When I first came to Canada, I had to acquire it, and did succeed in doing so, on a high rented farm, and under other unfavourable circumstances. I cannot, therefore, admit, that farmers in general, long residing upon their own farms, under ordinary circumstances, have any reasonable excuse for want of necessary capital. Doubtless extraordinary circumstances, such as adverse seasons, loss of cattle, great depression in the price of produce, &c. &c., may occur, and prevent the most industrious from adding constantly to his capital; but these extraordinary disappointments will not be frequent or general, and should have no general effect.

Man is ever inclined rather to impute real, and in many cases, imaginary evils, and inconveniences, to causes over which he allows himself to believe he has no controul, than take the trouble to examine into them, and endeavor to find means for their removal or remedy. Nine cases in ten of what are looked upon as irremediable evils and inconveniences that we submit to in this life, are suffered, and permitted to continue, in consequence of this want of examination, and industrious application. This indolence is not only extremely prejudicial in its consequences, to those who justly suffer under it, but to those who would, and do, actdifferently, (though perhaps the latter may not generally think so,) and to the whole community. This world, viewed in all its boundless extent, is beautiful and faultless, every way calculated to produce what is necessary for the comfort, enjoyment, and temporal happiness of man, if man will only act in concert, and learn to perform his part rationally and well.

I am not an advocate for lightly introducing innovation or change, and shall carefully abstain from recommending changes, that I am not convinced, from reading, reflection, and experience, will be likely to prove advantageous; but when we shall discover that any system, custom, or practice, pursued by ourselves or our forefathers, is capable of amelioration, and that the produce we obtain from agriculture under our present system, &c., requires to be augmented, to afford the means of educating and settling our children, and providing those comforts and conveniences which a respectable yeomanry should be ambitious to see their families in the enjoyment of; surely we should not hesitate to adopt with alacrity the necessary improvements. However laudable it may be that certain customs and habits of our ancestors should be cherished, and have attractions for us, in the age and state of society in which we happen to live, no wise man will hesitate to reject any habit, custom or practice, that he discovers to be manifestly at variance with individual or general interests or prosperity. To cherish or retain them after this conviction, is voluntarily to submit to what is injurious, and forego all the advantages that the diffusion of knowledge is rapidly introducing into other countries, by the improvement of every art, and consequently of civilized life.

It is necessary, however, before we desire any good, that we know what it is, and how to estimate it; and it is by education alone, that we can be made acquainted with the good that is attainable. It is impossible that agriculture can be duly improved, until farmers are educated. Though education may not make a good practical farmer, there can be no good practical farmer without it. Let education and knowledge extend, and we may assure ourselves, old customs and practices will be less regarded, particularly, if we perceive that they debar us from attaining advantages, and comforts, that we want, and have not. When education will enable men to scrutinize and examine into the cause of things, much of the veneration for old customs, habits, and usages, will be at an end; and those only will be regarded and retained, that are clearly subservient to some useful or profitable purpose.

Farmers here have to direct and superintend, as well as join in the labour of agriculture; and a man who has received a reasonable education is better qualified to do so, than one who is illiterate. There may be instances of educated men of the middle class being idle, and useless members of society, but surely it cannot be a proper education that would make them so, but because they will not make a proper use of it, in the industrious pursuits of common life.

The reader will, perhaps, censure me for wandering from my subject. My object, however, is to make my book useful to the agricultural classes in Canada, and if possible to induce them, and others who are capable of advising them, to examine into those causes and effects, in which themselves and the rising generation are deeply interested.

SCIENCE OF

AGRICULTURE.

PART II.

" The object of the art of agriculture is to increase the quantity, and improve the quality, of such vegetable and animal productions of the earth as are used by civilized man ; and the object of the agriculturist ought to be to do this, with the least expenditure of means, or, in other words, with profit. The result of the experience of mankind as to other objects, may be conveyed to an enquiring mind in two ways : he may be instructed in the practical operations of the art, and their theory, or the reasons on which they are founded, laid down and explained to him as he goes along ; or he may be first instructed in general principles, and then in the practices which flow from them. The former is the natural and actual mode by which every art is acquired, (in so far as acquirement is made,) by such as have no recourse to books, and may be compared to the natural mode of acquiring a language without the study of its grammar. The latter mode is by far the most correct and effectual, and is calculated to enable an instructed agriculturist to proceed with the same kind of confidence and satisfaction in his practice, that a grammarian does in the use of language."

Were I to enter fully on the science of agriculture, a volume of this size would not contain one-fourth even of what is interesting in that science. I must, therefore, confine myself to that part that I conceive will be useful and necessary for Canadian farmers to be acquainted with, and endeavor to convey a general idea, first, of the compound products of vegetables ; second, germination of seeds ; third, food of vegetable plants, and the nature and properties of various soils, as the different soils are calculated to afford nourishment to plants ; fourth, improvement of soils ; fifth, the principle of rotation of crops ; sixth, of manures, fermentation, &c. ; seventh, mineral manures ; eighth, distribution of plants ; ninth, diseases of plants ; tenth, natural decay of plants ; eleventh, climate and temperature, evaporation, rain, snow, and frost ; twelfth, means of prognosticating the weather.

COMPOUND PRODUCTS OF VEGETABLES.

Plants may be considered as beings endowed with a species of life, absorbing nourishment from the soil in which they grow, and assimilating it to their own substance by means of the functions and operation of their different organs ; a specific knowledge of the primary principles of vegetables, and their mutual action upon one another, is therefore useful if not actually necessary, to agriculturists who would desire to practice the art scientifically or profitably. The compound products of vegetable analysis obtained by chemical processes, are very numerous ; some of them only are neçessary to be introduced in this work, such as sugar, starch, gluten, albumen, extract, tannin, charcoal, sap, ashes and earth.

Sugar is produced chiefly from the sugar cane, from the juice of the American maple, grapes, common beet, turnips, carrots, parsnips, maize, and from several other vegetables or their productions.

Starch, may be obtained from wheat, barley, oats, rice, maize, millet seed, peas, beans, acorns, and many other plants, is an extremely nutritive substance, and forms one of the principal ingredients in almost all articles of vegetable food, used by man, or by inferior animals.

Gluten is that part of the paste formed from the flour of wheat, which remains unaffected by the water, after the starch contained in it has been washed off. It is of a tough, elastic substance, of a dull white colour, without taste, but of a very peculiar smell ; it is insoluble in water and in alcohol, but soluble in acids and alkalies. Gluten has been detected, in a very considerable number of vegetables, or vegetable substances, as well as in flour of wheat. It is one of the most important of all vegetable substances, as being the principal that renders the flour of wheat so fit for forming bread by its occasioning the panary fermentation, and making the bread light and porous. It is also used as a cement, and is capable of being used as varnish, and a ground for paint.

Albumen, which is a thick, glairy, and tasteless fluid, resembling the white of an unboiled egg, is a substance which has been lately proved to exist in the vegetable kingdom, and is often the most valuable part of a plant ; it is nearly related to animal gluten. In corn, it is that which is ground into flour.

Extract : When vegetable substances are macerated in water, a considerable portion of them is dissolved ; and if the water is again evaporated, the substance held in solution may be obtained in a separate state. This substance is denominated extract.

Tannin may be obtained from a great variety of vegetables, but chiefly from the bark, and of barks, chiefly from those that are astringent in the taste. Sir H. Davy, ascertained the value of the different species of bark, as exhibited in the following table. It gives the average obtained from 480 pounds of the entire bark of a middle sized tree of the different species, taken in spring when the quantity of tannin is the largest.

Oak - - -	29 lbs.	Lombardy poplar - -	15 lbs.
Spanish chesnut -	21	Birch - - -	8
Leicester willow (large)	33	Hazel - - -	14
Elm - - -	13	Blackthorn - - -	16
Common willow (large)	11	Coppice oak - -	32
Ash - - -	16	Inner rind of oak bark -	72
Beech - - -	10	Oak cut in autumn -	21
Horse chesnut -	9	Larch cut in autumn -	8
Sycamore - - -	11		

The bark of the oak tree, which contains tannin in great abundance, is that which is most generally used in the British Isles by the tanner. The hides are prepared for the process of tanning, by steeping them in lime-water, and scraping off the hair and cuticle. They are then soaked, first in the weaker and afterwards in a stronger infusion of the bark, till at last they are completely impregnated. This process requires a period of from ten to eighteen months, if the hides are thick, and four or five pounds of bark are necessary on an average to form one pound of leather.

Charcoal; when wood is burned with a smothered flame, the volatile parts are driven off by the heat, and there remains behind a substance exhibiting the exact form, and even the several layers of the original mass. This process is denominated charring, and the substance obtained, charcoal. 100 parts of the following trees affords the following :

Chesnut	23	Elm	19½
Oak	22½	Ash	17¾
Black birch	21¼	Birch	17¼
Walnut	20½	Scotch pine	16½
Beech	19¾	Norway fir	19¼
Maple	19¾		

Charcoal is insoluble in water, and incapable of putrefaction ; it is of great utility to the chemist and artist, as fuel for heating furnaces, and is an excellent filter for purifying water.

The sap is a clear colourless fluid, that may be procured from almost any plant, by cutting an incision in spring, before the leaves begin to expand, particularly from the vine, maple, birch, and walnut tree, by boring a hole in the trunk. A small branch of vine has been known to yield from twelve to sixteen ounces in the space of twenty-four hours. A maple tree of moderate size yields about two hundred pints in a season, and a birch tree has been known to yield in the course of the bleeding season a quantity equal to its own weight. Sap is the grand and principal source of vegetable aliment, and may be regarded as being somewhat analogous to the blood of animals. The sap of the birch may be manufactured into a very pleasant wine ; and it is well known that the sap of the American maple yields a considerable quantity of sugar.

Ashes, are analyzed with a view to discover the ingredients of which different plants are composed; very frequently more than one half of the ashes of vegetables consists of carbonate of lime. The other principal substances obtained are potass, and soda.

Earths : The only earths which have hitherto been found in plants, are lime, silicia, magnesia, and alumina. Lime is by far the most abundant earth. The phosphate of lime is, next to the alkaline salt, the most abundant ingredient in the ashes of green herbaceous plants, whose parts are all in a state of vegetation. The leaf of a tree, bursting from the bud, contains in its ashes, a greater portion of earthy phosphate than at any other period. Carbonate of lime, is next to phosphate of lime, the most abundant of the earthy salts that are found in vegetables. In green herbaceous plants, whose parts are in a state of increase, there is but little carbonate of lime ; but the ashes of the bark of trees contain an enormous quantity of carbonate of lime, and much more than the alburnum, as does also the ashes of the wood. The ashes of most seeds contain no carbonate of lime ; but they abound in phosphate of potass. Hence the ashes of plants, at the period of the maturity of the fruit, yield less carbonate of lime than at any previous period.

Silicia is not found to exist in a great proportion in the ashes of vegetables. The ashes of some stalks of wheat, gathered a month before the time of flowering, and having some of the radical leaves withered, contained 12 parts of silicia, and 65 of alkaline salts in 100. At the period of the wheat flowering, and when more of the leaves were withered, the ashes contained 32 parts of silicia, and 54 of alkaline salts. Seeds divested of their external covering, contain less silicia than the stem furnished with its leaves ; and it is remarkable that there are trees of which the bark, alburnum, and wood, contain scarcely any silicia, and the leaves a great deal, particularly in autumn. The greater part of the grasses contain a very considerable portion of silicia.

Magnesia does not exist so abundantly in the vegetable kingdom, as the two preceding earths. Alumina has been detected in several plants, but in very small quantities.

Iron, and even gold, have been discovered in the ashes of vegetables, but in such small quantities as not to be detected except by the most delicate experiments.

Such are the principal ingredients that enter into the vegetable composition ; there are, however, numerous other ingredients which I do not think necessary to allude to.

Gay Lussac, and Therard, have deduced from a series of the most minute and delicate experiments, the three following propositions.

First, Vegetable substances are always acid, when the oxygen they contain is to the hydrogen in a greater proportion than the water.

Second, Vegetable substances are always resinous, or oily, or spirituous, when the oxygen they contain is to the hydrogen in a smaller proportion than in water.

Third, Vegetable substances are neither acid nor resinous, but saccharine, or mucilaginous, or analogous to woody fibre or starch, when the oxygen and hydrogen they contain are in the same proportion as in water.

GERMINATION OF THE SEED.

Germination is universally the first part of the process of vegetation, for it may be regarded as an indubitable fact that all plants spring originally from seed. The conditions necessary to germination relate either to the internal state of the seed itself, or to the circumstances in which it is placed with regard to surrounding substances.

The first condition necessary to germination is, that the seed must have reached maturity. Unripe seeds will seldom germinate, because their parts are not yet prepared to form the chemical combinations on which germination depends. Most seeds, perfectly ripe, and guarded from external injury, will retain their germinating faculty for a period of many years. This has been proved by the experiment of sowing seeds that have been so kept, as well as the deep ploughing up of fields which have been long left without cultivation. A field which was thus ploughed in Scotland, after a period of forty years' rest, yielded black oats without sowing. This could only have occurred from the plough bringing up near the surface seeds that had been too deeply lodged for germination; however, the farmer will always find it his interest to sow seed that has not been over one year kept. The second condition is, that the seed sown must be covered, and defended from the action of the rays of light.

A third condition necessary to germination is the access of heat. No seed has ever been known to germinate at or below the freezing point. Seeds will not germinate in winter in Canada, even though lodged in their proper soil; though the vital principle is not necessarily destroyed in consequence of this exposure, the seed will germinate still on the return of spring, when the ground is thawed, and the temperature raised to the proper degree. This degree varies considerably in different species of seeds, as is obvious from observing the times of their germination, whether in the same climate or in different ones; for if seeds which naturally sow themselves, germinate in different climates at the same period, or in the same climate at different periods, the temperature necessary to their germination must of consequence be different. These cases are constantly occurring and presenting themselves to our notice, and have been made the subject of particular observation. Adanson found that seeds which will germinate in the space of twelve hours, in an ordinary degree of heat, may be made to germinate in the space of three hours by exposing them to a greater degree of heat; and that seeds transported from the climate of Paris to that of Senegal, have their periods of germination accelerated from one to three days. Upon the same principle, seeds transported from a warmer to a colder climate, have their periods of germination protracted till the temperature of the latter is raised to that of the former. A fourth condition necessary to germination is, the access of moisture. Seeds will not germinate if they are kept perfectly dry. Water, or some liquid equivalent to it, is essential to germination. Rain should always be acceptable to the farmer, immediately after he has sown his seeds; and, if no rain falls, recourse ought to be had, if possible, to artificial watering. The quantity of water applied is by no means a matter of indifference. There may be too little, or there may be too much. If there be too little, the seed dies for want of moisture; if there be too much, it rots. The case is not the same with all seeds. Some can bear but little moisture, while others will germinate when partially immersed, as rice, and some other watered grains; but none of the latter is cultivated in Lower-Canada.

The period necessary to complete the process of germination is not the same in all seeds, even when all the necessary conditions are furnished. Some species require a shorter, and others a longer period. The grasses are among the number of those plants the seeds of which are of the most rapid germination.

Adanson gives the following table as the result of his observation of the periods of the germination of a considerable variety of seeds:

Wheat and millet seed	1 days.	Barley from	4 to 7 days.
Beans - - -	3	Oats from	2 to 6
Melon and cucumber cress	5	Peas from	2 to 6
Radish and beet-root -	6		

When a seed is committed to the soil under the conditions which have been specified, the first infallible symptom of germination is to be deduced from the prolongation of the radicle bursting through its proper integuments, and directing its extremity downwards into the soil. The developement of the rudiments of a stem, if the species be furnished with one, is the concluding step, and the plant is complete. Whatever way the seed may be deposited, the invincible tendency of the radicle is to descend and fix itself in the earth ; and of the plumelet, or first real leaf, to ascend into the air. Many conjectures have been offered to account for this. The only reasonable one that I can discover is, that the Creator has placed a power in the vegetable kingdom, analogous to what we call instinct in the animal subject, infallibly directing it to the situation best suited to the acquisition of nutriment, and consequent developement of its parts. The chemical phenomena of germination consist chiefly in the changes which are effected in the nutriment destined for the support and developement of the embryo till it is converted into a plant. The seed sown contains the food destined for the support of the embryo in its germinating state. This food however, is not yet fitted for the immediate nourishment of the embryo ; some previous preparation is necessary ; some change must be effected in its properties. The moisture imbibed by a seed placed in the earth induces a degree of fermentation precisely similar to the fermentation in the process of converting barley into malt, known by the name of saccharine fermentation, which converts the farina of the seed into a mild and saccharine food, fit for the nourishment of the infant plant. The more full and perfect, therefore, the seed sown, the more capable it will be to feed, and produce a healthy and perfect plant. The radicle gives the first indication of life, expanding and bursting its integuments, and at length fixing itself in the soil ; the plumelet next unfolds its parts, developing the rudiments of leaf, branch and trunk, and finally, the seminal leaves decay and drop off, and the embryo is converted into a plant, capable of abstracting immediately from the soil or atmosphere, the nourishment necessary to its future growth.

FOOD OF VEGETATING PLANTS—NATURE AND PROPERTIES OF SOILS, &c. &c.

The substance which plants abstract from the soil or atmosphere, or the food of the vegetating plant, has been a matter of anxious inquiry. The discoveries of modern chemists have done much to elucidate this subject. I shall avail myself of what has been written, and submit for the consideration of farmers, the most useful and practical of the discoveries.

NATURE AND PROPERTIES OF VARIOUS SOILS.

When we penetrate the surface of the earth, we generally find that the appearance, texture and colour, vary at different depths. There is a layer of earth nearest the surface, of greater or less thickness, which covers the more solid and uniform materials which lie below it. A distinct line, nearly parallel to the surface, generally marks the depth of the upper soil, and separates it from the sub-soil. The soil is more or less composed of minute parts of various kinds of earth, mixed with animal and vegetable substances, in different states of decomposition; and to these, in a great measure, it owes its colour, which is generally darker than that of the sub-soil. Except where iron, peat, coal or slate, abound in the soil, a dark colour is an indication of corresponding fertility. The rich soil of gardens, long cultivated and highly manured, is nearly black. As the soil is the bed in which the vegetables are to be reared, and in which they are to find their proper nourishment, its texture and composition become objects of great importance to the farmer; and, without some knowledge of these, it will be to no good purpose that practical rules should be laid down, nor can they be depended on.

All soils are composed of earths, metallic oxides, saline substances, vegetable and animal matter, and water. The earths are chiefly clay or alumina, flint or silicia, and lime. Magnesia barytes, and other earths, are occasionally met with, but in so few instances, that they may be omitted in the list. Of the metals, the most abundant is iron, in the state of peroxide. The other metals are rarely found near the surface. Saline substances form a small part of a soil, but a most important one.

Potassa exists in almost every vegetable, soda in a few, and ammonia is produced by the decomposition of animal matter, but from its volatile nature it is not long retained in the soil, except when it forms a fixed compound with other substances. The vegetable acids, as a general rule, are perhaps, limited to small portions of acetic acid in combination with some base, as lime or potash.

The mineral acids are found united with earths and alkalies, in the state of neutral compounds. These saline substances have a powerful effect on vegetation, and a knowledge of their proportions in the soil, and of their various qualities, is very necessary in order to modify or correct their action by other substances to which they have an affinity.

Water, in a state of combination, or of mere mechanical diffusion, is essential to the growth of all plants; without it, and atmospheric air, there can be no life, either animal or vegetable.

Earths.—Clay or alumina, so called because it is obtained in its purest state from alum, in which it is combined with the sulphuric acid, is the basis of all strong and heavy soils. When it is minutely divided, it is easily suspended in water; when dried slowly, and stirred while drying, it becomes a fine powder, soft to the touch, and when kneaded with water, a tough, ductile mass, easily moulded into hollow vessels, which retain liquids. This property, of being imperious to water, gives the specific character to clay as an ingredient of the soil. In a pure and unmixed state, such clay is absolutely barren. When clay is heated to a great degree, it parts with the water combined with it; it is then said to be baked, as we see in bricks; it is no longer diffusible in water, and differs little from silicia, or sands, in its effects on the soil.

Silicia, or the earth of flints, suffer no change in water. It consists of crystals, or fragments of very hard stone, forming gravel or sand according to their size; and the finest silicious sand, when examined with a magnifying glass, has the appearance of irregular fragments of stone without any cohesion between them. Silicious sand holds water in its interstices by simple cohesive attraction in proportion to its fineness. It heats and cools rapidly, letting the water pass through it readily, either by filtration or evaporation. Its use in the soil is to keep it open, to let the air and water, as well as those other substances on which the growth of plants depends, circulate through it. Unmixed, it dries so rapidly that no vegetation can continue in it, unless a constant supply of moisture be given by irrigation. A small portion of clay will much improve light sands ; it takes a large quantity of sand to correct the tenacity of clay.

In England it is found that a small quantity of finely divided matter is sufficient to fit a soil for the production of turnips and barley ; and a tolerable crop of turnips have been produced on a soil containing eleven parts out of twelve of sand. A much greater portion than this of sand produces absolute sterility. Bagshot heath contains less than one-twentieth of finely divided matter, and is almost entirely devoid of vegetable covering.

Plants which have bulbous roots, require a looser and a lighter soil than such as have fibrous roots ; plants possessing only short fibrous radicles, demand a firmer soil than such as have tap-roots or extensive lateral roots ; the latter therefore, is best adapted to sandy soils.

Lime, in its pure state, is familiar to every one as the basis of the mortar used in building. It is produced by burning marble, chalk, limestone or shells, in great heat. In the stones which are formed principally of lime, it is combined with some acid, most generally the carbonic acid, which separates from it by the operation of burning, in the form of air or gas, hence called fixed air, from its being thus fixed in a stone. These stones of various degrees of hardness, are now all classed under the name of carbonate of lime.

Lime unites readily with water, which it also absorbs from the atmosphere. It then becomes slacked. By uniting with carbonic acid, it returns to its former state of carbonate, with this difference, that unless much water be present, it remains a fine impalpable powder. Pure lime is soluble in water, though sparingly ; a pint of water cannot dissolve more than about twenty grains ; the carbonate is not soluble in water. Carbonate of lime has a powerful effect on the fertility of a soil, and no soil is very productive without it. It is consequently used extensively as an improver of the soil, otherwise called a manure. Carbonate of lime, as an earth, is neither so tenacious as clay, nor so loose as sand. In proportion to the fineness of its particles, it approaches to the one or the other, and when the portions are large and hard, it takes the name of limestone gravel. Its distinguishing feature is its solubility in acids, which it neutralizes, depriving them of their noxious qualities in the soil. A proper mixture of these three earths, in a due state of mechanical division, forms a soil well fitted to the growth of every species of plants, especially those which are cultivated for food, and nothing more is required than a proper climate as to heat, a proper degree of moisture, and sufficient nourishment, to make all the plants generally cultivated thrive most luxuriantly in such a mixture, which is usually called a loam.

On the dry parts of the globe, the decay of vegetables and animals have formed additions to the outer surface of the earths, and constitute what may be called soils, the difference between which and earths is, that the former always contain a portion of vegetable or animal matter.

The formation of peaty soils is produced from causes interesting to contemplate. The earth, which supplies almost all our wants, may become barren alike from the excessive application of art, or the utter neglect of it. Continual pulverization, and cropping without manuring, will certainly produce a hungry, barren soil ; and the total neglect of fertile tracts will, from their accumulated vegetable products, produce peat soils and bogs. Where successive generations of vegetables have grown upon a soil, Sir H. Davy observes, unless part of their produce has been carried off by man, or consumed by animals, the vegetable matter increases in such a proportion, that the soil approaches to a peat in its nature ; and, if in a situation where it can receive water from a higher district, it becomes spungy and permeated with the fluid, and is generally rendered incapable of supporting the nobler classes of vegetables. The neighbourhood of morasses, in which much aquatic vegetables decompose is usually agueish and unhealthy ; whilst that of the true peat, or peat formed on soils originally dry, is always salubrious.

There are two grand classes of soils, viz., primitive soils, or those composed entirely of inorganic matter, and secondary soils, or those composed of organic and inorganic matter, in mixtures. These classes have been subdivided into orders, the orders subdivided into genera, the genera subdivided into species, and species into varieties, founded on colour, texture, or moisture, dryness, richness, lightness, &c.

In determining the genera of soils, the first thing is to discover the prevailing earth or earths ; either the simple earths, as clay, lime, sand, or the particular rocks from which the soil has been produced, as granite, basalt, &c. When one earth prevails, the genera name should be taken from that earth, as clayed soil, calcarious soil, &c. ; when two prevail, to all appearance equally, then their names must be conjoined in naming the genus, as clay and sand, lime and clay, basalt and sand, &c. Sir Humphrey Davy has observed, the term sandy soil should never be applied to any soil that does not contain at least seven-eighths of sand ; sandy soils which effervesce with acids, should be distinguished by the name of calcarious sandy soil, or sandy soil abounding with lime, to distinguish them from those that are silicious, or of the nature of flint. The term clayed soil, should not be applied to any land which contains less than one-sixth of impalpable earthy matter, not considerably effervescing with acids. The word loam should be limited to soils containing at least one-third of impalpable earthy matter, copiously effervescing with acids. A soil considered as peaty, ought to contain at least one half of vegetable matter. In general, the soils, the materials of which are the most various and heterogenous, are those called alluvial, or which have been formed from the depositions of rivers, and these deposits may be named silicious, or calcarious, as the materials which compose soils so denominated, are found most to prevail. In naming the species of soils, they are always determined by the mixture of matters, and never by the colour or texture of that mixture, which belongs to the nomenclature of varieties. Thus, a clayed soil with sand, is a sandy clay ; this is the name of the species ; the colour may be added which will express the genus, species, and variety. A soil containing equal parts of clay, lime, and sand, would, as a generic term, be called clay, lime, and sand ; if it contained no other mixture in considerable quantity, the term entire might be added as a specific distinction ; and if notice was to be taken of its colour or degree of comminution, it might be termed a brown, a fine, a coarse, a stiff, or a free entire clay, lime, or sand.

There are some soils which, besides a proper mechanical texture and mixture of earths, contain a large proportion of natural manure which renders them extremely fertile. This is a substance produced by the slow decay of animal and vegetable matter. It can be separated from the other parts of the soil, and has been accurately analyzed and described by many of the most experienced chemists, particularly by Fourcroy, Davy, Chaptal, and Theodore de Saussure. This substance has been called *vegetable mould* ; but, as this is not a very distinct term, it may be well with Thaer, and other eminent writers on agriculture, to adopt the name of *humus*, when speaking of it. Humus, is described, as a dark, unctious, friable substance, nearly uniform in its appearance. It is said to be a compound of oxygen, hydrogen, carbon, and nitrogen, which, with the exception of nitrogen, which is found only in some substances, are really the elements of all animal and vegetable substances. It is the result of the slow decomposition of organic matter in the earth, and is found in the greatest abundance in rich garden mould, or old neglected dunghills. It varies somewhat in its qualities and compositions, according to the substances from which it has been formed, and the circumstances attending their decay. It is the product of organic power, such as cannot be compounded chemically. Besides the four essential elements in its composition, it also contains other substances in smaller quantities, viz., phosphoric and sulpuric acids, combined with some base, and also earths and salts. Humus is the product of living matter and the source of it. It affords food to organization; without it nothing material can have life. The greater the number of living creatures in a country, the more humus is formed ; and the more humus, the greater the supply of nourishment and life. Every organic being in life adds to itself the raw materials of nature, and forms humus, which increases as men, animals and plants increase in any portion of the earth. It is diminished by the process of vegetation, and wasted by being carried into the ocean by the waters, or it is carried into the atmosphere by the agency of the oxygen of the air, which converts it into gaseous matter.

Humus, in the state in which it is usually found in the earth, is not soluble in water, and we might have some difficulty in comprehending how it enters into the minute vessels of the roots of plants ; but here the admirable provision of nature may be observed. Humus is insoluble and antiseptic ; it resists further decomposition in itself, and in other substances in contact with it. It remains for a long time in the earth unimpaired ; but no sooner is it brought into contact with the atmosphere, by the process of cultivation, than an action begins. Part of its carbon uniting with the oxygen of the atmosphere, produces carbonic acid, which the green parts of plants readily absorb, while its hydrogen with the same forms water, without which plants cannot live ; and in very warm climates, where this process goes on more rapidly, the moisture thus produced keeps up vegetable life, when rains and dews fail. The residue becomes a soluble extract, and in that state is taken up readily by the fibres of the roots. But the changes still go on; the extract absorbs more oxygen, and becomes once more insoluble, in the form of a film, which Fourcroy calls *vegetable albumen*, and which contains a small portion of nitrogen, readily accounted for. By bringing fresh portions of humus to the surface, and permitting the access of air to it, more carbonic acid, water, extract, and albumen are formed, and give a regular supply to the plants, which by their living powers, produce the various substances found in the vegetable kingdom of nature. Hence we may see the great importance of frequently stirring the surface of the earth between vegetables.

It is to the patience and perseverance of the chemists I have named, that we owe this insight into the wonderful process of vegetable growth, and what is here stated is on their authority.

The great importance of humus, and of those rich manures which are readily converted into it, when not immediately absorbed by plants, may now be easily understood. But it has still another property, highly important to fertility; it renders stiff clay porous, and consolidates loose sand. It does so more than lime, or any other earth. Hence a soil with a considerable proportion of humus, is much more fertile than the quantity of alumina, or of sand, in its composition, would lead one to expect, as will be proved by the results of the analysis of soils of known fertility; and we see the great advantage of animal aud vegetable manures, not only as nourishment of vegetables, but as mechanical improvers of the texture of soils.

The greatest enemy of humus, is stagnant water; it renders it acid and astringent, as we see in peat: and soils abounding with vegetable matters, from which water is not properly drained, become sour, as is very justly said, and produce only useless and unpalatable plants. The remedy is simple and obvious; *drain well*, and naturalize the acid with lime, or calcarious clay, or sand; by these means abundant fertility will be restored.

In very light soils, humus is seldom found in any quantity, being too much exposed to the air, and rapidly decomposed; the extract is washed through them by the waters, and as they waste manure rapidly, they are called hungry. Such soils are very unprofitable, until they are improved and consolidated by clay or marl, which makes them retain the moisture.

With calcarious earths, humus acts well, provided they are pulverized and of sufficient depth. Some very poor soils may be rendered fertile by judicious culture and manuring.

In order to ascertain the probable fertility of a soil, it is very useful to analyze it, and find out the proportion of its component parts. To do this with great accuracy requires the knowledge of an experienced chemist; but, to a certain degree, it may be easily done by any person possessed of an accurate balance and weights, and a little spirits of salts, or muriatic acid. For this purpose, some of the soil, taken at different depths not too near the surface, (from four to eight inches, if the soil is uniform in appearance,) is dried in the sun till it pulverizes in the hand,

and feels quite dry: the small stones and roots are taken out, but not minute fibres. A convenient portion of this is accurately weighed; it is then heated in a porcelain cup, over a lamp or a clear fire, and stirred, till a chip or straw put in it turns brown. It is then set to cool, and weighed; the loss of weight is the water, which it is of importance to notice. Some soils, to appearance quite dry, contain a large proportion of water; others scarcely any. It is then pulverized and sifted, which separates the fibres and coarser parts. The remainder, again weighed, is stirred in four or five times its weight of pure water; after standing a few minutes to settle, the water is poured off, and it contains most of the humus and soluble substances. The humus is obtained by filtration, well dried over the lamp, and weighed. The soluble substances are obtained by evaporating the water; but, unless there is a decidedly saline taste, this may be neglected. The humus may be further examined by heating red hot in a crucible, and stirring it with a piece of the stem of a tobacco pipe, when the vegetable part will be consumed, and the earths remain behind; thus the exact quantity of pure vegetable humus is found. Some muriatic acid, diluted with five times its weight of water, is added to the deposit left after pouring off the water containing the humus and soluble matter; the whole is agitated, and more acid added gradually, as long as effervescence takes place, and until the mixture remains decidedly acid, which indicates that all the calcarious earth is dissolved. Should there be a great portion of this, the whole may be boiled, adding muriatic acid gradually, till all effervescence ceases; what remains, after washing it well, is silicious and argillaceous earth. These are separated by agitation, allowing the silicious part to settle, which it does in few seconds. The alumina is poured off with the water, filtrated, heated over the lamp, and weighed; the same with the silicious sand. The loss of weight is calcarious earth. In this manner, but with greater care and more accurate tests, various soils of known fertility have been analyzed, of which we will give a few examples.

A very rich soil near Drayton, Middlesex, examined by Davy, consisted of three-fifths of silicious sand, two-fifths of impalpable powder, which analyzed, was found to be composed of

Carbonate of lime - - - - -	28 parts.
Silicious earth - - - -	32
Alumina - - - - - -	29
Animal and vegetable matter - -	11-100

This is a rich sandy loam, probably long and highly manured, fit for any kind of produce, and if deep, admirably fitted for fruit trees.

Another good turnip soil, by the same, consisted of eight parts of coarse silicious sand, and one of fine earth, which being analyzed consisted of

Carbonate of lime - - - -	63
Silicia - - - - - -	15
Alumina - - - - - -	11
Oxide of iron - - - - -	3
Vegetable and saline matter - -	5
Water - - - - - -	3-100

This is a very light sandy soil, and owes its fertility to the fine division of the carbonate of lime and the vegetable and saline matter. It may probably have been limed or marled at some time or other.

The best soil in France, according to Mr. Tillet, consists of

Fine silicious sand - - -	21 parts.
Coarse ditto - - - -	25
Carbonate of lime - - -	37-5
Alumina - - - - -	16-5
	100-0

A loam at Chamart, highly prized by gardeners about Paris, as the basis of their artificial soils, consists of

Argillaceous sand - - -	57 parts
Finely divided clay - - -	33
Silicious sand - - -	7-4
Carbonate of lime, coarse - -	1
Ditto fine - - - -	-6
Woody fibre - - - -	-5
Humus and soluble matter - -	-5
	100-0

The argillaceous sand is composed of fragments of soft stone, which retain moisture, and do not bind hard ; the small proportion of humus is of no consequence where manure is to be had in any quantity.

A very rich heath or bog earth, found at Meuden, and in great request for flowers and in composts, consists of

Gritty silicious sand - -	62 parts.
Vegetable fibres partly decomposed -	20
Humus - - - - -	16
Carbonate of lime - - -	-8
Soluble matter - - -	1-2
	100-0

This soil, like our bog earth, would be very unfit for the growth of corn ; but, from the quantity of humus and vegetable matter, is highly useful in composts and artificial soils ; mixed with lime, it would make an excellent top dressing for moist clay soils.

Mr. Thaer has given a classification of soils of known qualities, which may be interesting to farmers. It is as follows :

No.		Clay per cent.	Sand per cent.	Carb'te of lime per ct.	Humus per cent.	Value.
1	First class of strong soil	74	10	4½	11½	100
2		81	6	4	8⅔	98
3		79	10	4	6½	96
4		40	22	36	4	90
5	Rich light sand in natural grass	14	49	10	27	?
6	Rich barley land	20	67	3	10	78
7	Wheat land	58	36	2	4	77
8	Ditto	56	30	12	2	75
9	Ditto	60	38	very insignificant quantities.	2	70
10	Ditto	48	50		2	65
11	Ditto	68	30		2	60
12	Good barley land	38	60		2	60
13	Ditto 2nd quality	33	65		2	50
14	Ditto	28	70		2	40
15	Oat land	23½	75		1½	30
16	Ditto	18½	80		1½	20

Below this are very poor rye lands.

In all these soils the depth is supposed the same, and the quality uniform to the depth of at least six inches ; the sub-soil sound, and neither too wet nor too dry.

Nos. 1, 2, and 3, are alluvial soils, and from the division and the intimate union of the humus, are not so heavy and stiff, as the quantity of clay would indicate.

No. 4, is a rich clay loam, such as is found in many parts of England, and in Canada, neither too heavy nor too loose ; a soil easily kept in heart by judicious cultivation.

No. 5, is very light and rich, best adapted for gardens and orchards, but not for corn ; hence its comparative value can scarcely be given.

Nos. 6, 7, and 8, are good soils ; the quantity of carbonate of lime in No. 8, compensates for the smaller portion of humus. This land requires manure, as well as the others below. In those from No. 9, downwards, lime or marl of good quality, would be the greatest improvement.

Nos. 15 and 16, are poor light soils, requiring clay and much manure. But even such lands will repay the cost of judicious cultivation, and rise in value.

The last column, of comparative value, is the result of several years careful valuation of the returns, after labour and seed have been deducted. Few soils in England contain more than four or five per cent. of humus, even when in good heart ; and two per cent. with a good loamy texture will render a soil fit for corn with judicious cultivation.

The texture is of the most importance, as may be seen by comparing Nos. 7 and 8, with No. 6. If this be of good quality, dung will soon give the proper supply of humus.

Water and gases constitute a considerable part of vegetable food, but I do not think it would be useful to occupy the reader's time in elucidating how these substances are taken up by plants, or in what proportion. The most important food of plants, is vegetable extract. When plants have attained to the maturity of their species, the principle of decay begins gradually to operate upon them, till they at length die, and are converted into dust or vegetable mould, which, as might be expected, constitutes a considerable portion of the soil. The chance then is, that it is again converted into vegetable nourishment, and again enters the plant. But it cannot wholly enter the plant, because it is not wholly soluble in water. Part of it, however, is soluble, and consequently capable of being absorbed by the root, and that is the substance which has been denominated extract.

Saussure filled a large vessel with pure mould of turf, and moistened with distilled or rain water, till it was saturated. At the end of five days, when it was subjected to the action of the press, 10,000 in weight of the expressed and filtered fluid yielded, by evaporation to dryness, 26 parts of extract. In a similar experiment upon the mould of a kitchen garden, which had been manured with dung, 10,000 parts of fluid yielded 10 of extract ; and in a similar experiment on mould taken from a well cultivated corn field, 10,000 parts of fluid, yielded 4 parts of extract. Such was the result in these particular cases. But the quantity of extract which can be separated from the common soil is not very considerable. After eleven decoctions, all that could be separated was about one-eleventh of its weight ; and yet this seems to be more than sufficient for the purposes of vegetation ; for a soil containing this quantity was found by experiment to be less fertile, at least for peas and beans, than a soil containing only one-half or two-thirds of the quantity. But if the quantity of extract must not be too much, neither must it be too little. Plants that were put to vegetate on soil deprived of its extract, as far as repeated decoctions could deprive it, were found to be much less vigorous and luxuriant than plants vegetating in a soil not deprived of its extract ; and yet the only perceptible difference between them is, that the former can imbibe and retain a much greater quantity of water than the latter. From this last experiment, as well as from the great proportion in which it exists in the living plant, it evidently follows that extract constitutes a vegetable food, and a most essential one.

Salts are known to exist in the soil, and found in a certain proportion in most plants, and the root is supposed to absorb them in solution with the water by which the plant is nourished.

The depth of the soil and nature of the sub-soil greatly affect its value. However rich it may be, if there is only a thin layer of good soil over a sharp gravel or a wet clay, it can never be very productive ; in the first case, it will be parched in dry weather ; and in the latter, converted into mud by every continued rain. If the sub-soil be loam, six inches of good soil will be sufficient. With a foot of good soil, the sub-soil is of very little consequence, provided it be dry, and the water can find a ready outlet. The best alluvial soils are generally deep.

The exposure, with respect to the sun, and the declivity of the ground, are very important circumstances, and equivalent to an actual difference in the climate. A gentle declivity towards the south, and a shelter against cold winds, may make as great a difference as several degrees of latitude; and in comparing the value of similar lands in different climates, the average heat and moisture in each must be accurately known.

A soil very valuable in the south of Europe, may be very unproductive in Canada; as a light soil of some value in the west of Scotland, might be absolutely barren in Italy or Spain.

Soils in a state of culture, though consisting originally of the due proportion of ingredients, may yet become exhausted of the principle of fertility by means of too frequent cropping; whether by repetition of the same, or rotation of different crops. In this case, it should be the object of the cultivator to ascertain by what means fertility is to be restored to an exhausted soil, or communicated to a new one. In the breaking up of new soils, if the ground has been wet or marshy, as is frequently the case, it is often sufficient to prepare it, merely by means of draining off the superfluous and stagnant water, and of paring and burning the turf upon the surface. If the soil has been exhausted by too frequent a repetition of the same crop, it will often happen that a change of crop will answer the purpose of the cultivator; for, though a soil may be exhausted for one sort of grain, it does not necessarily follow that it is also exhausted for another. Accordingly, the practice of the farmer is to sow his crops in rotation, having in the same field a crop, perhaps of wheat, barley, beans and tares, in succession; each species selecting in its turn some peculiar nutriment, or requiring perhaps, a smaller supply than the crop which has preceded it.

But even upon the plan of rotation, the soil becomes at length exhausted, and the cultivator is obliged to have recourse to other means of restoring its fertility. In this case an interval of repose in pasture is considered efficacious, as may be seen from the increased fertility of fields that have not been ploughed up for many years, but used for pasture. Hence also the practice of fallowing and of trenching, or deep ploughing, which in some cases has nearly the same effect as trenching.

The fertility of soil is restored, in the case of draining, by means of its carrying off all such superfluous moisture as may be lodged in the soil, which is well known to be prejudicial to plants not naturally aquatics, as well as by its rendering the soil more firm and compact. In the case of the rotation of crops, the fertility is not so much restored, as more completely developed and brought into action; because the soil exhausted from one species of grain, is yet found to be sufficiently fertile for another, the food necessary for each being different, or required in less abundance.

In the case of the repose of the soil, the restored fertility may be owing to the decay of vegetable substances which are not now carried off in the annual crop, but left to augment the proportion of vegetable mould. In case of fallowing, it is owing undoubtedly to the action of the atmospheric air upon the soil, in rendering it more friable, and in hastening the putrefaction of noxious plants. In case of trenching or deep ploughing, it is owing to the increased facility with which the roots can now penetrate to the proper depth, by which their sphere of nourishment is increased. But it often happens that the soil can no longer be ameliorated by any of the foregoing means, or not at least with sufficient rapidity for the purposes of the cultivator ; and in this case, there must be a direct and actual application made to it of such substances as are fitted to restore its fertility. Hence the indispensable necessity of manures, which chiefly consist of animal and vegetable remains that are buried and finally decomposed in the soil, from which they are afterwards absorbed by the root of the plant, in a state of solution.

Soil affords food and support to plants, and in all cases the ashes of plants contain some of the earths of the soil in which they grow ; but never equal more than one-fiftieth of the weight of the plant consumed. Wheat, oats, and many of the hollow stalked grasses, are said to have an epidermis, or outside covering of the stalk or stem, principally composed of silicious earth, the use of which seems to be to strengthen the stem and defend it from the attacks of insects, and other injuries.

The power of soil to absorb water from the air is much connected with fertility. When this power is great, the plant is supplied with moisture in dry seasons. Stiff clays which take up the greatest quantity of water when it is poured upon them in a fluid form, are not the soils which absorb most moisture from the atmosphere in dry weather. They cake, and present only a small surface to the air, and the vegetation on them is generally burned up as readily as on sands. The soils most efficient in supplying the plant with water by atmosphoric absorption are those in which there is a due mixture of sand, finely divided clay, and carbonate of lime, with some animal or vegetable matter, and which are so loose and light as to be freely passed through by the atmosphere. The absorbent power of soils, with respect to atmospheric moisture, is always greatest in the most fertile ; so that it affords the best method of judging the productiveness of lands.

The productiveness of soils is influenced by the nature of the sub-soil, or the stratum on which they rest. When soils are immediately situated upon a bed of rock or stone, they are much sooner rendered dry by evaporation, than where the sub-soil is of clay or marl ; and a prime cause of the real fertility of the land in the moist climate of Ireland, is the proximity of the rocky strata to the soil. A clayed sub-soil will sometimes be of material advantage to a sandy soil, retaining moisture in such a manner as to be capable of supplying that lost by the earth above, in consequence of evaporation or the consumption of it by the plants. A sandy or gravelly sub-soil often corrects the imperfections of too great a degree of absorbent power in the upper soil. It is said that there is a considerable difference between the sandy soils, on the east and west coasts of Scotland. On the west coast, such soils are more productive than soils of a similar quality on the east coast, under the same circumstances of management.

In a moist climate, where the quantity of rain which falls annually equals from forty to sixty inches, a silicious sandy soil is much more productive than in dry districts ; and in such situations, plants having bulbous roots will flourish in a soil containing fourteen parts out of fifteen of sand ; even the exhausting power of crops will be influenced by like circumstances. In cases where plants cannot absorb sufficient moisture, they must take up manure. Oats, particularly in dry climates, are more impoverishing than in moist ones.

Some soils are much more heated by the rays of the sun, other circumstances being equal, than others ; and soils brought to the same degree of heat, cool much sooner than others. This property in soils, has the highest importance in culture. In general, soils which consist principally of stiff clay, are with difficulty heated, and if moist, retain their heat only for a short time. A black soil containing much more vegetable matter, is most heated by the sun and air, and the coloured soils, and the soils containing much carbonacious matter, exposed under equal circumstances to the sun, acquire a much higher temperature than pale soils. The temperature of the surface soil, when bare and exposed to the rays of the sun, affords one indication of the degree of its fertility ; and the thermometer may be sometimes a useful instrument to the purchaser or improver of land. In peaty soils, though of a dark colour, the moisture materially affects their temperature, and indeed all soils saturated with water, while they continue so, will not attain to any great degree of heat or cold, or fertility.

The soils which contain the most alumina and carbonate of lime, are those which best preserve manures, and merit the application given to them, of rich soils ; from the constitution of these soils, vegetable nourishment is long preserved in them, unless exhausted by severe cropping. Silicious sands, on the contrary, may be termed hungry soils, but they may, nevertheless, be cultivated with great success in Canada, for some species of crops.

IMPROVEMENT OF SOILS.

Soils may be improved by pulverization, consolidation, exposure to the atmosphere, alteration of their constituent parts, changing their condition with respect to water, and by a change in the plants cultivated.

Pulverization of the soil will give scope to the roots of vegetables ; whatever may be the richness of the soil, without abundance of roots, the plant will not become vigorous. The great advantage of pulverization of the soil to the plants that grow in it is, that it increases the number of their fibrous roots or mouths by which they imbibe their food, facilitate the more speedy and perfect preparation of this food, and conduct the food so prepared more regularly to their roots, though in itself it does not supply one particle of this food.

The depth of pulverization depends upon the nature of the soil, and sub-soil. In rich clayed soils it can scarcely be too deep, or in any soil, unless the sub-soil contains some principles noxious to vegetables. When the roots of plants are sufficiently deep, they are less liable to be injured either by excessive rain or drought ; and the radicles are shot forth into every part of the soil ; and the space from which the nourishment is derived is more considerable than when the seed is superficially inserted in the soil.

Consolidation will improve spungy peats, and light dusty soils, and may be effected by the addition of earthy matters, or gravel, rolling and treading together.

Exposure to the atmosphere by aration or fallowing, is considered by some as of little use in husbandry, but many good farmers are of a contrary opinion. One obvious advantage of summer fallow is, that the soil may be heated by the sun to a degree which it never could be if partially covered with the foliage of even the widest drilled crops. A clayed soil may by aration in Canada be heated to 130° or 140° degrees, which may in some degree alter its absorbent powers as to water, and contribute materially to the destruction of weeds and their roots, of insects and their eggs. By aration of lands in winter, minute divisions are obtained by the freezing of the water in the soil ; for, as water in a solid state occupies more space than when fluid, the particles of earthy matters and of decomposed stones, are thus rent asunder, and crumble down in a fine mould. Lands that are properly summer fallowed, are thoroughly freed from weeds, from many injurious insects that perish for want of nourishment, and must be well pulverized, and the top, bottom, and middle of the soil well mixed together. Lands so managed, produce some of the best crops of wheat in Lower-Canada.

Alteration in the constituent parts of soils is necessary when they contain any particular ingredient which causes them to be unproductive. If, on washing a sterile soil, it is found to contain the salts of iron, or any acid matter, it may be ameliorated by the application of quicklime. A soil containing sulphate of iron, will be sterile, but top-dressing with lime, will convert the sulphate into manure. If there be an excess of calcarious matter in the soil, it may be improved by the application of sand or clay. Soils too abundant in sand are benefited by clay, marl, or vegetable matter. Light sands are benefited by a dressing of peat ; and peats by a dressing of sand. Calcarious matter is absolutely necessary in bringing peats into profitable cultivation. The best natural soils are those of which the materials have been derived from different strata, and are intimately blended together ; and the cultivator cannot do better, in improving soils artificially, than to imitate the processes of nature. The materials necessary for the purpose are seldom distant from where they are required. The labour of improving the texture or constitution of the soil is repaid by great permanent advantages ; less manure is required, and its fertility insured ; and capital laid out in this way secures for ever the productiveness, and consequently the value, of the land. The great improvement produced in mixing soils, I have proved in Ireland, and in Canada.

Alteration of the soil by burning, I have ever considered extremely injurious to almost any soil, though good farmers are of opinion that stiff clays, marls, and soil containing much dead vegetable fibre, are improved by burning. Deep peaty soils that could be perfectly drained, could not be injured by burning part of the surface. In this country, it is generally from their low situations that they are peaty, and therefore they would require their surface to be raised, rather than lowered, by burning. Dressing peat with heavy earth, is the best means of improving them.

Changing the condition of land with respect to water, is a most essential part of husbandry. Stagnant water is injurious to all the useful classes of plants, and where moisture is superabundant in the soil, no useful plants can prosper, until properly drained.

At some future period, surface irrigation may be applied to cultivated crops in Canada, with good effect. For the present, labour will be more productive in draining lands of the superabundant water, and improving forest land. Where moss lands have been drained and cultivated on the surface, in summer their vegetation may suffer from deficiency of moisture. In that case, it would be very beneficial to supply moisture, if it were possible to do so, by damming the drains, and water courses. This plan is adopted in the British Isles, and may be introduced here. Warping is used chiefly as a mode of enriching the soil by an increase of the alluvial depositions, or warp of rivers, during winter, and produces great fertility. It will be found that waters which breed the best, and greatest quantity of fish, are the best fitted for watering meadows. Waters containing ferruginous impregnations, though possessing fertilizing effects when applied to calcarious soils, are injurious on soils which do not effervesce with acids, and calcarious waters, which are known by the earthy deposits they afford when boiled, are of most use on silicious soils, or other soils containing no remarkable quantity of carbonate of lime.

PRINCIPLES OF ROTATION OF CROPS.

Growing different crops in succession is a practice which cultivators will find to be very advantageous. Sir H. Davy says, " It is a great advantage in the convertible system of cultivation, that the whole of the manure is employed, and that those parts which are not fitted for one crop, remain as nourishment for another. Thus, if the turnip is the first in the order of succession, the crop, manured with recent dung, immediately finds sufficient soluble matter for its nourishment ; and the heat produced in fermentation, assists the germination of the seed and growth of the plant. If, after turnips, barley with grass seeds are sown, then the land having been little exhausted by the turnip crop, affords the soluble part of the decomposing manure to the grain. The grasses and clover which remain, derive only a small part of their organized matter from the soil, and probably consume the gypsum in the manure which would be useless to other crops. When the soil is exhausted, recent manure is again applied.

Peas and beans, in all instances, seem well adapted to prepare ground for wheat ; and in some rich lands they are raised in alternate crops for years together. Peas and beans, contain a small quantity of matter analagous to albumen ; but it seems that the azote, which forms a constituent part of this matter, is derived from the atmosphere. The dry bean-leaf when burnt, yields a smell approaching to that of decomposed animal matter ; and in its decay in the soil, may furnish principles capable of becoming part of the gluten in wheat. Though the general composition of plants is very analagous, yet the specific difference in the products of many of them, prove that they must derive different materials from the soil : and though the vegetables having the smallest system of leaves will proportionably most exhaust the soil of common nutritive matter, yet the particular vegetables, when their produce is carried off, will require peculiar principles to be applied to the land in which they grow. Strawberries and potatoes at first produce luxuriantly in virgin mould, recently turned up from pasture ; but in a few years they degenerate, and require a fresh soil. Lands in a course of years, often cease to afford good cultivated grasses ; they become tired of them ; and one of the probable reasons for this is, the exhaustion of the gypsum contained in the soil." Experience has proved that land, whatever may be its quality, should not be sown with clover at shorter intervals than five years.

The power of vegetables to exhaust the soil is remarkably exemplified in certain funguses. Mushrooms are said never to rise in two successive seasons on one spot.

Of late it seems to have been satisfactorily established that the roots of all plants, besides imbibing nourishment, perform also an excretory office, and that in the soil in which plants grow, there are deposited by the roots, certain matters of an excrementitious nature, injurious to the plants from which they have been separated, and which, therefore, cannot be absorbed again, till they have undergone decomposition. Such excreted matters have been adduced as the reason why a soil becomes so much deteriorated by any one species of plant having long grown in it, that it will not support other individuals of the same species ; whence the increased necessity of a rotation of crops.

The principle of rotation of crops is thus laid down by Yvart and Ch. Piclet (Cours complet d'Agricuiture, articles Assortimens, and Succession de Coulture ; au d'Traité des Assolemens, Paris, 8vo.)

The first principle or fundamental point is, that every plant exhausts the soil.

The second, that all plants do not exhaust the soil equally.

The third, that plants of different kinds do not exhaust the soil in the same manner.

The fourth, that all plants do not restore to the soil the same quantity, nor the same quality of manure.

The fifth, that all plants are not equally favorable to the growth of weeds.

The following consequences are drawn from these fundamental principles :

First. However well a soil may be prepared, it cannot long nourish crops of the same kind in succession, without becoming exhausted.

Second. Every crop impoverishes a soil more or less, as more or less is restored to the soil by the plant cultivated.

Third. Perpendicular rooted plants, and such as root horizontally, ought to succeed each other.

Fourth. Plants of the same kind should not return too frequently in a succession.

Fifth. Two plants favorable to the growth of weeds, ought not to succeed each other.

Sixth. Such plants as eminently exhaust the soil, as the grains and oil plants, should only be sown when the land is in good heart.

Seventh. In proportion as the soil is found to exhaust itself by successive crops, plants which are least exhausting ought to be cultivated.

The influence of rotation in destroying insects, Olivier, member of the

Institute of France, has described all the insects *tépulæ múscæ*, which live upon the collar or crown of the roots of the cereal grasses, and he has shown that they multiply themselves without end, when the same soil presents the same crop for several years in succession, or even crops of analogous species. But when a crop intervenes on which these insects cannot live, as beans or turnips after wheat or oats, then the whole race of these insects perish from the field, for want of proper nourishment for their larvæ. (*Mém. de la Société Royale de Centrale d'Agr. de Paris.*)

OF MANURES, FERMENTATION, &C.

Every species of matter capable of promoting the growth of vegetables, may be considered as manure. Sir H. Davy's Chemical Treatise on soils and manures, is a highly satisfactory work. He has explained the manner in which nourishment is derived by the plant from animal and vegetable substances.

Vegetable and animal substances deposited in the soil, we know by experience, are consumed during the process of vegetation ; and they can only nourish the plant by affording solid matters capable of being dissolved by water. The great object, therefore, in the application of manure should be to make it afford as much soluble matter as possible to the roots of the plants ; and that in a slow and gradual manner, so that it may be entirely consumed in forming its sap and organized parts. Vegetable manures in general, contain a great excess of fibrous and insoluble matter, which must undergo chemical change before it can become the food of plants. In proportion as there is more gluten, albumen, or matter soluble in water, in the vegetable substances exposed to fermentation, so in proportion, all other circumstances being equal, will the process be more rapid. Animal matters are more liable to decompose than vegetable substances, and carbonic acid and ammonia is formed in the process of their putrefaction. Whenever manures consist principally of matter soluble in water, their fermentation or putrefaction should be prevented as much as possible : and the only cases in which fermentation and putrefaction can be useful, are, when the manures consist principally of vegetable or animal fibre. To prevent manures from decomposing, they should be preserved dry, defended from the contact of air, and kept as cool as possible.

The properties and nature of manures in common use should be known to every farmer. Different manures contain different proportions of the elements necessary to vegetation, and require a different treatment to enable them to produce their full effects in culture. All green plants contain saccharine or mucilaginous matter, with woody fibre, and readily ferment. They cannot, therefore, if for manure, be used too soon after their death. Hence the advantage of digging or ploughing in green crops, whether natural or sown on purpose ; they should not, however, be turned in too deep, otherwise fermentation will be prevented by compression and exclusion of air. Green crops should be ploughed in, if possible, when in flower, or at the time the flower is beginning to appear ; for it is at this period that they contain the largest quantity of easily soluble matter, and that their leaves are most active in forming nutritive matter. Green crops, water-weeds, or the parings of drains or ditches, require no preparation to fit them for manure, nor does any kind of fresh vegetable matter. The decomposition proceeds slowly beneath the soil, and the soluble matters are gradually dissolved. When old pastures are broken up and made arable, not only has the soil been enriched by the death and slow decay of the plants which have left soluble matters in the soil, but the leaves and roots of the grasses living at the time, and occupying so large a part of the surface, afford saccharine, mucilaginous, and extractive matters, which become immediately the food of the crop, and from their gradual decomposition, afford a supply for successive years.

Dry straw of wheat, oats, barley, beans, and peas, spoiled hay, or any similar kind of dry vegetable matter is, in all cases, useful manure. In general, such substances are made to ferment before they are employed. Sir H. Davy states, " that there can be no doubt that the straw of different crops, immediately ploughed into the ground, affords nourishment to plants ; but there is an objection to this mode of using straw, from the difficulty of burying long straw, and from its rendering the husbandry foul. When straw is made to ferment, it becomes a more manageable manure ; but there is likewise, on the whole, a great loss of nutritive matter. More manure is, perhaps, supplied for a single crop, but the land is less improved than it would be, supposing the whole of the vegetable matter could be finely divided and mixed with the soil. It is usual to carry straw that can be employed for no other purpose, to the dunghill, to ferment and decompose : but it is worth experiment, whether it would not be more economically applied when chopped small by a proper machine, and kept dry till it be ploughed in for the use of a crop. In this case, though it would decompose much more slowly, and produce less effect at first, yet its influence would be much more lasting."

I am decidedly of opinion that a given quantity of dry straw ploughed into the soil judiciously, will afford more nourishment for plants grown on such soil, during a period of three years, than an equal quantity of straw applied after being fermented.

Peaty matter, mixed with farm yard dung, after proper fermentation, will make good manure. Wood ashes, horn, hair, woollen rags, feathers, the refuse of different manufactures of skin and leather, will all make manure.

Horses, cows, or other quadrupeds that die by accident or disease, after their skins are separated, are often suffered to remain exposed to the air, till they are destroyed by birds or beasts of prey, or entirely decomposed ; and, in this case, most of their organized matter is lost for the land on which they lie, and a considerable portion of it employed in giving off noxious gases to the atmosphere. By covering dead animals with five or six times their bulk of soil, mixed with one part of lime, if possible, and suffering them to remain for a few months, their decomposition would impregnate the soil with soluble matter, so as to render the whole an excellent manure ; and by mixing a little fresh quicklime with it at the time of its removal, the disagreeable effluvia would be in a great measure destroyed, and it might be applied to crops in the same way as any other manure.

Fish forms a powerful manure, if ploughed in fresh, in limited quantity. Blubber, or any oily substance, mixed with clay, sand, or common soil, makes excellent manure, and retains its fertilizing pcwers for several successive years.

Bones are much used in England, Scotland, and on the Continent of Europe. The more divided they are, the more powerful are their effects. They are ground in a mill, and applied in the state of powder. To apply bone manure with effect, it is essential that the soil be dry. It is generally used for growing turnips.

Urine of animals, mixed with solid matter, will greatly increase manure. It is said to contain the essential elements of vegetables in a state of solution.

Night soil is well known as a most powerful manure, and in whatever state it is used, whether recent or fermented, it supplies abundance of food to plants. The disagreeable smell of night soil may be destroyed by mixing it with quicklime. The Chinese, who have more practical knowledge of the use and application of manures than any other people existing, mix their night soil with one-third of its weight of marl, make it into cakes, and dry it by exposure to the sun. The cakes are said to have no disagreeable smell, and form a common article of commerce of the empire. Desiccated night soil, in a state of powder, forms an article of commerce in France ; and in London, it is mixed with quicklime, and sold in cakes under the name of desiccated night soil.

The dung of horses, cattle, and sheep, has been chemically examined by Thaer, and others, and found to contain matter soluble in water ; and that it gave in fermentation, nearly the same produce as vegetable substances. There seems therefore, no reason why it should be made to ferment except in the soil, like the other pure dungs ; or, if suffered to ferment, it should be only in a very slight degree.

Street and road dung, and sweepings of houses, may be regarded as compost manures, and may be applied without being fermented.

Soot is a poweful manure, well fitted to be used in the dry state, thrown into the ground with the seed, and requires no preparation.

Liquid manure is carefully collected from the stalls and stables in Holland, Flanders, Netherlands, France and Switzerland. It is collected into under-ground pits or reservoirs, in which it is allowed to ferment. The manner of collecting it by the agriculturists of Zurich, is as follows : The floor on which the cattle are stalled is formed of boards, with an inclination of four inches from the head to the hinder part of the animal, whose excrements fall into a gutter behind, in the manner of English cow houses ; the depth of this gutter is fifteen inches, its width ten inches. It should be so formed as to be capable of receiving at pleasure, water to be supplied by a reservoir near it; it communicates with five pits by holes, which are opened for the passage of the slime, or closed as occasion requires. The pits or reservoirs for manure are covered over with a kind of boarding, placed a little below that on which the animals stand. This covering is important as facilitating fermentation. The pits or reservoirs are made in masonry, well cemented, and should be bottomed in clay, well beaten in order to avoid infiltration. They should be five, in order that the liquid may not be disturbed during the fermentation, which lasts about four weeks. Their dimensions should be calculated according to the number of animals the stable holds, so that each may be filled in a week. But whether full or not, the pit must be closed at the week's end, in order to maintain the regularity of the system of emptying. The reservoirs are emptied by means of portable pumps. In the evening, the keeper of the stables lets a proper quantity of water into the gutter, and on returning to the stable in the morning, he carefully mixes with the water the excrement that has fallen into it, breaking up the more compact parts, so as to form of the whole an equal and flowing liquid. On the perfect manner in which this process is performed, the quality of the manure mainly depends. The liquid ought neither to be thick, for then the fermentation would be difficult ; nor too thin, for in that case it would not contain sufficient nutritive matter. When the mixture is made, it is allowed to run off into the pit beneath, and the stable keeper again lets water into the gutter. During the day, whenever he comes into the stable, he sweeps whatever excrement may be found under the cattle into the trench, which may be emptied as often as the liquid it contains is found to be of a due thickness. The best proportion of the mixture is three-fourths of water, to one-fourth of excrement, if the cattle be fed on corn ; if in a course of fattening, one-fifth of excrement to four-fifths of water will be sufficient. (*Bull du Comité d'Agri. de la Soc. des Arts de Genève.*) This mode of increasing the manure produced by stalled cattle and cows, is in general use in Holland and the Netherlands, and in several places in France and Germany. The severe frost in Canada, would not readily admit of this mode being adopted throughout the winter, in all situations : but were stables constructed in suitable situations, where such can be had, this plan might be very generally adopted the greater part of the year, and save an immense quantity of the best manure, that now generally wastes into the sub-soil, or is carried off in rivers.

FERMENTING, AND APPLYING MANURES.

The great mass of manures procured by the farmer are a mixture of animal and vegetable matters, and the great source of supply is the farm yard. Here the excrementitious matter of horses, cattle, swine, and poultry, is mixed with straw, and various kinds of litter. To what degree should this be fermented before it is applied to the soil ? and how can it be best preserved when not immediately wanted ? A slight fermentation is undoubtedly of use to the dunghill ; for, by means of it, a disposition is brought on in the woody fibre to decay and dissolve, when it is carried to the land, or ploughed into the soil ; and woody fibre is always in great excess in the refuse of the farm. Too great fermentation, is very prejudicial to manure, and it would be better that there should be no fermentation, than that it should be carried too far. The excess of fermentation tends to the destruction and dissipation of the most useful part of the manure ; and the ultimate results of this process are very like those of combustion.

During the violent fermentation which is necessary for reducing farm-yard manure to the state in which it is called short muck, not only a large quantity of fluid, but likewise of gaseous matter, is lost, so much so, that dung is reduced one-half or two-thirds in weight ; the principal elastic matter disengaged is carbonic acid with some ammonia, and both of these if retained by the moisture in the soil, are capable of becoming a useful nourishment to plants. Besides the dissipation of gaseous matter, when fermentation is pushed to the extreme, there is another disadvantage in the loss of heat, which, if excited in the soil, is useful in promoting the germination of the seed, and in assisting the plant in the first stage of its growth, when it is most feeble and most liable to disease. It is, I believe, a general principle in chemistry, that in all cases of decomposition, substances combine much more readily at the moment of their disengagement, than after they have been perfectly formed. Now, in fermentation beneath the soil, the fluid matter produced is applied instantly, even while it is warm, to the organs of the plant, and consequently is more likely to be efficient, than that from manure which has gone through the process, and of which all the principles have entered into new combinations.

In all cases when dung is fermenting, there are simple tests by which the rapidity of the process, and consequently the injury done, may be discovered. If a thermometer plunged into the dung, does not rise to above one hundred degrees of Fahrenheit, there is little danger of much gaseous matter flying off. If the temperature is higher, the dung should be immediately spread abroad. When a piece of paper, moistened in muriatic acid, held over the steam arising from a dunghill, gives dense fumes, it is a certain test that the decomposition is going too far ; for this indicates that the volatile alkali is disengaged. The practice of many farmers in Scotland and the Netherlands, is against this theory.

No rule of universal application can be laid down on this subject. The degree of decomposition to which farm yard dung should arrive before it can be deemed a profitable manure, must depend on the texture of the soil, the nature of the plants, and the time of its application. In general, clayed soils, more tenacious of moisture, and more benefited by being rendered incohesive and porous, may receive manure less decomposed than well purverized, light, or sandy soils require. Some plants too, seem to thrive better with fresh dung than others, potatoes particularly, but small seeded plants, such as turnips, carrots, &c., which are extremely tender in the early stage of their growth, require to be pushed forward into luxuriant vegetation with the least possible delay, by means of short dung. The season when manure is applied is also a material circumstance. In spring and summer, whether to be used for corn or green crops, the object is to produce an immediate effect, and it should, therefore, be more completely decomposed than may be necessary when it is laid on in autumn, for a crop whose condition will be almost stationary for several months as in England.

There can be no question that in such a warm and generally dry climate as that of Canada, farm yard manure requires to be fermented to a certain degree, before it is applied for spring crops in light soils ; otherwise if the summer happen to be dry, the manure produces no good effect on the crop. It is not necessary however, that the fermentation should be carried further than to decompose the woody fibre, and fit it for producing vegetable food.

The doctrine of the proper application of manures from organised substances, offers an illustration of an important part of the economy of nature, and of the happy order in which it is arranged. "The death and decay of animal substances tend to resolve organised forms into chemical constituents ; and the pernicious effluvia disengaged in the process, seem to point out the propriety of burying them in the soil, where they are fitted to become the food of vegetables. The fermentation and putrefaction of organised substances in the free atmosphere, are noxious processes ; beneath the surface of the ground, they are salutary operations. In this case the food of plants is prepared where it can be used ; and that which would offend the senses and injure the health, if exposed, is converted, by gradual processes, into forms of beauty and of usefulness : the fœtid gas is rendered a constituent of the aroma of the flower, and what might be poison becomes nourishment to animals and to man."

MINERAL MANURES.

It seems a fair conclusion, that the different earths and saline substances found in the organs of plants, are supplied by the soils in which they grow. The tables of De Saussure shew that the ashes of plants are similar in constitution to the soils in which they are vegetated. It appears that in vegetation, compound forms are uniformly produced from simple ones ; and the elements in the soils, the atmosphere, and of the earth absorbed and made parts of beautiful and diversified structures. Fossil manures must produce their effect, either by becoming a constituent part of the plant, or by acting upon its more essential food, so as to render it more fitted for the purposes of vegetable life. It is perhaps in the former of these ways that wheat and some other plants are brought to perfection after lime has been applied upon land that would not bring them to maturity by the most liberal use of dung alone.

Davy, in his Agricultural Chemistry, says, "The most common form in which lime is found on the surface of the earth, is in a state of combination with carbonic acid or fixed air, and will effervesce if thrown into a fluid acid. When limestone is strongly heated, the carbonic acid gas is expelled, and then nothing remains but the pure alkaline earth : in this case, there is a loss of weight, and if the fire has been very high, it approaches to one half the weight of the stone ; but in common cases, lime-stone, well dried before burning, does not lose much more than from 35 to 40 per cent., or from seven to eight parts out of twenty. Slaked lime is a combination of lime with about one-third of its weight of water ; that is, 55 parts of lime absorb 17 parts of water.

When lime, whether freshly burned or slaked, is mixed with any moist fibrous vegetable matter, there is a strong action between the lime and the vegetable matter, and they form a kind of compost together, of which a part is usually soluble in water. By this kind of operation, lime renders matter which was before comparatively inert, nutritive : and, as charcoal and oxygen abound in all vegetable matters, it becomes at the same time converted into carbonate of lime. The operation of quick-lime and marl depends upon principles altogether different. Quick-lime in being applied to land, tends to bring any hard vegetable matter that it contains into a state of more rapid decomposition and solution, so as to render it a proper food for plants. Marl, or carbonate of lime, will only improve the texture of the soil, or its relation to absorption; it acts merely as one of the earthy ingredients. Quick-lime, when it becomes mild, operates in the same manner as marl; but, in the act of becoming mild, it prepares soluble out of insoluble matter.

When lime is employed upon land, where any quantity of animal matter is present, it occasions the evolution of a quantity of ammonia, which may, perhaps, be imbibed by the leaves of plants, and afterwards undergo some change so as to form gluten. It is upon this circumstance that the operation of lime in the preparation for wheat crops depends; and its efficacy in fertilising peat, and in bringing into a state of cultivation all soils abounding in hard roots, dry fibres, or inert vegetable matter.

The solution of the question, whether quick-lime ought to be applied to a soil, depends upon the quantity of inert vegetable matter that it contains. The solution of the question, whether marl, mild lime, or powdered lime-stone ought to be applied, depends upon the quantity of calcalcareous matter already in the soil. All soils which do not effervesce with acids are improved by mild-lime, and ultimately by quick-lime; and sands more than clays. Lime destroys to a certain extent, the efficacy of animal manures, and should never be applied with them, unless they are too rich, or for the purpose of preventing noxious effluvia. It is injurious when mixed with any common dung, and tends to render the extractive matter insoluble.

Lime-stone, containing alumina and silicia, are not so fitted for the purposes of manure as pure lime-stone.

Gypsum. Besides being used in the form of lime and carbonate of lime, calcareous matter is applied for the purposes of Agriculture in other combinations. One of these bodies is gypsum, or sulphate of lime. This substance consists of sulphuric acid (the same body that exists combined with water, in oil of vitriol,) and lime; and when dry, it is composed of 55 parts of lime, and 75 parts of sulphuric acid.

The nature of gypsum is easily demonstrated. If oil of vitriol be added to quick-lime, there is a violent heat produced; when the mixture is ignited, water is given off, and the gypsum alone is the result, if the acid has been used in sufficient quantity, and gypsum mixed with quick-lime, if the quantity has been deficient. Plaster of Paris is powdered dry gypsum. It has been much used in the United States, where it was first introduced by Franklin, on his return from Paris, where he had been much struck with its effects. He sowed the words, *This has been sown with gypsum*, on a field of lucern, near Washington; the effect astonished every passenger, and the use of the manure quickly became general, and signally efficacious. It has been tried in most counties of England, but has failed, though tried in various ways, and upon different crops. It is difficult to account for the operation of gypsum. It has been supposed by some to act by its power of attracting moisture from the air; but this agency must be comparatively insignificant. When combined with water, it retains that fluid too powerfully to yield it to the roots of the plants, and its adhesive attraction for moisture is inconsiderable; the small quantity in which it is used likewise is a circumstance hostile to this idea. It has been erroneously said, that gypsum assists the putrefaction of animal substances, and the decomposition of manure.

The ashes of saintfoin, clover, and rye-grass, afford considerable quantities of gypsum; and the substance is probably intimately combined as a necessary part of their woody fibre. If this be allowed, it is easy to explain the reason why it operates in such small quantities; for the whole of a clover crop, or saintfoin crop, on an acre, according to estimation, would afford, by burning only three or four bushels of gypsum. The reason why gypsum is not generally efficacious, is probably because most cultivated soils contain it in sufficient quantities for the use of the grasses. In the common course of cultivation, gypsum is furnished in the manure; for it is contained in stable dung, and in the dung of all cattle fed on grass: and it is not taken up in corn crops, or crops of peas and beans; but where lands are exclusively devoted to pasturage and hay, it will be continually consumed.

It is a remarkable circumstance, that gypsum is said to have no beneficial effect whatever as a manure, if within the influence of the sea air. This may be the cause of its failure in England.

Soaper's wastes has been recommended as a manure. Its efficacy depends upon the different saline matters it contains, of which the principal ingredient is mild-lime.

DISTRIBUTION OF PLANTS.

Temperature has a great influence on Vegetation.—The wheat and barley of Europe will not grow within the tropics, nor will plants from the polar circles vegetate in more southern latitudes. Plants of a dry nature resist cold better than such as are watery; all plants resist cold better in dry winters than in moist winters; and an attack of frost always does most injury in a moist country, in a humid season. The temperature of spring has a material influence on the life of vegetables; the injurious effects of late frosts are known to every cultivator, and in a country subject to late frosts, a tardy is better than an early vegetation. This is particularly the case in Canada. Autumn is an important season for vegetation. When that season is cold and humid, plants that flower late, are never abundant. Frosts early in autumn are as injurious as those which happen late in spring. Indian corn and potatoes are subject to great injury by early autumnal frosts.

America and Asia are much colder in the same degree of northern latitude than Europe. American plants vegetating at forty-two degrees of northern latitude, will vegetate very well in fifty-two degrees in Europe: the same, or nearly so, may be said of Asia; which in the former case is perhaps owing to the immense tracts of woods and marshes covering the surface, and in the latter to the more elevated and mountainous situation of the country affecting the degree of temperature.

Vegetables which best resist extreme drought are those with deep roots, and those of the succulent tribe. On clayey surfaces, plants are difficult to establish, but when established, are more permanent than those on light sandy soils; and are generally coarse, vigorous, and perennial in their duration.

The relative proportions of the primitive earths appear to have a very considerable influence on the distribution of plants in Canada, particularly forest trees. The nature of the soil is indicated by the species of timber growing upon it. The walnut, or butter-nut, is found on the best land. Mixed timber of large growth is considered to indicate good land. Soft wood of small size, or hard wood of stunted growth, is a proof of inferior or very light or stony land. Unmixed soft wood, however large the trees, will not indicate very good land. From my own experience, I should always prefer wild land producing large trees of various kinds, which I think indicates a fertile soil, and the best adapted to the purposes of agriculture.

By the art of man, plants may be inured to circumstances foreign from their natural habits, and cultivated in climates, soils, and situations, of which they are not indigenous. Herbaceous plants particularly, in going from a hot to a cold climate, are preserved in winter from the inclemency of the atmosphere by a covering of a snow. When the temperature of the atmosphere is below 32 °, the moisture will be changed, and fall on the earth in snow. Summer being nearly the same thing in most countries, annual plants of the tropics are made to grow in the summers of the temperate zones, and, indeed, in general, the summer plants of any one country will grow in the summer climate of any other. The potatoe and kidney bean, so long cultivated in Europe and North America, there is no reason to suppose are in the least degree more hardy, than when first imported from Asia, or South America. The same slight degree of autumnal frost blackens their leaves, and of spring cold destroys their germinating seeds. Buck-wheat, and most species of corn and peas, come from the East. Bruce says he found the oat wild in Abyssinia. Wheat and millet have been found in a wild state in hilly situations in the East Indies.

The plants chiefly employed in human economy differ in different climates and countries : but some, as the cereal grasses may be said to be in universal use ; and others as the banana and plantain, only in the countries which produce them. The bread-corn of the temperate climate ischiefly wheat and maize ; of the hot climates, rice ; and of the coldest climates, barley and oats. The edible roots of the Old World are chiefly the yam, sweet potatoe, onion, carrot, and turnip ; of the New, the potatoe.

In hot climates, pot-herbs are little used. Legumens, as the pea, bean, and kidney bean, are in general use in most parts of the World,

The most useful timber trees of temperate climates are of the pine or fir kind ; of warm climates the palm and the bamboo.

The total number of species of plants known at present, is supposed to be from 100,000 to 200,000, of which nearly half the number is found on the American Continent.

There are of European plants in the artificial Flora of Britain, 4169—Asiatic, 2365—African, 2639—South American, 644—North American, 2353—Native Countries unknown, 970. Total, 13,140 species of plants. Of these are grown for food for man and cattle, 43 species, and 90 varieties.

Moist and moderately warm climates, and irregular surfaces, are most prolific in species of plants. From observation and experience, the conclusion may be drawn, that the greater number of plants, native or foreign, will thrive best in light soils, such as a mixture of soft, black, vegetable mould or peat and fine sand, kept moderately moist; and that on receiving unknown plants or seeds, the native sites of which the cultivator is ignorant, he will be on the safe side by placing them in such soils, rather than in any others; avoiding, most of all, clayey and highly manured soils, as only fit for certain kinds of plants constitutionally robust, or suited to become monstrous by culture.

"The final object of all the sciences is their application to purposes subservient to the wants and desires of man." The study of the vegetable kingdom is one of the most important in this point of view, as directly subservient to the arts which supply food, clothing and medicine; and indirectly subservient to those which supply houses, machines for conveying us by land or by water, and in short almost every comfort and luxury.

Without the aid of the vegetable kingdom, few mineral bodies would be employed in the arts, and the great majority of animals, whether used by man as labourers, or as food, could not live.

To increase the number and improve the nutritive qualities of plants, it is necessary to facilitate their mode of nutrition, by removing all obstacles to the progress of the plant. These obstacles may exist under or above the surface; and hence the necessity of draining, clearing from surface incumbrances, and the various operations, as digging, ploughing, &c., for pulverizing the soil. By these means, the quality of vegetables may be ameliorated, because their food is increased, their roots being enabled to take a more extensive range, more is brought within their reach.

Manuring is necessary to supply food artificially to plants. All organized matters are capable of being converted into the food of plants; but the best manure for ameliorating the quality, and yet retaining the peculiar chemical properties of plants, must necessarily be decayed plants of their own species. It is true that plants do not differ greatly in their primary principles, and that a supply of any description of putrescent manure will cause all plants to thrive; but some plants, as wheat, contain peculiar substances, (as gluten and phosphate of lime,) and some manures, as those of animals, or decayed wheat, containing the same substances, must necessarily be the best food or manure for such plants. Manuring is an obvious imitation of nature, everywhere observeable in the decayed herbage of herbaceous plants, or the fallen leaves of trees, rotting into dust or vegetable mould about their roots; and in the effect of the dung left by pasturing of other animals.

Increase in the magnitude of vegetables, without reference to this quality, is to be obtained by an increased supply of all the ingredients of food, distributed in such a body of well pulverized soil as the roots can reach to; by additional heat and moisture, and by a partial exclusion of the direct rays of the sun, so as to moderate perspiration, and of wind, so as to prevent sudden desiccation. But experience alone can determine what plants are best suited for this, and to what extent the practice can be carried. Nature gives the hint in the occasional luxuriance of plants accidentally placed in favourable situations: man adopts it, and, improving on it, produces cabbages and turnips, of half a hundred weight each, and other fruits proportionably large.

To increase the number, improve the quality, and increase the magnitude of particular parts of vegetables, it is necessary to remove such parts of the vegetable as are not wanted, as the blooms of bulbous or tuberous-rooted plants, when the bulbs are to be increased, and the contrary; the water-shoots, and leaf-buds of fruit trees; the flower stems of tobacco; and the male-flowers and barren runners of the Cucumus tribe, &c. Hence the importance of pruning, ringing, cutting of large roots, and other practices for improving fruits, and throwing trees into a bearing state. It may be said that this is not nature but art; but man, though an improving animal, is still in a state of nature, and all his practices, in every stage of civilization, are as natural to him as those of other animals are to them. Cottages and palaces are as much natural objects as the nests of birds, or the burrows of quadrupeds; and the laws and institutions by which social man is guided in his morals and politics, are not more artificial than the instinct which congregates sheep and cattle in flocks and herds, and guides them in their choice of pasturage and shelter.

To propagate and preserve from degeneracy, approved varieties of vegetables, it is in general necessary to have recourse to the different modes of propagating by extension. Approved varieties of annuals are in general multiplied and preserved by selecting seeds from the finest specimens, and paying particular attention to supplying suitable culture. Approved varieties of corns and ligumens, no less than other annual plants, can only be with certainty preserved by propagating, by cuttings, or layers, which is an absolute prolongation of the individual; but as this would be too tedious and laborious for the general purposes of agriculture, all that can be done is to select seeds from the best specimens. This part of culture may be said to be the farthest removed from nature, and will depend on the experience, judgment, and industry of the agriculturist.

The preservation of vegetables for future use is effected by destroying or rendering dormant the principle of life, and by warding off, as far as practicable, the progress of chemical decomposition. Drying in the sun, or in ovens, is one of the most obvious modes of preserving vegetables for food, or for other economic purposes; but of course not for growth, if the drying process is carried on so far as to destroy the principle of life in seeds, roots or sections of the roots of ligneous plants. Corn may be preserved for many years, by first drying it thoroughly in the sun, and then burying it in dry pits, and closing these so as effectually to exclude the atmospheric air. In a short time the air within is changed to carbonic acid gas, in which no animal will live, and in which, without an addition of oxygen or atmospheric air, no plant or seed will vegetate. The corn is thus preserved from decomposition, from insects, from vermin, and from vegetation, in a far more effectual manner than it could be in a granary. In this way the Romans preserved their corn in chambers hewn out of dry rocks; the Moors, in the sides of hills; and the Chinese of the present day, in deep pits, in dry soil; and the Africans, in earthen vessels hermetically sealed.

The whole art of vegetable culture is but a varied developement of fundamental practices, all founded on nature; and may, for the most part, be rationally and satisfactorily explained on chemical and physiological principles. It would, therefore, be highly useful to the cultivator to know something of botany. The more perfect his knowledge of the vegetable kingdom, the more probable will be his success as a farmer.

DISEASE OF VEGETABLES.

Diseases are corrupt affections of the vegetable body arising from various causes, and tending to injure the habitual health either of the whole or part of the plant. The diseases which occur most frequently among vegetables in Canada, are the following: Blight, smut, mildew, and the ear-worm in wheat, thought to be occasioned by the wheat fly. Blight or blast, if taken in the most general acceptation, will include four distinct species; blight, originating in cold and frosty winds, in a sort of sultry and pestilential vapour, from want of due nourishment, and the propagation of a sort of small and parasitical fungus.

Blight, originating in cold and frosty winds, is often occasioned by the cold winds of spring, which nip and destroy the tender shoots of the plant, by stopping the current of juices. The leaves which are now deprived of their due nourishment, wither and fall, and the juices now stopped in their passage, become the food of innumerable insects which soon after make their appearance. Hence they are mistaken for the cause of the disease itself, while they are only generated in the stagnant juices as forming a proper nidus for their eggs. Their multiplication will no doubt contribute to the spread of the disorder, as they always breed fast where they find plenty of food.

Blight, originating in sultry and pestilential vapour, generally happens in summer, when the grain has nearly attained its full growth, and when there are no cold winds or frost to occasion it. Such was the blight that used to damage the vineyards of ancient Italy, and which is yet found to damage the hop plantations and wheat crops in England. The Romans observed that it generally happened after short but heavy showers occurring about noon, and followed by clear sun-shine, about the season of the ripening of the grapes, and that the middle of the vineyard suffered the most. This corresponds pretty nearly with the manner that hops are affected in England. Wheat is also affected with a similar sort of blight, and about the same season of the year, which in some instances has been known totally to destroy the crop in England; but I have never seen it very destructive here. In the summer of 1809, a field of wheat in England, on rather a light and sandy soil, came up with every appearance of health, and also into ear, with a fair prospect of ripening well. About the beginning of July it was considered as exceeding anything expected from the soil. A week afterwards a portion of the crop on the east side of the field, to the extent of several acres, was totally destroyed, being shrunk and shrivelled up to less than one half the size of what it had formerly been, and so withered and blasted as not to appear to belong to the same field. The rest of the field produced a fair crop.

Blight, for want of due nourishment, may happen to all plants, wild or cultivated; but it is most commonly met with in cornfields, in very dry seasons, in those thin gravelly surfaces, which do not sufficiently retain the moisture. In such spots the plants are prematurely thrown into blossom, and the ear or seed-pod ripens before it is filled. In England, the farmers call this the white blight. I have seen this blight frequently in Canada, but not to great extent. Blight, originating in fungi, attacks the leaves and stems of herbaceous plants, but more particularly our most useful grains, wheat, barley, and oats. It always appears in the least ventilated parts of a field, and has generally been preceded by cold, moist weather, which, happening in the warm month of July, suddenly chills, and checks vegetation. It generally assumes the appearance of rusty-looking powder, that soils the fingers when touched. Sickly plants are the most subject to be affected, and it is thought that the fungus may exist in the manure or soil, and enter the plant by the pores of the root. It is known in England among farmers by the name of *red rust*, and chiefly affects the stalks and leaves. There is another species of fungus, known by the name of *red gum*, which attacks the ear only, and is extremely prejudicial. This last is generally accompanied with a maggot of a yellow colour, which preys upon the grain, and increases the injury.

The only means of preventing or lessening the effect of any of the different varieties of blight mentioned, is proper culture. Grisenthwaite conjectures that in many cases in which the blight and mildew attack corn crops, it may be for want of the peculiar food requisite for perfecting the grain ; it being known that the fruit or seeds of many plants contain primitive principles not found in the rest of the plant. Thus, the grain of wheat contains gluten and phospate of lime, and when they are wanting to the soil, that is, in the manured earths in which the plant grows, it will be unable to perfect its fruit, which of consequence becomes more liable to disease.

Smut is a disease incidental to cultivated corn, by which the farina of the grain, together with its proper integuments and even part of the husk, are converted into a black soot-like powder. The disease does not affect the whole body of the crop, but the smutted ears are sometimes very numerously dispersed throughout it. Some have attributed it to the soil in which the grain is sown, and others have attributed it to the seed itself, alleging that smutted seed will produce a smutted crop ; but in all this, there seems to be some doubt. Willdenow regards it as originating in a small fungus, which multiplies and extends till it occupies the whole ear. It is said to be prevented by steeping the grain in a weak solution of arsenic, before sowing. But besides the disease called smut, there is also a disease analogous to it, or a different stage of the same disease, known to the farmer by the name of *bags* or *smut-balls*, in which the nucleus of the seed only is converted into a black powder, whilst the ovary, as well as the husk, remains sound. The ear is not much altered in its external appearance, and the diseased grain contained in it will even bear the operation of threshing, and consequently mingle with the bulk ; but it is always readily detected, and fatal to the character of the sample. It is said to be prevented as in the case of smut.

That this disease is the most injurious to the wheat crop of Canada, of any that it is subject to in latter years, there can be no doubt : scarcely a field that is not more or less affected by it ; and if there is a remedy, it should by all means be adopted by every farmer. Two interesting papers have been published in the Penny Magazine, from F. Bauer, Esq. of Kew, in the county of Kent, England, deservedly celebrated for his valuable discoveries connected with the diseases of grain. From these communications I give the following extracts.

"This disease is occasioned by the seed of an extremely minute parasitic fungus, of the genus *uredo*, being absorbed by the roots of the germinating wheat grains, and propelled by the rising sap, long before the wheat blossoms into the young germen or ovum, where the seeds of the fungi vegetate, and rapidly multiply, thereby preventing not only the fecundation of the ovum, but even the developement of the parts of fructification. In consequence no embryo is produced in an infected germen, which, however, continues to grow as long as the sound grains do, and, when the sound grains arrive at maturity, the infected ones are generally longer than, and are easily distinguished from, the sound grains, by their darker green colour, and from the ova retaining the same shape and form which they had at the time when the infection took place.

The name of this disease is also as undecided and various as the hitherto supposed cause of its existence ; the most prevailing names in England, being smut-ball, pepper-brand, and brand-bladders ; and many others have been given to it, not only by the farmers in almost every county, but also by scientific naturalists. No author has yet been found who mentions or describes this species of *uredo*, the distinguishing characteristic of which being its extremely offensive smell, I think the most proper specific name of it would be that of *uredo fœtida*.

The earliest period at which I discovered the parasite within the cavity of the ovula of a young plant of wheat, (the seed grain of which had been inoculated with the fungi of *uredo fœtida*, and sown the 14th November, 1805,) was the 5th of June 1806, being sixteen days before the ear emerged from the hose, and about twenty days before the sound ears, springing from the same root, were in bloom. At that early stage, the inner cavity of the ovum is very small, and, after fecundation, is filled with the albumen or farinacious substance of the seed, and already occupied by many young fungi, which, from their jelly-like root or spawn, adhere to the membrane which lines the cavity, and from which they can be easily detached in small flakes with that spawn ; in that state their very short pedicles may be distinctly seen. At first the fungi are of a pure white colour, and when the ear emerges from the hose, the ovum is much enlarged, but still retains its original shape, and the fungi rapidly multiplying, many have then nearly come to maturity, assumed a darker colour, and having separated from the spawn, lie loose in the cavity of the ovum ; the infected grains continue growing, and the fungi continue to multiply till the sound grains have attained their full size and maturity, when the infected grains are easily distinguished from the sound ones by being generally larger, and of a darker green colour ; and if opened, they appear to be filled to excess with these dark-coloured fungi ; but the grains infected with the *uredo fœtida* very rarely burst, and these fungi are seldom found on the outside of the grain ; but if the grain be bruised they readily emit their offensive smell, which is worse than that from putrid fish. When the sound grains are perfectly ripe and dry, and assume their light brown colour, the infected grains also change, but to a somewhat darker brown, retaining, however, the same shape which the ovum had at its formation, the rudiments of the stigma also remaining unaltered. If the infected grain be cut in two, it will be found to consist solely of the outermost integument of the ovum, filled with the ripe black fungi, without any trace of the embryo or albumen. Plants of wheat infected with smut balls may be easily distinguished in the field, by their size, being generally higher than plants not infected, and larger in bulk; and I have found in all instances a greater number of stems produced from the same root, the ears containing more spickets, and those spickets more perfect grains, than were contained in those of sound plants, of the same seed, and growing in the same field. One plant, produced from seed which I had inoculated, had 24 complete stems and ears. Some of the stems with ears, measured above five feet, every part of the plant proportionately large, and all the ears entirely infected. Another specimen had eight stems from the same root, five of them were above six feet high, and the ears entirely infected; the other three stems were considerably shorter, their ears smaller, and their grains perfectly sound. This enlargement of the plant, however, is not to be attributed to the infection, but is undoubtedly the consequence of a luxurious vegetation, produced by a rich or moist soil, which secures and promotes the infection more than a dry or a moderately rich soil.

Neither does this disease always affect the entire ear. I found some ears having one side infected, whilst the opposite side was perfectly sound. Sometimes five or six perfectly sound grains are found in an infected ear, and a few thoroughly infected grains are found in an otherwise sound ear. The infected grains are always in the last spicket at the apex of the ear, from which it appears that the infecting seed of the fungi did not reach the ovum before fecundation. In some of these grains a portion of the albumen was formed, but no trace of an embryo existed; but, in others there was a considerable portion of albumen, and a perfect embryo formed.

At the time when the sound grains change their colour, the fungi being ripe, cease to multiply; they are all of a globular form, and nearly of equal size, viz., one sixteen-hundredth part of an inch in diameter. I could never yet see the seeds of these fungi in a dry state, for they then appear to be mixed with some mucous fluid, which causes them to adhere together in hard lumps.

That the seeds of the fungi of *uredo fœtida* are the sole cause of that destructive disease in wheat, the *smut-ball* or *pepper-brand*, I think I have fully ascertained by numerous experiments of inoculating even the finest and purest samples of seed wheat; and if that fact be admitted, it becomes evident that the prevention of it can only be effected by cleansing the seed-wheat so effectually, that every particle of the fungi and their seed be entirely removed from the grains. But as these extremely minute fungi, when once mixed with the seed-wheat, insinuate themselves into the grooves at the backs and the beards at the tops of the wheat grains, I think it almost impossible to dislodge them by the mere process of washing. I once received some samples which had been so prepared, and washed in salt water, and declared to be perfectly clean, but on my putting some of these purified grains into water, in a watch-glass, and leaving them to soak about twelve hours, on then bringing them under the microscope, I found many of the fungi floating on the water. This fact convinces me that mere cleansing is no secure preventive of this disease; and that the most efficacious, and perhaps the only remedy for preventing it, is that of depriving the fungi of their vitality. To effect this, innumerable remedies have been recommended, and I believe, applied by the farmers, but have seldom proved entirely successful. From my own often repeated experiments, though on a limited scale, I am convinced that the best and surest remedy is, to steep the seed wheat in properly prepared lime-water, leaving it to soak at least twelve hours, and then to dry it well in the air, before sowing it; but, I fear that it will be found very difficult, if not impossible, even by this method, to kill the seeds of the fungi entirely, when the quantity of seed-corn is great, and consequently some infected plants might still be found in large fields. Steeping and properly drying the seed-corn in the above manner, not only prevents the disease arising from the infected seed-corn, but does also effectually prevent the clean seed from being infected by the seed of the fungi, which might exist in the soil of the field on which diseased wheat has been growing before; and consequently the cleanest samples of seed-wheat should be steeped, as well as the most notoriously infected. These facts I have ascertained by repeated experiments, of strongly inoculating with the fungi, seed-corn which before had been properly steeped and dried, and the result has always proved satisfactory, for the infection never took place, as in the case of inoculating clean seed, that was not previously steeped and dried. Wheat is the only plant that is liable to be infected by the *smut-ball* or *pepper-brand*, which is occasioned by the *uredo fœtida*. The smut or dust-brand, is also occasioned by an *uredo*, but of a decidedly different species of parasitic fungus, the genus *uredo segetum*. It is distinguished from *uredo fœtida*, not being more than half the size, and by being perfectly scentless, whilst *uredo fœtida* is characterized by an extremely offensive smell. The manner in which *uredo segetum*, acts upon the plants which it attacks is also very different, and the effect much more destructive than that of *uredo fœtida*, which only attacks the grains in which it vegetates, but seldom bursts, whereas the *uredo segetum* not only generally destroys the whole ear, but even the leaves and stem. Further, *uredo segetum* attacks not only barley, but wheat and oats. I have ascertained by repeated experiments of inoculation, that the seed of the fungi of *uredo segetum*, like that of *uredo fœtida*, is absorbed by the roots of the germinating seed-corn, and, being so extremely minute, is mixed with, and propelled with the circulating sap, and deposited in almost every part, even in the cellular tissue of the plant, where these seeds continue to vegetate and multiply rapidly, as well as in every part of the plant where there remains the least vitality. The whole ear is found entirely destroyed many weeks before even the individual florets are quite developed, or the sound ears emerge from the hose. Sometimes, but rarely, the infection takes place after the parts of fructification have been formed, and even after fecundation has taken place; in that case the progress of the disease can easily be observed. The germen is generally the first attacked, and found partially or half filled with the fungi; then the pistils, the stigmas, the anthars, and even the extremely tender filaments appear full of black spots, which are occasioned by small clusters of these fungi, which vegetate and multiply so rapidly that in a few days the whole ear is completely filled.

In oat plants such late infection occurs more frequently than in barley or wheat, and the whole panicle often emerges from its hose, to all appearance in a perfectly sound state, or perhaps with only a few infected spikets at its base, but the infection soon spreads visibly through the whole panicle, and every other part of the plant ; and even when such a partially infected ear is separated from the growing plant, the vegetating and multiplying of the fungi continue as long as any moisture remains in that portion of the plant which has been so separated. I once cut off and collected several such partially infected ears, which I intended to preserve as specimens, and for that purpose I laid them in brown paper to dry them ; they were accidentally mislaid, and did not come into my hands again till after a period of six months, when, on examination, I found that the whole specimens were consumed by the fungi. I have not the least doubt that the seeds of the fungi are shaken out by the wind ; and that even many infected ears and plants are thrown on the soil of a field where such diseased plants have been growing, and that the fungi continue growing and multiplying on the soil like those on the paper, until they become part of the soil from which they cannot be distinguished. I fear it will prove very difficult to find an efficient remedy to prevent, or even to check this destructive disease ; and this fear seems strengthened by the consideration of the numerous remedies suggested by many eminent authors, as well in this country as on the Continent. That the remedies of these authors should have failed of producing the desired effect is not surprising to me, for I find that the most eminent of them, not only confound two or three distinct diseases, but are totally unacquainted with the real cause of any of the diseases ; for some consider them caused by insects, some attribute them to blasts of the wind, and others consider the diseases to be a corruption of the sap of the plants. These, and many other causes equally erroneous, have been advanced ; but I hope that, if it be admitted that the seeds of the parasitical fungi are the real and the only cause of this disease, it will naturally occur to every one, that if the vitality of the seeds of these parasites could effectually be destroyed, the disease would be prevented. That the steeping in lime-water destroys the vitality, I have proved by many experiments ; and also, that the lime-water has the same effect upon the seeds of the *uredo segetum*, as it has upon those of the *uredo fœtida*.

I fear that much difficully will present itself to the steeping of the seed corn effectively, from the structure of the seed of barley and oats, the kernels of which are so tightly enclosed in the husks, that the lime-water cannot so readily penetrate and reach the embryo, as in the naked seed-kernels of wheat and rye."

Mr. Bauer has given drawings of the diseased grain and plants as they are affected, throughout the progress of the disease, viewed through a microscope ; and from my own experience and observation, I think his remarks are the most correct, and deserving of the attention of farmers, of any I ever read on the same subject ; and I have little doubt that the remedy he proposes, or any other that will destroy the vitality of the fungi in the seed-corn, will prevent the disease, unless the seed becomes infected from the soil, and even in that case, he proved that steeping the seed in lime water, and drying it in the air previous to sowing, prevents the seed from being infected from the soil. Farmers should try every reasonable experiment to eradicate entirely, these most destructive diseases.

Mildew is a coating with which the leaves of vegetables are sometimes covered, occasioning their decay and death, and injuring the health of the plant. It is found on wheat in the shape of a glutinous exudation. Spring and summer wheat is less liable to this disease, than the fallow winter species.

Whether blight, rust and mildew be considered separately, or viewed as one and the same disorder, appearing at different periods of the plant's growth, we are convinced that both may with truth be reckoned to proceed from an unhealthy atmosphere, when the crop is in certain stages of its progress to maturity. The kind of wheat sown, namely, whether thin or thick chaffed, has a very considerable effect in lessening or increasing the effects of these baneful disorders; and that even soil, culture and situation, have each their respective influence. It rarely occurs, that either blight, rust, or mildew are felt in dry warm seasons, except in close confined fields, where the evening dews stagnate, and remain till they are removed by the meridian sun. Hence the wheat crops, in such situations, seldom or never escape a partial or general injury. On the other hand, in very moist seasons, whether cold or warm, blight, mildew, rust, or gum on the ear, are experienced in a greater or less degree. In such seasons thin chaffed wheats are much less injured than those that are thick-chaffed, which circumstance appears in direct opposition to the doctrine that these diseases are brought on by parasitical plants or fungi. A field sowed with both kinds of wheat in one day, and harvested in like manner, the part which carried the thin chaffed grain, had not only one-third more produce, but actually sold for two shillings and six-pence per bushel higher in the market than the other kind. Soils that are naturally moist at bottom, are apt to disease wheat; and where the crop is lodged from excessive manuring or any other cause, one disease or other is sure to seize upon it. Confined situations, where the air has not free egress, are unfavourable, particularly when there is warm drizzling rains and morning fogs. In a word, when hoar-frost or vapour of any kind is dispelled by wind, *no danger* will follow to the crop; but, where a hot sun is the agent to dispel such moisture, at particular seasons, serious losses may be apprehended to follow.

" Here it may be remarked that though mildew is a disease altogether unknown during dry weather, yet it is only in seasons when the weather has been very warm and dry, that its effects are most strikingly displayed. In such seasons, rust often appears upon dry and light soils, and upon all soils that have not good stamina, brought on, it would seem, by the plants being stunted of nourishment.

When these diseases are communicated from the atmosphere, they operate so suddenly that it seems impracticable to provide a complete antidote to their effects. In England, wheat crops are most affected in low, damp situations, in the vicinity of woods, hedge-rows, and winding rivers. Poplars, willows, and birch trees, are considered to promote rust and mildew, when growing near cornfields."

M2

The *wheat fly*, is described, as of late years, being one of the greatest enemies to the wheat crop in Scotland, and as there is every reason to suppose, that the same species of fly has injured the wheat crop in Canada last year, it may be useful to give a description of this fly, and its destructive ravages.

" In North America, this insect, or one of the same family, has been known for many years, more especially in New-England, and its alarming ravages are depicted from time to time in the newspapers, under the name of the *Hessian Fly*. In the modern nomenclature, the Rev. W. Kirby informs us,that the wheat-fly, formerly the *tripula triciti*, (*Lin.*) is now the *cecidomyia tritici*, and the Hessian fly, the *C. distructor*. The wheat-fly generally makes its appearance about the end of June ; and, according to the observations of Mr. Shirreff, they exist throughout a period of thirty-nine days. The hue of the fly is orange, the wings transparent, and changing colour according to the light in which they are viewed. It lays its eggs within the glumes of the florets, in clusters, varying in number from two to ten, or even fifteen ; and the larvæ feed upon the grain. They are produced from the eggs in the course of eight or ten days ; they are at first perfectly transparent, and assume a yellow colour in a few days afterwards. They travel not from one plant to another, and forty-seven have been numbered in one. Occasionally there are found in the same floret, larvæ and a grain, which is generally shrivelled, as if deprived of nourishment ; and although the pollen may furnish the larvæ with food in the first instance, they sóon crowd around the lower part of the germen, and there, in all probability, subsist on the matter destined to form the grain. The larvæ are preyed on by the *céraphron distructor*, an ichneumon fly, which deposits its eggs in the body of the larvæ of the wheat-fly ; and this is the only check hitherto discovered for preventing the total destruction of the wheat crops attacked by the *cecidomyia*. Mr. Shireff, speaking of the ichneumon, says, " I could not determine if it actually deposits its eggs in the maggot's body, but there can be no doubt, however, of the ichneumon piercing the maggots with a sting, and, from stinging the same maggots repeatedly, it is probable the fly delights to destroy the maggots, as well as to deposit eggs in their bodies. The earwig also devours the maggots as food. Mr. Gorrie estimates the loss sustained by the farming interest in the Carse of Gowrie dictrict alone, by the wheat fly, at 20,000*l.* in 1827, at 30,000*l.* in 1828, and at 36,000*l.* in 1829. The same writer in 1830, thus depicts the prospect of the wheat crop in the Carse of Gowrie. The *cecidomyia* are still alive in considerable legions ; that the flies will in this season be in as great plenty as ever, is now quite certain ; that they will lay their egg on no other plant than those of the wheat genus, is also true ; the only chance of escape is in the time the pupæ appear in the fly state. Should this sunny weather bring them forward within a fortnight or three weeks of this date, the greater part will have perished before the wheat is in the ear ; or should the earing take place before the fle appear, then only the late, or spring sown wheat, will suffer ; but hiese appear slender chances. We know the history and the habits of the insect too well to believe that either mist, or rain, or dew, or drought, will either forward or retard their operations, if the main body appear about the time the wheat comes into the ear. In addition to that vile gnat, our neighbours in the Lōthinas are threatened with a no less formidable invador in the *ascices pumilàrius*, which, as we are informed on respectable authority, have already commenced their depredations, and are thinning the wheat plants rather liberally in that quarter. It, like the Hessian fly in America, attacks the under joints, which become habitations, for the young larvæ. Is it not probable that it is the same species of insect which in spring, thins the wheat crop so frequently in Canada.

Mr. Gorrie has, in Scotland, proved by experiment, that a description of wheat of the species *turgidum*, known in England as *turgid*, or *cone wheat*, is proof against the ravages of the wheat fly. This wheat has a tall and vigorous stem, and is very productive ; but the quality of the grain is inferior to the common fall wheat. The opinion of the most eminent farmers that the only certain remedy against the ravages of the wheat fly, is, to cultivate that sort of wheat that will be unfavourable to their propagation, or proof against their ravages. Mr. Shirreff discovered myriads of wheat flies at the time of their first appearance, rising from a fallow field, which had been previously repeatedly ploughed and harrowed. I am not aware that this insect has been much known in England or Ireland, and this circumstance is difficult to account for.

NATURAL DECAY.

Although a plant should not suffer from the influence of accidental injury, or from disease, still there will come a time when its several organs will begin to experience the approaches of a natural decline insensibly stealing upon it, and at last inducing death. The duration of vegetable existence is very different in different species ; yet in the vegetable as well as in the animal kingdom, there is a term or limit set, beyond which the individual cannot pass. Some plants are annuals, and last for one season only, springing up suddenly from seed, attaining rapidly to maturity, producing and sowing their seeds, and afterwards immediately perishing. Such is the character of the various species of corn, as exemplified in oats, wheat, and barley. Some plants continue to live for a period of two years, and are called biennials, springing up the first year from seed, and producing roots and leaves, but no fruit ; and in the second year producing both flower and fruit, as exemplified in the carrot, parsnip, and carraway. Other plants are perennials, that is, lasting for many years. Even of perennial plants, there are parts which perish annually, or which are annually separated from the individual, namely, the leaves, flowers, and fruit, leaving nothing behind but the root, or the root and trunk, which submit in their turn to the ravages of time, and ultimately to death.

Plants are affected by the infirmities of old age as well as animals, and are found to exhibit similar symptoms of approaching dissolution. The root refuses to imbibe the nourishment afforded by the soil, or if it does imbibe a portion, it is but feebly propelled, and partially distributed; the circulation of the sap, and proper juices, are effected with difficulty, and at last become almost totally obstructed ; the shoots become stunted and diminutive ; and the fruits palpably degenerate, both in quantity and quality. The smaller or terminal branches fade and decay first, and then the larger branches also, together with the trunk and root ; the vital principle gradually declines, without any chance of recovering, and is at last totally extinguished. When life is extinguished, nature hastens the decomposition ; the surface of the tree is overrun with litchens and mosses, which attract and retain the moisture ; the empty pores imbibe it, and putrefaction speedily follows. Then come the tribe of fungi, which flourish on decayed wood, and accelerate its corruption ; butterflies and catterpillars take up their abode under the bark, and bore innumerable holes in the timber ; and woodpeckers, in search of insects, pierce it more deeply, and excavate large hollows in which they place their nests. Frost, rain, and heat assist, and the whole mass crumbles away, and dissolves into a rich mould, fit for the production of new plants.

TEMPERATURE AND CLIMATE.

I believe the lowest authentic observations of temperature we possess are those by Captain Parry, at Melville Island. Here the thermometer in the ship was as low as 50°, and at a distance from the ship, as low as 55° under zero. The greatest degree of cold hitherto produced artificially, has been 91° under zero. Humboldt fixed the main equatorial temperature at 81½°. The temperature of the surface of the earth has been found to be 118°, 120° and 129° : a loose and coarse granitic sand, had a temperature of 140°, when at the same time the thermometer in the sun indicated a temperature of only 97°. In Canada, I have seen the thermometer on one occasion as low as 34° below zero, and frequently from 20° to 30° below and in summer stand 100° above, and for weeks together, range from 80° to 100°. The mean temperature of Upper and Lower Canada may be seen by the following table taken for the year 1820, as given by Colonel Bouchette.

	Upper-Canada.			Lower-Canada.		
	Maximum.	Minimum	Mean.	Maximum.	Minimum	Mean.
	73,8	25,72	48,37	68,25	11,75	42,1
Summer months, June, July, August.	99,66	57,33	77,37	99,33	58,33	77,54
Winter months.	46,33	04,67	22,49	38,66	24,33	11,25

Humboldt gives a summary sketch of the actual distribution of temperature over the northern hemisphere, in the following words: "The whole of Europe compared with the eastern parts of America and Asia, has an insular climate; and the summers become warmer, and the winters colder, as we advance from the meridian of Mont Blanc towards the east or the west. Europe may be considered, as the western parts of all continents are, not only warmer at equal latitudes than the eastern parts, but even in the zones of equal annual temperature, the winters are more rigorous, and the summers hotter on the eastern coasts than on the western coasts of the two continents. The northern part of China, like the Atlantic region of the United States, exhibits seasons strongly contrasted; while the coast of New California and the embouchure of the Columbia have winters and summers almost equally temperate. The meteorological constitution of those countries in the northwest, resembles that of Europe as far as 50° or 52° of latitude. In comparing the two systems of climates, the concave and the convex summits of the same isothermal lines, we find at New-York, the summer of Rome and the winter of Copenhagen; at Quebec, the summer of Paris and the winters of St. Petersburgh. At Pekin, also, when the mean temperature of the year is that of the coasts of Britanny, the scorching heats of summer are greater than at Cairo, and the winters are as rigorous as at Upsal. So also the same summer temperature prevails at Moscow, in the centre of Russia, as towards the mouth of the Loire, notwithstanding the difference of 11 degrees of latitude; a fact that strikingly illustrates the effects of the earth's radiation on a vast continent deprived of mountains. This analogy between the eastern coasts of Asia and America, sufficiently proves, continues Humboldt, that the inequalities of the seasons depend on the prolongation and enlargement of continents towards the pole; on the size of seas in relation to their coasts; and on the frequency of the north-west winds, and not on the proximity of some plateau or elevation of the adjacent lands. The great table lands of Asia do not stretch beyond 52 degrees of latitude; and in the interior of the new continent, all the immense basin bounded by the Alleghany range, and the Rocky Mountains, is not more than from 656 to 920 feet above the level of the ocean.

TABLE OF TEMPERATURE.

Names of Places.	Position.		Height in feet.	Mean temperature of the year.	Distribution of heat in the different seasons.				Maximum and Minimum.	
	Latitude. North	Longitude.			Mean temp. of winter.	Mean temp. of spring.	Mean temp. of summer.	Mean temp. of autumn.	M. an temp'r. of the warmest months.	Do. do. of the coldest do.
	° ′	° ′		° ′	°					
Nain	57,8	61,20W	0	26,42	0,60	23,90	48,38	33,44	51,80	11,28
Enontekies	68,30	20,47 E	1356	26,96	0 68	24,98	54,86	27,32	59,54	-0,58
Hospice de St. Gothard	46,30	8,23 E	6390	30,38	18,32	26,42	44,96	31,82	46,22	15,08
North Cape	71,0	25,50 E	0	32,00	23,72	29,66	43,34	32,08	46,58	22,10
St.Petersburg	59,56	30,19 E	0	38,84	17,06	38,12	62,06	38,66	62,60	11,48
Moscow	55,45	37,32 E	970	40,10	10,78	44,06	67,10	38,30	64,94	19,58
Stockholm	59,20	18,3 E	0	42,26	25,52	38,30	61,88	43,16	64,04	22,82
Quebec	46,47	71,10W	0	41,74	14,18	38,84	68,60	46,04	73,40	13,81
Christiana	59,55	10,48 E	0	42,08	23,78	39 02	62,60	41,18	56,74	28,41
Copenhagen	55,41	12,35 E	0	45,68	30,74	41,18	62,60	48,38	65,66	27,14
Kendal	54,17	2,46W	0	46,22	30,86	45,14	56,84	46,22	58,10	34,88
Zurich	47,22	8,32 E	1350	47,84	29,66	48,20	64,04	48,92	65,66	26,78
Edinburgh	55,57	3,10W	0	48,84	38,66	46,40	58,28	48,56	59,36	38,30
Warsaw	52,14	21,2 E	0	48,56	28,76	47,48	69,08	49,46	70,34	27,14
Dublin	53,21	6,19W	0	49,10	39,20	47,30	59,54	50,00	61,16	35,42
Bern	46,5	7,26 E	1650	49,28	32,00	48,92	66,56	49,82	67,28	30,56
Vienna	48,12	16,22 E	420	50,54	32,72	51,26	69,26	50,54	70,52	26,60
Paris	48,50	2,20 E	222	51,08	38,66	49,28	64,38	51,44	65r30	36,14
London	51,30	0,5 W	0	50,36	39,56	48,56	63,14	50,18	64,40	37,76
Philadelphia	39,56	75,16W	0	53,42	32,18	51,44	73,94	56,48	77,00	32,72
New-York	40,40	73,58W	0	53,78	29,84	51,26	79,16	54,50	80,78	25,34
Pekin	39,45	116,27E	0	54,86	26,42	56,39	82,58	54,32	84,38	24,62
Milan	45,28	9,11 E	390	55,76	36,32	56,12	73,04	56,84	74,66	36,14
Rome	41,53	12,27 E	0	60,44	45,86	57,74	7[illegible],30	62,78	77,00	42,26
Algiers	36,48	3,1 E	0	69,98	61,52	65,66	80,24	72,50	82,76	60,08
Cairo	30,20	31,18 E	0	72,32	58,46	73,58	85,10	71,42	85,82	56,12
Montreal	45,30	73,22W		50,10	21,30	44,40	70,15	51,10	80,20	15,30

Continents have a colder atmosphere than islands situated in the same degree of latitude ; and countries lying to the windward of the superior classes of mountains or forests, are warmer than those which are to the leeward. Earth always possessing a certain degree of moisture has a greater capacity to receive and retain heat, than sand or stones ; it is from this circumstance that the intense heats of Africa and Arabia, and the cold of Terra del Fuego, are derived. The temperature of growing vegetables changes very gradually ; but there is a considerable evaporation from them ; if those exist in great numbers, as in forests, their foliage preventing the rays of the sun from reaching the earth, it is perfectly natural that the immediate atmosphere must be greatly affected by the ascent of chilled vapours.

The northern ice extends during summer, about 9° from the pole, the southern 18° or 20°, and in some parts even 30°. In south latitude between 54° and 60°, snow lies on the ground throughout summer. The line of perpetual congealation is three miles above the surface at the equator, where the mean heat is 84°. At Teneriffe latitude 28°, two miles; the latitude of London, a little more than one mile; and in latitude 80° north only 250 feet. At the Pole the mean temperature, by Kirwan, should be 31°. In London the mean temperature is $50\frac{1}{2}$°; at Rome and Montpellier, a little more than 60°; in the Island of Madeira 70°, and Jamaica 80°; New-York $53\frac{3}{4}$°; Quebec $41\frac{3}{4}$°, and Montreal 50°.

Of the distribution of solar heat and light, and the proportion that actually arrives at the surface of the earth, at different latitudes, it may be interesting to give some of the estimates that have been made. M. Pouillet has attempted to show that the amount of heat annually received by the earth from the sun, is equal to that which would be required to melt a stratum of ice nearly 46 feet thick, and covering its whole surface.

A vertical ray of light, in its passage through the clearest air, has been calculated to lose at least a fifth part of its intensity before it reaches the earth's surface. From this cause, and from the actual condition of the atmosphere, it has been estimated that under the most favourable circumstances, of a thousand rays emanating from the sun, only 378, on a medium, can penetrate to the surface of the earth at the equator, 228 at the latitude of 45°, and 110 at the poles, while in cloudy weather these several proportions are a great deal less. In consequence, natural objects generally speaking, become sad and faded as we approach the colder regions, till they merge into the white of the polar snow. While the light and heat of tropical countries, produce decided dark and beautiful colours, the abstraction of light in cold climates causes plants and animals to become more or less white or eliolated, particularly in the cold seasons; and in the polar regions the natural covering of the earth, the snow, is the whitest body in nature.

Different colours have a very considerable influence on the absorption and reflection of heat and light; black and dark colours reflect most and absorb least. Why does whiteness prevail in the polar regions? Why, for instance, is snow white? On the contrary, why are all sorts of dark and decided colours met with in the tropical climates, except whiteness, which is comparatively rare? Might not snow have been black instead of white, which was just as likely if its colours had been the result of accident, or might not whiteness be predominant under the equator? Perhaps the best mode of answering these questions, and placing the subject in a striking view, is to examine what would have been the consequence if whiteness *had* prevailed under the equator, and blackness at the poles.

As heat and light are supposed to obey nearly the same laws, as far as absorption, radiation, and reflection are concerned, it is obvious that if white had prevailed in the tropical climates, almost all the solar heat and light instead of being absorbed, would have been reflected. The consequence of this reflection would have been, that the accumulation of heat and glare of light in the lower regions of the atmosphere near the surface of the earth, would have been intolerable, and would have rendered these regions quite uninhabitable, at least by the present race of beings. On the other, what would have been the consequence had the snow been black, or if black or dark colours had prevailed in the polar regions. In this case, all the light and heat that reach them would have been absorbed, and the effect would have been darkness more or less complete. Thus the polar regions would have been one dark and dreary void, inaccessible to organic life.

The soil, from a few inches to a foot below the surface, participates very much in the fluctuations of the surface temperature. In general, perhaps it may be stated, that the temperature of the surface of the earth is a little above that of the incumbent atmosphere by day, and below it by night, though much will depend in this respect upon the nature of the soil, and many other conditions that will readily occur to the reader.

At a certain distance below the surface, there are instances of a uniformity of temperature, particularly in the caves under the observatory in Paris, at a depth of about eighty-five feet below the surface ; a thermometer placed in these caves has, during fifty years, scarcely varied more than a quarter of a degree, and has been at $53\frac{1}{4}°$ of Fahrenheit.

In this climate, we owe as much to the lightness of snow, as to its whiteness. By the low conducting properties and lightness of snow, it shields vegetation from the rigorous cold that would destroy everything herbaceous during the winter, were it not from the protecting influence of snow. Again, if the water which in winter descends to the earth in snow, were to be precipitated in the form of solid masses of ice or hail, vegetation would be ultimately destroyed, and the whole of the colder parts of the earth would be uninhabitable.

Snow is of great use to the vegetable kingdom, particularly in Canada, where the ground continues covered with it for several months. It fructifies the earth, and guards the young corn, and roots of herbaceous plants from the intense cold of the air, and especially from the cold piercing winds. It has been a generally received opinion, that it is in consequence of nitrous salts which snow is supposed to acquire by freezing, that it is fertilizing to the land ; but it appears by experiments, that the chemical difference between rain and snow-water is exceedingly small, and that the latter contains somewhat less proportion of earth than the former ; but neither of them contain either earth or salts, in any quantity which can be sensibly efficacious in promoting vegetation. The peculiar agency of snow as a fertilizer, may be ascribed to its furnishing a covering to the roots of vegetables, which not only guards them from the influence of atmospherical cold, but prevents the escape of the internal heat of the earth. Different vegetables are able to preserve life under different degrees of cold, but all of them perish when the cold which reaches their roots is extreme. Providence has, therefore, in the coldest climates, provided a covering of snow for the protection of the roots of vegetables, than which, there could not be a better covering. Although in itself it is cold, it nevertheless shelters the earth, and maintains the warmth which is necessary. From whatever cause, when the snow fully covers the ground during the severity of the winter in Canada, the good effect is always perceptible the ensuing spring.

In tropical countries where the seasons are uniform, and where there is no cold to injure, the leaf buds of plants are without covering or protection, and are freely and confidently exposed to the atmosphere. But in climates where the seasons change, and where vegetation is liable to be suspended by the cold, the leaf buds exhibit a structure remarkably different. Developed in the latter end of autumn, they are almost invariably provided with coverings, within which, during the period of torpor, they are cradled, safe from cold and from accident. It has been observed, also, that the flowers of plants which are removed from a warmer to a colder climate, expand at a later hour in the latter.

A flower that opens at six o'clock in the morning in Senegal, will not open in France or England till eight or nine, nor in Sweden till ten; a flower that opens at ten o'clock at Senegal, will not open in France or England till noon or later, and in Sweden it will not open at all; a flower that does not open till noon at Senegal, will not open at all in France or England.

Bonnet has remarked that the ripe ears of corn which bend with the weight of the grain, scarcely ever incline to the north, but always less or more to the south; of the accuracy of which remarks, any one may easily satisfy himself by looking at a field of wheat ready for the sickle; he will find the whole mass of ears nodding as with one consent to the south. The cause is the contraction of the flower-stalk on the side exposed to the sun.

In some parts of Norway, corn is sown and cut within the short period of six or seven weeks. A Lapland summer, including also what in other countries are called spring and autumn, consists of fifty-six days, as follows:—June 23d, snow melts; July 1st, snow gone; 9th, fields quite green; 17th, plants at full growth; 25th, plants in full blow; August 2nd, fruits ripe; 10th, plants shed their seeds; 18th, snow. From this time to the 23d June, the ground is covered with snow, and the waters with ice. On the Island of Montreal, on a dry, sandy soil, I have had wheat in ear, in nine weeks from the day of sowing. January is the coldest month in every latitude; July the warmest month in all latitudes, above 48 degrees; in lower latitudes, August is generally the warmest. Every habitable latitude must, to produce corn, enjoy a mean heat of 60 degrees for at least two months of the year.

Increased temperature, when not carried to excess, will augment the quantity of nutritive matter in a plant, or improve the quality of fruit grown under its influence. Thus English barley of equal weight is more valuable than the Scotch, because from growing in a warmer climate, and enjoying the advantage of a greater quantity of heat and light, it is more fully ripened. It thence acquires more saccharine matter, and produces a greater quantity of spirit, or of malt liquor. It is also proved, by the experiment of Sir Humphrey Davy, that wheat, ripened in a more regular and warmer clime, contains more of that valuable article called gluten, than the same species of grain when raised in England. The average heat of the year is not, however, of so much importance to the growth of plants as its duration, and its steadiness at a certain degree, during the season when the grain is ripening. This gives the uniform climate of Canada a great advantage over the variable seasons of the British Isles. The quantity of solar light which a climate furnishes, is likewise an important object of inquiry; light is essential to increase the proportion of starch or farina, to complete the formation of oil in plants, and to give to fruits their proper colour and flavour. It has also the effect of augmenting saccharine matter, in so much that those sugar-canes which are exposed to the sun, have more of that important ingredient than when they grow under shade.

A wet climate is a great disadvantage to farmers who have a heavy retentive soil to work. It is calculated that in the richest district in Scotland, the Carse of Gowrie, there are only twenty weeks in the year fit for ploughing. The climate of Canada affords much more time in general, for performing that necessary operation, notwithstanding the length and rigour of the winters. The real excellence of a climate depends on its yielding in perfection and abundance, the necessaries of life, or those which constitute the principal articles of food for man, and for the domestic animals kept for his use. In this point of view, a meadow or a field of grain is much more productive, and in most respects more valuable than either a vineyard or a grove of oranges; though the one may be situated in a cold climate, and the other in a country celebrated both for its regularity and warmth of temperature.

It has been remarked that the hurtful effects of cold, in spring and summer, on serene and calm nights, occur chiefly in hollow, low places. Closely connected with the preceding observation is a fact, that on clear and still nights in summer, frosts, when they occur, are less severe upon the hills, than upon the neighbouring plains. This has excited attention chiefly from its contradicting what is commonly regarded as an established fact, that the cold of the atmosphere always increases with the distance from the earth. But on the contrary the fact is certain that, in very clear and still nights, the air near to the earth is colder than that which is more distant from it, to the height of 250 feet, this being the greatest to which experiments relate. The cold of the atmosphere, on clear, still nights in summer, and when on such occasions slight frosts occur, is always greater and more injurious to tender plants, growing on low, flat lands, or in sheltered situations, than on high, or more exposed situations, provided they are not too much elevated. This fact is well ascertained in Canada. The explanation given of this phenomenon is of too great length to introduce in this place.

It is supposed that evaporation goes on very rapidly from snow and ice. Howard mentions an instance in the month of January, in a certain year, when the vapour, from a circular area of snow, five inches in diameter, amounted to 150 grains between sunset and sunrise; and before the next evening, 50 grains more were added to the amount, the gauge having been exposed to a smart breeze on the house-top. Under like circumstances an acre of snow would, in the course of twenty-four hours, evaporate the enormous quantity of 64,000,000 grains of moisture. Even by the evaporation during the night only, 1,000 gallons of water would, in that short time, be raised from an acre of snow. It may thus be easily understood how a moderate quantity of snow may entirely vanish during a soft gale of wind without the slightest perceptible liquefaction on the surface.

The quantity of water evaporated and condensed over the globe, varies with the mean temperature, and consequently with the latitude. But from local or other causes, the quantity varies so much, even in the same place, in different years, that the exceptions are more numerous than the instances of the correctness of the rule. The following table shows the general truth of the supposition that the average quantity of rain diminishes from the equator to the poles.

TABLE.

	Inches.
Uleaborg - - - - - -	13,5
Petersburg - - - - -	16-17,5
Paris - - - - - - -	19,9
London - - - - -	20,7-22,2-25,2
Edinburgh - - - - -	22-24,5-26,4
Carlesruhe, Menheim, Stuttgard, Wurtzburg, Augsburg, and Regensburg, mean of	25,1
Epping, (England) - - - -	27
Bristol, (Do.) - - - - -	29,2
England (Dalton's mean.) - - -	31,3
Liverpool, (England) - - - -	34,1
Manchester, (Do.) - - - -	36,1
Rome - - - - -	39
Lancaster, (England) - - - -	39,7
Geneva - - - - -	42,6
Penzence, (England) - - - -	44,7
Kendal (enclosed by mountains,) Do. - -	53,9
Mean of twenty places in the valleys at the base of the Alps	58,5
Great St. Bernard - - - -	63,1
Vera Cruz - - - -	63,8
Kiswich (enclosed by mountains,) England, -	67,5
Calcutta - - - - -	81
Bombay - - - - -	82
Ceylon - - - - -	84,3
Adam's Peak, ditto - - - -	123,5
Leogane, St. Domingo. - - -	150

This table fully establishes the fact, of the general decrease of rain with the increase of distance from the equator. With respect to the quantity of rain that descends annually on the same place, there may be some considerable fluctuations in the times of its precipitation ; but scarcely any in the mean quantity proper to the place ; thus showing that the distribution of rain or of frozen vapour falling in flakes of snow, obeys the same laws that regulate the more general and fixed operations of nature.

In temperate climates, though the total quantity of rain that falls be much less than within the tropics, there is generally no protracted dry season ; and the rainy days in the year are more numerous the nearer we go to the poles. Still more rain seems to fall in temperate climates during the first six months of the year. The long prevalence of certain winds may cause the seasons to be wet in one part of the world, and dry in another ; the water being as it were, distilled off from the one, in order that it may be precipitated on the other. Yet the whole amount of rain in the two countries may, perhaps, differ very little from the usual average, while the two countries may have the benefit of variety in the general amount of their rain, which variety may be salutary at particular periods, and may even be necessary to their well-being.

The portion of water deposited as dew, in England, in the course of a year is computed to be equal to about four inches. The proportion of dew in Canada must be much greater, from being more copious.

In temperate climates, and with us particularly, wet summers are usually cold. This diminution of temperature is supposed to be the cause, and not the effect, of an extraordinary precipitation of moisture in any particular locality. From north latitude 12° to 43°, the mean number of rainy days is 78 ; from 43° to 46° the mean number is 103 ; from 46° to 52°, 134 ; and from 51° to 60°, 161. The whole quantity of water in the atmosphere in January is usually supposed to be about four inches. In the month of July it is equal to seven inches ; thus the atmosphere contains three inches of water more in the latter month than in the former, and the rain or moisture precipitated to the earth in July is generally double what there is in January. Dalton's table gives an average for many years of the quantity of rain that falls at various places in Britain, and it appears that one-third more rain fell the last six months than the first six months of the year. I think it is generally so in Canada.

MEANS OF PROGNOSTICATING THE WEATHER.

The study of atmospherical changes has, in all ages, been more or less attended to by agriculturists; the study in England, an island situated as it is, is a very different thing from the study of it in our climate, on the Continent of North America. There is a much greater variety of weather in England than with us, particularly as regards rain and drought.

The natural data for this study are the vegetable kingdom. Many plants shutting or opening their flowers, contracting or expanding their parts, &c., depend on the state of the atmosphere. Thus, if the Siberian sow-thistle shuts at night, the ensuing day will be fine ; and if it opens, it will be cloudy and rainy. If the African Marigold continues shut after seven o'clock in the morning, rain is near at hand. The animal kingdom exhibit signs of approaching changes, especially cattle and sheep, and hence shepherds are generally, of all others, the most correct in their estimate of weather.

The mineral kingdom, stones, earths, metals, &c., often show indications of approaching changes. The appearance of the atmosphere, the moon, and general character of the season, the prevalence of particular winds, all these signs may be attended to.

The influence of the moon on the weather has in all ages been believed by the generality of mankind. The following are the principles on which learned men have grounded their reasons for embracing the received notions on this interesting topic: There are ten situations in the moon's orbit where she must particularly exert her influence on the atmosphere; and when, consequently, changes of the weather most readily take place : These are—1st, the new ; and 2d, the full moon, when she exerts her influence in conjunction with or in opposition to the sun. 3rd and 4th—the quadratures, or those aspects of the moon when she is 90° distant from the sun ; or when she is in the middle point of her orbit, between the points of conjunction and opposition, namely, in the first and third quarters. 5th—the perigee ; and 6th, the apogee, for those points of the moon's orbit in which she is at the least and greatest distance from the earth. 7th and 8th—the two passages of the moon over the equator, one of which Toaldo calls the moon's ascending, and the other the moon's descending, equinox ; or the two lunistices, as De la Lande terms them ; 9th,—the boreal lunistice, when the moon approaches as near as she can in each lunation (or period between one new moon and another) to our zenith, (that point in the horizon which is directly over our heads). 10th—the Austral lunistice, when she is at the greatest distance from our zenith ; for the action varies greatly according to her obliquity. With these ten points Toaldo compared a table of forty-eight years observations ; the result is, that the probabilities that the weather will change at a certain period of the moon, are in the following proportions :—New moon, 6 to 1 ; first quarter, 5 to 2 ; full moon, 5 to 2 ; last quarter, 5 to 4 ; Perigee, 7 to 1 ; Apogee, 4 to 1 ; ascending equinox, 13 to 4 ; northern lunistice, 11 to 4 ; descending equinox, 11 to 4 ; southern lunistice, 3 to 1.

That the new moon will bring with it a change, is in the doctrine of chances as 6 to 1. Each situation of the moon alters that state of the atmosphere which has been occasioned by the preceding one ; and it seldom happens that any change in the weather takes place without a change in the lunar situations. These situations are combined on account of the inequality of their revolutions ; and the greatest effect is produced by the union of the syzigies, or the conjunction and opposition of a planet with the sun, with the apsides or points in the orbits of planets, in which they are in the greatest and least distance from the sun or earth. The proportion of their power to produce variations is as follows : New moon coinciding with the perigee, 33 to 1 ; ditto, with the apogee, 7 to 1. Full moon coinciding with the perigee, 10 to 1 ; ditto with the apogee, 8 to 1. The combination of these situations generally occasions storms and tempests ; and this perturbing power will always have the greatest effect, the nearer these situations are to the moon's passage over the equator, particularly in the months of March and September.

At the new and full moons, in the months of March and September, and even at the solstices, especially the winter solstices, the atmosphere assumes a certain character, by which it is distinguished for three, and sometimes for six months. The new moons which produce no change in the weather, are those that happen at a distance from the apsides. As it is perfectly true that each situation of the moon alters that state of the atmosphere which has been produced by another, it is also observed, that many situations of the moon are favourable to good and others to bad weather. The situations of the moon favourable to bad weather are the perigee, new and full moon, passage of the equator, and the northern lunistice. Those belonging to the former are the apogee, quadratures, and the southern lunistice. Changes of the weather seldom takes place on the very days of the moon's situation, but either precede or follow them. It has been found by observation, that the changes effected by the lunar situations in the six winter months precede, and in the six summer months follow them. The octants, beside the lunar situations to which the above observations refer, attention must be paid also to the fourth day before new and full moon, which days are called the octants. At these times the weather is inclined to changes, and it may be easily seen that these will follow at the next lunar situation. Virgil calls this fourth day a very sure prophet. If on that day the horns of the moon are clear and well defined, good weather may be expected ; but if they are dull, and not clearly marked on the edges, it is a sign that bad weather will ensue. When the weather remains unchanged on the fourth, fifth and sixth days of the moon, we may conjecture that it will continue so till full moon, even sometimes till the next new moon ; and in that case the lunar situations have only a very weak effect. Many observers of nature have also remarked, that the approach of the lunar situations is sometimes critical for the sick. According to Dr. Herschel, the nearer the time of the moon's entrance at full, change, or quarters, is to midnight, (that is within two hours before and after midnight,) the more fair the weather is in summer, but the nearer to noon the less fair. Also, the moon's entrance at full, change, or quarters, during six of the afternoon hours, viz., from four to ten, may be followed by fair weather ; but this is mostly dependant on the wind. The same entrance during all the hours after midnight, except the first two, is unfavourable to fine weather: the like, nearly, may be observed in winter.

By means of the barometer, we are enabled to regain, in some degree at least, that foreknowledge of the weather, which the ancients did possess. Chaptal considers that the value of the barometer, as an indicator of the approaching weather, is greater than the human knowledge of the most experinced countryman, and indeed of all other means put together.

The rising of the mercury presages, in general, fair weather, and its falling, foul weather, as rain and snow, high winds and storms.

The sudden falling of the mercury foretels thunder, in very hot weather, especially if the wind is south. The rising in winter indicates frost; and in frosty weather, if the mercury falls three or four divisions, there will follow a thaw ; but if it rises in a continued frost, snow may be expected.

When foul weather happens soon after the falling of the mercury, it will not be of long duration ; nor are we to expect a continuance of fair weather, when it soon succeeds the rising of the quicksilver. If, in foul weather, the mercury rises considerably, and continues rising for three or four days before the foul weather is over, a continuance of fair weather may be expected to follow.

In fair weather, when the mercury falls much, and low, and continues falling two or three days before rain comes, much wet must be expected, and probably high winds.

The unsettled motion of the mercury indicates changeable weather.

Towards the end of March, or more generally in the beginning of

April, the barometer sinks very low with bad weather, after which it seldom falls lower than 29 degrees 5 minutes, till the latter end of September or October, when the quicksilver falls again low with stormy wind, for then the winter constitution of the air takes place. From October to April, the great falls of the barometer are from 29 degrees 5 minutes to 28 degrees 5 minutes, and sometimes lower, whereas, during the summer constitution of the air, the quicksilver seldom falls lower than 29 degrees 5 minutes. It therefore follows that the fall of one-tenth of an inch, during the summer, is as sure an indication of rain, as a fall of between two and three-tenths is in the winter.

Oil of vitriol is found to grow lighter or heavier in proportion to the less or greater quantity of moisture it imbibes from the air. The attraction is so great, that it has been known to change its weight from three drachms to nine.

If a line be made of good well dried whipcord, and a plummet be fixed to the end of it, and the whole be hung against a wainscot, and a line be drawn under it, exactly where the plummet reaches, in very moderate weather it will be found to rise above such line, and to sink below it, when the weather is likely to become fair.

A farmer who will accustom himself to observe the rising and setting sun, throughout the year, may be able to make a very accurate estimate of the weather. If the sun set clear and no clouds intervene, when disappearing below the horizon, the succeeding day will generally be fine, and on the contrary, if the sun sets cloudy, or is intercepted from the view by clouds at the moment of disappearing below the horizon, rain will generally fall within the succeeding twenty-four hours. Winds and storms will be indicated by the appearance of the atmosphere before they occur. In fact Providence has afforded many signs whereby the attentive and industious farmer may be in a great degree guarded against any sudden changes in the weather, which would be injurious to him ; and in observing constantly the rising and setting sun, he is amply repaid for his attention by the opportunity it gives him of seeing the most glorious picture nature offers to our view. If some seasons are less propitious to us than others, from long continued drought or moisture, we should rejoice and be thankful that they are not of frequent recurrence, and are generally occasioned by natural causes, which are partly explained in the foregoing pages.

AGRICULTURE.

PART III.

DOMESTIC ANIMALS USED IN AGRICULTURE.

In every part of the world, man has, and may continue to exercise, in various ways, a powerful influence over animals, and their distribution and improvement. In most countries he has succeeded in domesticating those that are useful, and exterminating those that are hostile to his interests.

The benefits that have resulted to man from the domestication and improvement of animals, are beyond all calculation. He has employed them as labourers, and in furnishing him with food, clothing, medicine, and materials for various manufactures. All the most useful quadrupeds of the Old World have been successfully introduced into America, and other newly discovered countries, and have multiplied prodigiously.

In the British Isles, domestic animals have been brought to the highest state of profitable improvement, that the various species are capable of. The soil and climate in summer and winter, being extremely favourable for breeding, rearing, and feeding, they have attained that degree of perfection that is proportioned to the farmer's skill, industry, and care, applied to their management. No other country in the world is so suitable for animals of the largest size, the climate being temperate, and the pastures most luxuriant, and winter food abundant and excellent in quality.

On the various breeds of animals, and the principles of their improvement in breeding, rearing, managing and feeding, much has been written. I have it in my power to avail myself of the most approved authorities on these subjects, and will make such selections as I conceive will be most useful to the Canadian agriculturist, in order to enable him to make the most judicious and profitable choice of animals to suit his situation and circumstances, and when he has made his choice, to manage and improve them by care in breeding, and furnishing them with sufficient nutritive food, at all seasons of the year, which alone can make domestic animals profitable to their owners, in this, or in any other country.

THE OBJECT OF IMPROVEMENT OF BREEDS OF ANIMALS.

The great object of the husbandman, in every case, ought to be to obtain the most valuable returns from his raw produce ; to prefer that kind of live stock, and that breed of any kind, which will pay him best for the food the animal consumes. The value to which the animal itself may be ultimately brought, is quite a distinct aad inferior consideration.

" *To improve the form rather than to enlarge the size, in almost every case, ought to be the grand object of improvement. Size must ever be determined by the abundance or scarcity of food, and every attempt to enlarge it beyond that standard must prove unsuccessful, and for a time, destructive to the thriving of the animals, and the interest of their owners. It is certain that animals, too large or too small, will alike approach to that profitable size which is best adapted to their pastures ; but the large animal becomes unhealthy, and degenerates in form and in all its valuable properties ; whereas the small one, while it increases in size, improves in every respect.*" (Gen. Rep., Scotland, c. 14.) This opinion, I am convinced, is most correct in every particular.

THE MEANS OF IMPROVING THE BREED OF ANIMALS.

By improvement of a breed is to be understood the producing such an alteration in shape or description, as shall render the animal better fitted for the labour he has to perform ; better fitted for becoming fat, or producing milk, or wool, or particular qualities of these. The fundamental principle of this amelioration is the proper selection of parents. First, by breeding from choice individuals of the same parentage, called the *in-and-in* system ; second, breeding from individuals of two different offsprings or varieties, called the system of *cross-breeding* ; and the third, breeding from animals of the same variety, but of different parentage, which may be called breeding in the *line*, or in the same race.

Breeding in the same line is, however, the system at present adopted by what are considered the best breeders.

The size, form, and general properties of the inferior animals in a state of nature, may be always traced to the influence of soil and climate ; therefore, climate, soil and quantity, and quality of its produce, in a great measure, prescribe to the husbandman the kind of stock which he ought to employ for consuming that produce. Where he has not a constant supply of rich pasture, such as they have in England and Ireland, he cannot cultivate profitably the larger, and most improved breeds of these countries. To select animals that will thrive upon the pastures of Canada, is the first object of the farmer here. His situation, and circumstances must determine his crop, and must also determine the particular description of his live stock.

Early maturity is a most valuable property of all sorts of live stock. With regard to those animals which are fed for their carcasses, it is of peculiar importance that they should become fat at an early age, because they not only return the price of their food, with the profits of the feeder, but in general also, a greater value for their consumption than slow-feeding animals. A propensity to fatten at an early age is a sure proof that an animal will fatten speedily at any after period of its life. Tameness and docility of temper are desirable properties in most of the domesticated animals. The quantity of the flesh, and the proportions which the fine and coarse parts bear to each other, and the weight of both to that of the offal, constitute the comparative value of two animals of equal weight.

The first of these properties seems to be determined by the breed and food ; the second, by the form and proportions of the animal ; and a third, by all these and its degree of fatness. The flesh of well-formed small animals, both of cattle and sheep, is well known to be finer grained, of a better flavour, more intermixed with fat, and to afford a richer gravy than that of the large animals, and it brings a higher price accordingly, (by nearly a penny per pound,) in all the principal markets of England and Ireland.

The desirable properties of animals are different according to the purposes to which they are applied. The principal productions of live stock are meat, milk, labour, and wool. A breed of cattle equally well adapted to the butcher, the dairy-maid, and the plough, would be very desirable, but are scarcely to be found. These properties are by most judges, considered to be inconsistent with one another, and to belong to animals of different forms and proportions. With regard to sheep, I believe that *very fine wool* cannot be produced by such as have the greatest propensity to fatten, and will return the most meat for the food they consume. In Canada, the wool of the sheep is a very great object to the farmer, and bears a much higher proportionate value to the carcass than in England ; therefore, a good description of sheep, producing long wool, of reasonable fineness, are the best adapted to this country.

The shapes which indicate a propensity to fatten in the shortest time, and with the least consumption of food, and lay the fat upon the most valuable parts of the carcass, are considered to be the following.

The head, bones, and less valuable parts, ought to be fine, clean, and as small as possible. The collar full at the breast and shoulders, and tapering gradually to where the neck and head join. The bosom broad, and the chest deep. The carcass should be large, and the ribs standing out from the spine, both to give strength of frame and constitution, and likewise to admit of the intestines being lodged within the ribs, but yet not to be what is called high-ribbed. The shoulders ought not only to be light of bone, and rounded off at the lower point, but also broad, to impart strength, and well covered with flesh. The back, from the shoulders to the tail should be broad, flat, and nearly level ; the quarters long, and the flank, full and large. Round bodied, and barrel-shaped animals, with clean heads, necks, and throats, small legs, and the least appearance of offal, will be easiest fattened, and pay most for the food they consume.

A breed may be said to be improved when some desirable property, which it did not possess before, has been imparted to it, and also when its defects have been removed or diminished, and its valuable properties enhanced. Improvement, in its most extensive application to the live stock of a country may also be effected when, by a total or partial change of live stock, the value of the natural produce of the soil is augmented, and a greater quantity of human food and other desirable commodities obtained from it. Whatever may be the merit of that skilful management which is necessary to the formation of a valuable breed, a considerable degree of the same kind of merit may be justly claimed by those who shall introduce and establish it in situations where its advantages have never been contemplated, and in which the obstacles to its success may appear almost insurmountable.

That the breed of animals is improved by the largest males, is a very general opinion ; but this opinion, according to some, is the reverse of the truth, and has done considerable mischief. The great object of breeding, by whatever mode, is the improvement of form, and experience has proved that this has only been produced in a eminent degree in those instances in which the females were larger than in the usual proportion of females to males ; and that it has generally failed where the males were disproportionately large. The following epitome of the science of breeding is by the late eminent surgeon, Henry Cline, who practised it extensively on his own farm at Southgate. Though some breeders have disapproved of Mr. Cline's system, yet it has been translated into most of the Continental languages, and has lately been illustrated by M. De Dombasle in France, and by others.

On the size, soundness, and strength of the lungs, the health of animals principally depends. The power of converting food into nourishment, is in proportion to this size. An animal with large lungs is capable of converting a given quantity of food into more nourishment than one with smaller lungs, and therefore has a greater aptitude to fatten. The size of the chest indicates the size of the lungs, and its capacity depends on its form more than on the extent of its circumference ; for when the girth is equal in animals, one may have much larger lungs than the other. A circle contains more than an ellipsis of equal circumference. A deep chest, therefore, is not capacious unless it is proportionately broad.

The head being small generally indicates that the animal is of a good breed. Horns are particularly injurious to sheep. The skull of a ram, with its horns, weighed five times more than a skull that was hornless, both the skulls being taken from sheep of the same age, four years old. The natural size of the head was the same in both, independent of the horns. A mode of breeding which would prevent the production of horns, would afford a considerable profit in the increase of meat, wool, and other valuable parts in sheep.

To obtain the most improved form, the two modes of breeding described as the *in-and-in* and *crossing* modes have been practiced. The first mode may be the better practice, when a particular variety approaches perfection in form, especially for those who may not be acquainted with the principles on which improvement depends. When the male is much larger than the female, the offspring is generally of an imperfect form. If the female be proportionately larger than the male, the offspring is of an improved form. For instance, if a well-formed large ram be put to ewes proportionately smaller, the lambs will not be so well shaped as their parents ; but if a small ram be put to larger ewes, the lambs will be of an improved form.

The proper method of improving the form of animals consists in se lecting a well formed female, proportionately larger than the male. The improvement depends on the principle that the power of the female to supply her offspring with nourishment is in proportion to her size, and to the power of nourishing herself from the excellence of her constitution. The size of the fœtus is generally in proportion to that of the male parent; and, therefore, when the female parent is disproportionately small, the quantity of nourishment is deficient, and her offsping has all the disproportions of a starveling. But when the female is large, she is more than adequate to the nourishment of a fœtus of a smaller male than herself.

To obtain animals with large lungs, crossing is the most expeditious method. By selecting large, well-formed females to be put to a well-formed male of a variety that is rather smaller, will produce this improvement, considered so necessary by Mr. Cline. If a hornless ram be put to horned ewes almost all the lambs will be hornless, partaking of the character of the male more than of the female parent. Crossing with hornless bulls will often produce the same results.

Examples of the good effects of crossing may be found in the improved breed of horses and swine in England. The great improvement of the breed of horses arose from crossing with the diminutive stallions, Barbs and Arabians; and the introduction of Flanders mares into this country was the source of improvement in the breed of cart-horses. The forms of the swine have been greatly improved, by crossing with the small Chinese boar.

Examples of the effects of crossing the breed are more numerous. When it became the fashion in London to drive large bay horses, the farmers in Yorkshire put their mares to much larger stallions than usual, and thus did infinite mischief to their breed, by producing a race of small-chested, long-legged, large-boned, worthless animals. A similar practice was adopted in Normandy, to enlarge the breed of horses there, by the use of stallions from Holstein, and, in consequence, the best breed of horses in France would have been spoiled, had not the farmers discovered their mistake in time, by observing the offspring much inferior in form to that of the native stallions. Some graziers in the Isle of Sheppy, conceived that they could improve their sheep by large Lincolnshire rams, the produce of which, however, was much inferior in the shape of the carcass and the quality of the wool; and the flocks were greatly impaired by this attempt to improve them. Attempts to improve the animals of a country by any plan of crossing, should be made with the greatest caution; for by a mistaken practice, extensively pursued, irreparable mischief may be done. In any country where a particular race of animals has continued for centuries, it may be presumed that their constitution is adapted to the food and climate.

The policy of the animal economy is such, that an animal will gradually accommodate itself to great vicissitudes of climate, and alterations in food, and by degrees undergo great changes in constitution; but these changes can be effected only by degrees, and may often require a great number of generations for their accomplishment. It may be proper to improve the form of a native race, but at the same time it may be very injudicious to enlarge their size, for the size of animals is commonly adapted to the soil and climate which they inhabit. Where produce is nutritive and abundant, the animals are large, having grown proportionately to the quantity of food which for generations they have been accustomed to obtain. Where the produce is scanty, the animals are small, being proportioned to the quantity of food which they were able to procure. Of these contrasts the sheep of Lincolnshire and of Wales are examples. The sheep of Lincolnshire would starve on the mountains of Wales.

The general mistake in crossing has arisen from an attempt to increase the size of the native race of animals, being a fruitless effort to counteract the laws of nature. No attempt to enlarge the size of animals, by any mode of breeding, will ever succeed without a corresponding change in the quantity and quality of their food, and their means of procuring it without much fatigue. The climate also requires attention. An improved short horn could never arrive at perfection on the scanty and coarse fare, and severe climate of the Highlands of Scotland. Size, in fact, is a very subordinate consideration. The great object, as observed above, is to obtain the greatest possible return for the food consumed ; and it is only where the quantity and quality are in great abundance, that large animals, if of a good description, may be preferred to small ones.

Arabian horses are, in general, the most perfect in the world, which probably has arisen from great care in selection, and also from being unmixed with any variety of the same species ; the males, therefore, have never been disproportioned in size to the females.

The native horses of India are small, but well proportioned. With the intention of increasing their size, the East India Company have adopted the plan of sending large stallions to India. If these stallions should be extensively used, a disproportioned race must be the result, and a valuable breed of horses may be irretrievably spoiled. From theory, from practice, and from extensive observation, the last more to be depended on than either, it is reasonable, Mr. Cline observes, to form the conclusion ; it is wrong to enlarge a native breed of animals, for in proportion to their increase of size, they become worse in form, less hardy, and more liable to disease.

The above opinions may be considered as supported by the most eminent practical breeders, as Bakewell, Cully, Lord Sumerville, Perry, and others, and by most theorists, as Coventry, Darwin, Hunt, Young, &c. though some persons of less experience may be of a contrary opinion.

George Culley, a Northumberland farmer of great practice in breeding and feeding, in his observations on live stock, not only concurs in this principle as far as respects quadrupeds, but considers it to hold good in the feathered tribe, and in short, in animals of every kind. His conclusion is, " That of all animals, of whatever kind, those which have the smallest, cleanest, and finest bones, are in general the best proportioned, and covered with the best and finest grained meat. " I believe," he adds, " they are also the hardiest, healthiest, and most inclinable to feed ; able to bear the most fatigue while living, and worth the most per pound when dead."

After the birth, the first interference on the part of man should be, that of supplying the mother with food of a light and delicate quality, compared with that which she had been in the habit of using, and also of administering the same description of food to the offspring, as far as it may, by its nature, by able to use it. As the animals increase in size and strength, they should have abundance of air, exercise, and food, according to their nature ; and whatever is attempted by man in the way of taming or teaching, should be conducted on mild and conciliating principles rather than on those of harshness and compulsion.

The purposes for which animals are fed or nourished are for promoting their enlargement of growth, for fitting them for labour, for the increase of certain animal products, or for fattening them for slaughter as human food. In the fattening of cattle, the following points require to be attended to : abundance of proper food, a proper degree of heat, protection against extremes of weather, good air and water, tranquility, cleanliness, comfort, and health.

Food, though it must be supplied in abundance, ought not to be given to satiety. Intervals of resting and exercise must be allowed according to circumstances. Even animals grazing in a rich pasture have been found to feed faster when removed from it once a day, and either folded or put in an inferior pasture for two or three hours. Coarser food may be first given to feeding animals, and as they acquire flesh, that which is of more solid and substantial quality. In general it may be observed, that if the digestive powers of the animal are in a sound state, the more food he eats the sooner will the desired result be obtained ; a very moderate quantity beyond sufficiency constitutes abundance ; but by withholding this additional quantity, an animal, especially if young, may go on eating for several years without ever attaining to fatness. An ox properly treated, of moderate size, will fatten on good pasture in from three to five months. Young growing animals require less rich food than such as are of mature age. Unless food be thoroughly deprived of its vegetative powers before it enters the stomach, the whole nourishment which it is capable of affording cannot be derived from it. In the case of the leaves and stalks of vegetables, this is in general effected by mastication ; but it requires some care to accomplish it in the case of grains. Hence the advantage of mixing corn given to horses or cattle with chaff of cut straw ; and hence it is supposed by some, that the instinct which fowls have to swallow small stones, is intended by nature for the same object. But the most effectual mode of destroying the living principle is by the application of heat ; and if vegetable food of every kind could be steamed or boiled before it was given to animals, (at least in winter,) for fattening for the shambles, or feeding for milk, it is rendered probable, by analogy and experiment, that much more nourishment would be derived from it. Salt may be advantageously given to all animals ; it acts as a whet to the appetite, promotes the secretion of bile, and in general, is favourable to health and activity, and preventing or curing diseases.

In the excessive heats in summer, animals require shade, and abundance of good water at all times. Water ought to be soft and pure, of a moderate temperature, under that of the open air in hot weather, and exceeding it in winter. Except in giving warm drinks, mixed with a little meal, or other rich matter, it is not supposed that liquid food is so generally advantageous for fattening animals, as that which being equally rich is solid. It is not necessary to give water to animals for some time after eating; animals pasturing in the field seldom seek water after filling themselves; they generally lie down first, and after the process of digestion seems to have gone on for some time, they then go in quest of water. To give water to housed animals, in an hour or an hour and an half, after what may be called their meals, will, I believe, be the best time.

Cleanliness is favourable to health, by promoting perspiration and circulation. Animals in a wild state attend to this part of their economy themselves; but in proportion as they are cultivated, or brought under the controul of man, this becomes out of his power; and to insure their subserviency to his wishes, this part of the culture as well as others, must be supplied by art. Combing and brushing stall-fed cattle and cows are known to contribute materially to health. Bathing or steeping the feet of stalled animals occasionally in warm water, would, no doubt, contribute to their health. Bathing swine in hot water, as in that used for boiling or steaming food, has been found a real advantage.

An animal may be well fed, lodged and cleaned, without being comfortable in every respect; and in brutes, as well as man, want of comfort operates on the digestive powers. If the surface of a stall in which an ox or a horse stands, deviates much from a level, he will be continually uneasy; and he will be uneasy during night if its surface is rough, or if a proper bed of litter is not prepared every evening for him to repose on. The form of racks and mangers is often less commodious than it might be. It should be a duty as agreeable as it is conducive to our own interest to promote as much as possible the comfort of those animals whose lives are shortly to be sacrificed for ours. A good state of health will, in general, be the result of a proper mode of feeding and treatment; but in proportion as our treatment, either of ourselves or other animals, is refined and artificial, in the same proportion are the functions of nature liable to derangement or interruption from atmospherical changes, and various accidental causes.

CHOICE OF LIVE STOCK FOR THE PURPOSES OF BREEDING OR FEEDING.

The bulk of an animal was the sole criterion of its value before the improvements introduced by Bakewell; and if a great size could be obtained, more regard was paid to the price the animal ultimately fetched, than to the cost of its food. Of late, since breeders began to calculate with more precision, small or moderate sized animals have been generally preferred, for the following reasons:

Small sized animals are more easily kept, they thrive on shorter herbage, they collect food where a large animal could hardly exist, and thence are more profitable. Their meat is finer grained, produces richer gravy, has often a superior flavour, and is commonly more nicely marbled, or veined with fat, especially when they have been fed for two years. Large animals are not so well calculated for general consumption as the moderate sized, particularly in hot weather; large animals poach pastures more than small ones; they are not so active, require more rest, collect their food with more labour, and will only consume the nicer and more delicate sort of plants. Small cows of the true dairy breed give proportionately more milk than large ones. Small cattle may be fattened solely on grass of even moderate quality; whereas the large require the richest pastures, or to be stall-fed, the expense of which exhausts the profit of the farmer. It is much easier to provide well-shaped and kindly feeding stock of a small size than of a large one. Small sized cattle may be kept by many persons who cannot afford either to purchase or to maintain large ones; and their loss, if any accident should happen to them, can be more easily borne. The small sized sell better for a butcher, from a conviction that, in proportion to their respective dimensions, there is a greater superficies of valuable parts in a small than a large animal, and will give more money for two oxen of twelve stone each per quarter than for one of twenty-four stone equally fat.

In favour of the large sized it is, on the other hand, contended, that without debating whether from their birth till they are slaughtered the large or the small one eats most for its size; yet on the whole, the large one will pay the grazier or the farmer who fattens him as well for his food; that though some large oxen are coarse grained, yet where attention is paid to the breed, (as is the case with the Herefordshire,) the large ox is as delicate food as the small one; that if the small sized are better calculated for the consumption of private families, of villages, or of small towns, yet that large cattle are fitter for the markets of great towns, and in particular of London, that where the flesh of the smaller sized ox is better when fresh, yet the meat of the large sized is unquestionably more calculated for salting, a most essential object in a maritime and commercial country, though not for Canada at present. The thicker the beef, the better it will retain its juices when salted, and the fitter it is for long voyages; that the hide of the large ox is of very great consequence in various manufactures; that when the pastures are good, cattle and sheep will increase in size, without any particular attention on the part of the breeder. Large animals are, therefore, naturally the proper stock for good pastures.

Such are the arguments generally made use of on both sides of the question, from which it appears that much must depend upon pastures, taste, mode of consumption, markets, &c., and that both sides have their advantages. The intelligent breeder, however, (unless his pastures are of a nature peculiarly forcing,) will naturally prefer a moderate size in the stock he rears. Davis, of Longleat, one of the ablest agriculturists England has produced, has given some useful observations on the subject of size. He laments that the attempts which have been made to improve the breed of cows, horses and sheep, have proceeded too much upon the principle of enlarging the size of the animal; whereas, in general, the only real improvement has been made in the pig, and that was by reducing its size, and introducing a kind that will live hardier, and come to greater perfection at an earlier age.

Though it is extremely desirable to bring the shape of cattle to as much perfection as possible, yet profit and utility ought not to be sacrificed for mere beauty which may please the eye, but will not fill the pocket; and which, depending much upon caprice, must be often changing. In regard to form, the most experienced breeders seem to concur in the following particulars: That the form or shape should be compact, so that no part of the animal should be disproportioned to the other parts, and the whole should be distinguished by a general fulness and rotundity of shape; that the chest should be broad, for no animal whose chest is narrow can easily be made fat; that the carcass should be deep and straight; that the belly should be of a moderate size, for when it is more capacious than common in young animals, it shows a diseased state, and in older ones it is considered a proof that the animal will not return in flesh, in milk or in labour, the value of the extra quantity of food which it consumes; that the legs should be short, for the long limbed individuals of the same family or race are found to be the least hardy, and the most difficult to rear or to fatten; and that the head, the bones, and other parts of inferior value, should be as small as is consistent with strength, and with the other properties which the animal ought to possess. In animals bred for the shambles, the form must likewise be such as to contain the greatest possible proportion of the finer compared with the coarser and less valuable parts of the animal. This, by selection, may be attained, and thus the wishes of the consumer may be gratified.

The form of animals has fortunately attracted the attention of an eminent surgeon, Henry Cline, Esq. of London, whose doctrines I have already laid down in part, and the substance of which is: That the external form is only an indication of the internal structure; that the lungs of an animal form the first object to be attended to, for on their size and soundness the health and strength of an animal principally depend; that the external indications of the size of the lungs are the form and size of the chest, and its breadth in particular; that the head should be small, as it generally indicates that the animal is of a good breed; that the length of the neck should be in proportion to the size of the animal, that it may collect its food with ease; and that the muscles and tendons should be large, by which an animal is enabled to travel with greater facility. It was formerly the practice to estimate the value of animals by the size of their bones. A large bone was considered to be a great merit, and a large-boned animal always implied great size. It is now known that this doctrine was carried too far. The strength of the animal does not depend upon the bones, but on the muscles; and when the bones are disproportionately large, it indicates, in Cline's opinion, an imperfection in the organs of nutrition. Bakewell strongly insisted on the advantage of small bones; and the celebrated John Hunter declared, that small bones were generally attended with corpulence in all the subjects he had an opportunity of examining. A small bone, however, being heavier and more substantial, requires as much nourishment as a hollow one with a larger circumference.

Early maturity in animals, or speedily growing to a proper size, is of great consequence. Animals having the property of growing, are usually straight in the back and belly; their shoulders well thrown back, and their belly rather light than otherwise. At the same time gauntness and paucity of intestines should be guarded against as a most material defect, indicating a very unthriving animal. A bull distinguished for getting good growens is inestimable ; but one whose progeny are unnatural, or gigantic in size, ought to be avoided.

Arriving soon at perfection, not only in point of growth or size, but in respect of fatness, is a material object for the farmer, as his profit must, in a great measure, depend upon it. When animals, bred for the carcase merely, become fat at an early age, they not only return sooner the price of their food, with profit to the feeder, but in general also, a greater value for their consumption, than slow feeding animals. This desirable property greatly depends on a mild and docile disposition ; and as this docility of temper is much owing to the manner in which the animal is brought up, attention to inure them early to be familiar cannot be too much recommended. A tamed breed also has other advantages. It is not so apt to injure fences, or to break into adjacent fields ; consequently it is less liable to accidents, and can be reared, supported, and fattened at less expense. The property of early maturity in a country where the consumption of meat is great, is extremely beneficial to the public, as it evidently tends to furnish greater supplies to the market ; and this propensity to fatten at an early age is a sure proof that an animal will fatten speedily at a later period of his life.

The possession of a hardy and healthy constitution, is a most valuable property in stock. Where the climate is rigorous, it is essential that the stock bred and maintained there should be able to endure the severities and vicissitudes of the weather, as scarcity of food, or any other circumstance in its treatment that might subject a more delicate breed to injury ; in this respect, differect kinds of stock greatly vary, and it is a matter of much consequence to select for different situations, cattle with constitutions suitable to the place where they are to be kept.

Some breeds are distinguished by the quality of the flesh. In some breeds the flavour of the meat is superior, and the gravy they produce is well flavoured and rich. Breeds whose flesh have these properties are the most valuable. A disposition to fatten is a great object in animals destined for the shambles ; some animals possess this property during the whole progress of their lives, while in others it only takes place at a more advanced period, when they have attained their full growth, and are furnished at the same time with a suitable supply of food. In England it is considered by good judges, " that the best of the short-horned breed of cattle being larger than any other kind requires good keeping, and more age than cattle in general ; the ox will improve to seven years of age, and the cows to six ; and if they are not well supported when young, will require another year ; that they have large bones, and said to be coarse-grained, and the beef not so marbled as that of some other kinds, though some of them die very fine beef ; that many of them have larger shoulders than the long-horned breed, a great defect, for although the shoulders cannot be deemed offals, yet are they comparatively a loss, as the flesh is of less value than that of the rump, loins, and chine ; wherefore the most perfect formed cattle are those that have the smallest shoulders in proportion to their size, and the least offal, and parts of inferior value."

By a report of a farm in Cumberland, England, selected for superior good management, in 1832, it appears, " the pure short-horned cattle are found, after many years experience, to be rather too tender for the climate, and difficult and expensive to winter." This farm in point of soil, is said to be equal in value to any lands in the north of England.

The improved long-horned breed of cattle were, by the celebrated Bakewell, preferred to all others. He was of opinion, that breed kept themselves in good condition on less food than any other of equal weight, that at an early age no other breed equalled them for slaughter, or would pay so much money for three years' consumption of food. The long-horned breed of cattle were the most esteemed in the best feeding counties in Ireland, and were brought to great perfection, grass fed, at the age of four years and a half, and often at the age of three years and a half. I have seen them sold in lots of 100 together, grass fed, in the county of Galway, at twenty, twenty-three, and on one occasion as high as twenty-five pounds sterling each ; and fat heifers of the same age, at from fifteen to eighteen pounds sterling each, *that never had been housed.* The long-horned cattle were well adapted for grazing, being well protected by thick mellow hides, and long, close set hair.

The pastures on which these large cattle are fed in Ireland are the best in the world, and this large beef was generally purchased for supplying the government contracts for the army and navy in the time of war, and is now, I suppose, consumed in the large manufacturing towns in England, as well as the supply of the British navy, war and mercantile. I know these animals to be of a hardy constitution, and were selections made from them of a moderate size, I am very confident they would succeed well here with farmers who would provide them with a sufficiency of nutritive food.

They mistake greatly who expect to improve a breed of animals by crossing with large over fed males, or suppose that such males will impart all the qualities of size and flesh which they have acquired by superior keep and feeding, to their progeny. The progeny may certainly have bone and size, but without suitable keep afterwards, this increase in bone will be most injurious to them and their owners.

It may be very profitable for fancy breeders to feed and make up stock to an extraordinary degree of perfection, and they are much to be commended for giving an example of what care and superior keep is capable of producing ; but those who would wish to possess a similar description of stock, may rest assured, that they must adopt the same plan of care and feeding, or they never can possess them by any crossing with these superior animals. A farmer in England, who, ambitious to excel, purchased a bull from a fancy breeder, and after keeping him for some time, the beast lost flesh, and became weak and languid ; the farmer, on meeting with his former feeder, complained that the animal was fast declining, although he had plenty of grass, hay, &c., the feeder told the farmer, " that grass and hay were not sufficient, for besides these, he had been fed on grain, and had also been indulged with a pail of milk every day, from the time of quitting his mother."

All animals kept by a farmer should be abundantly supplied with nutritive food at all times ; and males kept for breeding fed generally as common stock, and not a great deal more pampered, would appear in their true light, and would be much more useful than when over fed, or even considerably better fed than the farmer's other stock. The best informed farmers are well convinced, that a great quantity of fat laid upon an animal, cannot produce fat or a better stamina in the offspring, or were ever the best animals produced from the largest males.

Mr. Hayward, an English farmer, says : "It is well known that there are many farms, and many large districts that never do fatten their stock, and indeed are inadequate to it ; and what other cause can be assigned for this but that the stock are bred by continual crossing with males reared under advantages of superior lodging, food, and climate, to what such farms and districts naturally produce ? The consequence is, that the stock are always lean and long, and large in the bones, unequal to sustain the hardships of the natural climate, lodging and food, that most farmers have to give them in health and vigour ; and hence it is obvious, that the practice of crossing is not only attended with much useless expense, but that it obstructs what ought to be the object of every rational farmer to obtain, viz : the possession of a stock, in every respect adapted to the nature and localities of his situation and circumstances."

I do not give these selections in order to dissuade farmers from crossing with animals of moderate size. On the contrary, I think such crossing would improve the stock of the country, provided always, that the stock of whatever kind are constantly and abundantly supplied with nutritive food, and without this, all attempted improvement will be in vain.

The Canadian breed of cattle, if due attention were given to their breeding and feeding would, I have no doubt, prove to be the most suitable and profitable stock for the province of Lower-Canada, of any at present in the country. I have had better dairy cows of that breed than of any other, though buying in the market, stock that were not bred, reared or fed, in the most judicious or careful manner. The cows are of a small size, but generally of excellent shape, and fine bone, head and horns. They give richer milk than any other cows, and though the quantity they give in the day may not be so great as that given by larger American cows, they will continue to give it more constantly, and for a longer period.

Were this breed carefully attended to, as the choice breeds of cattle in England, provided with sufficient food from their birth to maturity, selections made of the best formed animals, male and female, for breeding, fattening those of imperfect form, both male and female for the shambles, cutting all male animals not necessary to be preserved for breed, at eight or ten days old, this race of cattle would show perfections that farmers do not appear to be aware of. The oxen of this breed judiciously managed, might be readily fed to weigh from 700 to 1000 pounds dead weight, at four years old, and the cows from 400 to 600 pounds at the same age ; a weight that would be fully sufficient for our pastures, food, and market. A cross with bulls of different breed, good form, and moderate size, might be profitably tried, but the size of the bull should approximate as nearly as possible to that of the race of animals the females are selected from.

The relative estimate of the flesh of the principal breeds at Smithfield market, London, and the average difference in price for the best qualities of each, in March, 1829, is as follows :

Scotch oxen, -	4s.	8d.	per stone of 8lbs.	to sink the offal.
Leicester, Hereford, and fine short horn,	4	4	do.	do.
Lincoln short horns,	4	0	do.	do.
Coarse, inferior beasts,	3	10	do.	do.

Sheep, calves, and lambs of moderate size, sell for higher prices in proportion, than those of the largest size. I have seen reports from the English markets last year, that show the differènce to be fully a penny per pound in most kinds of butcher's meat in favour of the small size. This difference in two animals of 700 pounds weight each, and one animal of 1400 pounds weight, would amount to about 5*l.* or 6*l.* in favour of the small animals in the English market ; an amount that would pay for their stall feeding.

It may be very possible that two animals of 700 pounds weight each, will consume more food than one animal of 1400 pounds weight. I believe the fact has not yet been ascertained by careful experiments. The most competent judges, however, have computed the food necessary for animals by their respective live weight and size, and from my own observations and experience, I believe most animals in perfect health, will consume food in proportion to their size and weight, or nearly so, though there may be exceptions.

The practice of Canadian farmers here to allow male cattle and sheep to remain uncut after the proper time, is a great injury to the quality of the beef and mutton, and we need not expect to see beef or mutton in perfection while this practice is allowed to continue ; animals will not be kindly feeders, or produce the best meat, if not cut when young ; calves at the age of a week or two, and spring lambs cut about the first or second week in May, or before, if the weather is favourable.

By an experiment I made in 1833, with three cows, one of the middle horned breed, a large well made cow of the kind, and two of Canadian, or nearly full-blooded Cadadian breed, reared by myself, all of the same age, eight years old, had calves in the spring of 1833, were milked to the 1st of August and then dried, and had abundance of clover and timothy after-grass from that time until slaughtered. When the cows were put to fatten, most Old Country farmers would have given a much greater price for the large cow than either of the others ; they were all in excellent condition when put to feed. During the period of their giving milk, the small cows gave more milk each, than the large. On the 8th October the smallest cow was slaughtered, the other Canadian cow was slaughtered on the 7th of November, and the larger American middle-horned cow on the 21st of November ; all continued to improve till slaughtered.

	Weight of 4 qrs. tallow taken out.	Tallow.	Hide.	Offal.	Total.	
No. 1	362 lbs.	72½	48	58	541	offal consisted of head
2	410	97	48	63	619	heart, tongue, liver,
3	473	58	63	86	683	skirts, kidneys & feet.

Had No. 1 been kept on the grass until No. 2 was slaughtered, I believe she would have had as much tallow as No. 2. If No. 3 had been equally fat as No. 2, she would, from her size and appearance have weighed 900 pounds at least, when killed. When the cows were put to feed, I did not think it possible that either of the small cows could, on the same grass, and in the same time, be fed to weigh within 200 pounds of the large cow. No. 1 had nearly a seventh of her whole weight in tallow, while her offal did not amount to a ninth. No. 2 had nearly a sixth of her own weight in tallow, while her offal was not much over a tenth. No. 3 had only about a twelfth of her own weight in tallow, while she had over an eighth in offal. The feet of the large cow, No. 3, weighed 18½ pounds ; those of No. 2, only 13 pounds ; so much for large and small bone.

It was impossible that any experiment could be made with grass-fed cattle more fairly than this was, as regarded the health and condition of the cattle, their feed the same, and being the best animals of the different breeds in my possession. These animals having been fed in winter in separate stalls, I had an opportunity of ascertaining the usual quantity consumed by each for years, and I observed the large cow to be the greatest feeder of any cow in my possession. I stall-fed cows on one occasion of different breeds, with the same results in favour of the small sized.

What I mean by small or moderate sized cows would be such as could be grass-fed to weigh near or about the same as No. 1 and 2, in the above experiment, at four years old ; and as these cows were, at all times from their birth, regularly fed with suitable food. Canadian, or Old Country farmers, should not judge of the qualities of Canadian neat cattle, by the present general condition of that stock. The breeding, rearing, and feeding, has been too much neglected, to allow a fair estimate being made of their value by their present appearance, except by such farmers as have given the breed a fair trial. It cannot surely be patriotism, and will not increase national or individual wealth, that we should seek from abroad, what we possess at home in equal, (and I conceive in greater,) perfection ; and even though in their present state they should be inferior, it ought to be our pride and ambition by care and feeding to advance them to that full degree of excellence they are capable of attaining. Those, however, who will prefer large stock, and are determined to feed them abundantly and carefully, I do not presume to advise to change them for any other. They may find their profits perfectly satisfactory, and while that is the case, it would be inexpedient to reduce the size of their animals. I am more particularly desirous by what I have said to recommend to those who have small animals, and may be anxious to enlarge their size, to seek to accomplish their object, rather by superior care and feeding, than by any other means, this being the only method to do so profitably, or permanently.

The native or Canadian sheep require amelioration, and their improvement might be easy to accomplish, as there are several flocks increasing in the province from imported sheep of a very good description that might be crossed with the native sheep to great advantage. In producing the requisite improvement, profit should be duly attended to, and that description of sheep preferred that will give the largest returns of marketable value of produce for the food it consumes.

As I before observed, the wool is the most valuable return a sheep will give here, if the quantity and quality were anything like what the fine long-woolled Leicesters produce in England. However good the shape of a sheep may be, he should be rejected as a ram to breed from, if he has not a good fleece of wool covering every part of his body. It is supposed that the wool of imported sheep becomes, after two or three years, deteriorated and coarser in quality. I cannot say that such is the fact, or why it should be so. Though sheep will require more care here than in England, as they must be housed in winter, and fed on dry food four or perhaps five months in the year, yet they may be a very profitable stock, if carefully attended to. The rot, so destructive to sheep in the British Isles, they are entirely free from in Canada. They cannot attain perfection however if restrained by yokes, or ties in summer to prevent them trespassing on the crops. They should be confined by sufficient fences to keep them from trespassing, without requiring yokes or any other injurious restraint. Better not keep sheep, if not kept as they ought. Sheep require shade to retire to occasionally in the heat of summer, as they are much annoyed by flies.

The varieties of sheep in England are numerous. The Lincolns or old Leicesters, are a large breed, that are said to produce wool from ten to eighteen inches long, and weighing from eight to fourteen pounds the fleece. They are said to be slow feeders, except on the richest lands.

The New Leicesters or Dishely breed are much approved of in England, when well woolled, which they are not considered to be, unless the fleeces average seven pounds each, on a full grown flock. The wool should be long, fine and silky, not coarse or inclined to curl. The forms of these sheep are very handsome. Their heads are clean and small, their necks short, and their breasts full: their bodies are round, with broad, straight backs, but the bellies rather light or tucked up; their legs and the whole bone are fine, and particularly small in proportion to their size. They are of a quiet disposition and fatten early and kindly, and the flesh is fine grained and well flavoured, but too fat in England to please most palates.

I would expect very great improvement from crossing Leceisters two or three times with Canadian sheep. I have seen good sheep produced in Ireland from a cross between them and the Merino.

The South Down sheep are much esteemed in England; their mutton above all other. The wool is excellent, but the quantity is small. I think they might by a useful cross here, and by careful breeding, be the means of introducing a hardy breed of sheep, with heavier fleeces than the South Down generally have in England.

The Canadian breed of swine are of a description that cannot be very profitable. They require a large quantity of food to fatten them, and have not one characteristic mark of the most approved kind of swine. In England, the Woburn breed, a new variety of swine introduced by the Duke of Bedford, are the most perfect animals of the pig kind I have seen. They are well formed, very thick in the body, legs short, and very small, hardy constitution, very prolific, kindly disposed to fatten, and attain to nearly twice the weight of some other hogs within the same given period of time. A cross with these, or the Chinese breed of swine, with the Canadian breed, would be productive of improvement. Our neighbours of the United States have a very good description of swine, brought into this province every day. There is no difficulty whatever in producing the improvement required in our stock of swine, if we only choose to pay due attention to it, and it may be accomplished with very little expenditure. There are several good breeds of swine in the province that are to be had at moderate prices.

In making choice of swine, small, fine bone will be the best recommendation they can have. This quality is more essential in swine than in any other animal. Swine do not, like beasts of burden, or draught, require great limbs to carry them about ; indeed the more confined they are the better for the farmer, and I have ever found those of the smallest bone, the most inclined to flesh, the easiest fatted, and pay most for the food they consume, whatever their weight may be. The Woburn, and Chinese breed are finest of bone in proportion to their size, of any swine I have seen, and would, I am convinced, be the best description of swine that could be introduced into these provinces. Swine are, or ought to be, a most valuable part of our live stock, and might be increased four fold what they are at present without any difficulty.

CHOICE OF LIVE STOCK FOR PURPOSES OF LABOUR.

The animals of labour used in Canadian farming are exclusively the horse and the ox. Much difference of opinion prevailed in Englend, as to which of these animals should be preferred, and the preference has been given by many to the ox, and by others to the horse. One of the greatest objections to the ox in England is, that they will not bear constant work, but require very frequent intervals of rest. This is a material objection, where ploughing is going on nine months in the year. The same objection, however, does not apply in Canada. The greater part of the ploughing is confined to three months, and in the cool season of the year, when the oxen are best able to perform their work, and do so, at a very trifling expense for their maintenance. The strong lands of Canada, in the fall, require in general a greater power of draught than two ordinary horses are able to give, in ploughing. By keeping a regular succession of oxen, two might be disposed of annually at five years old, stall-fed after the ploughing was finished, and sold during the winter or spring. By this management, I am convinced farmers might execute their ploughing at a very trifling expense. Oxen, moderately worked, two or three months in the year, would not be injuriously affected in their growth, if provided with reasonable keep, and keep will not amount to half the expense of keeping a horse. The ox may be worked for three seasons, the first very moderately, and be increasing in size and value to the end, while the horse will decrease in value. The succession of oxen necessary for one plough would be two of one years old, two of two years old, two of three years, and two of four years old ; selling off two annually in the latter part of the winter or in spring, fat, that would bring the farmer from 60 to 100 dollars.

In England, allowing 60 acres as the average extent of land that may be cultivated by two horses in the best manner, the horses are said to consume the produce of one acre out of every six which he cultivates, and sometimes one out of every five which he ploughs.

A second objection to oxen is, their slow movement. In Canada, they generally plough with one or two horses before the oxen, which gives the oxen a much quicker step than when worked alone.

In Sussex, England, four oxen to one plough ploughed an acre of land in four hours and ten minutes. I have seen a pair of spayed heifers worked at a ploughing match in Ireland, without a driver, and completed their work in less time than some horse teams did.

In Portugal, oxen are harnessed in the following manner : a long leather strap is wrapped round the yoke, whence it passes round the lower part of the horns, and is again fastened to the yoke. By this contrivance, the heads of the oxen become more steady while performing their work, and these useful animals are rendered more tractable.

In France and Spain, oxen are in general worked by the head and yoke, as they are in Canada, or nearly so. The method of working them in Portugal was very much approved of by Lord Sommerville. The Canadian mode might very readily be assimilated to that of Portugal, and would be an improvement.

Those who prefer horses to oxen, I would not by any means attempt to persuade against that preference. Of course, they have decided on their choice, after calculating its advantages. On light soils a pair of good horses are very well able to plough sufficiently deep, but there is a great proportion of the lands of Lower-Canada which two horses are not able to plough in a proper manner.

It is said that the farm-horses in most parts of England are much too cumbrous and heavy, and are more fitted for drawing heavy drays or waggons in towns, than for the operations of agriculture. The objections of the celebrated Davis, of Longleat, to the using of large, heavy-heeled horses, in preference to the smart, the active, and the really useful breeds, merit particular attention. In some situations the heaviness of the soil requires more than ordinary strength ; but, in such cases he maintains, that it would be better to add to the number of horses than to increase their size. Great horses not only cost proportionately more at first than small ones, but require much more food, and of a better quality to keep them in flesh. In many instances, indeed, the expense of keeping a fine team of horses in England, amounts nearly to the rent of the farm on which they are worked. In ploughing light soils, the strength of a great dray-horse is not wanted ; and in heavy soils, the weight of the animal does injury to the land.

If large heavy horses are considered unfit for the operations of agriculture in England, where the climate is moderate and the roads excellent at all seasons of the year, how much more unsuitable must such horses be for Canada? The farmer must use his plough horses here in winter to take his produce to market. What would become of him on a long journey with the temperature twenty degrees below zero, having a large English horse, that should never be drove out of a walk, and scarcely ever are drove faster in England? The horse best calculated for agricultural purposes here in summer and winter, is one of moderate size, strong, active, spirited and of hardy constitution. Can any horse more nearly come up to this description than a well shaped, good sized Canadian horse? I have seen Canadian horses possess more perfection of form and size, for agricultural purposes in Canada, than could be found in any other horses here. The breed is certainly deteriorated by the mixtures that have been introduced, and the great want of attention in the farmers in not breeding from the best males and females; and in suffering to go at large uncut horses, unfit to breed from. To this cause principally, is to be attributed the deterioration, and reduced size of most Canadian horses; but it is easy to remedy the defect, by first putting an end to the chief cause, and then making selections, and giving due attention to the breeding, and increasing the size gradually, where necessary. In neat cattle, it is a similar neglect, and inattention in breeding, as regards age, size, or good shape, that has deteriorated the breed, and lessened their size and usefulness.

The people of the United States come to Canada to purchase our best Canadian horses; and I know several of the most superior stallions of that breed, that have been so purchased, and taken away, while we purchase and breed from their horses, which, I maintain, are every way inferior to the Canadian horses for agricultural purposes. What farmer of judgment would prefer for use on a farm a slender carcassed, long-legged horse, to one of a shape exactly the reverse? A tall, slender horse, well fed and groomed, and splendidly harnessed, may be very showy, and answer very well for pleasure about town, but will not be the most suitable or profitable for a farmer.

The Suffolk punch is considered a very useful animal for labour in England, and is particularly esteemed by farmers in Norfolk, Suffolk, and Essex. The merit of this breed chiefly consists in hardiness of constitution. Their colour is mostly sorrel, with a white blaze on the face, backs very straight, legs round and short in the pasterns, deep-bellied, and full in the flanks. Experience proves, that deep-bellied horses carry their food long, and consequently are enabled to stand longer and harder days work than slender-bellied horses. It is said that farmers in Suffolk and Norfolk plough more land in a day with these horses than any other people in Britain; and these are the kind of horses everywhere used in these counties. Much pains have been taken latterly in England to improve this breed, and to render them by cultivation fitted, not only for heavy, but for light work. It is no uncommon thing for a Suffolk stallion to fetch from 200*l.* to 300*l.* The best show of these stallions in England is at Woodbridge Lady-day fair, where Suffolk cart-mares have brought from 100*l.* to 150*l.* and one mare and her offspring, a few years ago at this fair brought 1000*l.*

This breed was introduced into Ireland, and greatly approved of. I saw one of them, exhibited at a cattle show, draw a weight of forty-two quintals, or 4,704 pounds, in a Scotch cart; and I heard of another horse of the same breed, draw a heavier load in the city of Dublin.

A quick even step, an easy movement, and a good temper, (which Canadian horses possess in a greater degree than any horses I have seen,) are qualities of the greatest importance to a working horse; and the possession of them is of more avail than big bones, long legs, a very slender, or very lumpy carcass.

The horses of Russia are said to be small and hardy, and capable of enduring great fatigue. Great attention is paid to such as are fast in their trot; and such a breed is much encouraged for trotting matches on the snow and ice. The Calmuck horses are somewhat higher than the Russian common horses, and are so lasting and constitutionally strong as to be able to run three or four hundred English miles in three days. They are said to subsist, summer and winter, solely upon grass in the great desarts which are between the Rivers Don, Volga, and Yaik. The climate of Russia is very similar to that of Canada. The horses of Poland and Sweden, are of moderate size, but strong, hardy and active.

Those who breed horses should be very particular that the stallion has no defect of any kind in body or temper. That the mare should have a good shape, a gentle disposition, a large carcass, conformable to her height, and belly well let down, and be perfectly free from all sorts of blemishes and defects, either hereditary or acquired.

I do not think it necessary to allude to any other description of horses but those used in agriculture. Farmers who find it profitable to breed horses for other purposes, and for sale, will not of course embark in this kind of speculation without being well acquainted with all that belongs to the breeding and management.

The expense of keeping horses in England is variously stated. A work horse is supposed to require about 28 pounds of hay daily, and when worked, three feeds of oats per day, at about eight feeds to the bushel, or nine feeds to our bushel. Potatoes, Swedish turnips, or carrots, are sometimes substituted for oats or beans. The produce of from five to seven acres is considered necessary for the support of one horse, for pasture, hay, and oats, and I am well convinced it cannot be much short of this.

By the statistical returns of Lower-Canada, refered to in the first part of this work, there are about 120,000 horses. Allowing 100,000 to be fit for work, the whole of the oats raised in the province, (if the returns be correct,) after allowing for seed, would not give more than 24 bushels for each working horse, a quantity not half sufficient, and not more than one-fourth of what would be required for horses constantly worked. This number of horses would, on a moderate estimate take from 300 to 400 bundles of hay each in the year, together with pasture in summer. Allowing 200 bundles of hay to the acre, this would take 240,000 acres of meadow to support our horses. I know that some horses are supported on pea-straw occasionally, which may be a considerable saving of hay, but on the other hand, many horses are fed on hay for the whole year. Two or three acres of oats, say two, would be required for each horse; this would make 240,000 acres for oats; hence, near 500,000 acres of our improved land, or near one-fourth of the whole, would be necessary to support our present stock of horses, besides what would be required for their pasture. I do not say that our horses actually do consume the produce of so much land now, but they certainly would require so much to keep them in working condition, and if they are not wanted for work, we should have some other stock in their place.

Much saving might be made in supporting horses by growing carrots, Swedish turnips, or potatoes, for their keep, as a substitute for oats. I have tried carrots, and I know them to be excellent food for horses. Every farmer in Canada should grow some of this root; they may be cultivated with less expense than potatoes, and will produce a greater quantity to the acre, on suitable soil well managed.

From what calculations I have been able to make, to keep horses as well as they are kept in England, seven acres of land will not be too much for the support of each horse. Farmers may draw their own conclusions from these facts whether oxen or horses will be the most profitable for farm labour. Every farmer must have some horses for certain purposes, going to market, &c.; but I believe some oxen ought to be kept by all farmers who require more than two horses to plough, or do the work of his farm.

AGE OF ANIMALS.

The criteria of a horse's age are determined from the appearance of the teeth. According to La Fosse, the younger, there are these appearances: The horse is foaled with six molar or grinding teeth in each jaw; the tenth or twelfth day after, the two front nippers appear above and below, and in fourteen or fifteen days from this, the two intermediate are pushed out; the corner ones are not cut till three months after. At ten months the incisors or nippers are on a level with each other, the front less than the middle, and these than the corners; they at this time have a very sensible cavity. At twelve months this cavity becomes smaller, and the animal appears with four molar teeth on each side, above and below, those of temporaneous or colts, and one permanent or horse tooth. At eighteen the cavity in the nippers is filled up, and there are five grinders, two of the horse, and three temporaneous; at two years, the first of the colt's molar teeth in each jaw, above and below, are displaced; at two years and a half, or three years, the front nippers fall and give place to the permanent ones; at three and a half the middle nippers are likewise removed, at which period the second milk-molar falls; at four years the horse is found with six molar teeth, five of his new set, and one of his last; at four years and a half the corner nippers of the colt fall and give place to the permanent set, and the last temporaneous grinder disappears; at five years old, the tusks in the horse usually appear; at five and a half they are completely out, and the internal wall of the upper nippers, which before was incompletely formed, is now on a level with the rest; at this period the incisors or nippers have all of them a cavity formed in the substance between the inner and the outer walls, and it is the disappearance of this that marks the age; at six years, those in the front nippers below are filled up, the tusks are likewise slightly blunted; at seven years the mark or cavity in the middle nippers is filled up, and the tusks are little more worn; at eight years old, the corner nippers are likewise plain, and the tusks are round and shortened. In mares, the incisors or nippers only present a criterion; at this period the horse is said to be aged, and to have lost his mark; but among good judges, the teeth still exhibit sufficient indications. At nine, the groove in the tusks is worn away nearly, and the nippers become rather rounded ; at ten, the appearances are still stronger ; at twelve, the tusks only exhibit a rounded stump, the nippers push forward, become yellow, and as the age advances, appear triangular and usually uneven.

To make a horse look younger than he really is, dealers perform operations on the teeth, called bishopping, from the name of a noted operator, which consists in making an artificial cavity in the nippers, after the natural one has been worn out by age, by means of a hard, sharp tool, which cavity is then burned black by a heated instrument. But no art can restore the tusks to their form and height, as well as their internal grooves. It is, therefore, common to see the best judges put their finger into a horse's mouth, contenting themselves with merely feeling the tusk. To less experienced judges other appearances present themselves as aids.

Horses, when aged, usually become hollow above the eyes, the hoofs appear rugged, the under lip falls, and if grey, they become white. In this country, where the horses are so early worked before the frame is consolidated, and where afterwards to be exerted unceasingly, and often on bad roads, it is not uncommon to find a horse at eight years old feeble, debilitated, and exhibiting all the marks of old age, except in his mouth. On the contrary, when the animal falls into other hands, at ten or twelve he has all the vigour of youth, and his teeth are the only parts that present an indication of age. It is, therefore, more useful to examine the general appearance of the animal, than to be guided altogether by the marks in the teeth, a too strict adherence to which leads into a great error on the subject of the age of horses. The commonly received marks grant not a criterion of a third of the natural life of the animal, nor of one-half of the time in which he is perfectly useful. Many good judges in England will not purchase a horse for hunting, earlier than eight years old, and regard him only in his prime at twelve. A gentleman at Dalwich has a monument to the memory of each of three several horses which died in his possession at the age of thirty-five, thirty-seven, and thirty-nine years, the latter of which was suddenly taken off by a fit of colic, having been in harness but a few hours before. Culley mentions a horse of forty-five ; and an instance lately occurred of one which lived to fifty. Blain draws the following comparison between the relative situation of the state of the constitution between the horse and man, under the ordinary circumstances of care towards each :

The five years of the horse may by considered as equivalent to the first twenty years of a man ; a horse of ten as a man of forty ; of fifteen as a man of fifty ; of twenty as a man of sixty ; of twenty-five as a man of seventy ; of thirty as a man of eighty ; and of thirty-five as a man of ninety.

The criteria of the age in neat cattle are derived from the teeth. At the end of about two years they shed their first four teeth which are replaced by others, larger, but not so white ; and before five years all the incisive teeth are renewed. These teeth are at first equal, long and pretty white ; but as the animals advance in years, they wear down, become unequal, and grow black.

The manner of growth of the horns is not uniform, nor the shooting of them equal. The first year, that is, the fourth year of the animal's age, two small-pointed horns make their appearance, neatly formed, smooth, and towards the head terminated by a kind of button. The following year this button moves from the head, being impelled by a horny cylinder, which, lengthening in the same manner, is also terminated by another button, and so on, for the horns continue growing as long as the animal lives. These buttons become annular joints or rings, which are easily distinguished in the horn, and by which the age of the creature may be easily known, counting three years for the point of the horn, and one for each of the joints or rings. The cow continues useful for more than twenty years, but the bull loses his vigour much sooner.

It is common with dealers to obliterate these rings, by shaving the horns, in order to conceal the age of the beast. The terms applied to different ages are as follows : A young castrated male, after the first year, is called a stirk ; when a year older, a stot or steer ; at four years old an ox. A female after the first year, is called a heifer, when about to bring a calf, she is called a young cow. A castrated female is called a spayed heifer. Certain of the Welsh and Scotch cattle, of rather a coarse and sturdy kind, are denominated runts. Bullock is the general term for any full grown male cattle, fat or lean.

The natural duration with the bull and cow may be stated at upwards of twenty years, to nearly the end of which the latter is useful with her milk, but the bull generally loses his vigour, and consequently his use, many years sooner, and should not be kept over ten years old.

The criteria of a sound, healthy sheep are, a rather wild or lively briskness, a brilliant clearness in the eye, a florid ruddy colour on the inside on the eyelids, and what are termed the eye-strings, as well as in the gum, a fastness in the teeth, a sweet fragrance in the breath, a dryness of the nose and eyes, breathing easy and regular, a coolness in the feet, dung properly formed, coat or fleece firmly attached to the skin and unbroken, the skin exhibiting a florid red appearance, especially upon the brisket. Where there are discharges from the nose and eyes, it indicates their having taken cold, and should be attended to by putting them in warm and sheltered situations.

The criteria of the age of sheep are the state of their teeth by their having, in their second year, two broad teeth ; in their third year, four broad teeth ; in their fourth year, six broad teeth ; and in their fifth year, eight broad teeth before, after which none can tell how old a sheep is while their teeth remain, except by their being worn down. About the end of one year, rams, wethers, and all young sheep lose the two fore teeth of the lower jaw, and they are known to want the incisive teeth in the upper jaw. At eighteen months, the two teeth joining to the former also fall out ; and three years, being all replaced, they are even, and pretty white. But as these animals advance in age, the teeth become loose, blunt, and afterwards black. The age of all horned sheep may also be known by their horns, which show themselves in the very first year, and often at the birth, and continue to grow a ring annually to the last period of their lives.

The different ages and conditions of sheep, have different names in different countries or districts. In Ireland, the lambs were generally termed ewe or wedder, as the case might be, until one year old; they were then termed hogget, or one shear ewes or wedders; when two years old, they were termed two-year-old, or two shear ewes or wedders, and every subsequent year kept, they were designated by the number of years of age, or fleeces produced in the same way. Rams were termed hoggets, or one shear, two-year-old, or two shear, &c. Old ewes, and all ewes considered unfit to breed from, when fatted for the shambles, were termed culs.

I have now given as correct a description of the animals that are and may be used in agriculture in Canada, as in my power to give; also the object and means of improving breeds; some remarks on the choice of live stock for the purposes of labour, breeding or feeding, and the criteria of the age of animals. The economy of live stock, and the dairy, shall be considered in succession, after the general process of arable culture, and the management of crops has been treated of.

PRACTICE OF AGRICULTURE.

In the foregoing part of this work I have endeavored to give a concise view of the state of agriculture in several countries in the world, particularly in the British dominions, in order to interest the reader on the subject of agricultural improvement. I have also exhibited a very limited view of the science of agriculture, but only sufficient to induce farmers to make themselves more thoroughly acquainted with the elementary principles of the art they practice. The notice I have taken of the improvement of the breed of domestic animals used in agriculture, and the choice of these animals for feeding, labour, &c. chiefly belongs to the science of agriculture.

Before I enter on the more practical part of husbandry, I shall give a few hints on the personal character which a farmer ought to have, and the expectations he should entertain on embracing this profession, to give him any reasonable grounds to hope to be successful or happy as an agriculturist. It may be the more necessary in this country where men are continually becoming farmers who were not brought up as agriculturists. For all who may belong to this class, it may be well, previously to deciding on embracing the occupation of a husbandman, to examine a little into their disposition and talents, their patience and perseverance, in order that they may judge fairly of their fitness for the profession they propose to follow.

PERSONAL CHARACTER OF, AND EXPECTATIONS OF A FARMER.

Professor Thaer observes that every one who proposes to farm with success, ought to unite energy and activity to reflection, to experience, and all necessary knowledge. It is true, he says, farming has long been considered as an occupation fit for a young man incapable for any other, and such has sometimes succeeded; but this has always been chiefly owing to a fortunate concurrence of circumstances, which it is not now very easy to meet with.

The practice of agriculture consists of an infinite number of particular operations, each of which appears easy in itself, but is often, for that very reason, the more difficult to execute to the precise extent required; one operation so often interferes with another. To regulate them according to the given time and strength, and in such a way that none is neglected, or causes the neglect of others, requires at once a great deal of attention and activity, without inquietude, of promptitude without precipitation, of general views, and yet with an extreme attention to details.

To casualties and accidents no business is so much exposed as farming; and, therefore, to enjoy an ordinary degree of happiness, it is essential that the farmer possess a certain tranquility of mind. This may either be the result of a naturally phlegmatic habit of body, or of elevated views in religion or philosophy. These will enable him to bear with every misfortune arising from adverse seasons, or death of live stock, and only permit him to regret accidents which result from his own neglect.

A good education is essentially necessary in the formation of a good farmer. By education is not meant that portion of knowledge which is obtained at schools only, but every thing or circumstance that affects the body and mind from the earliest period of our existence.

Besides reading, writing, and accounts, a farmer should possess some knowledge of history, geography, arts, science, and general literature, not only that he may be fit for good society, and possess the materials of intellectual enjoyment, but also in order that his views may be expanded, and he may acquire the habit of judging correctly on the practices of his profession. A dull, stupid person, with little native activity, will never desire to know more than what enables him to perform the ordinary routine of business. He becomes narrow-minded and jealous, and never can be respected, nor increase his capital by the exercise of talents and industry. In short, his ignorance and selfishness render him incapable of directing profitably the operations of others.

Let no young man sit down in despair, because he has not learned at school the elements of scientific knowledge. An astonishing progress may be made by regularly devoting a particular portion of time to study. Nor is the assistance of a master necessary where an ardent desire for improvement exists. There is scarcely anything that a rational person can desire that he may not obtain, by maintaining a powerful impression of the necessity of obtaining it. The progress of all cannot be equal; some can acquire with less labour than others; but every one may, on any useful subject, acquire by application, a respectable degree of knowledge.

A person desirous of becoming an able farmer, should make every other acquirement subservient to that of his profession. The knowledge of agriculture comprehends such an extent and variety of particulars, as to require every portion of disposable time, and to afford sufficient relaxation to the mind. The knowledge of stock is a most important part of a farmer's education. This knowledge is difficult and tedious in the acquirement, requires great accuracy of observation, and practical experience.

It cannot be expected that all farmers, even though proprietors, can obtain all these advantages ; however, much may be done in this way, by young men who are industrious and persevering, and who feel that the acquirement of knowledge would enable them to perform their part in life, with satisfaction to themselves and others. In every situation of life, knowledge is always useful ; ignorance is always an evil, and should be so considered by every human being.

The prospects of a good farmer very properly include independence, which should always be the grand object of those who are destined to live by the exercise of their labour or talents. He who is skilful and unremitting in the pursuit of his profession will be sure to command a tolerable degree of success. Not that a farmer, even though a proprietor, should expect to make a fortune in Canada ; under present circumstances it is almost impossible. Capital employed *judiciously* in farming, though it may produce less profit than capital employed in trade, yet it has this advantage, there is less risk attending it. The products of the farmer are in universal demand, at some reasonable rate, what people in trade are not always sure of. A farmer is sure of a home, of the necessaries of life, and in general, of most vigorous health. He is lord of the soil, has horses, cattle, sheep, and other domestic animals, and rural retirement, the object of every commercial man's ambition. Many trades and professions preclude, (according to general prejudices,) their followers from being gentlemen ; whereas, though every farmer is not a gentleman, yet any gentleman may become a farmer, without in any degree lowering his rank and character ; a farmer may, therefore, if he chooses to adopt the habits and manners of a gentleman, be reckoned as such, though dressed in plain cloth of home manufacture from the wool of his own sheep.

The profits of farming are much exaggerated by people in general, and by none more than those who have described the prospects of agricultural settlers in Canada, or the United States. The calculations that have been published of the profits that are attainable by a settler in the wild forests of North America, are so extremely chimerical, and so infinitely exceeds anything that ever has been realized, or ever can be, that it is difficult to account for the motives which have prompted the authors to make such statements. A very recent one of them in 1834, endeavors to make it appear that a settler coming to the country with 600*l*. and investing it in purchasing and clearing wild land in Upper-Canada, might realize about 300 per cent. in four years. These statements, read and credited in the British Isles, ought to be sufficient inducement to all the farmers there to emigrate to Canada. Such statements are, perhaps, made with a view to encourage emigration, but I think they are calculated to produce ultimately a contrary effect. When persons come out to purchase and settle here, on the strength of these representations, and find how infinitely exaggerated were the prospects of success held out to them, from the reality, they will for ever abandon the country in disgust, and prevent the future emigration of the most useful class of emigrants. Moderate expectations will be more likely to be successful, with emigrants in promoting useful and successful settlements, than expectations that are wild and chimerical, and inconsistent with all practical experience. The British provinces of North America, offer to the industrious and well conducted, all *reasonable* prospects of success, and those who do not consider such sufficient inducement, had better remain in the Old Countries.

Whether from habit or not, no man can be more attached to the profession of a husbandman than I am, but, nevertheless, I feel it my duty to give a just view of the prospects which it affords to those who would choose it as a profession, though not brought up to it. Many persons, tired of a city life, fancy they will find profit and happiness in retiring to the country and commencing farming. To the generality of men such a change will probably be attended with disappointment, and not unfrequently with pecuniary losses. The activity required, and (what such person will consider) privations that must be endured, are too painful to be submitted to patiently, by those not accustomed to that mode of life. There are, and will be however, many exceptions ; men of strong minds, who can conform themselves to circumstances, and find pleasure and happiness in the laborious occupation of the farmer, and ample compensation for the bustle and society of a city life, in the beauties of nature, and in the resources of their own fire-side. If men were aware of the difficulties that are inseparable from the profession they choose for themselves, before they have decided on their choice, they have no reasonable excuse for any subsequent murmurs or complaints at their lot. It is childish, and worse, if they do not endeavor to act with energy, and acquit themselves like men in the profession they have voluntarily assumed.

The most likely persons to engage in farming with success are the sons of farmers, or such others as have been regularly brought up to the practice of every part of agriculture. They must also have an inclination for the profession, as well as a competent understanding of its theory or principles. Books are to be found from which the science of the art is to be obtained, and a knowledge of this science is not to be despised or neglected by young farmers.

CAPITAL REQUIRED BY THE FARMER.

The importance of capital in every branch of industry is well known, and in none is it more requisite than in farming. An industrious, frugal and intelligent farmer, who is punctual in his payments, will strive with many difficulties, and get on with less money than a man of different character. But if he has not sufficient live stock to work his lands in the best manner, as well as to raise a sufficient quantity of manure, and purchase the articles required for the farm and the necessary help of labour, he cannot, under ordinary circumstances, cultivate his farm to the greatest advantage, or obtain returns from it, adequate to support him comfortably.

The amount of capital required must depend upon a variety of circumstances. Farmers who are already settled on cleared farms of their own, and have the requisite buildings erected, and a reasonable stock of cattle and implements, if they require more stock, or funds for the employment of labour, for further improvement, where there is no rent to pay, they should be able in the course of three or four years, to augment their working capital, and should require no assistance from any other source.

Farmers hiring or renting a farm of 100 arpents or thereabout, would require a capital of from two to three hundred pounds. I have known persons succeed with much less, but even with this sum, great industry and frugality are requisite. Profits will generally be increased when accompanied with skill, spirit, and industry, in proportion to the capital employed, if judiciously expended. Prudent farmers will be cautious in laying out money on expensive harness, or implements, more than is actually necessary.

For persons who are disposed to purchase, the amount of capital must be in proportion to the situation, extent, and many other circumstances of the lands they select, or that are offered for sale. I shall give in the last number the prices that several farms have been sold for, in different parts of both provinces, the situation, extent, buildings, soil, &c. ; this may give some idea of the selling value of cleared farms ; but the prices depend upon so many circumstances, that it is difficult to determine on any just scale for the purchase of improved land, or even of wild land. I am not aware that there is any seigniorial forest land to be had at present less than six pence the arpent annual rent.

The amount of capital necessary for the settling in the woods, depends very much on the former habits of the settler. One of the labouring class, who is sober and industrious, with a small family, or with a large family, who are able to assist him, will not require much capital, except what will support him and his family until he can have a crop. Emigrants of this class arriving in Canada in summer, should endeavor to get work, until the fall, or month of September. This would prevent them from encroaching on their capital, and in some cases, where there are large families able to work, enable them to add to their capital. They should then fix upon some location and erect a house, barely sufficient to shelter them for a year or two, and if they are industrious, they may have sufficient land cleared, or prepared for burning, the ensuing spring, to afford them abundance of potatoes, Indian corn, and other vegetables, from the first of August. They should have the means of buying a cow and pigs. I think a family might provide themselves with food of sufficiently good quality, for about thirty dollars each grown person, for twelve months, and in some situations for less. From forty to sixty dollars would be sufficient to buy a cow, two small pigs, purchase some of the materials necessary for erecting a small house, and some implements. I shall give the particulars in the last number.

If the families consist of many working persons, and their capital is insufficient to employ them on their own farms, some of the family may go to service, and accumulate capital to take home to their families. The funds that are requisite for settlement in the forest, may from this be readily ascertained. Though there are numerous instances of settlers succeeding with scarcely any funds to begin, yet, I could not recommend the experiment. With moderate capital, a settler will have sufficient difficulties to contend with for a few years ; and therefore the price of wild land, or the annual rent of it, should be as little burdensome on poor settlers, natives of the country or emigrants, as possible. I shall advert to this subject again.

From what I have stated, settlers of all classes may be able to determine the amount of capital necessary in each particular case. They will best know the style of living and other comforts, they will require in the woods. I believe it is unnecessary to acquaint them, they will find no comforts there but work, except they pay for them, and all those who will not work themselves, will have to pay others to work for them. The purchase of wild land is various, from 2s. 6d. to three or four dollars the English acre, and the clearing for a crop, leaving in the roots of the trees, may cost from ten to fifteen dollars the acre. Hence settlers may very well understand what capital they will require, after they have determined upon their style of living, the kind of house and furniture they would desire, and whether they can or will work, or pay for doing it. I shall give a table of prices in the last part, which will assist strangers in making their calculations. Whatever class a settler may rank himself in, the more carefully capital is husbanded, the more certain will be his chance of future success.

Were I to offer an estimate of the capital necessary for those who rank themselves above the working class, it might not suit any two of them ; and those who would find my estimate insufficient to supply what they might consider a very reasonable quantum of comforts and conveniences, would no doubt be very ready to find fault. I have, therefore, thought it my safest course to allow this class of settlers to estimate for themselves, according to their several desires, and funds for supplying them. I will furnish them with the means of doing so with as mnch accuracy as they could well expect under such circumstances.

SELECTING A FARM FOR PURCHASE OR HIRING.

In selecting a farm for purchase or hiring, it is necessary to attend to a variety of considerations. Those of the greatest importance are the soil, sub-soil, character of surface, aspect, and situation with regard to the market.

Soil.—The necessity of paying attention to the nature and quality of the soil need not be dwelt upon. By ascertaining the qualities it possesses, and by removing its defects, if it has any, the profits of the farmer will be greatly influenced. Such is the importance of soil, and the necessity of adapting a system to its peculiar properties, that no general system of cultivation can be laid down, unless all the circumstances regarding the nature and situation of the soil and sub-soil be known ; and such is often the force of habit, that it rarely happens that a farmer who has been long accustomed to one species of soil will be equally successful in the management of another. From inattention to the nature of soils, many foolish, fruitless, and expensive attempts have been made to introduce different kinds of plants, not at all suited to them ; and manures have often been improperly applied. This ignorance may likewise prevent many from employing the means of improvement, though the expense might be trifling, and within their reach. From ignorance also of the means calculated for the proper cultivation of different soils, many unsuccessful practices may be adopted. Soils may be considered under the following general heads: Sandy, gravelly, clayey, stony, peaty, alluvial and loamy.

Though sandy soils are not naturally valuable, yet being easily cultivated, and well calculated for sheep, a most profitable species of stock, under good management, they might be farmed with considerable advantage, and when of a good quality, under a regular course of husbandry, they might be invaluable. They are easily worked, and at all seasons, at a moderate expense ; are not so liable to injury from the vicissitudes of the weather ; and in general they are retentive of moisture, which secures excellent crops even in the driest summers. The crops raised on sandy soils are numerous, such as potatoes, carrots, barley, rye, oats, buckwheat, peas, Indian corn, clover, saintfoin, timothy, and other grasses. This species of soil has not in general strength enough for the production of wheat or beans, in great perfection, without much improvement in its texture, by the addition of great quantities of enriching manure and the most skilful management ; it will, therefore, be more profitable to grow such crops on sandy soil as can be raised with the greatest perfection at the least expense, consistent with good farming. The fertility of sandy soils is, in a great measure, proportioned to the quantity of rain that falls, combined with the frequency of its recurrence. The climate of Canada is, in general, sufficiently favourable for sandy soils under judicious cultivation.

Gravelly soils differ materially from sandy, in their texture. They are frequently composed of small stones of various kinds, and often contain granite, limestone, and other rocky substances, partially, but not very minutely decomposed. Gravel is generally what is called a hungry soil, especially when the parts of which it consists are hard in substance, and rounded in form. Gravelly soils are easily exhausted ; for the animal and vegetable matter they contain, not being thoroughly incorporated with the earthy constituent parts of the soil, (which are seldom sufficiently abundant for the purpose,) are more liable to be decomposed by the action of the atmosphere, and carried off by water. A gravelly soil may be profitably cultivated with potatoes, provided they are early planted, and the season moderately moist. Indian corn will grow in perfection in such soils, in favourable seasons.

Stony soils, when cleared of all the large stones over a certain size, will in general produce good crops of every kind. It is by no means necessary or useful to remove any stones but such as will greatly impede the ploughing and harrowing, while in a state of tillage. When laid down under grass, of course, all the stones on the surface that would prevent the operation of mowing, must be gathered off.

A clayey soil is often of so adhesive a nature, that in a dry season the plough turns it up in great clods, scarcely to be broken or separated by the heaviest roller. It requires, therefore, much labour to put it in a state fit for producing either corn or grass, and it can only be cultivated in a particular state, and in favourable weather. There is much of this kind of land in Canada, that would yield great crops under a proper system of management, yet, as it must be cultivated under a heavy expense, requiring strong instruments and a powerful team, the profits of such land are not so great, unless occupied by an attentive and skilful farmer. These soils are well calculated to grow beans, wheat, oats, clover, and timothy, but are not adapted for barley or potatoes, unless under very particular management. Clays become good meadow lands, and answer well for hay. A stiff clay, when not cold or wet, is preferred in Cheshire, and other parts of England, for the dairy.

On reclaimed peaty soils, oats, rye, potatoes, turnips, carrots, clover and timothy, may be cultivated in great perfection. Wheat and barley might succeed on such soils, were they supplied with abundance of lime, or calcareous earth; and the fiorin grass is well adapted to that description of soil in the warm climate of Canada. I have seen it produced naturally and most luxuriantly on such soils. The fens in Cambridgeshire, and Lincolnshire, England, consist of peat and sediment, and are most productive.

Alluvial soils are derived from the sediment of water. Along the sides of rivers, and other situations, water-formed soils are to be met with, consisting of the decomposed matter of decayed vegetables, with the sediments of streams. They are in general deep and fertile, and not apt to be injured by rain, as they usually lie upon a bed of open gravel. They will produce good crops, if well drained, and secure from floods.

The term loamy soil is applied to such as are less tenacious than clay, and more so than sand. Loams are the most desirable of all soils to occupy. They are friable; can in general be cultivated at the suitable season of the year; are ploughed with greater facility, and less strength of team than clay; bear better the vicissitudes of the seasons, and seldom require any change in the rotation of crops adopted. Above all they are particularly well adapted for the convertible husbandry, so suitable for Canada, for they can be changed, not only without injury, but generally with benefit, from grass to tillage, and from tillage to grass.

As to the comparative value of soil, it has been justly remarked, that too much can hardly be paid for a good one, while a bad one is not profitable at any price, however low. The labour of cultivating a rich and a poor soil, is nearly the same, while the latter requires more manure, and consequently is more expensive. On whatever kind of soil a farmer happens to be settled, he will find it a wise maxim, that the soil, like the cattle by which it is cultivated, should always be kept up in good condition, and never be suffered to fall below the work it may be expected to perform.

Sub-soil.—On the nature of the sub-soil depends much of the value of the surface soil. The sub-soil may in many cases be of great use to the surface soil, by supplying its deficiencies and correcting its defects. The hazard and expense of cultivating the surface is often considerably augmented by defects in the under stratum, but which, in some cases may be remedied. Disorders in the roots of plants are generally owing to a wet or noxious sub-soil.

A stony sub-soil is generally prejudicial, unless it is of limestone rock. In that case, if there is a reasonable covering of soil, it may be converted into healthy pasture, and in favourable seasons will, if stocked with dairy cows, produce more milk and butter than any other kind of land. It is very good for mutton and wool. It will also produce good grain and green crops, but is subject to the wire-worm.

A porous sub-soil is attended with this advantage, that by its means all superfluous moisture may be absorbed. Below clay, and all the variety of loams, an open sub-soil is particularly desirable. It is favourable to all the operations of husbandry ; it tends to correct the imperfections of too great a degree of absorbent power in the soil above ; it promotes the beneficial effects of manures ; it contributes to the preservation and growth of the seeds, and insures the future prosperity of the plants. Hence it is, that a thinner soil, with a favourable sub-soil, will produce better crops than a more fertile one incumbent on wet clay, or on cold and non-absorbent rock. The sub-soil in Canada is generally favourable, if properly drained.

CHARACTER OF SURFACE, ASPECT, AND SITUATION IN REGARD TO MARKET.

A hilly, irregular surface, is considered unfavourable to arable farming. The labour of ploughing, carrying home produce, and carrying out manure, is greatly increased, while the soil on the summit of steep hills, or declivities, is unavoidably deteriorated. On the sides of slopes the finer parts of the clay and mould are washed away, while the sand and gravel remain. Much of Lower-Canada has scarcely any perceptible rise. In other districts, the eastern townships, and the neighbourhood of Quebec, the surface is less level, which contributes very much to the ornament of these districts, without being particularly prejudicial to agriculture, as the elevations are not very great in any part of the country. I have ever found an irregular surface, of moderate hills and valleys, the most valuable land for grazing, affording land shelter the best of all for stock. These kinds of land will be found better for pasture in Canada, than such as are perfectly level. The valleys affording excellent pasture in very dry weather, when pasture on the higher, level and more exposed lands is entirely burned up.

Upper-Canada is represented to be a level country, beautifully undulated, but no where attaining an elevation exceeding from 300 to 500 feet above the level of the waters of the great chain of lakes. A ridge of mountains, or rather a chain of broken hills, skirts the northern boundaries of both provinces from the 74th to the 98th degree of west longitude. The geographical and physical circumstances of Upper-Canada are most favourable for agriculture. In some situations, however, the lake fever, and ague, or intermitting fevers, are very prevalent.

In England, the situation of farms with regard to markets, has a great influence on the value of land ; so it should have here, but not so great as in England. There the advantage resulting from vicinity to a large town is very great. Some crops, as those of potatoes, turnips, and clover, are frequently sold on the ground, without any further trouble or expense to the farmer ; and great quantities of manure are to be had. In such situations there is a ready sale for every article the farm can produce, and the expense of bringing to market, from the excellence of the roads, very trifling. Here our system of agriculture must necessarily be quite different from that of England. In a population of about 300,000 in the district of Montreal, the only city or town of any consequence is Montreal, with a population of less than 30,000, being only one-tenth of the population of the district ; while in England, the population residing in cities towns and villages, are about as two or three to one, of those residing in the country.

It almost surpasses belief that the farmers of Canada do not supply the small proportion of the population resident in her cities and towns with agricultural produce of the first necessity, namely, butchers' meat, cheese and butter, but allow foreigners to furnish a large proportion of these commodities. We may have this home market which is very considerable, at any time we choose to avail ourselves of it, turn our attention to supplying it, and demand of the Legislature such reasonable protection against foreign competition as agricultural interests have a right to. I shall in the last number advert to this subject.

In a country like this, where markets are not at hand, the farmer ought to take into consideration what articles will best suit those at a distance, to which his produce must be sent. Bulky articles will not pay the expense of carrying them a great distance to market, and except wheat alone, on farms at a considerable distance from market, say thirty or forty miles, all the produce ought to be consumed, or manufactured on the farms, into butchers' meat, cheese and butter. The carriage of vegetables and hay, should be confined to a much narrower circle. If breeding, rearing, and feeding stock be the object of the farmer, that system of farming may be as profitably carried on at a distance from market as in the immediate vicinity ; and I believe this kind of husbandry, together with the dairy, will yield more nett profit than arable culture. For manure, farmers in general must depend upon the resources afforded them by their own farms and stock.

Old Country farmers making a purchase need not in future speculate on the chance of purchasing manure from the farmers in their neighbourhood, who might heretofore have been so foolish and ignorant, as to offer for sale, or be persuaded to sell what was so requisite for their own lands. I hope this practice, so discreditable, is at an end in Canada. Canadian farmers in general are become well aware of the value of manure, and the necessity of applying it to their own crops.

EXTENT OF LAND SUITABLE FOR A FARM.

The extent of a farm should very much depend upon the farmer's capital, but farms should never be of less extent than 100 arpents in this country, even though the farmer's capital might be insufficient to bring it all into the best state of cultivation at once. The profits of a smaller sized farm are not sufficient, with the utmost frugality, or even parsimony, to maintain the family of a yeoman, with a reasonable degree of comfort. These remarks, however, more particularly apply to cultivators who are proprietors. Those who rent farms will do well to prefer farms rather under their capital, than such as they would be unable to stock, and cultivate in a proper manner. It would be unwise to pay rent for land that cannot be occupied profitably, for the want of necessary means, and it might also induce a slovenly cultivation, that could not be profitable for landlord or tenant. But as hiring land is not practiced to any great extent in Canada, it is unnecessary to dwell much on the subject of leases, or rents. Farmers from the Old Country who have families, with any reasonable capital, will find it their interest to purchase wood-land rather than rent a worn out farm, on a short lease. The improvements that are necessary, cannot be prudently made by any one, who is not a proprietor. To strangers coming here, it may appear very plausible, to be offered cleared land at from five to twenty shillings the acre annual rent, not many miles from Montreal or Quebec, and this land free from tithes and taxes; nevertheless, the profits which can be realized, will be by no means equal to what is generally anticipated from calculations made of rent, produce and prices.

BUILDINGS NECESSARY FOR A FARMER.

A variety of buildings are necessary for carrying on the business of agriculture. Suitable buildings are not less necessary to the husbandman than suitable improvements; and there is nothing which will mark more decidedly the state of agriculture in a country, than the plan and execution of these buildings.

From the manner that farms are laid out generally in Canada, and the access to them, a choice of situation for farm buildings is scarcely in the power of the farmer, and in place of such buildings being set down at nearly an equal distance from the extremities of the farm, they have to be placed at the extremity. This is a great disadvantage, and the more so as it is difficult of remedy.

The form that ought to be adopted for a set of offices, is a square, or rather a rectangular parallelogram; the houses and sheds being arranged on the north, east and west sides, and the south side fenced, to which low buildings for calves, pigs, poultry, &c. might be attached. The space thus enclosed might be separated by one or more partition fences, for different kinds of stock. The farmer's dwelling house should stand at a short distance from the offices, but if possible command a view of the inside of the square. The distance between the dwelling house and offices, I would recommend to be sufficient to prevent fire communicating from one to the other, in case of any accident.

The principal buildings required for the occupation of land, are barns, stable, cow-house, cattle sheds, cart sheds, &c. and farm house, dairy, &c. The barn should be in proportion to the size of the farm, and indeed all the buildings should be in the same proportion, *never over large.* Hay or grain will keep well in stacks properly made, and thatched, if the farmer should occasionally want room for an extra quantity of produce. The most convenient width for a barn is about thirty feet, and side wall twelve feet high. In situations where the land would be favourable, cow houses, or houses for sheep or pigs, might be very conveniently placed under the barn. This would save much roofing, and afford very warm houses for stock, but there are not many situations perfectly suitable. When barns exceed sixty feet in length, they require a second door of entrance, as the space to be filled will be at an inconvenient distance from the loaded carts. If the barn is not sufficiently long to form the north side of the square, the cow house might be attached to it on the end nearest to the dwelling house. The cow house, the width of the barn thirty feet and twenty-eight feet long, would afford stalls for sixteen cows, and a single or a double row may be added, on the same plan, if required. (See plan of the farm yard in the last part.)

The following is a plan of one of my own cow houses. It is fifty feet long, twenty-eight feet wide, and eight feet in height. Four rows of posts are placed throughout the length ; first row seven feet from the outside wall, next row, four feet from the first ; third row, six feet from the second, and fourth row, four feet from the third, and seven feet from the other outside wall. These posts are distant one from the other in each row, about four feet, including the posts, which are five inches square. The space in the middle between the rows of posts that are six feet apart, forms an alley from which the cattle are fed, and on each side of this alley, the cows stand in separate stalls, with their heads towards each other. The stalls are formed by the posts above described, into which two inch planks are grooved from one to the other, to the height of four feet. There are thirteen stalls in a row, allowing a space for each animal of three feet ten inches. The partitions dividing the stalls are only four feet long, and therefore do not extend so far back as to prevent the milker from sitting to the cow with perfect ease. Each stall has a manger the width of the stall, and one foot ten inches the other way, separated from where the animal stands by a plank only one foot in height. From the manger to the gutter, where the dung falls, is six feet ; on this space the animal stands ; the gutter is one foot wide and three inches deep ; on the other side, this gutter next the outer wall is a raised walk two feet two inches wide. The stalls are arranged in the same manner on the other side of the house. The cows are secured by chains round the necks, and rings which run on upright iron rods eighteen inches long, rivetted in the partitions in the corners of the stalls. In front of the stalls, boards are nailed to the post, on each side of the feeding alley, to the height of about three feet and a half, leaving an opening near the floor of one foot in height, for feeding the cattle in moveable boxes, which are passed through these openings, and removed again when the animals are done feeding ; they are fed with hay or straw through the same opening. The cattle can be kept much cleaner by feeding them in moveable boxes than when fed in immoveable troughs. Over the cows is a hay loft, from which the hay can be let down into the feeding alley at the cows' heads. In a building adjoining, is a room for grains, chaff, and straw-cutting machine ; from this there is a passage to the feeding alley, which takes up the place of one stall. The calf house is adjoining the cow house; one is in six divisions for calves that are fattening, the other is sufficiently large for ten or twelve calves that may be intended for rearing, with troughs for feeding them with milk, and a rack for hay. From the farm yard, there are three doors into the cow house, one at each end for the cattle to enter, and one in the middle into the feeding alley ; on the opposite end of the alley is a glazed window for lighting the house, and in the outer wall are three small openings for putting out the dung from the cattle. I have found this kind of cow house, or feeding house, the best of any I ever had ; each animal can be fed separately, and from the manner they are fastened, they are perfectly at their ease ; and since the house was erected, a period of five years, no accident has occurred, or animal got loose, except when let loose by the person in charge.

The horse stable might form a part of the east or west side of the square, and whatever may be the width of the building, the horses should all stand on one side. Fifteen feet in width will be sufficient for one row of horses, and the stalls should be from five to six feet wide for each horse. The following plan of rack and manger is very much approved of in England, and is very similar to that of Canada.

The rack is on the ground, rising three feet high, eighteen inches deep from front to back, and four feet long, the back part of the rack an inclined plane, gradually sloped towards the front, and terminating about two feet down. The front is generally closed, though some prefer having them open. Such a rack will hold more hay than ever ought to be put before one horse, and all the hay that is put into this manger will be eaten ; but in the common rack it is well known a large portion of the hay is pulled down upon the litter, and wasted in the dung. It prevents the hay seed and dust from falling upon the horse, or into his eyes, and what is of considerable importance, though seldom attended to, the hay will be given to the horse in small quantities at a time. The manger for oats, or water, may be placed over the rack sufficiently high not to interfere with the manger or rack for the hay.

The stable should be lofty, never under eight feet high to the loft, and should be lighted by windows placed as high as the loft will admit. Dark stables are considered injurious to horses' eyes. Stables should if possible be kept at a temperature above the freezing point in winter, and the heat ought to be moderated in summer, by open windows, and doors constructed of rails, that would admit a free current of air. These kind of railed doors are in very general use with Canadians to their stables in summer.

Convenient to the stable should be a harness room, and house for agricultural implements, old iron, &c. &c., one for summer and winter carriages, and over the last might be a place for keeping corn, and next to this a fowl house. On the opposite side of the square, may be an open shed for cattle, with racks to hold hay or straw for them during the time they may be at large in the day. A part of this shed might be appropriated for carts. A sheep house may be constructed in one of the sheds, proportioned to the flock, with a part of the yard fenced off for the use of the sheep alone, not allowing them to mix with horned cattle or horses, in the farm yard. The sheep house should be divided into one large, and two or more small apartments, to separate the sheep, particularly at lambing time. The sheep house and yards should be furnished with racks for hay, and with small troughs, for drink and other food. The profit of sheep will depend in a great degree on a good sheep house, suitable yards attached, and on careful attendance and feeding.

A straw house might be constructed at a trifling expense, by erecting a shed to the side of the barn. On the south side of the yard, hog-sties or piggeries, may be placed. Hogs require only warm dry places to be in, and therefore the stye may be built in a very simple manner. Convenient to the barn and straw yard, in order that they may be constantly and abundantly supplied with litter, is the best situation for them, as it is also most desirable to have all the farm buildings in one square if possible. The hog sty should have several divisions to keep the different sorts of swine separate; and it will be found advantageous not to have more than two in one division when fattentng. The sty may be constructed with shed roofs, about eight or nine feet wide, the back wall five feet, and front wall eight or nine feet high. The feeding troughs may be placed about five feet from the back wall, and separated from the hogs by upright rails six inches broad and two inches thick, placed sufficiently apart for the hogs to put their heads through to get at their food in the troughs. Over the troughs should be a cover with hinges to rise up and down. The troughs would occupy about a foot in width, and leave a space, or alley between the troughs and front wall, of two feet for the convenience of giving food, and in this space, food might be kept in barrels, for supplying the hogs at very frequent intervals. The sties may be separated into such divisions as the farmer may think most suitable. The front wall of the sty should face the south, and the back of the sty be to the farm yard, the entrance to the feeding alley being outside the gate to the farm yard. In rear of the sty, to the distance of six or eight feet, should be another fence for the purpose of affording a small uncovered yard to each sty; from these yards the dung can be removed into the farm yard. These kind of sties are already very general in Canada, but are not placed judiciously.

Poultry houses should be spacious and airy places properly constucted for them, with a number of spars reaching across the building at different heights, or at the same height, with a gangway attached for the fowls to ascend; or there might be a sloping stage of spars for the poultry to sit with ranges of boxes beneath for nests. The spars on which the clawed birds are to roost, should not be smooth, but roundish or roughish, like the branches of a tree.

When situations are favourable, root houses for storing up potatoes, carrots, Swedish turnips, or any other vegetables for the use of stock, might be constructed under the hay barn; but they must be proof against frost. Steaming houses cannot be safely placed in the square of farm buildings, however necessary they are, or conveniently they might be situated there, in preference to any other place. The danger from fire would be too great to be risked.

Racks for straw, or other fodder should be fixed in the yard. The dung pit should be placed in the centre of the farm yard. A pavement or causeway ought to be carried round the yard, next to the buildings, from nine to fifteen feet in width, according to the scale of the whole; the remaining part of the yard should be excavated so as to form a hollow, deepest at the centre, but not as deep as to prevent carts from taking away the dung without difficulty. From the lowest part of this hollow should be conducted a drain to a reservoir for liquid manure, or to where it may be mixed with earth, which can be occasionally removed for top dressing, replacing it with other poor earth or soil, which can be again applied in the same way. It would be very desirable to remove the greater part of the snow that may fall, or collect in the yard, during the winter. It has an injurious effect on the manure, when a large quantity is suffered to thaw in the yard. When the fields that are to be manured are not very convenient to the farm yard, the farmer will find it to be his interest to take out all the manure as it is made from his stables during the winter, and form it in heaps in the field where it will be required in the spring. The heaps should be made high so as not to allow much snow to mix with them. The dung will suffer less by washing there than in the yard, and if it is washed, it will run over the soil and not be lost. It is also a very great advantage in spring, when roads may be soft and bad to a late period of the spring, and greatly delay sowing and planting. Cattle should not be suffered to leave the yard in winter. If the water is supplied from a draw well, it can, in most places, be conveyed into the yard by a long trough, so placed as to allow all the cattle to drink from it. Cattle waste much manure in winter when suffered to wander about on roads or fields.

There is a very convenient sort of gate called the window-sash gate, of recent invention, which is extremely well adapted to farm yards, and places where snow is subject to accumulate. It is suspended by two weights between two posts, where it moves up and down in grooves in the posts, exactly on the principle of the window sash. The weights may be of stone or cast iron, and the pulleys are of iron, and nine inches in diameter. The inventor recommends it in the following terms:—

"It is easy to shut or open; remains in whatever situation it is placed; is not liable to be beaten to pieces by the action of the wind; shuts always perfectly close, whatever be the height of the straw, dung, or snow, in the gate way; a cart may be drawn quite close either side before opening; is perfectly out of the way when fully open, and not liable to shut on what is passing; not liable to get out of order; may be erected in a hollow place, where a swing gate could not open either outwardly or inwardly, and is likely to be more durable than ordinary gates." A small gate of this description is said to be long in use with the Dutch.

The dwelling house will be constructed according to the taste of the farmer. I do not, therefore, think it necessary to give any particular plan. I would recommend all who build a house, above all things to endeavor to have a good cellar; it will be found a most useful part of a farm house.

The dairy or milk house, would require to be cool in summer, and moderately warm in winter, so as to preserve if possible, a temperature nearly the same throughout the year, of about 50 degrees. It should be dry, to admit of its being kept clean and sweet at all times. A milk house must be partly below the surface of the ground in this climate, or it cannot be kept at the proper temperature, at any season of the year. It may be formed in a dry cellar, so situated as to have windows on two sides, the north and east, and these windows should be furnished with double sashes, to exclude the cold in winter, and the heat in summer, and on the outside of the sashes should be a fixed frame of close wire netting, to exclude flies and other insects. If the dairy is in a detached building, it would be a good plan to build the walls double, the inner of brick or stone, nine inches or a foot in thickness, and the outer about two feet distance, built of stone, and surround the whole with a bank of earth faced with green turf. Over this dairy might be a cheese room, and a room for dairy utensils.

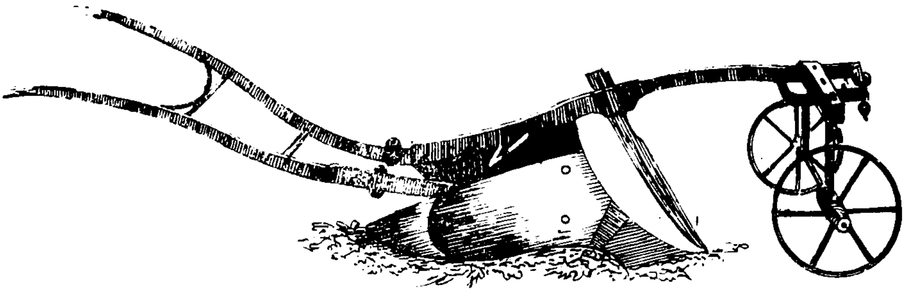
For twenty or thirty cows, a dairy twenty feet by fourteen might be sufficient, with a cheese room and place for utensils adjoining. The floor should be of brick, or smooth flags, with an open gutter formed of draining tiles, or of wood, in the floor, a foot or eigtheen inches from the wall, on all sides, for the purpose of carrying off the water that may be occasionally used in washing, or cooling the floor in summer. After washing or wetting the floor, it should be dried up immediately, as damp promotes the putrefaction or turning of milk. It would be a great advantage to have a well or pump in the dairy, and to have an ice house attached to it. It is said that an ice house surrounded with a double wall, with an interval between them like the dairy, and banked with earth and turf on the outside, will keep ice better than a cellar under ground. The place for holding the ice should be formed of upright posts, lined with wattled work, or close rail work, having a path all round of two feet and a half in width ; round this to be formed a gutter to carry off the water dropping from the ice. The utility of an ice house attached to a dairy, would amply compensate for the cost.

In Canada, it will generally be found necessary to have a summer and winter dairy ; if the dairy be in a detached building particularly, it will be difficult to keep it at the proper temperature in winter. In that case, it will be more advantageous to have a small room in the dwelling house, appropriated to milk in winter, that will not be too hot or too cold. Where large dairies are kept, it would be most convenient to have a fire place attached, to be used in winter, and make it unnecessary to change the dairy, but at present there are few dairies so extensive as to require this. The shade of trees would be very useful for the dairy and ice house.

TILLAGE IMPLEMENTS AND MACHINES.

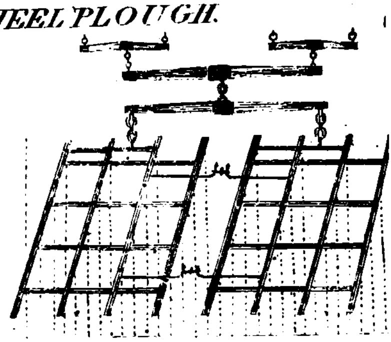
The fundamental implements of agriculture are the plough, the harrow, and the cart ; these are common to every civilized country, however rude of construction they may be in some. The plough is common to all ages and countries, and its primitive form almost everywhere the same ; various changes have, however, been made in its form from the 16th century to the present time, in the British Isles particularly. As the operations of ploughing, like many other operations in practical husbandry, must often vary in the manner of its being performed, it is evident that no one particular sort of plough can be superior to all others, in every season, and under every variety of soil or inclination of surface.

Ploughs are of two kinds ; those fitted up with wheels, and called wheel-ploughs, and those without wheels, called swing-ploughs. The latter are the lightest of draught, but require an experienced and attentive ploughman to use them ; the former work with greater steadiness, and require much less skill in the manager ; some sorts indeed do not require holding at all, except at entering in, and turning on and off the work at the ends of the ridges. On the whole, taking ploughmen as they are, and ploughs as they are generally constructed, it will be found that a

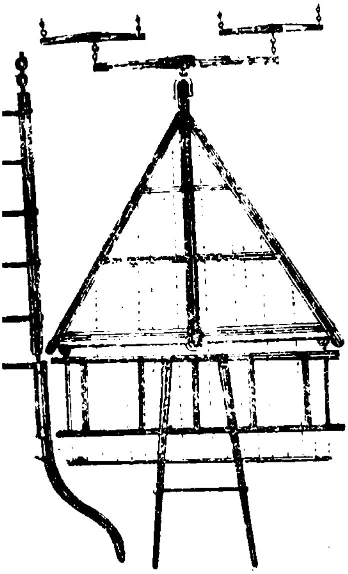


IMPROVED SCOTCH WHEEL PLOUGH.

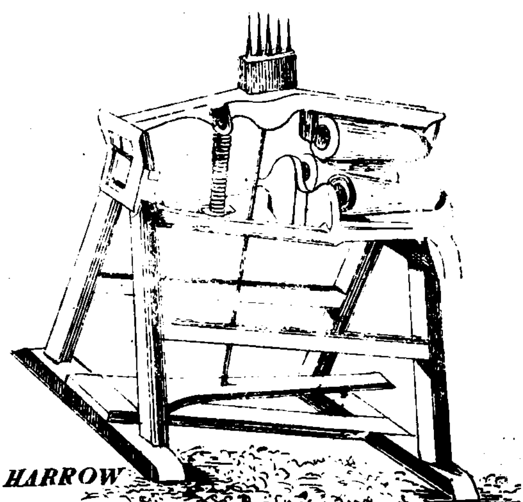
NORFOLK WHEEL PLOUGH.



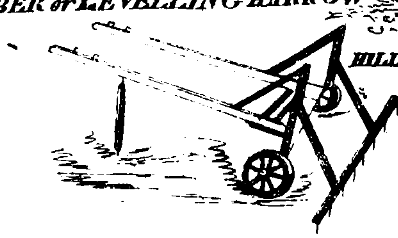
BERWICKSHIRE HARROW



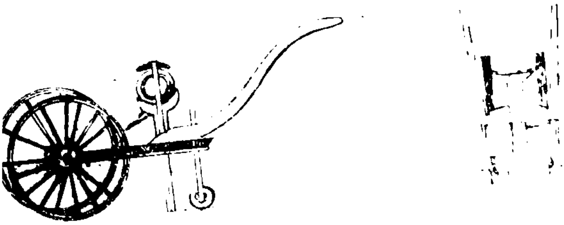
BRAKE GRUBBER or LEVELLING HARROW



HILL & BUNDY'S FLAX MACHINE



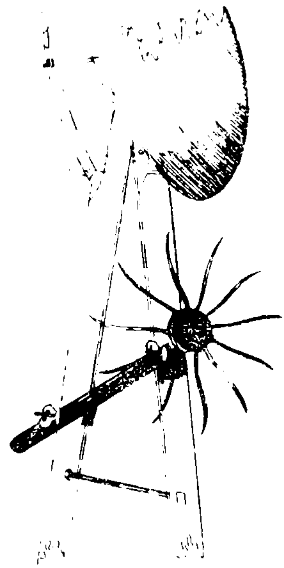
NORFOLK HORSE RAKE.



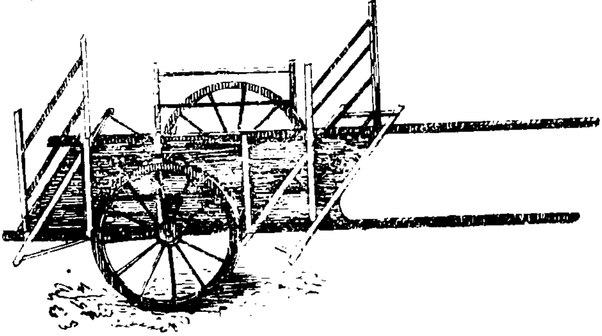
TURNIP BARROW DRILL.

SCOTCH SWING PLOUGH.

HERTFORDSHIRE WHEEL PLOUGH.



BEDFORDSHIRE WHEEL PLOUGH.



CANADIAN HAY CART.

district ploughed with wheel ploughs, will show greater neatness of work than one ploughed with swing ploughs ; but, on the other hand, taking a district where the improved form of swing plough is generally adopted, the ploughmen will be found superior workmen, and the work performed in a better manner, and with less expense of labour, than in the case of wheel ploughs.

In the construction of ploughs, whatever be the sort used, there are a few general principles that ought invariably to be attended to, such as the giving the throat and breast, or that part which enters, perforates, and breaks up the ground, that sort of long, narrow, clean, tapering, sharpened form, that affords least resistance in passing through the land, and to the mould board, that kind of hollowed-out and twisted form, which not only tends to lessen friction, but also contributes greatly to the perfect turning over of the furrow slice. The beam and muzzle should likewise be so contrived as that the moving power, or team, may be attached in the most advantageous line of draught. This is particularly necessary where a number of animals are employed together, in order that the draught of the whole may coincide.

Land, when properly ploughed, must be removed from a horizontal position, and twisted over to a certain angle, so that it may be left in that inclining state, one furrow leaning upon another, till the whole field be completely ploughed. The depth and width of the furrows, which is most approved of by farmers, and commonly to be met with in the best ploughed fields are in the proportion of two to three ; or if the furrow be six inches deep, it ought to be nine inches wide, and left at an angle of 45 degrees.

To have the line of draught at right angles to the horses' shoulders, is of great importance in the formation of a plough, a circumstance of which many plough-makers are totally ignorant, although it is well known to every one who has the least knowledge of mechanics. If we take the angle that the horses' shoulders make with a perpendicular from the horizon, and continue another line at right angles to it, or parallel to the draught chain, the length of this line from the horses' shoulders to where it meets or crosses the coulter, at half the depth of the furrow, will be thirteen feet two inches for ordinary sized horses.

If the plough be properly made, the line of draught should pass through the middle hole of the plough bridle at the point of the beam. This requires the beam to be seven feet long, to give it a proper height at the bridle. That part of the plough next the solid land should be a perfect plane, and run parallel to the line of draught. The coulter ought not to deviate much from an angle of 45 degrees.

The mould board, for free soils, and for summer fallows, is generally most effective when it has a considerable concavity ; but for breaking up pasture or any firm surface, and also for clayey soils, it is found to clean itself better, and make neater work when it approaches nearer to a plane, and in very stiff clays, if formed with a concave surface. The lower edge of the mould-board, on the most improved forms, is in a separate piece, which, when it wears, can be taken off and renewed. This slip of iron is called the wearing piece.

The sowing plough, is almost the only one used in Scotland, and in many parts of England; but in twenty-eight counties in England, the wheel plough is in general use at this day, and in some of the finest counties for crops, Devon, Kent, and Hertford, producing corn equal to any in England ; Norfolk, the best county for turnips and barley ; Berks, the county in which George the 3rd had large farms, and used the wheel ploughs ; Gloucester ; Worcester, said to be second to no other county in England in agricultural produce ; Warwick, famous for corn ; Lincoln, yielding more beef and mutton per acre than any county in Britain ; Hampshire, Wilts, and Dorsetshire, called by many the garden of England. These are of the number of English counties that use the wheel plough, almost exclusively, or at least very generally.

Wheel ploughs are of two kinds : those, and which are by far the most common, where the wheel, or wheels are introduced for the purpose of regulating the depth of the furrow, and rendering the implement more steady to hold ; and those where the wheel is introduced for the purpose of lessening the friction of the sole or share. This last is not much known, but is said to promise great advantages.

" Ploughs with wheels, for regulation and steadiness, vary considerably in their construction, in different places, according to the nature of the soils, and other circumstances ; but in every form, and in all situations, they probably require less skill in the ploughman. Wheels seem, indeed, to have formed an addition to ploughs in consequence of the want of experience in ploughmen ; and in all sorts of soil, but more particularly in those that are of a stony and stubborn quality, they afford great assistance to such ploughmen, enabling them to perform their work with greater regularity in respect to depth, and with much more neatness in regard to equality of surface. From the friction caused by the wheels, they are generally considered as giving much greater resistance, and consequently demand more strength in the team that is employed ; and besides, are more expensive in their construction, and more liable to be put out of order, as well as more apt to be disturbed in their progress by clods, stones, and other inequalities that may be on the surface of the ground, than those of the swing kind. It is also observed, that with ploughs of the wheel kind, workmen are apt to set the points of their shares too low, so as by their inclined direction to occasion a heavy pressure on the wheels, which must proceed horizontally. The effect of this struggle is an increased weight of draught, infinitely beyond what could be supposed ; for which reason, the wheel is to be considered as of no importance in setting a plough for work ; but passing lightly over the surface, it will be of material aid in breaking up old lays, or grounds where *flints, rocks, or roots of trees occur*, and correcting the depression of the share from any sudden obstruction, as well as bringing it quickly into work again, when thrown out towards the surface."—*Communications to the Board of Agriculture.*

" The improved Scotch plough, with one or sometimes two wheels, fixed near the end of the beam, without any carriage, goes very light, and is very useful ; such alterations as are necessary requiring very little time or trouble. Where two wheels are employed, the plough goes very well *without a holder* on a good tilth or light sward, where there are few stones, except at the setting in and turning out."

The Beverston wheel plough is considered an excellent implement. In a report of farms selected in England, for superior management, published in 1832, is one of the Farm of Beverston, near Titbury, Gloucestershire, containing more than 1300 acres, farmed by Mr. Jacob Hayward, whose system has grown out of the experience and observation of past years, and is not the offspring of fanciful theory, but of actual, continued, and successful practice. It is said that the cultivation, management, diligence and economy, practiced on this farm is worthy of the attention of every farmer in England. On this farm, the Beverston wheel plough is the only one used ; and this farm is the first on the list of selected well managed farms in Britain.

The Norfolk wheel plough has a clumsy appearance, from the great bulk of the wheels and their carriage ; but in light friable soils, it does its work with neatness, and requires only a small power or draught.

Morton, of Leith Walk, in 1813, conceived the idea of introducing into the body of the plough, a wheel about fifteen inches in diameter, to act as the sole, and made several exhibitions of a plough so constructed, before the Dalkeith Farming Society.

Plenty's friction wheel plough has been used in England ; it has two wheels under the beam, and one behind the sole, and is said to require a less power of draught than other plough. Wilkie's improved friction-wheel plough was invented in 1825, and is now manufactured near Glasgow. It is considered by far the most perfect implement of the plough kind that has hitherto been produced. The wheel is placed so as to incline from the perpendicular, at an angle of about 30 degrees ; and following in the angle of the furrow cut by the coulter and share, it insures a greater degree of steadiness in the motion of the plough than when rolling only on the bottom of the furrow. The sock, or share, is of cast iron, which is a great saving both in first cost and repairs. The wheel, which is of cast iron, will last many years. The draught of this plough has been proved at a public ploughing match in 1829, to be fully 30 per cent less than that of a common scoring plough of the most improved form. The price is also lower than that of any other plough now in use. There is a piece of mechanism attached to the wheel by which the quantity of ground passed over by the plough may be indicated.

The Society for the encouragement of Arts, Manufactures, and Commerce, presented the Silver Medal of the Society to a Mr. Ball, of Saxlingham, Norfolk, for a screw-adjusting wheel plough of his invention, and which has been adopted by many noblemen and gentlemen. Sir Jacob Astley certified that he had them in use, and had seen them worked against the common Norfolk plough, and found it much superior, laid the furrow much better, more equal, and with much less draught to the horses, and has not wanted the usual repairs which the common ploughs are subject to, and that they were generally approved of by the farmers in the neighbourhood. It is represented to be well calculated for breaking stiff land ; that by adjusting the screw, the furrow may be set from one to nine inches in depth, and secured to any of those intermediate depths with the greatest exactness. The beam is so connected with the axletree of the wheels, that the wheels always apply themselves to the inequalities of the ground, without influencing the mo tion of the plough. They can be converted into a swing plough, by disengaging the wheels.

An eminent English author on agriculture in 1830, observes: "On stiff and tenacious soils, no implement is, perhaps, better adapted than the *Herefordshire wheel plough*, notwithstanding the obstacles presented by their weight and increased difficulty of draught; as they are not easily thrown out of the ground, and at the same time compensate for the additional expense of their cost by their great expedition in work. "In Dorsetshire, wheels are considered an indispensable appendage to all sorts of ploughs used there, from the nature of the soil being difficult to plough.

There are many varieties of draining ploughs, generally with wheels, which regulate the depth of the drains. Some of them might be usefully introduced into Canada for cutting small drains. The most approved are the Duke of Bridgewater's, and those invented by Clark and Gray.

Drawings of several kinds of patent wheel-ploughs have been sent out to the Agricultural Society here, from Ransom's iron foundry, Ipswich, England, with the following advertisement: "The advantages of these ploughs over common ones are, they are more durable, less troublesome and expensive to keep in repair, and so simple in their construction, that every part subject to wear may be easily repaired by the ploughman without the inconvenience of sending them from the field. They are so formed as to turn their work with the least resistance, and by varying the breast or mould board which will shift to any width of furrow, may be suited to any lands."

The draught is exceedingly well applied to these ploughs, and must be most effectual. The point of draft is perpendicular above the point of traction, or breast, where the share fits on, and prevents entirely any pressure on the wheels, the greatest objection to wheel ploughs.

Plenty's improved Flemish plough, with one wheel and skim coulter, is recommended. This plough differs from the common swing plough, in having a small wheel, by which the depth of the furrow is more easily regulated, and a skim coulter which pares off the grass and weeds and turns them into the bottom of the furrow; it is also broader in the point. It is said to be suitable to light friable soils.

I have now given the opinion of many agricultural authors, on the merits of wheel ploughs. I have not introduced these selections by way of recommending wheel ploughs, or as an inducement to those who use swing ploughs, to adopt wheel ploughs instead. Farmers who have the swing plough, and who can execute the operation of ploughing in a perfect manner with that implement, would be unwise to make any change.

In England, agriculture is said to have arrived at the greatest possible improvement that it is capable of. Improved implements and machinery are brought to greater perfection there, than in any other country in the world, yet the wheel plough is still in very general use, though all the merits that the swing plough possesses, are known there to farmers and proprietors, by practical demonstration. If the wheel plough is in reality infinitely inferior to the swing plough, it appears an unaccountable species of obstinacy to continue its use in that country.

Canadian farmers may well be excused for not immedietely putting away the plough they can work with, and adopting the swing plough which they cannot manage perfectly well, when a majority of their fellow subjects in England, from the educated peer to the poorest farmer, persist in rejecting it, notwithstanding all that has been written and said, by theorists and others, and the practical experience they have constantly before them of any superior excellence it can have.

Much of the land in England is a very strong clay, and difficult to plough well. A great part of the land of Lower-Canada is strong land, and extremely difficult to plough at the particular season of the year it has to be ploughed. These circumstances make the wheel plough the more suitable in both countries in certain situations.

There can be no doubt that the wheel plough of Lower-Canada is susceptible of improvement in its construction, and the manner of applying the draught. I am persuaded, however, that a well constructed wheel plough is better adapted to a large portion of the strong and rough lands of the province, and the present skill and habits of the ploughman, than any swing plough that ever was invented. I have seen good work done with wheel ploughs, and in most cases where it is not done, the fault is more to be attributed to the inattention of the ploughman, than to the imperfections of the plough.

Where the furrow slice is cut of unequal proportions, it must make bad work ; when the ridges are not straight, and the furrows not properly cleaned out, the work must be still worse ; but these defects are not solely occasioned by the wheel plough ; with the best swing plough in the world, in the hands of an unskilful or inattentive ploughman, all these imperfections may occur in the execution of the work.

When agricultural improvement has advanced, the skill and experience of farmers and ploughmen will be increased, and farmers will adopt the sort of ploughs and other implements, that will be most suitable for their purpose. Those who have light lands that can be ploughed with two horses, and who are capable of managing the swing plough, should by all means use that implement ; but in other circumstances, I believe it will be more prudent to improve the Canadian wheel plough than to reject it altogether ; and I think it my duty to avow this opinion, however it may be at variance with that of most Old Country farmers.

There are many implements used in England, such as scarifiers, scufflers, cultivators, grubbers, brakes, &c. which probably will not be introduced here for some time, therefore, I do not think it necessary to describe them all. Drawings of some of the most useful implements will be given in the last number.

The brake, grubber, or levelling harrow, is a valuable implement on strong clayey soils. It consists of two frames, the one triangular and the other oblong. By means of the handles, the oblong part of this brake can be either raised up or depressed, so that when the ground is cut in small pieces by the teeth of the triangular harrow, then the oblong harrow following, its teeth being pressed down into the higher parts, carry or drag part of the soil off from the heights ; and when they are raised up by the handles, leave that soil in the hollow or low parts ; by this means the ground is brought nearly to one plain surface, whether that surface be horizontal or sloping. Somtimes it may be found necessary to place a greater number of teeth in the oblong part ot the brake, so that they may be nearer to one another, and perform the operation more effectually. The teeth are made sharp or thin on the fore edge, for cutting; broad and thick on the back, for strength ; and tapering from a little below the butts to their joints.

A triangular harrow, properly made, and furnished with iron teeth, will answer best on all rough lands where stones and stumps are suffered to remain. This harrow is well known in Lower-Canada.

The Berwickshire harrow is a perfect implement ; it consists of two parts joined together by iron rods, having hasps and hooks ; each part consists of four bars of wood, technically termed bulls, and connected together by an equal number of cross bars, of smaller dimensions, mortised through them. The former of these bars may be two inches and a half in width, by three inches in depth, and the latter two inches in width by one inch in depth. The longer bars are inclined at a certain angle to the smaller, so as to form the figure of a rhomboid, and they have inserted into them the teeth at equal distances from each other. This inclination of the longer bars is made to be such, that perpendiculars from each of the teeth, falling from a line drawn at right angles to the line of the harrow's motion, shall divide the space between each bar into equal parts, so that the various teeth, when the instrument is moved forward, shall equally indent the surface of the ground over which they pass. This harrow will be the best for all lands clear of stumps and stones.

A harrow for sowing grass seed, need be nothing more than the Berwickshire harrow on a smaller scale.

The brush harrow is used for harrowing grass lands to disperse roughness and decaying matter ; and it is also sometimes used for covering grass or clover seeds. Small, rigid branches of spray are interwoven in a frame, consisting of three or more cross bars, fixed into two end-pieces in such a manner as to be very rough and bushy underneath. To the extremities of the frame before, are sometimes attached two wheels, about twelve inches in diameter, upon which it moves ; sometimes, however, wheels are not employed, but the whole rough surface is applied to, and dragged on the ground.

The Norfolk horse rake, a figure of which is given, may be employed for barley and oat crops, and for hay. One man, and a horse driven by means of a rein, are said to be capable of raking from twenty to thirty acres in a moderate day's work. The grain or hay being deposited in regular rows or lines across the field, by simply lifting up the tool and dropping it from the teeth, without the horse being stopped. This implement will be found easier managed, and more effectual on lands of uneven surface, than the American horse rake. The hand corn rake is, in England, of different dimensions and constructions. In general the length of the rake is about four feet, and the teeth of iron about four inches long, and set from one to two inches apart. Young, mentions one of these dimensions which had two wheels of nine inches diameter, for the purpose of rendering it easier to draw ; the wheels were so fixed that the teeth might be kept in any posture by the holder. It was used for hay and corn, and answered the purpose well.

The hand hay rake ought to be made of light, seasoned wood, and may be from three, to three and a half feet long, and be perfectly manageable, if properly made. The teeth need not exceed two or three inches in length. Some farmers use a rake five feet long, or more, with strong teeth of wood four inches long, which is dragged over the surface by one man, and is said to answer the purpose effectually.

The one row turnip drill-barrow, is a very useful implement ; it has two wheels which run in the hollows on each side of the drill or ridgelet to be sown, by which means the man who uses it is enabled to keep the row exactly in the centre of the drill ; a small roller is fixed in the machine which covers and presses in the seed. In sowing large fields, it may be attached to a light roller drawn by a horse.

Wheel carriages, of a variety of construction, are used in agriculture. To employ carriages that are calculated to execute the required operations with the greatest facility, and at the least possible expense, is a matter of rural economy, highly deserving of serious consideration. In Lower-Canada, wheel carriages are not so much used in agriculture, as in England. The wheel carriages in common use here are simple in their construction, and answer a very good purpose. At a considerable distance from towns, they are not much used off the farms, as it is in winter the produce is generally carried to market. The wood cart is very well adapted to the work to be executed, and the Canadian dung cart, though not a very splendid machine, answers the purpose very well, and the cost of their carts is trifling.

The English and Scotch carts are coming into very general use in the neighbourhood of towns, particularly with all Old Country farmers, who scarcely use any other, except for hay or corn.

The Canadian hay carts are the most convenient machines for the purpose of carrying hay, and corn in the sheaf, of any I have ever seen. They are light, and easy to be loaded, and the load can be securely tied, by means of a roller fixed between the ends of the shafts of the cart, to which the cord that ties the load is attached, and may be wound up to the requisite degree of tightness, by a boy of ten years old. The same wheels that are used for the wood and dung carts, are generally changed to the hay carts, when wanted. Single horse carts are the most useful on a farm. Whenever the lands or roads are fit to draw upon, two horses and two carts will be able to do more work, than two horses with one cart, allowing that in each case, the horses have the carts that are most suitable. This rule does not, however, apply to winter carriages employed in carrying agricultural produce. Winter carriages constructed on the same principle as those in the United States, and in Upper-Canada, and drafted in the same way, by two horses abreast, should at once be adopted in Lower-Canada.

I do not know of any improvement more necessary to be introduced. There is not a farmer in the province but is sensible of the fact, that the winter roads are generally bad, though he may not be aware, that with our neighbours of the United States, of Upper-Canada, and even of the eastern townships, the winter roads are good, and that the cause of this difference is to be attributed solely to their using a different description of winter carriages, and mode of draft. The common traine of Lower-Canada, may be a very convenient machine on a farm, and in the woods, but should never go off the farm. I do not think it possible to construct any machine better calculated to form *cahots* in deep snow, than the common traine, particularly when loaded with wood, hay, or any other commodity that will overhang the runners, or form a high load ; and I do not see how any change in the manner of attaching the shafts can prevent it from making *cahots*, though possibly it might not make so many. The runners are so short and low, that they must necessarily collect the snow, press it forward, and form a heap. When the traine has to rise over this, or any other inequality in the road, it is raised off the perpendicular, and in coming down to its level again, the whole weight of the load bears upon the front, or fore part of the runners, and must commence forming hollows, or *cahots*. The effect is most injurious when the load overhangs the runners, or stands high over them. The draft being applied very low is apt to raise the fore part of the runners off the level, and in coming to the level again in soft snow, it must make the surface uneven, and every carriage *of whatever make*, that follows upon the same track, will increase these inequalities, and add to their number.

The winter carriages of our neighbours, are high, open, and long in the runners. There is a pole firmly attached to the front, as in four wheel carriages, which, passing between the horses and secured to their collars, keeps the machine perfectly steady, and the draft being applied over the runners, the carriage moves steadily on the road, free from that jerking motion, which traines constantly have. These carriages seldom carry a load that overhangs, and the horses travelling before the runners, track the snow, and make it impossible to form *cahots* on any road that was originally nearly level.

In some situations traines do not form *cahots*, and I cannot always account for this circumstance. It has been said that bad roads with us, are owing in a great measure to there being more snow in Lower-Canada in winter than in Upper-Canada, or the United States. I admit there could not be deep *cahots*, without deep snow ; nevertheless, I am fully convinced that the construction of our winter carriages, and the manner of draft, is the main cause of bad winter roads in this province ; and if by introducing carriages similar to those in use with our neighbours, we would insure good winter roads, there is not a farmer in the province but should feel interested in introducing them before another winter ; even the experiment is worth making. Were the winter roads good, two horses would bring as much produce to market, as four can do now, and in half the time ; the carriages and harness would last much longer, and all who would travel for business or pleasure would have cause for congratulation at a change that would enable them to perform a journey with nearly the ease and expedition they could do on a rail-road. It may be very pleasant on a fine summer day to travel leisurely through a beautiful country, but for any person acquainted with the cold of twenty degrees below zero, slow winter travelling in Canada can have no great charms ; particularly if occasioned by a bad road.

The farmers of Lower-Canada have the means of providing for the necessary change at once. They have more horses in proportion than the farmers of Upper-Canada, and during a period of seven years, the expense of improved winter carriages and harness, would not exceed that of the description of carriage and harness at present in use, and the advantage that will be gained by themselves, and the whole community, will be greater than they have any idea of.

Under existing circumstances, keeping the winter roads in repair, even in an imperfect manner at best, is considerable expense of labour, that with a properly constructed winter carriage, would, it is supposed, be unnecessary. A waste of labour, or labour unnecessarily applied, is an injurious waste of capital. I am aware that it is the opinion of several intelligent farmers, that two horses with traines will be able to carry more than two horses could do with the double sleigh. This, I believe, would prove to be perfectly correct could the experiment be made on good roads; but of what consequence can it be to us, while we have practical experience that we cannot have good roads so long as we continue to use the traine, and that the traine or any other description of winter carriage cannot, under present circumstances, carry more than half loads. If the traine is the true and only cause of *cahots*, I admit it is the very best description of winter carriage for using on bad roads; but if the first fact be clearly demonstrated, our duty is plain, to put an end to the cause, and thus prevent the effects so long complained of, at once and forever.

A reaping machine has been lately invented in Britain, by a Mr. Bell, that is said to answer the purpose extremely well, worked by two horses. It has been tried in Scotland before several landed proprietors, and, moved by a single horse, cut down a breadth of five feet at once, and attended by six or eight persons to tie up the corn, a field was reaped at the rate of an imperial acre per hour.

A schoolmaster in Northumberland, a Mr. Henry Ogle, has invented a machine for reaping, and at the same time making sheaves of the corn.

The operation of this machine has proved satisfactory, and was estimated to cut fourteen acres per day.

A Mr. Baily of the United States, invented a mowing machine, which is said to answer well, and to be extensively used.

Threshing machines are in very general use in Britain, and are coming much into use in the United States. They are not so necessary for Lower-Canada until her agriculture is in a more forward state of improvement, and her disposable capital considerably augmented. A threshing machine capable of executing the work *perfectly*, cannot be purchased much under fifty pounds currency, besides the cost of the building in which it would be erected. There are very few farmers who would not find an opportunity of applying this money more advantageously in clearing a new farm, or improving an old one. The winters prevent every field operation for four months of the year, and in the old settled parts of the country particularly, farmers, their families, and servants have not much other work to do, except threshing in the winter. Those who are independent, and have their farms in a high state of improvement, producing abundant corn crops, and who have capital unemployed, may, by all means erect threshing mills, but under any other circumstances, I believe it would be imprudent. In England, field work is seldom interrupted in winter, and consequently the labourers' time is more valuably applied in the field, than in the barn, and the threshing machine enables the farmer who has a large quantity of grain, to take advantage of any sudden rise in the market. Here, we seldom have any such fluctuations in the market, particularly in winter. It is only where water power can be applied, that threshing mills are considered *a great saving* in Britain. When the interest on the first cost, repairs, labour of horses, and hands attending, is calculated, it will be found that the cost of threshing by hand would not be much more, except on most extensive arable farms. Portable threshing machines would, I am convinced, cost the farmer more labour and expense in moving them from one place to another, erecting them, and taking them down, than to thresh his grain with the flail. To carry grain to a threshing mill off the farmer's premises, is wasteful and expensive. There are some hand threshing machines worked by two men and a woman, that completely separate the grain from the straw, but do not save human labour.

The hand machines used in agriculture in Canada are few in number compared with those used in England. The scythe, cradle-scythe, reaping-hook or sickle, smooth reaping-hook or scythe-hook, the hay-knife, wool-shears, the bill-hook, axe, hay-fork, dung-fork, spade, shovel, hand pick, turnip-hoe, potatoe-hoe, weed-hoe, thistle extirpator, dung-drag, mattock, grubber, wheel-barrow, hand-barrow, winnowing machine and chaff cutter, are the principal hand implements and machines necessary, and are all to be had in the country, though not of the best quality in every instance, particularly spades of all sorts and sizes, are very inferior implements for the farmer ; they are made of bad materials, not of good shape, and too short in the handle by at least six inches. I have seen spades brought out here from Gloucestershire by farmers, that were of the most excellent quality and make, of any I have ever met with.

The Flemish spade, is strongly recommended ; it has a long handle, but no tread for the foot of the operator. The long handle forming a very powerful lever, when the soil is easily penetrated it may be dug with greater ease with the spade than with any of the forms in common use, and carts may be filled, and earth thrown to a greater distance by this implement for the same reason. Add to this, that in no manner of using the spade, is the operator required to stoop so much as with the English one.

The Irish shovel is a very good implement for cleaning drains and some other purposes, but is unhandy to persons not accustomed to its use.

The mattock or grubber, is formed partly like the pick-axe, with this difference, that the ends are wedge shaped in reverse positions. These ends should be made of the best iron and steel, one end shaped like an axe, and the other like an adze. They are the best tools for digging up roots of trees, particularly where there are not many stones, of any I have ever seen in use. A man can do more with this tool, if he is accustomed to its use, in taking out roots of trees, than two men could do with axes. I have proved this by experience. The tool requires to be well made, and from six to nine pounds weight ; the handle from 30 to 36 inches long.

Useful machines are never intricate and complicated, nor should they be expensive. The following rules should be observed in purchasing agricultural implements :—They should be simple in their construction, both that their uses may be more easily understood, and that any common workman may be able to repair them when they get out of order ; the materials should be of a durable nature, that the labour may be less liable to interruption from their accidental failure ; their form should be firm and compact, that they may not be injured by jolts and shaking, and that they may be more safely worked by country labourers, who are but little accustomed to the use of delicate tools. In the larger machines, symmetry and lightness of shape ought to be particularly attended to, for a heavy carriage, like a great horse, is worn out by its own weight, nearly as much as by what he carries. The wood should be cut up and placed in a position the best calculated to resist pressure ; and mortises, so likely to weaken the wood, should, as much as possible be avoided. At the same time, implements should be made as light as is consistent with the strength that is necessary. Their price should be such, that farmers in moderate circumstances, can afford to buy them ; yet, for the sake of a low price, the judicious farmer will not purchase articles either of a flimsy fabric, or a faulty form, and implements ought to be suited to the nature of the country, whether hilly or level, and more especially to the quality of the soil ; for those which are calculated for light land, will not answer equally well in soils that are heavy and adhesive. The heavy wheel carriages of England, are very unfit for the soft bad roads of Canada ; and all hand implements ought to be as light as is consistent with the strength necessary for the work to be executed, that the workman may not be fatigued by the weight of a heavy implement in executing his work.

SUBDIVIDING AND FENCING FARMS.

Fencing, next to implements and suitable buildings, is in most situations indispensable to the profitable management of arable land. On all arable farms, on which cattle and sheep are pastured, the ease, security, and comfort, which good fences give, both to the owner and to the animals themselves, are too evident to require particular notice.

The situation of fences on a farm depends upon a great variety of circumstances, as the extent of the farm, the inequalities of surface, the nature of the soil, and on the course of husbandry to be followed.

The farms in Lower-Canada are generally of a uniform oblong shape, seldom less than a mile in length, or more than 200 yards in width. For a farm of an hundred arpents, Canadian farmers have almost invariably divided the cultivated part of each farm by a fence, through the middle from one extremity to the other, making each division about the square of one arpent and a half in width, the road of communication to the different parts of the farm and pasture, being along this dividing fence. The first change I would propose as to fencing would be, that *in every case* where the farms would not exceed four or even five acres in width, the middle fence should be removed to the one side or other, and the road of communication to the different fields, and waste lands, if there are any, enclosed by this fence on the one side of every farm.

The rotation that may adopted, should be the rule for dividing a farm into fields. A farm of superior soil, or even of moderate quality, might be divided into six fields, of nearly equal size, if circumstances will admit of doing so advantageously ; but on some farms where the lands are not of the same quality, and where they are broken by portions unfit for cultivation, it would be well to separate each quality, particularly any part unfit for cultivation, and incapable of profitable improvement, should be fenced off for pasture, if of an extent to make it worth while to do so. If, in regularly dividing the arable land of a farm, an acre or two of a different or inferior soil, should happen to mingle in the same field, it might be readily improved, at a slack time of the year. If such spots be of a light quality, some of the strong soil contiguous, could be carted on it, and if the prevailing soil of the field be light, the plan may be reversed. When small portions of an enclosure are low, the cleaning of drains, or other earth, might be carted on it, in many cases, at an expense that would be repaid by one crop ; but I would by no means recommend the expenditure of *one shilling* in the improvement of lands, where there is any doubt of the expense being refunded.

On farms of a light quality of soil, the cultivatible land should be divided into nine fields of equal size, subject to the same exceptions as those above explained. Two or three small enclosures would be necessary near the farm buildings for calves, pigs, &c. These fields might, in the first instance, be separated by open ditches for carrying off the surface water ; and if there were cedar posts or pickets permanently fixed in each cross line of fence, the rails might be removed wherever required, with very little trouble. It would seldom be necessary to keep up more than two or three cross fences in summer, as I shall hereafter explain. On the first proposed division of a farm into six fields, three would be under grain and green crops, and if necessary, a part in summer fallow, the other three fields would be in meadow and pasture. On the second division of nine fields, three would be under grain and green crops, and perhaps a part in summer fallow, and six fields in meadow and pasture. In each case adhering strictly to the principle of rotation of crops, and convertible husbandry. This division of farms would answer for Upper-Canada.

The live hedge fence of England, is a great improvement to the appearance of that country, and is the best sort of fence that could be adopted there. Whether it would be equally well adapted to this country, is a matter on which there is some difference of opinion. I have very little doubt that hedges might be successfully cultivated here, and become good fences in half the time which they take to come to perfection in England. The native thorn here is very suitable for fences, and there are so many other kinds of trees or shrubs that might be mixed with the thorn, that there could be no difficulty of rearing good fences in most situations ; and the rapid growth of these kinds of plants, in this climate, would be very favourable to the introduction of live hedge fences. They might be planted alongside the present rail fences on the level of the soil, not raised over it, and when sufficiently grown, the rail fences could be removed. The principal objection that I see to these fences, would be the danger of their preventing a free current of air to grain crops, and producing too much shade ; but these injurious effects might be prevented by keeping the hedges trimmed constantly to the height of about four feet. This trimming would also prevent the snow from breaking them down so much as it otherwise would. I have seen very fine hedges in the neighbourhood of Quebec, and they did not appear to suffer from snow or any other cause. Trimming hedges *annually*, would not cost more than repairing fences of wood, and it will be necessary, at no distant period, to find a substitute for wood fences. Live hedge fences would be a great improvement to the appearance of this country, if they would not produce any injurious effect on corn crops, in the hot, moist weather we occasionally have in summer. In order that hedges may grow luxuriantly, and soon become fences, it will be necessary to prepare the ground on which the plants are to grow, previously to their being planted. This will be best effected by ploughing or digging deeply, the proposed line of fence, manuring it if necessary, and planting on it a drill of potatoes. After the potatoes are taken out in the latter end of September, will be the best time to plant the hedge ; and if wild lands be convenient, there can be no want of plants that will form a good hedge, though they may not be all thorn. If hedge fences should be found to succeed well, thorn plants may be produced from seed, as in England, to supply the demand, at a cheaper rate than taking up wild thorns.

Stone fences might be constructed profitably where the materials are often to be found encumbering the land ; but they cannot in this country be so constructed as to be a good fence against sheep, without incurring a heavy expense, in sinking a deep foundation, as a security against the influence of the frost, and raising the wall to a considerable height. If stone fences are constructed in the usual way, broad at the foundation and tapering to the top, scarcely ever exceeding four feet in height, sheep will run over such walls without any difficulty whatever. A light paling on the top of this description of stone fence, where sheep are kept, would answer a good purpose, and if well executed, would have a handsome appearance. On all new lands where wood is in abundance, the farmer or settler will have ample materials for the construction of fences.

DRAINING.

Of all operations in agriculture, none is more necessary than draining, and to practice this operation successfully, it is necessary for the farmer to have a proper knowledge of the various strata near the surface of the land which requires draining. Oozing springs, bogs, swamps, or morasses, on level ground near elevated lands, are the most difficult to drain. When the water filters or slides down the porous sides of high grounds, the best method of draining is that of intercepting the descent of the water or spring, and thereby totally remove the cause of wetness. This may be done where the depth of the superficial strata, and consequently of the spring, is not great, by making horizontal drains across the declivities of the hills, above where the low grounds of the valleys begin to form, and connecting these with others made for the purpose of conveying the water thus collected into the brooks that may be near.

In Ireland, I have often seen on thin layers of clay, which had underneath them sand, stone, or other porous or fissured strata, to a considerable depth, that by perforating the thin layers of clay in different places, the water could be let down into the open porous materials that lay below them, and the surface land be thus completely drained.

The general origin of the wetness of land which it is the object of under-draining to remove, will be found to be the existence of water in sub-strata of sand, gravel, open rock, or other porous substances, which either lead to the surface, or having no natural outlet, become filled or saturated, while the pressure of more water coming from a higher source, forces that which is in the lower part of the stratum upwards through the superior strata to the surface ; thus occasioning either bursts and springs, or a general oozing through the soil. Any farmer who does not perfectly understand the general oozing of water through the soil, from water or moisture, in the immediate vicinity, naturally or artificially kept on a higher or equal level, may be convinced of the fact by the clearest demonstration if he has an opportunity of viewing a canal that may be so situated, and whose banks have not been secured by puddling, or the leakage through the embankment intercepted by proper and sufficient drains.

The object of under-draining therefore, is not to catch the surface water, but that which flows through the inferior strata ; and, for this purpose it is necessary to make a sufficient channel, either at the lower part of the porous stratum, or in such part of it as may conveniently carry off the water, so as the pressure referred to may be relieved, or the water intercepted before it reaches the surface. It must always be kept in mind, then, that under-draining and surface-draining are operations essentially distinct, and every care must be used in practice not to blend them in the execution. If surface water be allowed to get into a covered drain, the sand and mud which it will carry into these subterraneous channels will soon choke them up, and occasion bursts, creating, as may be conceived, new swamps ; while the expense of taking up and relaying the under drains will be very great, and the execution imperfect, the sides being found never to stand a second time so well as when first formed.

In the drainage of wet or boggy grounds, arising from springs of water beneath them, a great variety of circumstances are necessary to be kept in view. Lands of this description, or such as are of a marshy and boggy nature, from the detention of water beneath the spungy surface materials of which they are composed, and its being absorbed and forced up into them, are constantly kept in such state of wetness, as are highly improper for the purpose of producing advantageous crops of any kind. These tracts, if properly reclaimed, would be of considerable value in the climate of Canada, and should, therefore, be an object of great interest and importance to the industrious farmer who might have such lands. Wet grounds of these kinds, may be arranged under three distinct heads : first, such as may be readily known by the springs rising out of the adjacent more elevated ground, in an exact or regular line along the higher side of the wet surface ; second, those in which the numerous springs that show themselves are not kept to any exact or regular line of direction along the higher or more elevated parts of the land, but break forth promiscuously throughout the whole surface, and particularly towards the inferior parts, constituting shaking quags in every direction, that have an elastic feel under the feet, on which the lightest animals can scarcely tread without danger, and which, for the most part, show themselves by the luxuriance and verdure of the grass about them ; that sort of wet land, from the oozing of springs, which is neither of such great extent, nor in the nature of the soil so peaty as the other two, and to which the term bog cannot be strictly applied, but which, in respect to the modes of draining, is the same.

When on the declivity or slanting surface of the elevated ground from which the springs break forth, they are observed to burst out at different levels, according to the difference of the wetness of the season, and where those that are the lowest down continue to run, while the higher ones are dry, it is in general, a certain indication that the whole are connected, and proceed from the same source, and consequently that the line of drain should be made along the level of the lowermost one, which if properly executed may keep all the rest dry. But if the drain were made along the highest of the outlets, or place where the water breaks forth, without being sufficiently deep to reach the level of those below, the overflowing of the springs would merely be carried away, and the wetness proceeding from that cause be removed, while the main spring still continuing to run, would render the land below the level of the bottom of the drain, still prejudicially wet, from its discharging itself lower down below the surface of the ground. It is absurd to expect that by cutting drains between the wet and dry grounds where the highest springs show themselves, will take away the whole of the water from the land below unless they are cut of sufficient depth to command the level of the land tc the bottom of the declivity.

In swamps that are extensive and wet, other drains or cuts than such as convey off the springs must be made ; as, notwithstanding the higher springs which chiefly cause the wetness, may be intercepted, there may be lower veins of sand, gravel, or other porous materials, from which the water must likewise be drawn off. In cases of this nature, when the land is to be divided into enclosures, the ditches may be formed into such directions as to pass through and carry off collections of water of this kind as well as those that may be retained in the hollows and depressions on the surface of the land. There are in many places very extensive tracts of ground that are rendered very wet, and become full of flags and other coarse plants, from causes of such a nature as cannot be obviated by the making either open or covered drains, however numerous they may be.

Lands in this situation are frequently termed swamps, and mostly lie on the sides of such rivers and brooks as, from the frequency of their changing and altering their courses between their opposite banks, leave depositions of sand, gravel, and other porous materials, by which land is formed, that readily admit the water to filtrate and pass through it to the level of the last formed channels, and which preserves it constantly in such a state of moisture and wetness, as to render it productive of nothing but flags and other plants ; and if a pit or ditch be made in lands under these circumstances, it quickly fills with water to the same level as that in the water course. This effect is, however, more liable to be produced, as well as more complete, where the current of the water is slow, and its surface nearly equal with that of the land, than where its descent is rapid. Under such circumstances, while the river or brook remains at the ordinary height, no advantage can be gained, whatever number of drains be formed, or in whatever direction they may be made. The chief or only means of removing the wetness of land proceeding from this cause is, that of enlarging and sinking the bed of the stream, where it can be effected at a reasonable expense; where there is only one stream, and it is very winding or serpentine in its course, much may, however, be effected by cutting through the different points of land, and rendering the course more straight, and thereby less liable to obstruct the passage of the water.

A case of straightening the course of a river is given in The Code of Agriculture. The waters which, in their crooked course were almost stagnated, now run at the ordinary rate of the declivity given them. They never overflow their banks. Cattle can now pasture upon those grounds which formerly have been swamped. The surface of the water being now in general four, and sometimes six feet below that of the adjacent fields, this cut serves as a general drain to the whole valley, so that three hundred acres of meadow may be converted into arable land; sixty acres of moss may be improved into meadow, and five hundred acres of arable land are rendered of double their former value.

FORMATION OF DRAINS.

Drains should be formed with as much truth and exactness as possible, and unless labourers are dexterous in using their tools, and in the habit of making drains, they will not make them well.

Open drains are the most suitable for Canada in general. The large quantity of water that has to be disposed of at the melting of the snow in spring, could not be got rid of by means of covered drains, however well made; they would continue frozen, and the soil over them frozen long after the melted snow water should be run off the land. In heavy rains in summer, covered drains would be inadequate to carry off the water in time to prevent injury to the crops. There is considerable risk in covered drains becoming choked, or filled up, if surface water can get into them, thence it will be very unsafe for the farmer to construct covered drains for any other purpose but that of draining springs, and even in that case, unless they are properly made and abundantly filled with small stones, the frost will very probably injure them. Covered drains require double as much fall as open drains to cause them to run; and from the level surface of this country, this circumstance is of great consequence. The very same circumstance prevents in a great measure the necessity of covered drains, because in a level country, natural springs do not abound.

When a farmer, on due consideration, has determined on constructing covered drains, if there is sufficient fall, the drain should be at least from three to four feet deep, in the most shallow part, in order to be as much as possible out of the influence of the frost. The drain should be from two to three feet wide at the bottom, and from three to four feet wide at the top. The turf should be cut off, laying it upside down on one side of drain, and the earth cast out on the other. The drain should be well built with dry stone, all laid on the proper bed, (and not set up edgeways,) from nine to twelve inches thick, by six or eight inches high, forming an aperture of six, by six or eight inches, the covering stones of which must be sufficiently strong to sustain the pressure of the incumbent weight of stone and earth, and should project at least three inches over the inside of each side-wall ; two feet of stone, or more, should be well packed above the cover of the aperture. The first foot of stone above the cover may be put into the drains of from three to four pounds weight, but the upper part should be broken as small as common road metal, and should be made quite smooth or level, so that every part of the drains may have an equal depth or thickness of stone. The turf sod first taken off should then be put on the stones, the grass side downwards, and if there is no turf, a thin covering of straw should be laid on the top of the stones, to prevent the loose earth from falling through the aperture of the drains. The drains may then be filled with earth, nine inches above the natural level of the surface of the ground, to allow for sinking. I have constructed a drain on the above plan, but of larger dimensions, and it has continued to act perfectly well for three years past. If the farmer is anxious that the labour and expense of such drains shall not be ineffectually expended, he will *personally* attend to the building of the walls, covering of the aperture, and packing with small stones. In case the bottom of the drain is soft, it would be necessary to lay a thin flag on the bottom, to extend on each side an inch or two under the side walls. A drain of this description will be expensive ; but if not properly constructed, it will be worse than useless ; and those who will not incur the expense of making covered drains well, should be content with open drains.

Draining with tiles is much practised in England, but I would not recommend it here. The most effectual method of constructing covered drains, will be with abundance of small stone, filled in over the aperture in the bottom of the drain, whatever size it may be.

Open drains should be carefully made, with sloping sides. In this climate they can scarcely be too much sloped. A drain two feet deep should be at least four feet wide at the top, and the width of the shovel at the bottom. A drain three feet deep, should be six feet, and in some soils seven feet wide at the top, and only one foot wide at the bottom ; and the same proportion may be observed in drains of larger dimensions. When drains are necessary in the middle of fields, (indeed in most situations,) they might be hollowed out, and the earth carted off to low spots, or spread on the surface of the field ; the plough might then cross such drains without difficulty, and they would be more effectual in carrying off water from the furrows of the ploughed land, than when formed in any other way ; they would look well, and grass might grow upon them on each side to the bottom, and there would be no danger of their filling up from the sides falling in. The drains on most farms require improvement. The earth taken out of them is suffered to accumulate on the banks of the drain, and hence the edge of the drain being higher, when it ought to be lower, than any part of the field, prevents the water falling into the drain, and is the main cause of the sides of the drain falling in.

The earth that has accumulated in this way, would repay the farmer amply for carting it out on his farm, filling up hollows, or mixing it with compost. On most farms in Canada, this improvement is necessary, and the earth so cut away, as well as all high head ridges, if mixed with a little lime, and turned over with a spade once or twice, would make a rich compost for top-dressing the adjoining lands. The sloping of the sides of main drains, and open ditches has, with few exceptions, been greatly neglected in Canada, as well as removing high head ridges in almost every field, occasioned by the repeated use of the plough. These sources would afford the means of enriching the adjoining land at a very inconsiderable expense, and would be a great improvement to the drains, and the fields for future culture.

The late Mr. Nimmo, in an excellent paper on draining, gives the following data on the subject of the relative inclination of streams to insure the discharge of their waters :

" Large and deep rivers run sufficiently swift with a fall of about one foot per mile, or - - - - - - 1 in 5000

Smaller rivers and brooks run sufficiently swift with a fall of about two feet per mile, or - - - - 1 in 2500

Small brooks hardly keep an open course under four feet per mile, or - - - - - - 1 in 1200

Ditches or covered drains, require at least eight feet per mile, or - - - - - - 1 in 600

Furrows of ridges, and filled drains require much more."

I believe this estimate will be found correct in practice.

PLOUGHING AND HARROWING.

Three different points require particular attention in ploughing ; first, the breadth of the slice to be cut ; second, its depth ; and third, the degree in which it is to be turned over ; which last circumstance depends both upon the construction of the plough, particularly the mould board, and the care of the ploughman.

The breadth and depth of the furrow slices are, in swing ploughs, regulated by judiciously placing the draught on the nozzle or bridle of the plough, setting it to go more or less deep, and to take more or less land or breadth of slice, according as may be desired. In wheel ploughs of proper construction, the depth of the furrow is regulated by the wheels ; and the breadth of the slice is determined by a rack or muzzle of much the same shape as that of a swing plough. In this last most necessary appendage, the Canadian wheel ploughs are deficient, which is a great cause of the irregularity in the breadth of the furrow slice, and requires to be remedied.

The degree to which the furrow slice is turned over, is in a great measure determined by the proportion between the breadth and depth, which for general purposes is usually as three is to two ; or when the furrow is nine inches broad, it should be six inches in depth. When the slice is cut in this proportion, it will be nearly half turned over, or recline at an angle of forty or forty-five degrees. This is the most approved proportion for the furrow slice. But if the slice is much broader in proportion to its depth, it will be almost completely overturned or left nearly flat, with its original surface downwards, and each successive slice will be somewhat overlapped by that which was turned down immediately before it. And, finally, when the depth materially exceeds the width, each furrow slice will fall over on its side, leaving all the original surface bare, and only laid somewhat obliquely to the horizon. These two last proportions are inconsistent with good ploughing, or preparation for a crop.

The furrow slice five inches in depth, and eight or nine inches wide, was considered in the British Isles to answer well for breaking up lays, because it covered up the grass turf, and did not bury the manured soil. Ploughing with a depth of furrow exceeding the width, is considered an unprofitable and slow operation.

The most generally useful breadth of a furrow slice is from eight to ten inches, and the depth from five to seven inches, which it cannot often exceed, except in very thick and fertile soils. When it is found necessary to go deeper, as for carrots or other deep-rooted plants, a trench ploughing may be given by means of a second plough following in the same furrow.

In first ploughing for summer fallows, or green crops, it is adviseable to work as deep as possible ; no great danger is to be apprehended, though a small portion of the sub-soil be at that time brought to the surface, particularly in Canada.

The furrow slices are generally distributed into beds varying in breadth according to circumstances; these are called ridges, and are divided from one another by open furrows. Ridges are not only different in breadth, but are raised more or less in the middle, on different soils. On clayey or retentive soils, the great point to be attended to is, the discharge of superfluous water. On such soils, I would most strongly recommend that the ridges should never exceed eight or nine feet wide at most, and perhaps this width will be found most profitable for all kinds of soils. I never have them wider. It is most essential to have the ridges straight and of uniform breadth, and this necessary improvement should be universally adopted in Canada, if improvement is desirable. No less necessary is it that, in preparing land for a crop, particularly in lands ploughed in the fall for a spring crop, the gutters or open furrows between the ridges should be properly cleared out with the plough, after the ridges are finished, and that each of these furrows should open into the furrow of the head ridge, at each end of the field.

In the British Isles, clayey or tenacious soils, if ploughed when in a wet state, are very much injured. In this country, though clayey soils should be ploughed in a wet state in the fall, if the ridges are properly formed, well raised in the centre, and the furrows well cleaned out, the frost will most effectually pulverize the soil and do away any ill effects of ploughing the land even when very moist In spring, however, clayey or tenacious soils should not be ploughed when wet, particularly if a crop is to be sown without a second ploughing. Clayey soil will plough best when in that state, indicated by the phrase, " between the wet and the dry," while the ground is slightly moist, mellow, and the least cohesive.

The construction of the ridges, particularly in clayey soils, so that they may accord with the declivity, is a matter which must be carefully kept in view. They should in all such cases have a degree of elevation or roundness in the middle, sufficient to afford the water a ready fall into the furrows, which likewise should have such a depth and fall as may take it quickly into the drains. The ridges, besides being well laid up, should have small open drains, formed in a slanting direction across them, in such a manner as to form communications with one another, and with the furrows, by which means they are made to perform the office of draining, the water coming upon the ridges being thus readily conveyed into the furrows along which it proceeds till impeded in its course by the rising of the ground or other causes ; it then passes through the open cross drains into others where the descent is greater, and is ultimately conveyed off into the ditch, or other passage, at the bottom of the enclosure.

The distinguished success of the Flemish husbandry is well known. Soils of tenacious clay they manage most successfully, chiefly by preserving it in a due degree of dryness for the most valuable purposes of agriculture. Their general mode of drying land consists of ploughing it up in high broad ridges, from twenty to thirty, and even forty, feet wide, with the centre or crown three or four feet higher than the furrows. By attentively preserving the furrows in good order, and free from stagnating water, the land is kept in a dry state, and all kinds of crops flourish. This practice is followed in some of the central counties in England.

Farmers should carefully attend to the drains and water furrows of their ploughed land in the fall, that they should be well cleared out, that in spring, when the snow melts, the water may freely pass off without any obstruction. The spring sowing of wheat may mainly depend on the furrows and drains being in good order in the fall. This is more necessary here, in consequence of the short spring; the loss of a very few days in the commencement of the season, may prevent the farmer from sowing wheat.

The season for commencing fall ploughing should be *the first day it is fit for ploughing*, and continue without interruption until all is finished, if possible. The farmer who, by industry and attention to his business, gets all his ploughing finished in the fall, will be much better able to have his work properly executed in spring. Indolence and neglect is often the cause of farmers not finishing their ploughing in the fall, and when this is the case, slovenly, and imperfect culture in spring is sure to be the consequence, because the work of two seasons has to be executed in one, and that one perhaps not favourable ; all must, therefore, be hurry and confusion.

On strong lands, that two good horses are able to plough, a pair of such horses ought to plough three quarters of an acre *well* in nine hours ; on the same land, after the first ploughing, or on friable, and on light soils, one acre, or an acre and a quarter, is a common day's work. Throughout the ploughing season, an acre a day may be considered a full average on soils of medium consistency. These calculations are all made on the supposition that land is cleared from all obstructions that would retard the ploughing, and do not apply to land encumbered with stones or roots of trees. The whole series of furrows on an English statute acre, supposing each furrow slice to be nine inches broad, would extend to 19,360 yards; and adding 12 yards to every 220, for the ground travelled over in turning, the whole work of an acre may be estimated at 20,416 yards, or 11 miles and nearly 5 furlongs.

The following has been ascertained to be the quantity of land actually ploughed, and the ground gone over by a team, in nine hours, walking at the different rates per hour, and turning the different furrow slices as specified.

		At 1½ miles per hour.			At 2 miles per hour.		
					A.	R.	P.
Breadth of the furrow slice,	8 inches,	0	3	36	1	1	7
	9 do.	1	0	14	1	1	33
	10 do.	1	0	35	1	2	21
	11 do.	1	1	14	1	3	5

The distance travelled in each instance was, at the slow pace, within a fraction of 12, and in the quicker, 16 miles; thus it appears that in the first three instances, the additional quantity of land ploughed was about one-third, or in nearly equal proportion to the increase of pace; but that upon the 11 inch furrow, the additional quantity amounted to nearly the half.

Farmers ought to be aware that great attention is necessary to have land properly ploughed. It is a waste of land and labour, when this operation is not executed judiciously. A given quantity of land may be *turned over* with the plough, but unless the ridges are properly formed, and the furrow slice in due proportion, turned over so as to lean one upon the other, regularly, without having any interval or hollow between, land will not be in a state to produce profitable crops. When the furrow slice is completely upside down, and lies flat, the seed cannot be regularly covered; much of it will fall between the furrows to the subsoil, the most unfit place for it to vegetate and take root. It will be more profitable for a farmer to plough five acres well, than ten acres imperfectly.

The operation of harrowing is intended both to drag out weeds, and cover the seeds when sown. It is obvious that implements of different sizes are not only necessary, but even these implements should be worked in different ways, according to the strength and condition of the soil on which they are employed, and the nature of the work to be executed. On rough soils, harrows ought to be driven as fast as the horses can walk, because their effect is in direct proportion to the degree of velocity with which they are driven. In harrowing for covering the seed, the harrow-man's attention should be constantly directed to keep the harrow clear of any impediment, from stones, lumps of earth, or clods, grass or roots, for any of these prevent the implement from working with perfection, and cause a mark or trail upon the surface, always unpleasing to the eye, and generally detrimental to the vegetation of the seed. In the finishing part of the process, the harrow should be drawn in a straight line, without suffering the horses to go in a zigzag manner, and also that the horses enter fairly upon the ridge, without making a curve at the outset. Too much harrowing is not good, but it is always necessary to break the furrow, and level the surface, otherwise the operation is imperfectly performed.

ROTATION OF CROPS SUITABLE TO THE DIFFERENT DESCRIPTIONS OF SOIL.

The distribution of crops, and plan of their succession, is one of the first subjects to which all farmers require to direct their attention. Whatever little regard has been hitherto paid by farmers to a proper rotation of crops in Canada, it is now a point on which their profits depend more than on any other. The kind of crops to be raised, are determined in a great measure by the climate, soil, market, and demand.

It has been found by experience, that besides the general exhaustion of humus, or vegetable food produced by vegetation, especially those plants which bear farinacious seed, each kind of crop has a specific effect upon the soil, so that no care or manure, can make the same ground produce equal crops, of the same kind of grain, for any length of time without the intervention of other crops. Whether this be owing to any peculiar nourishment necessary to each particular kind of plants, or because plants not indigenous degenerate in a foreign soil, the fact is certain with respect to most crops usually raised. This points out the advantage of varying the crops, according as they are found to succeed best after each other. In general, all kinds of grain succeed best after a crop which has been cut before the seed has ripened, or the stem is dried up. Those plants which have a naked stem with few leaves, thrive best after leguminous plants, which have more succulent stems, and which bear their seeds in pods, as peas, beans, tares, or vetches, or after succulent roots, which strike deep into the ground, as carrots, parsnips, beet roots, and even potatoes. From this circumstance, confirmed by universal experience, the different systems of rotation have had their origin, taking the nature of the soil into consideration.

In the British Isles, where farmers have to pay heavy rents on short leases, there might be some excuse or justification for farmers deteriorating the lands by severe cropping; but here no such necessity exists, and consequently no such justification. Farmers are proprietors, and if they exhaust the soil by tillage beyond the point consistent with good management, they will be sure to pay dearly in the end for every crop forced from the land unreasonably. A farmer who is a proprietor, cultivating his own land with skill and experience, if he understands the quality of his soil, and state of his fields, will know what crops are most likely to grow well in each; he will know what is most in request, both for his own use, and in the market, and he will act accordingly. But if he allows his land to be impoverished for want of rest or manure, or to run wild with weeds, he does not exercise the experience, judgment or activity, necessary to make his profession and pursuits profitable, whatever his skill or experience may be.

The system of rotations is adapted for every soil, though no particular rotation can be given for any one soil which will answer in all cases. In some situations much depends on the kind of produce for which there is the greatest market demand; indeed, this will influence rotations di-

directly or indirectly, in every situation. But whatever the system of rotation that is followed, if the several processes of labour which belong to it are properly executed, land will rarely get into a foul or exhausted state, or at least, if foul or exhausted under a judicious rotation, matters will be much worse when any other system is followed.

The particular crops which enter into a system of rotation must be such as are suited to the soil and climate, varied by local circumstances, such as the proximity to towns, where there is generally a demand for potatoes, carrots, turnips, hay, &c. In a thinly peopled district, peas, beans, tares, flax, summer fallow, clover, and timothy might be interposed between corn crops on clay soils, and potatoes, carrots, Indian corn, clover and timothy, on dry loams and sands. A variety of plants, such as peas, tares, flax, Indian corn and carrots, might occupy a part of that division of a farm which is allotted to green crops, and on good lands, well managed, these plants might be grown to prepare the soil for wheat without perhaps resorting to summer fallow, except very rarely.

A farm of strong, rich soil, divided into six fields or enclosures, might have half the farm under different species of cereal grasses, or grain crops, peas, beans, tares, roots, or plain fallow; the other half under cultivated herbage, meadow and pasture. The rotation and distribution of crops might be the following:

One field or division, equal to one-sixth of the arable land, to be under wheat certainly, if the soil is suitable, if not, barley or oats should be substituted. The wheat is to succeed green crops, or summer fallow, and the land, with this crop, or any other crop substituted for it, to be seeded down *invariably* with clover and timothy, or other grass seeds. Second field, or one-sixth, ploughed in the previous fall, after pasture, to be in peas and oats, or perhaps all oats. Third field, or one-sixth, (following after oats and peas the year before,) to be manured with beans, peas, potatoes, carrots and flax; and should the farmer be unable to find manure for the whole division, he may fallow the remainder, or sow tares, or some other green crop that he might plough in as manure if necessary. This last division will be prepared for wheat or barley the ensuing spring, and be seeded down with whatever crop is sowed. The other half of the arable land comprising three fields or divisions, should be in meadow or pasture. One field or division, equal to one-sixth of the whole, coming annually into tillage, to replace the division seed down yearly with the crop of wheat or barley as before stated.

On farms of light or sandy soils, divided into nine fields or enclosures, the tillage should not exceed one-third of the arable land, or three fields in tillage, and six in meadow or pasture. By this rotation, the land would be under grass six years out of nine, instead of three out of six, as in the first rotation, the management and course of cropping for the part in tillage, to be the same as that laid down for the rich, or clay soil, varying the distribution of crops to suit the quality of the soil, and introducing Indian corn in this rotation.

It may be expedient to vary from these rotations. The experienced farmer will understand when and in what manner it will be prudent to do so. I believe, however, that the more nearly the rotation adopted in Canada, is conformable to these general rules, the more certain will be the *profitable* improvement of agriculture. This system of convertible husbandry, is the most suitable to the present circumstances of this province, and of British America. Under this course of husbandry, the lands would be constantly in good heart, capable of producing abundant and excellent crops, and though the largest portion may be under cultivated herbage and grass, I am well convinced the gross produce of the land, and the farmer's profit, may be augmented two or three fold, if the produce be judiciously applied, and the rearing and feeding of cattle, for the dairy and the shambles extensively introduced. Peas, beans, tares and roots, may be raised in this rotation in great abundance, for feeding cattle and hogs, and a greater quantity, and better quality of grain produced in one year, than under the present system of farming can be produced in two.

No food, no cattle ; no cattle, no dung ; no dung, no corn, is a maxim that ought to be fixed in every farmer's mind.

In a report of select farms in England, one in Cumberland, of excellent soil has adopted the following rotation : On clay soils of the best description, first year, summer fallow, sometimes green crop ; in either case, the land thoroughly cleaned, limed, and manured. Second year, wheat, with grass seeds for pasture. Third and fourth years, pasture. Fifth year, pasture, top dressed with lime or compost. Sixth and seventh years, pasture, and ploughed in the fall for oats the succeeding spring, to be followed by summer fallow, or green crop.

On gravelly soils : First year, green crops, well manured. Second year, barley, with grass seeds. Third and fourth years, pastured. Fifth year, pastured, and top dressed with compost. Sixth, seventh, and eighth years, pastured. Ninth year, oats, out of lay, and the rotation begins again.

It is no wonder that land managed in this way should be constantly in the best condition, producing from 34 to 38 imperial bushels of wheat to the acre, on an average of favourable years ; and I am well persuaded this kind of rotation is more profitable in every way than the scourging one of constant cropping, however well ploughed or manured the soil may be.

Not to repeat the same kind of crop at too short intervals, is a rule with regard the succession of crops, that ought to be strictly observed. Whatever may be the cause, whether it is to be sought for in the nature of the soil or of the plants themselves, experience clearly proves the advantage of introducing a diversity of species into every course of cropping. On new land, or land that has been pastured several years, before it is again brought under the plough, there may be less need of adhering steadily to this rule ; but the degeneracy of wheat, and other corn crops recurring upon the same land every second year for a long period, has been generally acknowledged.

Wheat it is supposed cannot be grown in perfection, on an average, more frequently than once in every five years on the same land. Beans, peas, potatoes, carrots and red clover, that may be called green crops, become less productive, and much more liable to disease, when they come into the course, upon the same land, every second, third, or fourth year. What the interval *ought* to be has not yet been ascertained, and from the great number of years that the experiments must be continued, to give any certain result, probably cannot be determined until the component parts of soils, particularly the sort of nourishment which each species of plant extracts from the soil, have been more fully investigated. All good farmers will, however, avoid overcropping, or treating land in any way so as to exhaust its powers, as the greatest of all evils.

SUMMER FALLOW.

The practice of fallowing lands has been objected to by many eminent agriculturists as unnecessary, and not conferring any benefit proportioned to the loss of one season. But after all the arguments against it have now spent their force, the practice in England does not appear to give way, but rather to extend. The most reasonable argument that has been used against the practice is, that green crops, particularly turnips, might be substituted for fallow, be as good a preparation for wheat, and pay a rent, and all the expenses of cultivation. However true this may be as regards England, with a dense population, and climate favourable for turnips, it cannot be equally applicable to Canada. Turnips are a very uncertain crop here, and the market for vegetables is very confined. There is no encouragement for their cultivation except for feeding cattle, and in the immediate neighbourhood of a few towns; therefore they cannot in all cases properly prevent the necessity of summer fallows.

Indeed I do not know how the fertility of the land can now be restored, so as to produce profitable crops without the aid of summer fallow. It is necessary in most cases to put the lands through a course of tillage to lay them down properly with grass seeds for pasture; and a sufficient quantity of manure cannot be obtained to do this as it ought to be, without summer fallowing to a great extent. This climate is most favourable for the operation, when the farmer is active and industrious, and endeavors to perform the work of each season within the season allotted for it, and not allow the different operations to encroach upon each other. A farm worn out, and exhausted by neglect and severe cropping, cannot in most situations be so speedily or cheaply restored to a moderate state of fertility, as by summer fallowing, *properly* executed.

A proper fallow should invariably be ploughed in the fall as soon after harvest as possible. This ploughing should be as deep as the soil will admit of, and should the soil not be more than six or eight inches deep, a little of the sub-soil might be brought up. This both tends to deepen the cultivated soil, as the fresh accession of hitherto uncultivated earth becomes afterwards incorporated with the former soil, and greatly facilitates the separation of the roots of weeds during the ensuing fallow process, by detaching them completely from any connection with the fast sub-soil. This fall ploughing promotes the rotting of stubble and weeds. In giving this fall ploughing, the ridges should be gathered, and well raised so as to be kept dry, and exposed to the influence of the frost. After the fields are ploughed, all enter furrows, and those of the head lands, should be carefully opened up by the plough, and afterwards gone over effectually by a labourer with a spade, to remove all obstructions, and to open up the water furrows into the fence ditches, wherever that seems necessary, that all moisture may have a ready exit. If there should be any hollows, oblique furrows should be drawn with the plough, and where they intersect the other furrows, carefully opened with the spade. Wherever it may appear necessary, cross cuts should be made through the head ridges into the ditches with the spade, and every possible attention exerted, that no water may stagnate in any part of the field. This draining management will be equally necessary to be observed the second fall, when the fallow is prepared, and left ploughed into ridges for sowing with wheat the following spring.

As soon as the seed time is over in spring, the fallow land should again be ploughed over, and the ridge split or cloven down. It should then be cross-ploughed, and when sufficiently dry, harrowed well, and rolled if necessary, and every particle of roots of weeds brought up to view, carefully gathered by hand into heaps, and then burned on the field, or carted to a compost heap. In this climate it may not be necessary to give any more ploughing, except when ridging up in the fall for the spring crop. But if weeds are not thoroughly extirpated from the soil, by the ploughings and harrowings it has received, it must be ploughed and harrowed till they are, or the work will not be properly or profitably executed. Between these successive operations, the larvæ of various insects, together with the seeds of weeds, are brought to the surface, and exposed to be devoured by birds, which are then the farmer's best friends, though often proscribed as his bitterest enemies.

When the fallow is effectually reduced to a fine tilth, and thoroughly cleaned from roots of weeds, the manure or lime, if any is applied, should be evenly spread over the surface, and the land ploughed into eight or nine feet ridges, carefully observing a regular depth and width of furrow slice, and forming the ridges with a proper rise in the middle, so as to dry fast in spring, for the seed sowing. The furrows to be cleaned out, as already mentioned respecting the first fall ploughing.

In case fall wheat is sown on fallows, the time for doing so will be after manure or lime is applied and spread on the surface. It should then be ploughed in with a light furrow into the same width of ridges, as if the soil were to be left for spring crop. This will be found to answer better than to harrow in the seed, provided the soil is reduced to a fine tilth, and well prepared.

The expense of fallowing in this way, may deter farmers from attempting it. But if it is not well executed, better not do it, as upon the manner in which the fallow operations are conducted, depend not only the ensuing wheat crop, but in a great measure the succeeding crops of meadow or the pasture.

CHOICE OF SEEDS.

However important the propagation of live stock may be when considered by itself, yet, when in connection with our agricultural system, embracing the cultivation and improvement of the herbage which supports animals, as well as those plants, parts of which form the ingredients of human sustenance, it becomes less imposing. The principles of propagating vegetable and animal life are nearly the same ; but the propagation of vegetables must exceed that of animals in importance, as much as the vegetable produce of most countries surpasses that of animals. Indeed animals may justly be considered as mere machines for converting our inferior herbage into nutriment of a different description ; grasses and roots are the raw materials, butcher's meat the manufactured commodity.

In the choice of seed corn, regard should be had to procure it from a suitable soil, and of a suitable variety. A change from one soil to another, if of a different quality, will be found advantageous. However, a stranger settling on a farm in a country with which he is little acquainted, will generally find it adviseable to select the best seed he can find in the neighbourhood, freeing it from all imperfect grains, and seeds of weeds, previous to sowing it.

In England, it is a very general practice for farmers to change the seed, the species and variety being the same. It is well known, that if two parcels of wheat, for instance, as much alike in quality as possible, the one which has grown on a soil differing much from that on which it is to be sown, will yield a better produce than the other that grew in the same or similar soil and climate. The farmers in Scotland find that wheat from the south, which is usually better than their own, is a very advantageous change. I have known wheat to be carried from England to Ireland by farmers, as change of seed, and pay amply for the trouble and cost. Oats, and other grain brought from a clayey to a sandy soil, other things being equal, are more productive than such as have grown on sandy soil. Changing the seed of potatoes from one soil to another, selecting the best, and planting each variety unmixed, will be found very advantageous in increased and excellent produce. As regards wheat, our principal grain, the samples have become in many instances very much deteriorated by being mixed with the seeds of wild pea, and other weeds, and are generally infected with smut. The varieties of wheat in the country are suitable to the climate and soil, but are unfit for seed without first having imperfect grains, and all that is not wheat, separated from the samples, and then the seed disinfected of smut by steeping in caustics. To accomplish this, is not a matter of much difficulty or expenditure of labour, with a properly constructed wire screen, which farmers ought to have, or even with what is termed a sieve, made of wire or split wood, sufficiently open to allow imperfect grains of wheat and seeds of weeds to pass through. This implement can be purchased for a few shillings, and it will be found to separate all the imperfect grains and small seeds completely; but should any of the wild pea remain, it must be taken out with the hand ; a very easy, and if necessary, a very profitable emplyment for the farmer's family in the idle time of winter, to cleanse and prepare the seed wheat for spring sowing. If clean seed is not sown, it cannot be expected to reap clean crops, or to sell the produce of crops mixed with wild pea, or infected with smut, for the same price that good clean wheat will bring. In fact, samples of wheat deteriorated by being mixed with seeds of weeds, and infected by disease, are unfit to be offered to merchants to purchase for exportation, unless at diminished prices, that will remunerate them for the labour and loss of taking out all mixtures that are not wheat. Farmers aware of this fact by experience, will not surely be so indifferent to their own credit and interest as to neglect providing a remedy that is simple and easy of execution. If, after clean seed, properly prepared, is sown, wild peas, and other weeds will grow with the wheat, it will be in consequence of improper management of the soil, by severe cropping, without any regard to a judicious rotation or distribution of crops, or reposing the soil in pasture. Were clean seed *invariably* sown on lands managed as they ought to be, and as they *must* be to produce profitable crops, I am persuaded that farmers would *invariably* reap clean crops, whether the season was wet or dry. Weeds of certain kinds may appear occasionally in the growing corn, but it is a part of good management to remove these weeds before they come to seed. Disease may also affect the crop, produced by the state of the weather, and this the farmer cannot prevent; but many of the diseases of wheat are produced in consequence of sowing infected seed, imperfect culture, or the want of some necessary ingredient in the soil. The difference of produce arising from sowing clean seed, and of a good and bad variety of plant is so great, that it does not seem inconsistent with probability to state, that the gross agricultural produce might be augmented in value through the agency of clean and good seeds of all descriptions, to the amount of twenty-five per cent. or more, particularly if a judicious rotation of crops were introduced at the same time. One remarkable feature of such improvement is, that it may be carried into effect at once without any additional investment of capital, or much expenditure of labour, and the little labour that is required to clean the seed can be applied in the idle time of winter. Were the seed once perfectly cleansed, and a good system of management adopted, it would not require much trouble afterwards to keep the seed and crops clean. It would be a very laudable ambition in farmers to desire to excel in producing clean and excellent crops, and would be found as profitable as it would be creditable.

The nutritive products of the following plants, are thus given by Sir H. Davy. The quantity analyzed of each sort of 1000 parts.

English Names.	Whole quantity of soluble or nutritive matter.	Mucilage of Starch.	Saccharine matter or Sugar.	Gluten or Albumen.
Middlesex wheat, average crop,	955	765		190
Spring wheat, - - -	940	700		240
Mildewed wheat of 1806, - -	210	170		32
Blighted wheat of 1804, - -	650	520		130
Thick skinned Sicilian wheat of 1810	955	725		230
Thin skinned Sicilian wheat of 1810,	961	722		239
Wheat from Poland, - - - -	950	750		200
North American wheat, - -	955	730		225
Norfolk barley, - - -	920	790	70	60
Oats of Scotland, - - -	743	641	15	87
Rye of Yorkshire, - - -	792	645	38	109

Botanists reckon seven species of wheat which are or may be cultivated. Summer wheat, or spring wheat, lammas wheat, Egyptian wheat, turgid or cone wheat, Polish wheat, spelt wheat, and one grained wheat. The first, second, fourth and fifth sorts are by many botanists considered as only varieties, and it is doubtful whether the third and sixth may not be the same; the seventh has all the marks of a distinct species, but it is very questionable whether if much cultivated, it would always continue to produce one row of grains. Professor Martin has described forty-nine varieties of wheat. Thaer speaks of their being a hundred varieties. The spring or summer wheat, is distinguished from fall or winter wheat by its narrow ears, and shorter and more slender straw. It is commonly sown in April, or even so late as the beginning of May. The varieties of spring wheat, known here and usually cultivated, are the bald, and the bearded. The bald wheat is shorter and plumper in the grain, of a lighter colour, thinner in the chaff, grows shorter and more slender in the straw, than the bearded wheat, and is the best variety for rich soils, but only for rich soils, not being so apt to lodge as the bearded wheat. The red or brown wheats, are considered more hardy than the white, but as yielding an inferior flour; this applies both to winter and spring varieties.

The common Canadian bearded spring wheat is a good variety, and very productive, well suited to the soil of Lower-Canada, and better adapted for inferior soils, or those of middling quality, than the white wheat. Egyptian, Talavera, and Vittoria wheat have been partially introduced, but I am unable to say with what success. Spelt wheat, the epeautre of the French, is much cultivated in France and the south of Europe; is the principal wheat sown in Suabia, the north of Switzerland, and is a good deal sown in Spain. It is known by its stout straw which is almost solid, and by its strong spikes, with chaff partially awned, the awns long and stiff. The chaff adheres so closely to the grain as not to be separated without great difficulty. In France it is sown in spring on land too coarse for common wheat, and ripens in July and August. The grain is light and yields but little flour; but it is said to contain a larger portion of gluten than common wheat, and for that reason is recommended as superior to any other in pastry and confectionary. It might be well to try it in this province. The variety turgid, or cone wheat, a coarse but very productive species, is said to be proof against the ravages of the wheat fly. I believe it is a winter wheat. In Yorkshire, a custom prevails of sowing a small quantity of rye with the wheat crop on all the lighter descriptions of soil, about one quart of rye mixed with a bushel of seed wheat. It is said that much advantage arises from this mixture of grain, the wheat being more plump, and a greater quantity of produce to the acre than when sowed alone, and effectually prevents the crop from being diseased by mildew. This mixture cannot be adopted here, except by farmers who only raise wheat for their own consumption, or with such portions of the crop as may be wanting for his own family. The mixture of rye would spoil the sample for sale, but would make excellent household bread.

To procure new varieties of wheat, the ordinary mode is to select from a field a spike, or spikes from the same stalk which has the qualities sought for, such as larger grains, thinner chaff, stiffer straw, a tendency to earliness or lateness, &c. and picking out the best grains from the ear or ears, to sow them in suitable soils in an open airy part of a field or garden. When the produce is ripe, select the best ears, and from these the best grains, and sow on till a bushel or more be obtained, which may then be sown in a field apart from any other wheat.

Marshall, of Yorkshire, mentions a case in which a man of accurate observation, having in a piece of wheat perceived a plant of uncommon strength and luxuriance, diffusing its branches on every side, and setting its closely surrounding neighbours at defiance, marked it, and at the harvest removed it separately. The produce was 15 ears, yielding 604 grains of a strong-bodied lever coloured wheat, differing in general appearance, from every other variety he had seen. The chaff was smooth, without awns, and of the colour of the grain, the straws stout and reedy. These 604 grains were planted singly, nine inches asunder, filling about 40 square yards of ground, the remainder of the ground being sown with wheat in the ordinary way, by which means extraordinary trouble and destruction by birds were avoided. The produce was $2\frac{1}{2}$ gallons, weighing $20\frac{1}{2}$ pounds, of prime grain for seed, besides some pounds for seconds. One grain produced 35 ears, yielding 1235 grains, so that the second year's produce was sufficient to plant an acre of ground.

A very excellent mode of procuring good and unmixed varieties of seed wheat, is to separate in the sheaf all the ears of a different variety, as well as all small and imperfect ears of the same variety, leaving only the best and fullest ears to be threshed for seed. This mode is easy of execution, and the only one, except the above, for obtaining unmixed seed of one variety, which is very essential to the production of good wheat.

In making a choice of species of wheat for sowing in the fall, the thin-skinned white wheats are preferred by most good farmers for good soil. For less favourable soils, the red varieties are generally preferred, and those are also generally preferred for sowing in spring. In England, however, red wheats are considered as at least fifteen per cent. less valuable than the white varieties. The only recommendation that can well be given to farmers, as to the choice of varieties is, to select the best from among those in use by the best farmers, in well cultivated districts, and to change often to prevent degeneracy.

Of barley there are several varieties, but only one, the square, or four-rowed, is much cultivated here, as it is found to be more productive than the two-rowed, or long-eared barley; and as the brewers make no objection to this kind for malting, the farmer will be right to continue to cultivate what they find most productive and profitable. Some farmers cultivate the two-rowed or long-eared barley, and produce fine samples.

We have in Canada almost all the varieties of oats known in England, and the farmer has ample means of choice. The white Poland oats are a very good kind, and produce abundantly in grain and straw, on soils of middling fertility. The potatoe oat, though much esteemed in Ireland and England, is not so productive in this country, in straw or grain, as the oland oat, and is much inclined to smut. The Georgian oat, is a large grain, and remarkably prolific in rich soil ; it will yield more grain per acre than any other variety whatever, when sown in rich soil.

The Siberian or Tatarian oat, a variety that has the grains mostly turned to one side of the panicle, is a coarse kind of oat, but is very suitable for poor soils, and exposed situations. It is said to yield well in meal.

The common white oat, is very productive, and though not so large or full in the grain, is suited to the climate and soil. The black oat is also very productive, and adapted to the country, but if grown by farmers who grow the white species, it is very difficult to keep them from mixing, and from this circumstance, perhaps, the farmer whose lands are best suited for the black oat, should not sow any other variety.

Several varieties of the pea, suited to the soil and climate of Canada, are to be had in the province. The English horse bean is wanted, and might be cultivated to great advantage. I have seen a few grains produce abundantly here, and I believe they would be a more certain and productive crop on an average, than in England. The small French bean, ought to be more extensively cultivated for various purposes ; there is no want of seed, and the climate and soil are most favourable. The tare or vetch, is a plant that might be advantageously introduced. This climate is more favourable for the summer species of tare, than the climate of England.

There are many good varieties of the potato in Cannda, from which farmers have ample means of choice. The common red potato is not many years known in the country, but extensively cultivated now, and are productive and of good quality when grown on suitable soil. The common white potato are long cultivated in the country ; they are productive, but not so much so, or of so good quality as the common red. The seed of these two varieties should be chosen from the smoothest and roundest, rejecting those of a long shape, and full of eyes or seed buds. These two are the most useful varieties of the potato, cultivated by farmers in Lower-Canada.

A variety of the potato, suitable for feeding cattle has been lately imported from Ghent, by the Horticultural Society of London, called the *Lanckman* potato. It is red outside, very solid, of prodigious produce, and an excellent keeper. I have grown these potatoes here, but unfortunately lost the seed by a flood, in August, 1833. I believe, however, that some seed may yet be had in the neighbourhood of Montreal. These potatoes will produce more to the acre than any potatoes generally cultivated in Canada.

The yam, or surinam potato, large, red and white skinned, and interior veined with red, flavour disagreeable, and not such as to admit of its being used as human food, is greatly esteemed in England for feeding stock. It succeeds best on heavy lands, and produces very abundantly.

Red and white clover and timothy seeds, of excellent quality are to be had generally at a moderate price. The seed of saint-foin should be introduced, it is considered as one of the best and most productive of herbage plants. Lucern is also highly spoken of in the United States.

With these seeds of herbage plants, we might, perhaps, rest satisfied; no country can possess better, whatever may be the variety. Carrot, parsnip, turnip, and other small seeds are to be had to purchase. Turnip seed is not always of the best quality.

The farmer will find it his interest in every case, to choose the best and purest seed of whatever species, and not to sow any seed that is not perfectly clean and unmixed; to adopt every reasonable precaution in preparing seed that may be likely to preserve the future crop from disease or the ravages of vermin. If he has to buy seed, the difference in the first cost between good, clean seed, and that which is foul, infected, and often spurious, should not influence his choice in the slightest degree, or prevent him from buying the best, and rejecting the inferior.

AGRICULTURE.

PART IV.

CULTURE OF CEREAL GRASSES, OR CORN CROPS.

The corn crops cultivated in Canada are wheat, barley, oats, rye, and Indian corn. On the culture of these plants, a few general remarks may be of use. Culmiferous, or corn plants, particularly wheat and rye, like most others, have two sets of roots. The first originate with the germination of the grain, are always under the soil, and are called the seminal roots ; the second spring from the first joint, which is formed near the surface of the soil, and from that joint strike down into the soil ; these are called coronal roots. The coronal roots appear chiefly intended for drawing nourishment from the soil ; and, as Professor Martin has observed, are judiciously placed for this purpose, the richest part of all soils being on or near the surface. These fibres are of larger diameter, more succulent, and never so long as the seminal. From these facts, as to the roots of corn plants, some important hints may be derived regarding their culture. The use of stirring the surface, to facilitate the extension of the coronal roots is obvious ; the immediate effects of a top-dressing for corn crops, is also apparent ; and also, that the manures may be ploughed in too deep, to give the full amount of their beneficial effects to corn crops or grasses. Sageret, a scientific French agriculturist, proved experimentally, that where any of the grains or grasses are etiolated immediately after germination, by growing too rapidly, or by being sown too thick, or in too warm a season, the first joint from which the coronal or nourishing roots spring, is raised above the ground, and in consequence either throws out no roots at all, or so few, as to nourish it imperfectly, in which case it either dies before it comes into flower, or before the seed is matured.

The uses to which the straw of corn may be applied, are various. Besides food for cattle, litter for animals, thatch, &c., it is bleached and plaited into ribands for forming hats ; and in other countries, it is used for a great variety of works, useful and ornamental. Paper is also made from straw, and the same pulp which forms the paper may be moulded into all the forms given to *papier machè*, medallion portraits, embossed works, &c.

The practice of reaping corn before it is perfectly ripe, originated in France, and has been lately recommended by M. Cadet de Voux. Corn reaped eight days before the usual time, this author says, has the grain fuller, larger, finer, and better calculated to resist the attacks of the weevil. An equal quantity of the corn thus reaped, with corn reaped at the period of maturity, gave more bread, and of better quality. The proper time for reaping is that when the grain, on being pressed between the fingers, has a doughy appearance, like the crumb of bread just hot from the oven, when pressed in the same manner. The farmer's own judgment and experience must direct him in this part of his work, better than any written instructions. I believe it will always be found the safest and best plan to cut the grain crops rather before, than when at full maturity.

The most general mode of reaping in Lower-Canada is by the sickle, and is certainly the best mode, for wheat particularly, and for all other grains that are heavy and good. The cradle scythe is very much used in Upper-Canada and the United States, and a good workman is said to cut from two to three acres a day. In England the cradle scythe is used differently from the bow and grass scythe, and has only one short handle or nib on the sned or long handle, for the right hand; the left grasps the sned with the palm upwards; this enables the mower, who generally mows from the corn, to bring the back of the scythe and cradle to the ground, and have the cut corn in a regular state for being put into sheaves.

Whatever be the mode the farmer adopts for reaping his crops, they should be carefully cut down and gathered. If crops are worth sowing, they should be worth gathering, without waste; and those who have not help in their own family, or the means of paying for labour, should only cultivate so much land as they are able to cultivate and manage in a proper manner. Slovenly culture, or harvesting, will never be profitable.

WHEAT.

Wheat is by far the most important of the cereal grasses; the flour made from its grains or seeds, from the quantity of gluten they contain, making the best bread in the world. A greater proportion of mankind are nourished by rice than by wheat, but there is no grain which comes so near wheat in its qualities for bread-making. Rice and maize are comparatively unfit for it, and oats, barley, and rye, but imperfectly adapted. Rye, however, comes nearer to wheat in its bread-making qualities than any other grain.

The soils best adapted for the culture of wheat, are rich clays and heavy loams; but these are by no means the only description of soils on which it is cultivated. I have seen good crops of wheat grown on sandy soils that were well managed, though such soils are not constitutionally disposed to the growth of that grain, nor will they under any management, bear such a frequent repetition of it as those first mentioned. Crops of equal bulk, grown upon a sandy soil, rich clays, and heavy loams, will not be equally productive in grain; the product of the sandy soil will be found deficient. Thin sands may, by dressing them well with clay, be brought to produce wheat ; but without this kind of dressing, wheat ought not to be ventured on such soils. A large proportion of the soil of the Canadas is adapted to the production of wheat, under a judicious system of rotation, and manuring.

According to the plan of rotation I have submitted, for old cultivated farms, wheat would invariably be sown on soils well prepared by green crops or summer fallow, after having been reposed under pasture. It is not in my power to point out any mode for the cultivation of wheat, that I believe would be better or more successful. Were it not for the beneficial influence of the frost and snow on the soil ploughed in the fall for the spring sowing of wheat, crops of even middling quality would not be raised here, from such a mode of culture as is usually practiced.

In the British Isles, land cultivated in the manner it is in Canada, would not produce a crop of wheat that would pay the expense of labour. I allude to the practice of sowing wheat every other year on the same land, without any preparation of the soil by fallowing, manuring or liming, but merely ploughing the land once in the fall. It is no wonder indeed that lands that must be exhausted by such management, should now produce weedy, diseased, and deficient crops, unless where the soil is of extraordinary good quality, and inexhaustible fertility, and even then the ear of wheat wants length and fullness.

The manures best calculated for wheat, are allowed by all agricultural chemists, to be animal matters and lime. The former has a direct influence in supplying that essential constituent to wheaten flour, gluten, and the latter azote and lime, both actually found in the straw of wheat. At all events, it is certain that wheat will not thrive on any soil which does not contain lime. In this, Sir H. Davy, Chaptal, Professor Thaer, and Grisenthwaite, fully agree.

A more abundant supply of manure is generally required for wheat than for any other grain. Professor Thaer says, it absorbs more nourishment from the soil than any of the corn tribe ; and he calculates, (hypothetically, as he allows,) that for every 100 parts of nourishment in a soil sown with this grain, 40 will be carried off by a fair average crop, not checked in the growth by unfavourable weather. At the same time, too large a dose of manure to land in good tilth, is very apt to cause the crop to lodge ; hence it will not be necessary to manure fallows, when the land is of good quality. The principal improvement required in the Canadian system of tillage, is, the adopting the practice of convertible husbandry, and a judicious rotation of crops. I know it is the opinion of some that where manure is abundant, wheat, alternating with green crop, may be grown alternately for an indefinite time. I believe it would be difficult to support this opinion by experience. Whatever is the cause, constant tillage will wear out the best soils in this climate, and the grain will be found to degenerate in quality, and decrease in quantity. In tropical countries, where watered grain is grown, crops have been raised on the same soil for ages ; but this mode of culture cannot be introduced in our climate.

The climate required to bring wheat to perfection must be such as affords a dry and warm season for the blossoming of the ear, and ripening of the grain. Wheat will endure a great deal of cold during winter, if sown in a dry or well drained soil, and if it be covered with snow while there is frost. Hence it is that wheat is sown as far north as Petersburg, and in Sweden, one thousand miles farther north than the settled parts of Canada. Moderately moist weather before the flowering season, and after the grain is set or formed, is favourable to wheat; but continued heavy rains after the flowering season, produce mildew and rust. Hoar frosts, when the plant is in ear, produce blights, and must be extremely injurious, as must be sultry moisture and fogs. Cold, in the blossoming and ripening season in July, even unaccompanied by wind or rain, produces an inferior grain, greatly deficient in gluten, and heat; if not too great, the contrary. The most valuable wheat in Europe, in this respect, is that of Sicily; and the North American wheat is nearly equal to it; each contains more gluten than the best wheats of Britain.

The season for sowing wheat in Lower-Canada is the month of April. In the district of Quebec, the sowing is sometimes protracted by a cold spring, to the beginning of May. In Upper-Canada, wheat is usually sown in the fall, in the latter end of August or September, and in favourable seasons, on good soils, produces abundantly, though the preparation of the soil is in general not conformable to the rules of good husbandry, nor is there a proper rotation of crops observed. Fall or winter wheat is not much sown in Lower-Canada, and in situations much exposed is a very uncertain crop. In the spring, if the snow melts off before the severe frost is over, the young plants of wheat are inevitably destroyed. In 1833, I had fall and spring wheat growing in the same field; the fall wheat, (except a small part, about half an acre on which the snow remained,) was not one-fourth of a crop; the part that was preserved by the snow grew up most luxuriantly to near six feet in height, was perfectly clean, the straw very strong, and the ear long. In the beginning of July this wheat became mildewed and rusted to such a degree that the grain was quite shrivelled and imperfect, and the spring wheat in the same field, was of excellent quality, and free from rust or mildew. Fall wheat is more subject to disease than spring wheat. In new, sheltered lands, perhaps fall wheat may be grown in Lower-Canada, but such situations generate disease, in moist seasons. When fall wheat is sowed, the safest mode for its cultivation is to sow it in August, ploughing it in, not too deeply, but with a shallow furrow, in well formed beds or ridges, eight or nine feet in width, well drained by furrows, &c. I am convinced that fall wheat sowed in this way, will be more likely to succeed, than when harrowed in, or when sowed at a later period. This applies to Upper and Lower Canada.

Seed wheat is prepared for sowing by the process called pickling. This process is at present, however, indispensably necessary on almost every soil, and all the seed wheat of Lower-Canada; otherwise smut, to a greater or less extent, will in nineteen cases out of twenty be likely to follow.

I have already in the second part of this work given the result of experiments made by a Mr. Bauer, of Kew, England. He recommends steeping the seed in lime-water, twelve hours, and afterwards drying the seed in the air previous to sowing it, and says this process will prevent infection from the soil, (where he insists it may have remained from having produced an infected crop,) or the seed, to the future crop. Stale urine is considered a safe and sure pickle, but there is some danger, because if the seed so steeped, is not immediately sown, it will lose its vegetative powers. A pickle of salt and water, sufficiently strong to buoy up a fresh egg, will answer a good purpose for grain not much infected, stirring the seed repeatedly in the pickle, and skimming off all the grains that float above, and when thoroughly washed and skimmed, taking out the seed on a clean floor, and mixing quick-lime with it till sufficiently dry for sowing. The Flemish mode of preparing seed wheat, (and it is said their wheat is seldom diseased,) is to steep it in salt and water, or urine, and copperas or verdigris. The proportion of verdigris is half a pound to every six bushels of seed, and the time in which the latter remains in the mixture is three hours, or one hour if cows' urine be used because of its ammonia, which is considered injurious. Any of these modes of preparation of the seed, may answer the purpose of disinfecting it of smut, or destroying the vitality of the fungi which is supposed to produce it in the future crop. The farmer who will neglect to adopt some one of those remedies, cannot justly complain if disease attacks his next crop.

The quantity of seed depends in some measure on the state of the land; poor land has always been allowed more seed than rich. In England the seed varies from two bushels to four, to the statute acre, a quantity that is nearly, (and in my judgment, fully,) double what is required in Canada. I have grown one of the best crops I ever had from about one bushel to the acre. On rich lands, in a proper state of preparation, one bushel and a quarter will be sufficient, or perhaps less; and on any lands fit to give wheat, one bushel and a half will be abundant seed, provided the seed is sound, and sown in such a way that no part of it will be lost, by being buried too deeply, or falling on the sub-soils in a situation unfit for it to take root or vegetate.

Drilling, ribbing, and dibbling, are modes of sowing wheat practiced in England, and with very advantageous results; but as the advantages of these modes of sowing arise principally from the after culture of hoeings, drill-harrowing, and hand weeding the crop, they are not likely to be introduced in Canada for the present; nor is it necessary, if we would only cultivate properly for broad-cast sowing; there would not be much work to be done when the crop is growing. But should any thistles or other long weeds appear, they should be cut down, or otherwise removed, before the crop of wheat is too far advanced towards maturity.

In harvesting wheat, the best farmers in Britain and the continent of Europe agree, that it ought to be cut before it becomes dead ripe. If it is not cut before it becomes dead ripe in this country, the loss will be very considerable, and the wheat is said to produce a less white flour. It will always be found most prudent to cut wheat before it is fully ripe, and less damage will be sustained from acting in this way than by adopting a contrary practice.

The mode of reaping wheat in most countries is by the sickle. In Upper-Canada, and in some of the townships of Lower-Canada, the cradle scythe is much used. I should always give the preference to the sickle for cutting down wheat. The practice in Lower-Canada is to leave the wheat when cut for several days on the swath, without being tied, and when perfectly dried to tie it up with withes into large sheaves or bundles, and cart it to the barn at once. There is one objection to this mode which deserves consideration; that is, in case of wet weather, or showers with heat, the wheat is in danger of sprouting and becoming spoiled and wasted, particularly if the crop is as heavy as it ought to be. I have seen this occur frequently; and would, therefore, recommend to farmers to discontinue this practice. The only advantage that can be derived from the usual practice is, that if there are weeds or grass in the wheat, they wither and dry when several days exposed on the swath. But if lands and crops were properly managed, weeds would not be mixed with the crops, and the wheat might be cut over the clover or other grasses. The wheat might then when cut, be tied in sheaves, made so small as to be done by bands the length of the straw. The sheaves should be set up in *shocks*, or *stooks*, each containing twelve, or if the straw be long, fourteen sheaves. Two rows of sheaves are made to stand in such a manner as to be in contact at the top, though in order to admit the circulation of the air, they are placed at some distance below; on this line two sheaves more are placed as a covering, the corn end of both being towards the extremities of the line. In a few days of good weather the crop will be ready for the barn or the stack yard. It will be found in practice that there is much less risk of injury or waste to the crop by this mode of management, than by leaving the wheat untied on the swath. Wheat will keep as well, in well made stacks, properly thatched, as in a barn.

Threshing wheat with the flail is so well understood by farmers, that it is unnecessary to describe it here. The Canadian farmers of Lower-Canada execute the business of threshing in a better and more effectual manner, than any other men I have ever met with. Threshing mills may be very desirable on extensive farms, but I do not see the great necessity for them on ordinary sized farms, that would justify the expenditure of capital on such machines under present circumstances.

The produce of wheat must vary of course, according to the soil, climate, culture, and kind grown. Professor Thaer says, that in general it gives double the weight of straw that it does of grain; on elevated grounds something less, and on low grounds something more. The yield of wheat in Canada, in some seasons, on good soils, has been under ten, while in others it has been over twenty, and even as much as twenty-five bushels the arpent, the soil and culture being very nearly the same. The average produce in Upper and Lower Canada, is not very easy to determine. All that is necessary to state is, that on soils fit to produce wheat, managed as in England, crops of wheat of nearly equal produce as those of England may be obtained; and the proportion of wheat soil to inferior soil, is much greater in Canada than in England. In Middlesex, the proportion which the wheat bears to the straw, is very nearly the same as Thaer's estimate. Eleven and a half bushels of wheat, weighing 690 pounds, from a load of straw of thirty-six tresses, or about 1296 pounds.

On new lands in Upper-Canada, it is said that heavy crops of wheat are raised, with no other cultivation, than to harrow in the seed, after the wood has been cut down and burned. The land cannot be ploughed well until the most of the roots are taken out, which must be some years after the first clearing. I shall again refer to this subject when treating of the settlement of new lands.

The yield of wheat in flour ought to be, on an average, thirteen pounds of flour to fourteen pounds of grain. In the chemical analysis of wheat, Sir Humphry Davy found that 100 parts of good, full grained wheat, sown in autumn, yielded in starch 77, and of gluten 19 : 100 parts of wheat sowed in spring, 70 of starch, and 24 of gluten. American wheat, he found to contain more than the British ; and in general, the wheat of warm climates, to abound more in gluten and in insoluble parts, and to be of greater specific gravity, harder and more difficult to grind.

Spring sown wheat requires a more minutely pulverized, and rather richer soil, than fall wheat. When grass or clover seeds are sown on the same ground, they are sown immediately after the wheat, and harrowed in with a light harrow, or rolled in. The preparation of the soil for, and the sowing of spring wheat, are the same as for barley. The produce of spring wheat, both in grain and straw, is generally less than that of fall wheat grown under favourable circumstances, and not injured by disease. The diseases of wheat have been so fully considered in the second part of this work, it is not necessary to refer to them here.

To judge of a sample of wheat, examine by the eye if the grain is perfectly fed or full, plump, and bright, and if there is any adulteration proceeding from sprouted grains, smut, or the seeds of weeds ; and by the smell, if there is any improper impregnation, and if it has been too much heated in the mow or the stack ; and, finally, by the feel, to decide if the grain is sufficiently dry, as when much loaded with moisture, it is improper for the uses of the merchant, the miller, or the baker. In cases where a sample handles coarse and rough, and does not slip readily in the hand, it may be concluded not to be in a condition either for shipping, grinding or laying up for keeping.

RYE.

Rye is very much cultivated on the Continent of Europe. It requires less culture and manure than wheat, though many consider it the most impoverishing of corn crops. The varieties of rye, are the winter, and spring, but there is so little difference between them, that spring rye, sown along with winter rye, can hardly be distinguished from it. Rye will grow on dry sandy soils, and produce a tolerable crop ; and on the whole, it may be considered as preferring sands to clays. The preparation of the soil should be the same as for wheat. According to Thaer, rye abstracts 30 parts in 100, of the nutriment contained in the soil on which it is grown. The climate for rye may be colder than for wheat, but is equally injured by moist weather during the flowering season. One bushel of seed will be sufficient for an acre. As it vegetates more slowly than wheat, it should be sown when the soil is dry, as a wet soil is apt to rot the grain before it has completely germinated.

The after culture and harvesting of rye, are the same as for wheat ; and the produce in grain is greater than could be obtained from wheat, under similar circumstances of soil, and the straw of much larger bulk. Sir H. Davy found, in 100 parts of rye, 61 parts of starch, and 5 parts of gluten. Thaer says, rye is the most nourishing grain next to wheat. The use of rye in other countries is chiefly for bread ; in Canada not so much so, but is used in the distilleries ; the straw is useless as fodder, but excellent for thatching ; and in Scotland it is manufactured into hats, in imitation of leghorn. It is a grain that might be very profitably cultivated on soil not fit for wheat. Rye is less subject to disease than most other grains. It is, however, subject to a disease called the *spur*, or *ergot*, which is a production of the seeds, is long, horny, and cartilaginous ; is sometimes straight, at others curved. The resemblance of this substance to cocks' spurs, has given it the name by which it is distinguished. Moist soils are more subject to produce this disease than dry. In France and Switzerland, a disease called the *chronic*, or dry gangrene, has been produced by eating *ergot*. In the latter country, animals refuse to eat rye affected with *ergot*.

BARLEY.

Barley, though less calculated for a bread corn than rye, may be considered as next in value to wheat. In Sweden and Lapland, it is more cultivated than any other grain, on account of its requiring to be so short a period in the soil ; sometimes no longer than six weeks, and seldom more than seven or seven and a half. In Spain and Sicily, they have two crops a year on the same soil ; one is sowed in autumn and ripens in May, and the other is sown in May, and is reaped in autumn. Barley is a tender grain, and easily hurt in the stages of its growth, or harvesting. The climate of Canada is very favourable for the cultivation of this grain in all stages of its progress until brought to the barn or stack-yard.

There are several varieties, if not different species, of barley. The variety generally cultivated in Canada is the square or four rowed, because it is considered the most productive, and is not objected to by the brewers. The two-rowed, or long eared-barley, is partially grown in the country, and produces a beautiful sample, and brings a higher price than the four rowed. The seed of the naked barley, or wheat barley, has been introduced. This grain is considered by some as nothing else than spelt wheat, which it greatly resembles. I cannot say with what success it has been cultivated.

In choosing from any particular variety, the best grain for sowing is that which is free from blackness at the tail, and is of a pale, lively, yellow colour, intermixed with a white, brightish cast ; and if the rind be a little shrivelled, it is so much the better, as it shows that it has sweated in the mow, and is a sure indication that its coat is thin. The husk of thick-rinded barley being too stiff to shrink, will lie smooth and hollow, even when the flour is shrunk from it within. The necessity of a change of seed from time to time, by sowing that of the growth of a different soil, as it has been before observed, is in no instance more evident than in the culture of this grain, which otherwise becomes coarser and coarser every year. But in this, as in all other grains, the utmost care should be taken that the seed is full bodied.

The best soil for barley is a light rich loam, finely pulverized. It will not grow in perfection on a very sandy, or soft soil, nor on strong clays, that are most suitable for wheat. It will succeed very well on light soil, if the situation lie warm and dry. It is generally sown in Canada after potatoes or other green crops, or naked fallow.

The best season for sowing barley will be the beginning of May, or sooner if the weather is favourable and the soil in a good state. A correspondent of the Bath Society, England, gives the following experiment:—"I soaked my seed barley in the black water taken from a reservoir which constantly received the draining of my dung heap and stables. As the light corn floated on the top, I skimmed it off, and let the rest stand 24 hours. On taking it from the water, I mixed the seed grain with a sufficient quantity of sifted wood ashes, to make it spread regularly, and sowed three fields with it. The produce was 60 bushels to the acre, of good, clean barley, without any small or green corn or weeds, at harvest. No person in this country had better grain." The same person goes on to say he sowed barley without steeping, the same year, and the crop was much deficient in every way compared to what was produced from the steeped seed.

There is considerable advantage in steeping, as it promotes the germination of the seed ; it also procures an equal germination, and consequently an equal ripening, and getting the start of weeds. The following directions are given for steeping the seed in clean water. First, take out about one-third of the contents of each sack of seed barley, to allow for the swelling of the grain ; lay the sacks with the grain to steep in clear water ; let it be covered with it for at least twenty-four hours ; when the ground is very dry, and no likelihood of rain for ten days, it is better to lie thirty-six hours. Sow the grain wet from steeping without any addition. The seed will scatter well, as clear water has no tenacity ; only the sower must put in a third or fourth more seed in bulk than is usual of dry grain, as the grain is swelled in that proportion. Harrow it in as quickly as possible after it is sown ; and though not necessary, give it the benefit of a fresh furrow if convenient.

The quantity of seed sometimes sown in Canada is near two bushels to the acre. One bushel and a half, or perhaps less, might be sufficient on soils well prepared ; however, it is considered that thin sowing of barley is a disadvantage, for the following reasons. If the early part of the season be dry, the plants will not only be stinted in their growth, but will not send out offsets ; and, if rain fall afterward, the plants will begin to stool, and send out a number of young shoots, and these young shoots cannot be expected to arrive at perfect maturity with the early shoots ; consequently an unequal sample will be produced, and the grain will be for the most part of an inferior quality. Good judges, therefore, think it preferable to sow a quantity of seed sufficient to ensure a full crop, without depending on its sending out offsets, that the crop grows and ripens more equally when this is done, and the sample of grain is uniformly good.

Barley is ripe when the reddish colour on the ear is gone off, or when the ears droop or fall, as it were double towards the straw. In the harvesting of barley, it requires more care than any other white crops, owing to the brittleness of the straw ; after it has reached a certain period it must be cut down, as when it is suffered to stand too long, much loss is sustained by the breaking of the heads. On that account, it should be cut at a time when the grain is soft, and the straw retains a great proportion of its natural juices ; consequently it will require a long time in the field before either the grain is hardened or the straw sufficiently dry. If put into a stack or barn sooner than it is in a proper state of dryness, it will be apt to heat, and greatly lessen the value of the grain. Barley may be cut down with the cradle scythe, and it will generally be found best to bind it in sheaves as it is cut, and set it up in shocks or stooks.

Barley is rather more difficult to thresh than other grain. They have in England, what is called a hand hummelling machine, for taking off the awns of the barley, and every farmer who cultivates the grain should have one. The produce of barley in Canada on well prepared soils, and in favourable seasons, is very little short of the produce obtained in England. From twenty to forty bushels the acre is raised, and I have even heard of a larger produce. The average produce of Middlesex, England, is about 1570 pounds of grain, and 2590 pounds of straw, to the acre of barley.

Barley is applied to various uses besides malting, and making whiskey and beer. It is dressed into pot and pearl barley ; the first by grinding off the husks, and the pearl barley is produced by carrying the operation so far as to produce roundness in the kernel. These are used in soups, gruels, and medicinal drinks. Barley meal is ground like oat meal, or flour ; the coarser sort, with the bran, may be used for fattening live stock, especially pigs and poultry ; but the fine bolted barley flour, mixed with wheat and rye flour, in the proportion of two of barley to one of wheat, and one of rye flour, are said to make a light and very agreeable loaf of bread. The finest of the barley flour without any mixture, will make good bread, much preferable to that made from the flour of Indian corn.

The produce of barley in flour, should be twelve pounds of flour from fourteen pounds of clean grain : the straw is chiefly used for litter and manure ; it is not very valuable for fodder. The diseases of barley are few, chiefly smut, which has been already described.

OATS.

The oat is a very useful grain, and the climate and soil of Canada are not unfavourable to its culture, notwithstanding the heat of the summer. It may be cultivated both as a bread corn, and as horse food. Of all grains it is the easiest of culture, growing almost in any soil that admits of of being ploughed and harrowed. The varieties of oats are very numerous.

The different varieties of oats cultivated here have been already described, and the farmer may choose from them the variety that will be suitable for his soil. The seed of oats of the best quality is so easy procured, that it must be the farmer's own fault if he sows any other. Farmers in parts of England have been known to be at the pains to select the choicest grain in order to get into the best seed ; they get them picked out by hand by women.

The soil for oats may be of any kind whatever, from the stiffest clays to moss or bog, provided it be laid sufficiently dry. If the season be moderately moist, poor, sandy or gravelly soils will produce a crop of oats of the common white or black varieties. The most suitable climate for oats is one rather cool and moist. When very dry and warm, the panicles are very apt to get so dry and contracted that they cease to convey sufficient nourishment to the ears, which in that case never become plump, but thick husked, long awned, and unproductive in meal. This is sometimes the case in Canada, and the best remedy is early sowing. Oats are not so exhausting to the soil in a moist, as in a very dry climate. The best oats, both in quality and quantity, are those which succeed grass, on newly broken up lands ; no kind of grain seems better qualified by nature for foraging upon grass-land than oats ; as a full crop is obtained in the first instance, and the land left in good order for succeeding crops. Oats should always be sowed on land not rich enough for wheat or barley, and will pay better on such lands than a crop of wheat or barley, that is much below an average.

The season for sowing oats should be as early as the farmer can sow them after the wheat is sowed. Much depends on early sowing, that the plants may be covering the soil before the time of extreme heat of summer. Oats that are not sowed before the 21st of May, might as well be left unsown, and summer fallow the land. Late sowed oats will sometimes succeed when the summers are cool and moist, and no early frosts in autumn ; but if the summers are very hot and dry, they are nearly a failure ; or if there are early frosts in autumn before they are perfectly ripe, they are of very little value. The quantity of seed is generally about two bushels to the acre ; but on good soils, if the seed is sound, and sowed in time, a less quantity will answer. The after culture of oats, is only the weeding of it before the flower stalks begin to shoot up.

In harvesting oats, they are often cut down by the scythe, and carried loose to the barn. When oats are a good crop, I should always recommend to bind them in sheaves, and set them up in stooks, as wheat and barley are managed ; it is the safest mode, and will much facilitate the process of threshing. Oats should generally be cut before they are dead ripe, to prevent the shedding of the grain, and to increase the value of the straw as fodder. Oats rarely get damaged, or waste under the harvest process in this climate, if cut at the proper time, and bound in small sheaves.

The produce of oats in many parts of the British Isles is greater than can be obtained in Canada, in ordinary seasons. I will not state here what I believe to be the average produce of this country hitherto, because no crop has been more neglected, and imperfectly cultivated in general. However, I am convinced that were oats cultivated even moderately well, and sowed in time, large crops might be obtained that would amply remunerate the farmer.

The produce of oats in meal, should be 8 pounds for 14 pounds of oats. This I have received from millers in Ireland, after allowing them the dues for grinding, which was a 14th part. Sir H. Davy found 100 parts of oats afford 59 parts of starch, 6 of gluten, and 2 of saccharine matter.

The uses of oats are partly for meal for human food, partly for horse food, and occasionally used in distillation. The consumption of oatmeal for human food, might be much increased in Canada, and be a considerable saving of wheat for exportation, and greatly increase the farmer's returns from agriculture.

INDIAN CORN.

The Indian corn is the most noble looking of the cereal grasses. It is considered to be a native of South America, and to have been cultivated in Peru and Mexico from time immemorial. It was introduced into Europe about the beginning of the 16th century. It is at present cultivated in almost every part of the universe, where tbe summer temperature equals or exceeds that common to 45°, and even in some cases to 48°. It flourishes on the Continent of America from about the 40th degree of southern, to higher than the 45th degree of northern latitude. It is that grain which, next to rice, supplies food to the greatest number of the human race ; and it may be held to be the most valuable gift of the new world to the old. As a bread corn, it cannot be greatly commended ; the grain is highly productive of flour, but that flour is deficient in gluten, and will not make good bread without a large admixture of the flour of wheat. It is much used as human food, prepared in various ways in the United States, Upper-Canada, and parts of Lower-Canada. For fattening cattle and poultry of every description, it is found to be most excellent, and its culture in a suitable climate and soil, should be encouraged and extended.

There are many varieties of the maize or Indian corn. The large red, large yellow, and large white, are all well known, and very productive. The sweet corn, the pearl corn, and the maize quarantine, that is said to ripen in forty days from the time of sowing, and the Egyptian or chicken corn. The two last have rather small, handsome ears, and can hardly be distinguished from each other. They are found decidedly the most early, take less time to ripen than any other, and might be a very suitable variety for Lower-Canada.

In this climate, Indian corn should be planted in the driest and warmest, loamy or sandy soil ; it will not succeed well on clays, or low, flat lands. A very considerable degree of heat in the soil and of the atmosphere is necessary to bring Indian corn to profitable maturity. It is almost everywhere planted in rows, at about the same width as drills of potatoes, or rather more, so as to admit of horse-hoeing the intervals. If the soil on which Indian corn is grown, is fit to produce wheat, it is considered a good preparation for wheat, as Indian corn contains very little gluten. The preparation of the soil may be the same as for a crop of potatoes or turnips, and the land be put into raised ridgelets, as for turnips. Ashes are the best manure that can be applied. The quantity of seed required for an acre will not exceed a gallon at most, or about 25,000 grains. From the 15th to 31st of May, is the best time for sowing, if the soil is dry and in good order. If the weather is cold or wet, the seed is apt to rot. The mode of planting in hills is only adapted to very dry soils. The soil is marked with a plough in straight lines, three feet apart from one end to the other, and then neat lines in the opposite direction at right angles to the former, so as to leave the surface in squares ; the planter then takes a hoe, and at every intersection of the lines, makes a little hole about an inch and a half deep, and six inches in diameter, and in this hole five or six grains are regularly distributed, and covered over with fine earth, to the depth of an inch and a half. When planted on the ridgelets, the seed is put in on the top in small holes at about two feet apart, and four or five seeds put in each hole, and covered with about an inch and a half of fine soil.

The after culture consists of weeding, hoeing, and stirring the soil with the hoe and by the plough. The last process is earthing up to the plants with the plough, after removing all weeds, and all sickly or delicate plants of the Indian corn that are not likely to be productive. Some pumpkin seeds are put in at every second hill of corn, which afford a very considerable weight of a rich vegetable, at very little expense or trouble, for feeding hogs or cattle. It is said that putting a table spoon full of gypsum to each hill of corn, when first hoed, is sufficient manure without any other.

Indian corn cannot be considered a certain crop when cultivated north of 45 degrees latitude ; and as Lower-Canada is north of that line, the cultivation of this grain is very uncertain ; indeed, when the summers are moist and cool, it is generally a failure. The farmer cannot remedy this, further than by planting Indian corn in the most favourable soils and situations. But should the crop fail, it will afford some food for cattle, and prepare the soil for the next crop, as well as if it had been summer fallowed.

"The period of topping the corn is, when you, upon stripping the husks, open a little at the tops of the ears, find the grains of the corn to be hard, not hard enough to grind nor dry, but hard enough to resist the strong pressure of the thumb nail. A second criterion is, all the farina having completely quitted the tassel, and the tassel being entirely dead and dry. A third is, the perfect deadness of the ends of the silk, where, instead of the bright green that appeared before, hanging gracefully down, it is become withered and brown. When all these signs appear, the top and the blades have performed their office, and the sooner they are taken away the better, because, after this, they do no good, and only serve to retard the ripening of the ears, by the exclusion which they cause to the sun and wind. The tops and leaves being removed, they are laid in bunches in the intervals, suffered to dry, and then carried away and stacked, or put into the barn, as provender for cattle." These tops and leaves are highly prized in the United States, and said to produce as much valuable provender to the acre, as an acre of hay. In this climate, however, I do not think they can be estimated at the same value of an acre of good hay, or anything near it.

The season of harvesting the grain is generally the latter end of September ; they are broken off the stem with the hand, carried at once to the barn floor, or some other convenient building. When given to hogs, the ears need not be husked or threshed ; but if intended for any other purpose, the ears are husked and shelled, or threshed. The produce of Indian corn in the United States and Upper-Canada may be estimated at from thirty to seventy bushels the acre, or perhaps in some instances more. In the Lower Province, in favourable years, and suitable soils, a produce nearly equal to that may be obtained, but only under these favourable circumstances. It is one of the best grain crops that can be cultivated on new lands for the first two or three years, and generally succeeds better in such situations where there are wood ashes than in any other.

The green ears of maize are applied to various purposes. In the neighbourhood of Paris, and the south of France, before the male blossoms expand, the female blossoms are gathered and pickled, in the manner of cucumbers. When the grain has arrived at its milky state, the ears are gathered for the purpose of boiling or roasting. A large field will afford soft ears for five of six weeks.

In common with other grain, maize may be fermented, and distilled from, so as to produce spirits. The meal of maize, made into paste, and fried with fat pork, is the ordinary food of some of the peasantry of Europe.

CULTURE OF LEGUMINOUS FIELD PLANTS, THE SEEDS OF WHICH ARE USED FOR MAN OR CATTLE.

The seeds of cultivated legumens are considered to be the most nutritive of vegetable substances grown in temperate climates. They contain a larger proportion of matter analogous to animal substances, having, when dry, the appearance of glue, and being as nourishing as gluten. To the healthy workman, this substance supplies the place of animal food. The straw, or haulm, cut before it is dead ripe, is more nourishing than that of any of the cereal grasses. But leguminous plants are not only more than all others nourishing to man and animals, but even to vegetables, they may be said to supply food; since they are not only known to be less exhausting to the soil than most other plants, but some of them, and more especially the lupine, have been ploughed in green as manure, from the earliest times. Many scientific agriculturists consider a luxuriant crop of peas or tares as nourishing the soil by stagnating carbonic acid gas on its surface, which corresponds with the general opinion of their being equal to a fallow, and with the value set on them in rotation, as already explained. Two reasons may be given for the circumstance of peas and tares not exhausting the land as much as other crops: first, because they form a complete shade to the ground; and next, because they drop so many of the leaves upon the surface. The legumes cultivated in Lower-Canada farming are almost confined to the pea, but as it is probable others may soon be introduced, I shall give a table of the nutritive products of the most useful of these plants, the pea and the bean, as given by Sir H. Davy, Einhoff, and Thaer. The products are taken from 1000 parts of each.

English Name.	Saccharine matter or Sugar.	Whole quantity of soluble or nutritive matter.	Mucillage or Starch.	Gluten or Albumen.	Extract, or matter rendered insoluble during Evaporation.
Dry Peas.	22	574	501	35	16
Common Bean.		570	426	103	41

THE PEA.

The pea is the most esteemed legume in field culture, both for its seeds and haulm. It is said to be a native of the South of Europe. In this province it is cultivated successfully, and to a considerable extent, but not so extensively as it ought to be. The ground, after the peas have been removed, if the soil be of good quality, might be prepared for wheat the following spring.

In Oxfordshire, England, on the excellent land about Banbury, they have introduced a new kind of pea called, the " nimble hog pea." It is said to be a gray variety of the early frame pea, as it has single flowers, and is fit to cut about the end of June, notwithstanding it must not be sown earlier than the middle of April. The produce is thirty-two bushels the acre ; and on the same land, when the crop is cut, turnips are sowed, and produce a good crop, so that two valuable crops are obtained in the year.

The soil best suited to the pea, is dry calcarious sand ; it should be in good tilth, but not too rich. The climate required for the pea, is dry, and not over warm. The climate of Canada is generally favourable, and by suitable culture, on suitable soils, peas may be as certain a crop as any we have. Early sowing will be most likely to produce the best crop. The quantity of seed is about one bushel and a half to the acre, and if the pea is small, one bushel or a little more. The mode of sowing adopted in England by good farmers, is to sow them in drills after the plough, depositing the seed in every second or third furrow ; or, if land is in a pulverized state, by ribbing or drilling with the plough, and then shaking the seed, and harrowing the land. Peas require from two to four inches covering of earth, and if they are sown broad-cast, the best way would be, on light dry lands, (the only lands suitable,) to plough them in lightly, in small ridges, well drained by open furrows, &c. ; no other crop requires to be better secured from too much moisture in the soil ; peas should, therefore, be sown on narrow, high ridges, whether broad-cast or in drills. When sowed in drills, hand or horse-hoeing, and placing the earth well up to the plants with a small plough before the period of their coming into blossom, will greatly improve the crop.

In harvesting peas, considerable care is requisite, both on account of the seed and haulm. When pea crops become ripe, they wither or turn brown in the haulm or straw, and the pods begin to open. In this state they should be cut immediately, in order that the loss sustained by their shedding may be as little as possible. After they have been reaped, or rather cut up by means of a sort of hook or scythe, they should be put up into small heaps or wads, which are formed by setting small parcels against each other, in order that they may be more perfectly dried both in the seed and stem, and be kept from being injured from the moisture of the ground. The stalks and leaves of peas being very succulent; they should be taken good care of in wet weather, and the heaps or wads, should be turned, or they will receive damage. White peas particularly require to be well dried before they are housed, otherwise the sample will not be good. The haulm or straw, if well harvested, will be very good fodder for all sorts of cattle, and for sheep; but if it receives much wet, or if the heaps or wads are not turned, it can be used only as litter, or to increase the manure in the farm yard. When wet weather happens while peas lie in wads in the field, it occasions a considerable loss, as many of the peas will be shed,.and those that remain will be injured; fortunately wet harvests are not frequent in Canada. In the neighbourhood of large towns, gathering green peas for the market is a profitable mode of disposing of a crop.

The produce of the pea in Canada is very difficult to determine. In England, the produce is from twelve to thirty-two bushels the acre. I have every reason to suppose that as great or greater produce of peas can be raised here by good management, as in England. The produce of peas in flour is as three to two of the bulk of grain, and husked and split for soups, as four to two. The use of peas for soups, puddings, and other culinary purposes, is well known.

In Scotland, bread is sometimes made of pea flour, and reckoned very wholesome and substantial. The portion of peas not consumed as human food here, is mostly appropriated to the fattening of hogs, and for this purpose are superior to any other food, Indian corn not excepted. Hogs fatten more kindly when fed with this grain, than with beans, and the flesh of swine which have been fed on peas, will swell in boiling, and be well tasted, whilst the flesh of hogs fed on other food wastes in boiling, and is of less delicate flavour. The Lower-Canada pork, from being chiefly fed on peas, is much superior to that brought in here from the United States. In England, the white pea is preferred to the gray for feeding hogs.

In boiling peas, some samples, without reference to variety, fall or moulder down freely into pulp, while others continue to maintain their form. The former are called boilers. " The property of boiling depends on the soil; stiff land, or sandy land, that has been limed or marled, or to which gypsum has been applied, produces peas that will not melt in boiling, no matter what the variety may be. The same effect is produced on beans, on kidney-beans in the pod, and indeed on the seed and pods of all leguminous plants; this family having a great tendency to absorb gypsum from the soil. To counteract this fault in the boiling, it is necessary to throw into the water a small quantity of sub-carbonate of soda.—(*Bull. de Sci. Agr.*, *eb.* 1828.)

The seed of peas of any particular sort, may be cleaned in the grain, by hand-picking, taking out all mixtures, or in the field when in blossom, by drawing out all plants that are not of the right kind, from what may be necessary for seed, and keeping it separate afterwards until wanted. The diseases of the pea are few, chiefly the worm in the pod, and mildew or blight. None of these evils are very common here in ordinary seasons, and there is no known way of preventing them, except by judicious culture, and early sowing. Steeping the seed before sowing is useful in promoting the vegetation, and rendering the growth more vigorous and uniform.

THE BEAN.

The bean is a valuable field plant, as affording food for live stock, and in part for man. It is said to be a native of Egypt. It has been cultivated in Asia and Europe for ages. Beans have been long known in Britain, but only of late years extensively cultivated upon general soils, being formerly considered as adapted only to rich and moist soils. The cultivation of beans is partly confined to clays and strong loams in the best managed districts in England, and the horse-bean is the kind most generally cultivated, but large and small ticks are preferred in some of the English counties.

Though beans are not cultivated in Canada, they are a plant that I think might be advantageously introduced, and the climate is better adapted to their cultivation than that of England. I shall, therefore, describe the mode of culture that I think will be most proper for the bean.

Beans, though still sown broad-cast, and sometimes dibbled, are, for the most part, drilled by good farmers in England. In preparing ground for beans, it ought to be ploughed with a deep furrow after harvest. It would be very advantageous to plough the land again in spring, and if there were time, a second ploughing in spring would be useful. The manure might be ploughed in, in the fall, but if not, it may be put into the drills immediately before the beans are sown, or ploughed in, in the spring.

The mode I would recommend for preparing the soil for the seed in spring, would be, " to plough the land into well shaped ridges nine feet wide, ploughing in the dung, if not previously dunged in the fall. When this part of the work is completed, the seed might be sown in drills, crossing the ridges at from thirty to thirty-six inches apart, the seed in the drills about two inches apart, and covered with earth to the depth of three or four inches. Another mode might be adopted, by drawing shallow furrows with the plough the length of the ridges, about four furrows or drills in each ridge of nine feet, and sow the beans in these drills, covering them with the hoe. I should, however, prefer the first mode, when horse-hoeing was not to be adopted in the after culture, as a man could hoe the drills from the furrow on each side, without walking on the ridge or breaking down the plants. By this mode the field may be laid perfectly dry, if the furrows are properly cleaned out, and in all cases this is most essentially necessary to the successful cultivation of beans ; if the soil is wet, or water allowed to stagnate where peas or beans are sown, neither plants will thrive. If the bean comes to be cultivated to any great extent, other modes of sowing may be preferred to this I have laid down; but for the present, this culture will answer very well to commence with, to make farmers acquainted with the true value of a bean crop.

The climate most favourable to the bean is one neither very dry, nor very moist. In general, however, a dry summer is the most favourable to the production of the seed. The season for sowing should be as early as possible after the severity of the winter is over. If not sown in time, they will often miscarry, especially if a dry summer should succeed. The quantity of seed given to the acre in England, is about two bushels, or two and a half. If the beans are planted thick, the top pods only fill to the number of three, four, and half a dozen; when thin, the plants will pod and fill to the bottom. Both in the broad-cast and drill husbandry, it is common to mix a small quantity of peas with the beans, and this mixture is said to improve both the quality and quantity of the straw for fodder.

The after culture of beans commences when they have made some growth. If hand hoes are used, as they must be, if the drills cross the ridges, the weeds should all be cut down, and those that cannot be reached with the hoe, pulled out with the hand. When the plants have considerably advanced in growth, the earth should be laid up to them as to potatoes. If the beans are planted in drills along the ridges, a small plough can work between the rows exactly in the same way as with potatoes, and have the earth taken from the plants, the weeds hoed out, and after an interval of a few days, the earth should again be laid up to the plants with the plough. In moist seasons, the grain will not ripen fast, and in that case it will be found advantageous to switch off the succulent tops of the plants with an old scythe blade, set in a wooden handle. This operation, it is said, will occasion the crop to be ready for reaping a fortnight earlier, also, perhaps, a week sooner ready for the barn after being cut down. Beans require to be tolerably well ripened before they are cut down, otherwise the quality is impaired, and they will not keep well.

Beans are usually cut with the sickle, but are sometimes mown, and even in some instances pulled up by the roots. It is proper to let them lie on the swath to wither and dry for a few days; they are then tied up in sheaves with ropes of straw or withes, and set up in stooks to dry, but without any head sheaves. Beans may be very well secured in stacks, with proper thatching, or heading the stacks with straw, if there is not barn room; and if put into a barn, they should be placed where there is least danger of heating. The threshing of beans is nearly as easy as that of peas. The produce in England, is various. Donaldson says, that a crop of beans, taking the island at large, may be supposed to vary from sixteen to forty bushels the acre, but that a good average crop cannot be reckoned to exceed twenty. Middleton says that in Middlesex, the bean crops vary from ten to eighty bushels the acre. I have seen on one bean stalk in Canada, thirty pods well filled.

Beans are sometimes made into meal, the finer for bread, and the coarser for swine: but beans are for the most part applied to the purposes of feeding horses, hogs, and other domestic animals. It is said that it has been found by repeated experience, that beans are a much more hearty and profitable food for horses than oats, and give them much greater spirit and sleekness of skin. Bean straw when properly harvested, is considered very good fodder for cattle, and horses often prefer it to pea straw.

The produce of beans in meal is, like that of peas, more in proportion to the grain than in any of the cereal grasses. A bushel of beans is supposed to yield fourteen pounds more of flour than a bushel of oats, and a bushel of peas twenty pounds more. The diseases of beans are, the rust, mildew, and honey dews. There is no remedy for these diseases, except what good culture may do to prevent them.

THE TARE.

The tare, or vetch, has been cultivated for its stem and leaves from time immemorial. It is considered as a native British plant, and I believe it may be considered so in Lower-Canada. It is found wild in China and Japan. The tare is of hardy growth, and when sown in good land, will return a large supply of green fodder for the consumption of horses, or for fattening cattle. It may also be converted into hay.

The spring variety of tare is that suitable to Canada. The quantity of seed to the acre may be from a bushel and a quarter to a bushel and a half. It should be sown as early in the spring as possible. Though tares are usually sown broad-cast in England, sowing them in drills at eight inches apart would be a better mode. This could easily be done, after the land was ploughed into ridges nine feet wide, by making small furrows along the ridges eight or nine inches apart, sowing the seed broad-cast over these furrows, and afterwards harrowing the ridges to cover the seed, which will all fall into the small drills or furrows in harrowing. Tares are managed in the same way as peas, when they run to seed and are preserved for that purpose. When tares are made into hay, the time of cutting is when the blossoms have declined and begin to fall flat. The hay from tares is of a nutritious quality; and as it requires much sun and air to dry it thoroughly, and is very apt to be injured by moisture, consequently this country is much more suitable for its cultivation than the British Isles. I do not know any plant that might be more usefully introduced in Canadian husbandry. I have seen tares give a very large produce in Ireland on lands worn out by other crops; before these tares were harvested, a part of the crop rotted near the ground, and remained on the soil, was ploughed in for wheat, and produced an excellent crop. I have mixed a small quantity of oats with tares in sowing, and found it to answer well.

The produce of green tares has amounted to twelve tons the acre in England, and when converted into hay, to about three tons. The produce of seed from the acre, has been known to exceed forty bushels. Tares are found to be an excellent food for all sorts of cattle. Cows give more butter when fed with this plant than with any other food whatever. Horses thrive better on tares than on clover, and the same remark is applicable to the feeding of cattle, which feed faster upon this article of green fodder, than upon any kind of grass or esculent with which we are acquainted. If the plants are cut green and given to live stock, either in the field or in the fold yards, there is perhaps no green crop would be of greater value in Canada, and that would afford a more abundant supply of green herbage for stock in July and August, when the pastures are often burned up ; and should it not be required for this purpose, it might be cut and made into hay. The celebrated Young observes, " that in the county of Sussex, tare crops are of such use and importance that not one tenth of the stock could be maintained without them ; horses, cows, sheep, hogs, all feed upon them ; hogs are soiled upon them without any other food. This plant maintains more stock than any other plant whatever. Upon one acre, Davis maintained four horses in much better condition than upon five acres of grass. Upon eight acres he has kept twelve horses and five cows for three months without any other food : no artificial food whatever is equal to this excellent plant." Professor Thaer observes, that tares cut green draw no nourishment from the soil whatever, while made into hay, they afford a fodder preferred by cattle to pea straw, and more nutritive than hay or any other herbage. In Germany, the grain of tares are given to horses, cows, sheep and swine.

THE KIDNEY-BEAN.

The kidney-bean is a native of India, but ripens in Canada. It is not much cultivated here except in gardens. It is grown in the fields in France, Germany, Switzerland, and similar climates. The sort generally used is the small dwarf white. The ground is well prepared, and the seed is dibbled in rows eighteen inches or two feet asunder, in May. The ground is hoed and weeded during the summer, and the crop is ripe in August. It is usually harvested by pulling up the plants, which being dried, are secured in stacks or under cover. The haulm is of little bulk or use, but the seed is used in making that esteemed French dish called *haricot*, which might be usefully introduced here amongst poor settlers, and others. There is perhaps no other vegetable dish so cheap and easily cooked, and at the same time so agreeable and nourishing. The beans are boiled, and then mixed with a little salt butter, or other fat, and a little milk or water and flour. From 3840 parts of kidney-bean 1805 parts of matter analogous to starch was obtained ; 851 of vegeto-animal matter, and 790 parts of mucilage.

PLANTS CULTIVATED FOR THEIR ROOTS AS FOOD FOR MAN OR CATTLE.

Plants cultivated for their roots or leaves are various, and most of them are adapted both for human food, and that of domestic animals. The plants which are included under this head, and which may be successfully cultivated in Canada are, the potato, Swedish turnips, carrot, parsnip, beet, cabbage tribe, lettuce, and chicory. Friable or light soil, superior pulverization and manuring, the row-method, and careful after culture, are essential to the maturation of these plants ; and hence the importance of such crops as preparations for those of the bread corns.

The nutritive produce of these plants are thus given by Sir Humphry Davy :—

English Names.	In 1000 parts.				
	Whole quantity of soluble or nutritive matter.	Mucilage of Starch.	Saccharine matter or Sugar.	Gluten or Albumen.	Extract or matter rendered insoluble during evaporation.
Potatoe, -	from 260 to 200	from 200 to 155	from 20 to 15	from 40 to 30	
Beet Root, -	148	14	121	13	
Mangle Wurtzel,	136	13	119	4	
Common Turnip,	42	7	34	1	
Swedish Turnip,	64	9	51	2	2
Carrot, - -	98	3	95		
Parsnips. - -	99	9	90		
Cabbage. - -	73	41	24	8	

THE POTATO.

The potato is ascertained to be a native of South America, having been found wild in Buenos Ayres and in Chili ; though Humboldt was very doubtful if that could be proved ; he admits, however, that it is naturalized there in some situations. Sir J. Banks considers that the potato was first brought into Europe from the mountainous parts of South America, in the neighbourhood of Quito, where they were called *papas*, to Spain, in the early part of the sixteenth century.

To England the potato was brought from Virginia, by the colonists sent out by Sir Walter Raleigh in 1584, who returned in 1586, and brought with them the potato. The sweet potato was used in England as a delicacy, long before the introduction of the now common potato ; it was imported from Spain and the Canaries, and was supposed to possess the power of restoring decayed vigour. The potato was first planted by Sir Walter Raleigh on the estate of Youghal, near Cork, Ireland, and was cultivated for food in that country, before its value was known in England, where, for a considerable period it was only eaten as a delicate dish. Parkinson mentions, that the potatoes were sometimes roasted and steeped in sack and sugar, or baked with marrow and spices, and even preserved and candied by comfit makers. There is a tradition among the peasantry of the county of Galway, that the potato was introduced there previous to its being known in any other part of Ireland, owing to a vessel with some of them on board having been wrecked on the coast, and a few of the roots having been roasted by children who found them ; they were so much approved of as to induce the planting of the remainder. It was near the middle of the eigeteenth century, however, before they were generally known and cultivated in the British Isles. In Ireland they are now the chief article of food for a large majority of the people. Though potatoes are certainly a nourishing and healthy food, relished by almost every palate, yet it is by no means desirable that they should become the principal food of the people in any country, and I hope they never will in Canada. They are an excellent vegetable with beef, mutton, pork, and other good things, but are only fit to be used in this way, if bread is attainable.

The value of potatoes as a fallow crop, and as an article of food for cattle, compared with turnips, may be considered thus : Potatoes are more nutritive, and, in the opinion of those who have used them, fatten cattle much quicker than any other root, particularly if boiled or steamed. Potatoes may be secured from the severities of winter with much less difficulty than turnips, cabbages, or any other roots, and will keep better. A much less quantity of potatoes will fatten an animal than will be required of any other vegetable. In Canada they are more certain and more valuable than any other root crop.

An acre of potatoes may produce from eight to twelve tons, or from 240 to 360 bushels, at 70 pounds to the bushel, and sometimes more. Turnips, even when a successful crop, will not often produce this weight of roots, and equal weight contains only about one-sixth of the nutriment in potatoes.

There are many varieties of the potato, most of them fit for human food, but some only fit for cattle. In choosing a sort or sorts of potato from the numerous varieties which are to be found every where, perhaps the best way is, for the selector to procure samples and taste them, and to fix on what best pleases his palate. The Lincolnshire pink eye is much esteemed in England as an early potato. It has been cultivated in Canada. The kidney potato is also an early variety, and are grown here. These early varieties, however, are not the most productive, and should only be planted to afford an early supply for the table. The common red potato, well known here, is productive, of good flavour, and keeps well, if properly stored, until the new potatoes are fit for use.

The soil in which the potato thrives best, is a light loam, neither too dry nor too moist ; but if rich, it is so much the better. They may, however, be grown well on many other sorts of lands, especially sandy, and those of the mossy, moory, and other similar kinds, where they are free from stagnant moisture, and have their parts well broken down by culture, and a reasonable portion of manure added. The best flavoured table potatoes are almost always produced from a newly broken up pasture ground, not manured, or from any new soil. Repeated on the same soil, except in new land, they very generally lose their agreeable flavour.

In preparing land for potatoes, it is of much importance to free it as completly as possible from weed roots, which cannot be so well extirpated afterwards as in some other drill crops, because at no period of their growth is it safe to work so near the plants, especially after they have made some progress in growth. The first ploughing should be given as soon after harvest as possible ; the second, and most commonly it will be necessary to give a third, early in spring : the land is then laid up into ridgelets, from twenty-seven to thirty inches broad, and manured in the drills. Land that has been some time pastured, and of reasonable fertility, if ploughed early in the fall, cross ploughed in the spring, well broken up with the break harrow, and again ploughed and well harrowed, will give a most excellent crop of potatoes, and of good flavour without manure ; and with a very light dressing of manure, or even without any, will give a good crop of grain the next year, if sown with the species suitable to the soil. From whatever cause, potatoes, when planted on suitable soil, (indeed on any soil except heavy clays,) is a most excellent preparing crop for most kinds of grain, and will not impoverish the soil so much as might be supposed from the great bulk produced.

The season for planting potatoes in the fields, depends much on the soil. They should be planted as early as the preparation of the soil will admit of. Potatoes planted late in June often happen to produce abundantly, when the season is favourable; but there is much risk in late planting in this climate, first in case of very dry warm weather in June and July, or if the weather is very wet ; and, secondly, in case of early autumnal frosts. In either case, the crop has no great chance to be a good one. The latter end of May or the first week of June, potato planting should be finished if possible.

The best climate for the potato is one rather moist than dry, and temperate or cool rather than very hot. Hence the excellence of the Irish potato which grow in a dry, loamy, calcarious soil, and moist and temperate climate. It is supposed that the potato is grown nowhere in the world to the same degree of perfection as in Ireland, and in Lincolnshire, England. I have seen as abundant crops of potatoes in Canada as in Ireland, or very little short of it, when the season was moderately moist, and the soil suitable ; and in these cases the quality is generally good ; however, potatoes need not be cultivated here for human food, so much as in other countries ; and for feeding cattle, abundant crops may be raised.

In preparing the sets of potatoes for planting, some recommend large sets, others small potatoes entire, and some large potatoes entire ; others, on the ground of experience, recommend small cuttings, sprouts, shoots, or even only the eyes or buds. The farmer will find it his interest to make tolerable sized cuttings of pretty large potatoes, with two or three good eyes or buds in each. The strength of the stem at the outset depends in direct proportion upon the vigour and power of the set. The set, therefore, ought to be large, rarely smaller than the fourth part of a good sized potato ; a feeble and late crop is often the consequence of small sets. It has been ascertained beyond a doubt, that seed taken from the top or watery end of the potato, planted at the same time with the sets taken from the root or mealy end, will ripen their tubers a fortnight sooner. Sets should always be cut some days before planting that the wounds may dry up ; but no harm will result from performing this operation several weeks before hand, provided the sets are not exposed too much to the drought so as to deprive them of their natural moisture. The quantity of sets depends on the size of the potatoes ; in general, where the sets are sufficiently large, about sixteen bushel will be required for an acre : some farmers plant less.

The best method of planting on suitable soils, is in drills, formed at equal distances, and of such width and depth as to contain the manure. The distance of the drills from each other is such, that the horse which leads out the manure may pass in one furrow, and each of the wheels of the cart in others, on the different sides. The manure is equally distributed in three furrows, by means of a crooked fork with two or three prongs. The distance of the drills is usually from 27 inches to 30 or 33 ; the richer and more fertile soils require the largest space. On the manure the sets are placed at from four to eight inches asunder, and the plough is run on each side, divides the ridgelets, and covers the seed. On dry sandy or gravelly soils, the sets are often put under the dung in the drills, and of a dry season it answers best in this way. In heavy clay, particularly long and unfermented dung, is decidedly preferable to short and well mixed manure for potatoes ; perhaps this is to be attributed chiefly to its mechanical influence in keeping the soil open. In any soil, a given quantity of unfermented dung, properly applied to crops by being buried in the soil, will produce much more beneficial results than the same quantity would do applied after being fermented and in a perfectly rotten state. What is called the lazy-bed method of planting potatoes answers well in a very moist climate or soil, and the greatest part of the potatoes are planted so in Ireland. The land is generally prepared by fallowing if potatoes are planted after corn crops. The dung is spread on the ridges, which are about five feet wide, and two feet and a half are left on each side for trenches. The sets are laid on the dung at proper distances, and they are covered to the depth of four or five inches with the mould dug from the side trenches with the spade. When the plants appear over the soil, there is more mould put on them from the trenches, and any weeds taken out that may appear. I have seen low, swampy lands planted with potatoes in the lazy-bed method in Canada, produce extremely well ; but this method is not suitable for dry soils.

The luxuriance and abundance of the potato crop depend greatly on the attention and industry which are employed in the cleaning and hoeing operations. It is recommended by some to harrow the land when the shoots from the sets under the surface have advanced about an inch, which is to be ascertained by examination. By the operation of harrowing, the surface of the soil is not only cleaned from weeds, but loosened, to allow the tender shoots to push freely through it. A bush harrow is best for light soils, but for strong soils, a small folding harrow is recommended for this purpose, by which the weeds are destroyed, and the mould is applied to the opposite sides of the contiguous rows. When the potatoes are entirely up, the earth and weeds may be removed from them, by forming a shallow furrow with the plough, running the plough as close as possible to the plants on each side, without injuring them. When the earth is taken from the plants, the rows must be hand wed, and hand hoed, to complete what is deficient in the operation of the plough. A small triangular harrow, about twenty inches wide in the widest part, with nine iron teeth, and two small handles for the harrowman to guide it by, is drawn by one horse along the furrows on the earth taken from the ridgelets on each side by the plough; two or three times will be sufficient to pass on each furrow. From the time the earth is taken from the plants, it is generally a week before it is again put to them by the plough, which is effected by again applying the plough, and separating the earth between the rows above mentioned, towards the plant on each side, but without covering it. After this, if there is an opportunity, the plough might again be passed between the rows, with one horse, and raise the earth still more to the plants; but the vegetation is so rapid here, that there is not often time to do so. In a wet season, there is considerable risk in cross harrowing potatoes on heavy soils, and leaving them in that state, even for a day. In such seasons, on clay soils, they should be ploughed immediately after being harrowed, or the whole crop may be lost. It will also be found a good plan to make the bottom of the furrow between the drills deeper than where the seed is placed, and in all cases to open each furrow into the head-land furrow, and open small drains in every part of the field where there are hollows, and crossing the furrows so that no water can possibly remain. This must be repeated after each ploughing; the safety of the crops often depends on it.

The taking up of a crop of potatoes on a small scale is generally performed with a spade; but under judicious farm management and the row culture by the plough. The coulter is removed, and the plough goes first along one side of all the ridgelets of any convenient breadth; and then, when the potatoes so brought to view are gathered by women placed at proper distances, it returns and goes along the other side. When the land is somewhat moist, or of a tenacious quality, the furrow slice does not give out the roots freely, and a harrow, which follows the plough, is commonly employed to break it, and separate them from the mould. Various contrivances have been resorted to for this purpose. A circular harrow or break to be attached to the plough, of very recent invention, has been found to answer the purpose well, and effect a considerable saving of labour.

It is said that potatoes intended for seed should be taken up a fortnight before they are fully ripe, that this will prevent the disease called *curl*. It is recommended to prevent potato plants that are intended to produce seed stock for the ensuing year, from producing flowers or seeds, by cutting them off in embryo, taking care, however, to take no more off than the extreme tops, as by taking more, the crop may be injured.

In this country potatoes do not blossom so much as in England; indeed some varieties scarcely ever blossom. It is said that potato plants that blossom, and perfect the fruit or apple, will not produce so abundantly as the plants that do not blossom; and I believe it will be found by experience to be so in every instance. Experiments have been made in Britain, by taking off the flowers or blossoms, and the produce of potatoes was nearly double that of the plants that were allowed to perfect the seed or apples; a difference of 10 or 15 per cent. at least, is certain. I should not like to see many blossoms on my potatoes, or to cultivate those that would produce many blossoms, in preference to those that would not.

Potatoes are stored in Canada in cellars, root houses, and sometimes in pits. Whatever mode is adopted, it is expedient that the tubers be perfectly dry, otherwise they are certain of rotting; and a few rotten potatoes will contaminate a whole mass. It is of great advantage to have the work performed in a dry season, as potatoes seldom keep well when taken up wet. If they are not perfectly dry, they might be put into long, narrow heaps in the field, and covered with mould. These heaps are generally about three feet wide, laid on the surface, and heaped up to about two and a half or three feet high, in the shape of a house roof, and covered with earth from nine to twelve inches thick. Potatoes will dry in these heaps in a few days, and may then be stored for the winter. The heaps should be placed in a straight line, to give as little interruption to the ploughing as possible, should the ploughing commence before the potatoes are removed.

In suitable situations, in dry banks, where there is no danger from water, potatoes will keep well in pits. The pits may be excavated to the depth of about five feet, four or five feet wide, and any length required. The potatoes may be filled into this pit to within one foot of the surface; this space should be filled with hay or straw; pieces of wood should then be placed across the pit sufficiently strong to bear up the weight of the earth necessary to cover the potatoes and on a level with the surface ; small branches can be laid on these pieces to keep the earth from falling through. The earth that has been excavated may then be thrown over the pit, and shaped like the roof of a house, neatly smoothed by flat strokes of the spade. A few loads of stable dung placed over the whole before winter, would make them more secure. I have kept potatoes in this way safer, and in a better state than in a cellar or root house ; they will do much better so kept, for seed. A dry situation is necessary, or potatoes cannot be safely kept in pits, however carefully put up. A bed of dry straw, or wood shavings, would be no harm in the bottom of the pit, unless when made in dry sand. The weight of clay that covers the pit should be carefully kept off the potatoes, or they will not keep.

The season, the fertility of the soil, and the more or less perfect culture which is employed, must no doubt occasion great diversity in the amount of the potato crop. The produce obtained in Canada, may be stated from 150 to 400 bushels to the acre ; from200 to 300 bushels to the acre may be raised almost with certainty, on suitable soils, properly cultivated, and a much larger produce of the large description of potatoes fit for feeding cattle.

The uses to which potatoes may be applied, are various. They contain about 25 per cent. of their weight in nutritive matter, rye 70 per cent. and wheat 950 in 1000. One acre of potatoes will supply more nutriment than two acres of wheat. Dr. Tissot was of opinion that the constant use of potatoes was not pernicious to the body, but that they hurt the faculties of the mind. He owns that those who eat maize, potatoes, or even millet, may grow tall, and even acquire a large size ; but doubts if any such ever produced any literary work of merit.

Of 7000 parts of the kidney variety of potatoes, 970 were soluble mucilage ; 700 pure starch ; 620 fibre ; and 4710 water ; which proves the propriety of boiling or steaming them when given to cattle.

The manufacture of potato flour is carried on to considerable extent in the neighbourhood of Paris ; and the flour is sold at a price considerably higher than that of wheat, for the use of confectioners, and for bakers who prepare the finer sorts of bread. The potatoes are washed and grated, and the starch separated from the pulp so obtained, by filtration: it is dried on shelves in rooms heated by a flue, and afterwards broken on a floor, by passing a cast iron roller over it. It is then passed through a bolting machine, and put up in sacks for sale. The most complete manufactory in the neighbourhood of Paris in 1829, was that of M. Delisle, at Bandy. Most of the operations there are performed by a steam engine, attended by children. It is reported by Count de Chabrol, in his statistical account of Paris, that 40,000 tons of potatoes are annually manufactured into flour within a circle of eight leagues around the city.

The quantity of farina which potatoes produce varies not only according to the species, but according to the period when the extraction takes place. The variations produced by this last cause, are nearly as follows:—Two hundred and forty pounds of potatoes produce of farina, or potato flour, in

August,	from 23 to 25 pounds;	March	from 45 to 38 pounds.
September,	from 32 to 38 pounds;	April,	from 38 to 28 pounds.
October,	from 32 to 44 pounds;	May,	from 28 to 20 pounds.

The extraction of the farina should be discontinued at the period when the potatoes begin to grow, the farina being destroyed by germination. Red potatoes produce a smaller quantity of farina. The best of all is that of the white which has a yellow tint, as its farina is of very good quality, and abundant. Potato flour is said to make excellent bread mixed with meal or wheaten flour, or even unmixed, made into cakes, and eaten warm. Potatoes make good starch; and the refuse of potatoes used in making starch, possesses the property of cleansing woollen cloths, without hurting their colour; and the water decanted from the starch powder, is excellent for cleansing silks, without the smallest injury to the colour.

Wine, of a good quality, may be made from the frosted potatoes if not so much frosted as to become soft and watery. The potatoes must be crushed or bruised with a mallet, or put into a cider press. A bushel must have ten gallons of water, prepared by boiling it, mixed with half a pound of hops, and half a pound of common white ginger. This water, after having boiled for half an hour, must be poured upon the bruised potatoes, into a tub or vessel suited to the quantity to be made. After standing in this mixed state for three days, yeast must be added to ferment the liquor; when the fermentation has subsided, the liquor must be drawn off as fine as possible, into a cask, adding half a pound of raw sugar for every gallon. After it has remained in the cask for three months, it will be ready for use.

Ardent Spirits.—Potatoes that have been injured by the frost, produce a much greater quantity of spirits, and of a much finer quality, than those that are fresh; they require a proportion of malt wash to promote the fermentation. About one-fourth of malt worts or wash, ought to be fermented at least six hours before the potato wash is joined to it; otherwise potato wash, having an aptitude to ferment, will be ripe for the still before the malt wash is ready; hence the effect will be, to generate an acid which renders the spirit coarse, and, when diluted with water, of a milky or blueish colour. When the spirit is strong, the acid is held in solution, but appears as above, when diluted with water.

Potatoes, boiled or steamed, and mixed with bean or barley meal and pollard, will fatten cattle, sheep, or hogs, in less time than any other food. Potatoes will not pay for production given in a raw state to animals. They are so much more nutritive in a boiled than in a raw state, that it is committing great waste to give them as food to stock, without boiling. Thaer found that potatoes given to live stock, produce more manure than any other food ; 100 pounds of potatoes produced 66 pounds of manure of the best description.

Frosted potatoes may be applied to various useful purposes for food, by thawing in cold water, and being boiled with a little salt. Salt, or saltpetre, chaff or bruised oats, boiled with them, will render them fit food for cattle or swine. Starch, and ardent spirits may be made from them when too sweet to be palatable.

The best preventive against disease in potatoes, is to change the seed frequently, and from different soil ; those grown on a moory soil make the best seed on all other descriptions of land. The curl in potatoes is said to be produced by frequently planting the same seed, and the tops carrying large quantities of apples. It is said that till within the last fifty or sixty years in England, the potato plant never brought the seed in the apples to maturity, and that the Surinam, and other kinds lately introduced, do not as yet produce perfect seeds at the top of their stem. This will account in some degree, for the common red potatoes here, bearing so few blossoms or apples ; and the Lanckman potato which I cultivated here two or three years did not produce one flower or apple, though the tops were very strong. I have, however, seen new varieties lately introduced that produced blossoms in abundance, but the roots were not so numerous as those without blossoms.

The farmer who will cultivate judiciously, planting good smooth seed potatoes on the most suitable soil, will generally be successful in raising a good crop ; and when he has not such soil, he should substitute some other green crop, as beans, tares, or summer fallow. A proper distribution of crops is as necessary to be strictly observed, as any part of farming.

TURNIPS.

Turnips and clover are considered the two main pillars of the best courses of British husbandry, as preserving the fertility of the soil for producing grain, improving the breed of cattle and sheep, and affording a regular supply of butcher's meat all the year. That such is the fact, there cannot be any doubt ; but, there is as little doubt that the turnip system can never be introduced with equal success or profit, into Canada. The climate is unsuitable, and probably ever will continue so, for the extensive cultivation of turnips, or for keeping them in a safe and good state after they were produced.

A cool, moist and temperate climate is the most desirable for turnips. Ireland produces larger turnips than any part of the British Isles. I have seen two turnips taken from a field the first week of October, and exhibited before the Farming Society of Ireland, that weighed 42 pounds each. Von Thaer says that turnips grown in the fields of Germany, seldom exceed half a pound weight each, and that all his care could not raise one at Magglen beyond 14 pounds. In France and Italy they are still less. They are found of no size in the rapid climate of Russia or Sweden. I have not seen them of any great size here ; and from the ravages of the turnip fly, and the frequent dry seasons, a turnip crop is the most uncertain that can be sown. On new lands in the woods, or moss lands with abundance of ashes, a crop may be had, but not of great bulk. Swedish turnips, with proper culture, might produce tolerable crops, and would keep better than any other. The yellow Aberdeen, and yellow Dutch turnips, are next to the Swedish for their hardiness, and nutritive qualities, and keep much better than the white. The Swedish and yellow turnips, are much used for work horses in Britain, as food, with hay or straw.

The land requires to be well pulverized and perfectly clean for turnips. When it is in that state of preparation, the drills may be opened with the plough to receive the manure, in the same way, and at about the same width between the rows, as for potatoes, from 27 to 30 inches. The manure is then carted out and spread in the drills, in as regular a manner as possible. When the manure is spread, it is covered with the plough, spliting each ridgelet in two, and forming a new ridgelet over the manure. The land being formed into ridgelets in this manner, is ready to receive the seed. This is sown on the tops of the ridgelets, by machines of various forms.

The most simple of these is the Northumberland one-row turnip drill. It has two wheels which run in the hollows on each side of the drill or ridgelet to be sown, by which the sower is enabled to keep the row exactly in the centre of the drill. The seed is put into a tin cylinder through an aperture which opens and shuts for the purpose ; from this the seed drops as it moves, through small equidistant holes made in it, into a tin tube, by which it is conveyed to the ground. Immediately before this tube is a hollow coulter of iron, sharp before, which encloses the forepart of the tin tube, and makes a track in the ground from one to two inches deep, into which the seed drops. This simple apparatus is mounted on light wheels, and has a light wooden frame work, having two shafts behind, by which the workman holds and keeps it steady in its course. It is generally attached by a rope to a tight wooden roller, that rolls two drills at a time, and is drawn by a horse. This drill barrow has a small roller attached to it behind the coulter and tube, which will press in and cover the seed when worked by a man, without a horse or roller, but the ridgelets must be previously rolled.

Many modes of preparing the seed to prevent the ravages of the fly, have been proposed, but hitherto without any great success. Mixing with radish seed has been adopted, as the fly is known to prefer the radish to the turnip. Steeping the seed for 24 hours in very strong tobacco water, in which the tobacco has been boiled, is also said to prevent the fly from injuring the young plants, until they get the rough leaf. But in very dry seasons, such as 1834, no remedy yet known will effectually prevent the ravages of the fly in Canada, on old cultivated lands. It is necessary in all cases to sow this seed thick, as the plants are so much exposed to contingencies.

The period of sowing may be from the 1st of June, for Swedish turnips, which should be sowed early, to the 10th of July. If the crop be intended for selling in market, for the table, the more rapid its growth, the more tender and better they will be found for cooking. Turnips long in growing will not cook well, but will be tough and sticky. Turnips require great care in hoeing and weeding, and should not be nearer to each other in the rows than eight or ten inches. Swedish turnips may be transplanted in moist weather, where blanks appear in the rows.

In Norfolk, the best county in England for turnips, *one acre of the best* is considered only sufficient to feed 100 sheep for a week. The produce of turnips sowed broad cast, varies in England from five to fifteen tons to the acre, and the last is reckoned a good crop. The white globe turnip drilled, generally produces in the north of England, from 25 to 30 tons per acre, equal to about 1000 or 1200 bushels ; the yellow and Swedish a few tons less. The produce of turnips in nutritive matter, as proved by Sir H. Davy, was 42 parts in 1000 ; Swedish 64 parts in 1000. According to Von Thaer, 100 pounds of turnips are equal to 22 pounds of hay ; and an ox to get fat on turnips, ought to have one-third of its weight daily. In England, an ox of 60 stone will require one acre of turnips of thirty tons produce, to make him fat ; the quantity will be sufficient for 10 sheep. Mr. Young says, a beast will eat from a third to one-half his own weight of turnips daily, with a portion of hay or straw.

Turnips cannot be preserved in Canada, unless in root houses or cellars ; and with the exception of Swedish turnips, they will not keep even in cellars if a large quantity is put together, without heating and spoiling. The following is the opinion given in the Supplement to the Code of Agriculture, on storing turnips in England.

"The storing of turnips is attended with too much labour and risk to be of much advantage in the greater part of the kingdom. Common turnips are never stored in any great quantity, though sometimes a portion is drawn and formed into heaps, like potato camps, and lightly covered over with straw, or preserved for some time under a shed : on these occasions, before storing up, the shaws or leaves, and the tap roots must be cut off and removed, to prevent heating and rotting. The heaps must not be covered with earth like potatoes, for in that case their complete destruction is inevitable. This root contains too much water to be preserved any length of time in a fresh and palatable state, after being removed from the ground ; and though the loss in seasons, unusually severe, particularly in the white globe variety, is commonly very great, it is probable that a regular system of storing the whole, or greater part of the crop every season would, upon an average of years, be attended with still greater loss ; besides the labour and expenses, where turnips are cultivated extensively, would be intolerable."

It is well known that turnips exposed to one night's severe frost in Canada, will be deprived of a great portion of their best qualities, and are thereby rendered totally unfit to be cooked for the table. They are of such a soft and watery nature, that if put together in any considerable quantity in cellars, they are inevitably destroyed. And supposing they might be kept safely in cellars or root houses, as potatoes are kept, in large quantities, what farmer could find room for as much as would be necessary to feed a few cattle, at the rate of 10 or 1200 bushels for one animal? All farmers who understand stall-feeding cattle on turnips, are well aware, that it is only by giving them as much as they can eat, they can be fatted on that food to profit.

CARROTS.

The climate and much of the soil of Canada is most favourable for the cultivation of carrots, and on suitable soil will yield a more valuable product, perhaps, than any bulbous or tap-rooted plant whatever. The best sort for the field, is the long red or field carrot. New seed and perfectly clean from chaff, is most essential, as it will not vegetate in the second year. Old seed should be carefully avoided. The best soil for the carrot is a deep, rich, sandy loam; such a soil should be at least a foot deep, and all equally good from top to bottom. Mossy or peaty soils well drained, will grow good carrots. On any other than these, the field culture of carrots will not answer well.

In preparing the soil for carrots, it is necessary that it should be ploughed before winter, that it may be pulverized by the frost. It should be again well ploughed in spring, to the depth of ten or twelve inches, and a second time by cross ploughing if possible. I would recommend ploughing in the manure in the fall, and that it should be well rotted dung or compost. At any time the manure is applied, it should be of this description. When the soil is perfectly well pulverized in spring, it should be formed into shallow ridgelets, about the same size as those for potatoes or turnips. A light wooden roller should then be passed over them to level the tops of the ridgelets, and on the top of these ridgelets, two rows of seed may be sown, about six or eight inches apart. The rows in which the seed is deposited, should be made about an inch deep by a wooden instrument or rake, with two broad teeth, six or eight inches apart, that can be drawn along the ridgelets, and thus form the rows. The seed may then be sown in these rows with the hand, and covered with a rake or light hoe. The after culture and weeding, will be much more readily effected when the carrots are sown in this way, than in any other. A double row of plants will grow on each ridgelet.

The preparation of seed for sowing practiced by some English farmers, is to mix about two pounds of clean seed with one bushel of fine sand or mould, which will be sufficient for one acre, and this is done several days before sowing, taking care to have the heap turned over every day, sprinkling the outside of the heap with water each time of turning over, that every part of the heap may be equally moist, and that vegetation may take place alike throughout. There is a great advantage in preparing the seed so long before hand, as it is by these means in a forward state of vegetation; it therefore lies but a short time in the ground, and is more able to contend with those numerous tribes of weeds in the soil, whose seeds are of quicker vegetation. The drainings of the dunghills are often used for watering the heaps.

After the first thinning and hoeing of the plants, those afterwards taken out may be given to the swine, and will afford considerable food in this way from an acre. The plants should be about six or eight inches apart in the rows, or if farther asunder it will be no harm.

Carrots are taken up generally in the latter end of October. They can be taken up with a spade or three-pronged forks; the tops are cut off, and the roots left in separate heaps to be carried away in carts. The tops should also be carried to the cattle, who eat them greedily. In dry sandy soil, carrots will keep in the ground till spring, and will not be much injured by frost. They are not so subject to heat as turnips, but more so than potatoes; they will keep well in a root house that is not too warm, but it is dangerous to put a great quantity of them together in cellars or root-houses. They should be perfectly dry when stored, and all those required for use before the first of January may be kept in any out house that is close, covered with hay or straw, as a slight frost will not injure those that are to be used immediately. Hence it will be only necessary to find cellar room for those that will be required in January, February and March, as the spring supply may be left in the soil in most situations. From two to five or six hundred bushels may be obtained from the acre, on suitable soil and culture, and they are not more expensive to raise than potatoes.

The application of the carrot to the feeding of working cattle and hogs, is thus detailed by Mr. Burrows, an English farmer: "I begin to take up the carrot crop in the last week of October, as at that time I generally finish soiling my horses with lucern, and now solely depend upon my carrots, with a proper allowance of hay, as winter food for my horses, until about the first week of June following, when the lucern is again ready for soiling. By reducing this practice to a system, I have been enabled to keep ten cart horses throughout the winter months for these last six years, without giving them any corn whatever, and have at the same time effected a considerable saving of hay. I give them to my cart horses in the proportion of about 70 pounds weight of carrots to each horse per day, upon an average, not allowing them quite so many in the very short winter days. The men who attend the horses, slice some of the carrots in the cut chaff or hay, and the barn door refuse; the rest of the carrots they give whole to the horses at night, with a small quantity of hay in their racks; and with this food my horses enjoy uninterrupted health. I mention this, as I believe some persons think that carrots only, given as food to horses are injurious to their constitution; but most of the prejudices of mankind have no better foundation, and are taken at random, or inherent from their grandfathers. So successful have I been with carrots as winter food for horses, that with the assistance of lucern for soiling in summer, I have been enabled to prove by experiments conducted under my own personal inspection, that an able Norfolk team horse, fully worked two journies a day, winter and summer, may be kept the entire year round upon the produce of one acre of land. I have likewise applied carrots with great profit to the feeding of hogs in winter, and by that means have made my straw into a most excellent manure, without the aid of neat cattle; the hogs so fed are sold at Norwich-hill to the London dealers as porkers." An additional circumstance greatly in favour of the carrot is, that it does not require to be steamed or boiled, as the potatoes, for horses, cattle or hogs, though steaming or boiling might no doubt, make them more valuable as food. Carrots, in the distillery, owing to the great proportion of sugar in their composition, are said to yield more spirit than the potato; the usual quantity is 12 gallons per ton. A bushel will weigh 42 pounds, and sometimes over this weight. Hence, if an acre produce 3 or 400 bushels, it will be equal to 6 or 8 ton weight of carrots, at 50 bushels to the ton, and yield from 70 to 100 gallons of spirits to the acre, together with very valuable wastes for feeding cattle.

I do not think it necessary to give horses so large a quantity of carrots daily as given by Mr. Burrows. About three quarters of a bushel, or one bushel to large horses, would be sufficient; that would be from 32 to 44 pounds daily. I believe that from 3 to 4 bushels of carrots will be found equal in value to about one bushel of Canadian oats of ordinary quality, for feeding horses, and the comparative value of a crop of oats and carrots may hence be accurately estimated by the farmer. The cultivation of green crops is so necessary to be introduced into our agricultural system, that carrots should be grown by every farmer who has suitable soil. Successful and profitable husbandry cannot be carried on without having green crops, summer fallow and grazing, in due proportion; and our green crops should be such as may be a good substitute for grain in feeding of stock,

PARSNIPS.

Parsnips may be cultivated in the same manner as carrots, but will succeed best in a strong deep soil. They are said to be superior to carrots for feeding cattle and hogs, and to produce more to the acre. It is said that 30 perches of parsnips, when the crop is good, will be sufficient to fatten a perfectly lean ox of three or four years old, in three months. The roots are generally given in the proportion of about 30 pounds weight, morning, noon and night, and a little hay supplied at the intervals of these periods. I cannot say much of the value of parsnips from personal experience; however, I believe the above estimate of their value is not exaggerated.

THE FIELD BEET, COMMONLY CALLED MANGLE-WURTZEL.

The culture of Mangle-wurtzel is said to be considerable in the United States, and is very favourably reported of, as food for cattle. Any soil will suit it provided it is rich, and the season favourable. I have seen it cultivated in Canada, but not to any great extent, or very successfully; it is an uncertain crop compared with potatoes or carrots, and will not give a more profitable produce, under the most favourable circumstances. The preparation of the soil may be usually the same as for carrots or turnips; the after culture is also the same. According to Thaer, they afford ten per cent. of nutritive matter, and are in that respect, to hay, as 10 to 46, and to potatoes as 20 to 46. This root is said to be excellent food for milch cows, increases the quantity of milk, and improves its quality. It is as difficult to store in winter as turnips, or very nearly so, and this is a great objection to soft and watery roots for winter keep in Canada. Potatoes, carrots, parsnips, and Swedish turnips, will keep better than any other roots, if properly put up and secured in cellars, root houses, or pits.

CABBAGE.

The cultivation of cabbage for the common purposes of farming, will be still less profitable in these provinces than turnips or mangle-wurtzel, however highly the cultivation of this vegetable may be recommended elsewhere. For some time to come, it will be best only to cultivate such roots as are easy to manage, most certain to produce a crop, and after the crop is raised, least difficult to preserve during our severe winters, for future use. It is very dangerous to commence an improved system of agriculture by too many speculative experiments, with such an agricultural community as we have in British North America, who cannot afford to risk capital without a reasonable prospect of a return. Those who have abundant capital, and are fond of speculation and experiments, may be allowed to make them, without exciting any jealousy amongst their neighbours, whose means may be more limited ; and from these experiments they may learn and profit, without any cost to themselves.

The allowance of cabbage for a cow is from 100 to 150 pounds daily, and for a sheep 10 or 12 pounds, besides a moderate allowance of hay. As cabbage is cultivated in British America principally for human food, it may be interesting to some readers to know how it is preserved for this purpose in Germany, and other countries, for winter use.

Salted cabbage, or sauerkraut, is thus prepared. Any sort of cabbage, turnips, and kidney beans, may be prepared in this way ; but white, compact-headed large cabbages are preferred. The first process of preparing them is to scoop out the interior part of the stalk with an iron instrument or scoop ; they are then cut into small shreds by a wooden machine composed of a flat board or tray, which has a ledge on two sides, to steady a box or frame into which the cabbages are put. In the middle of the board are four flat pieces of steel, similar to the steel part of a spoke shave, placed in an oblique direction ; and the near edge of each being a little raised up with small spaces between each, to let the shreds fall down into a tub placed underneath to receive them. The cabbages are then put into the box before described, which is pushed backwards and forwards, when the cabbages, being cut by the steel, fall into a tub placed below. A barrel stands by ready to receive them when cut, the sides of which are first washed with vinegar. A man stands on a chair by the barrel, with clean wooden shoes on, whose business it is to salt and prepare them, which is done in the following manner : the man first takes as much of the cut cabbage as covers as much as four inches above the bottom, he next strews upon it two handfuls of salt, one handful of unground pepper, and a small quantity of sallad oil ; he then gets into the barrel, and treads it down with his wooden shoes, till it is well mixed and compact. He next takes another layer of cabbage, and puts salt and pepper on it as before, and treads it again, and so goes on till the barrel is filled. A board is then placed on it, and on the board some heavy weights are put; and it remains so ten or fifteen days, when it partially ferments, and a great deal of water swims on the surface; it is then put into the cellar for future use. The men who prepare sauer-kraut in Germany, are Tyrolese, and carry their machine from house to house.

There are several other plants which might be cultivated in the fields for their roots or leaves as food for man or cattle, in a recent state. Of these I shall only notice chiccory, and rough comfrey.

The chiccory, wild endive, or succory, has long, thick, perpendicular roots, a tuft of endive or lettuce-looking leaves, and when it shoots into a flower, its stem rises from one to three feet high, rigid, rough, branched, and clothed with leaves and blue flowers. It is found wild in dry calcarious soils in England, and in most parts of Europe of similar or greater temperature, it is also found in Canada, and considered as a weed. It is cultivated in France as an herbage plant, and in Germany and Flanders for its roots, from which a substitute for coffee is prepared. It is supposed that on poor soil this plant is superior to all others, and will yield a greater quantity of sheep food on such soils than any other at present cultivated. It also thrives well on bogs or peaty soils. It is said to do well for soiling cattle and swine, and is made into hay in France and Lombardy. It is objected to in England, on the ground of its rising and becoming a vivacious weed in succeeding crops. I have no experience of this plant, and therefore I cannot particularly recommend it to the notice of farmers.

The rough comfrey, a perrenial from Siberia, has been lately brought into notice in England by D. Grant, a nursery man at Lewisham, and tried by a number of cultivators. Cattle of every kind are said to be fond of this plant; and so great is its produce on good soil, that Mr. Grant thinks an acre might be made to produce 30 tons of green fodder in a year. He has grown it to the height of seven feet as thick as it could stand on the ground. The plant is of easy propagation, by seeds or by division of the roots; the better way would probably be to sow in a garden, and transplant, when the plants were a year old. As all the symphytums are plants of great durability, this species, if once established would probably continue to produce crops for many years.—(*Gardeners' Magazine, vol. 5th, Country Times, May, 1830.*)

This plant might perhaps be profitably introduced into Canada.

CULTURE OF HERBAGE PLANTS.

Until the middle of the 16th century, clover and other herbage plants were not much cultivated in Britain. The best of these plants were introduced from Holland. At present clovers enter largely into the succession of crops, on all soils, and in every productive course of management. Before they were introduced in cultivation in Britain it was necessary, when land was exhausted by grain crops, to leave it in a state of comparative sterility for several years before it become either valuable as pasture, or again fit for carrying corn; but at present clovers are not only indispensable in the cultivation of white and green crops alternately, upon very rich soils, but are the foundation of convertible husbandry on land that is not so rich as to permit a constant aration, and which therefore, requires two or more years pasturage at certain intervals. Lucern and saintfoin,though considered of much less value as general crops in England, are valuable plants in particular situations, more especially the latter, which will produce good crops on dry chalky and limestone soils, where most other agricultural plants, and even grasses, would barely maintain their existence.

If the introduction of these plants were so necessary in England, and that their cultivation has so greatly contributed to the improvement of agriculture, surely their cultivation is equally necessary in Canada, and would prove most advantageous to the improvement of husbandry, and the interest of farmers. It is highly desirable that not one acre of land should be let out for pasture, or rest if you will, without being seeded down with clover or other grass seeds ; the herbage that will be obtained in one year will amply repay the farmer the expense of seed.

The nutritive produce of the principal herbage plants are thus given by Sir H. Davy :—

English Name.	In 1000 parts.				
	Whole quantity of soluble or nutritive matter.	Mucillage or Starch.	Saccharine matter or Sugar.	Gluten or Albumen.	Extract, or matter rendered insoluble during Evaporation.
Red clover, -	39	31	3	2	3
Cow clover, -	39	30	4	3	2
White clover,	32	29	1	3	5
Saintfoin, - -	39	28	2	3	6
Lucern, - -	23	18	1		4

The clovers are a numerous family, and three or four of them are natives of Canada ; one species of them, particularly the white or creeping clover, is often found to spring up in great luxuriance on lands that were in tillage the year previous. I have seen red, white, and yellow clover come up naturally on lands cleared from the woods that never were cultivated, and where it was scarcely possible any seed could have been carried. The climate and soil of Canada are more favourable for the cultivation of clovers, than the British Isles.

The introduction of clovers and cultivated grasses in England, was the commencement of improvements in the different species of live stock, in the modes of cultivation, and in the superior quality as well as quantity, of the crops of grain. This should be sufficient inducement to Canadian farmers to adopt the same system, and they may rest assured the results will not be less favourable.

The red clover is known from other species by its broad leaves, luxuriant growth, and reddish purple flowers. The white or creeping, or

Dutch clover, is known by its creeping stems and white flowers. The yellow clover, hop-trefoil, or shamrock clover, the black nonsuch of the Norfolk farmers, is known by its procumbent shoots, and yellow flowers. This species is seldom cultivated. The meadow clover, cow clover, or cow grass, resembles the red clover, but of a paler hue, dwarfer habit, with pale red, or whitish flowers, and long roots, very sweet to the taste. This species is not much cultivated in England; and it is said to be extremely difficult to procure the seeds genuine. It comes into flower ten or fifteen days later than the red clover, has a solid stalk, a narrower leaf, and both leaves and flowers have a yellower hue. A poor sandy soil, it is said, will produce a good crop of cow-clover that would not produce half a crop of red clover; it is also as good a second year as the first.

The flesh-coloured clover, (*Faronche or Trefle de Roussillon*) has long been cultivated in some of the northern departments of France, and, though an annual, it is found very advantageous on dry,sandy soils. The Agricultural Society of Nantz, have lately recommended its culture in the province of Lorraine; and a writer in the Journal des Pays-Bas, as suitable to many parts of the Netherlands. M. De Dombasle, a theoretical and practical agriculturist in great estimation, sows it after harvest, in the stubbles, with no other culture than harrowing it in. It grows all the winter, and early in spring affords abundant food for sheep; or, if left till May, it presents a heavy crop for the scythe, and may be used for soiling or making into hay. This method of culture cannot be adopted in Canada; however, I believe it is a species of clover that would be very suitable and profitable for this country. It was introduced into England about the year 1824, by Mr. John Ellman, jun. of Southover, near Lewis, who gives directions for sowing in spring without a corn crop, and states that it will be in full bloom, and fit to cut in June. He says it is very productive, but should not be sown with corn crops like other clovers, because it grows so fast as to choke them. Seeds of this kind of clover may be obtained from Vilmorin,Andrieux & Co. seed merchants in Paris.

The red or broad-leafed clover is the kind most generally cultivated in England on lands that carry corn and herbage crops alternately, as it yields the largest produce for one crop of all the sorts. This kind is also the best to sow in Canada, though a little of the white might be mixed with it, when intended to be left several years in pasture, particularly on lands where the white clover is not indigenous to the soil.

The soil best adapted for clover, is a deep sandy loam, which is favourable to its long tap-roots, but it will grow well on any soil, provided it be dry. So congenial is calcarious matter to clovers, that the mere strewing of lime on soils, will cause clover to spring up. The climate most suitable for clovers is one not very hot nor very dry, if a second or third crop is expected. Most leguminous plants delight both in a dry soil and climate, and warm temperature, and the clover will be found to produce more seed under such circumstances. But as the production of seed is only in some situations an object of the farmer's attention, a season rather moist, provided it be warm, is always attended by the most bulky crops of clover herbage.

The preparation of the soil and the manures, which clover receives in ordinary farm culture, are those destined also for another crop; clover mixed with a certain proportion of timothy seed, being generally sown along with, or among corn crops, spring sown. Unless, however, the soils on which these crops are sown are well pulverized, clovers will not succeed so well upon them; but clovers will certainly succeed better in Canada on lands not so well prepared as they would require to be in England. The time of sowing should be in spring, when the grain is sown. In Switzerland, they prepare the seed by steeping it in water or in oil, and drying it with powdered gypsum, as a preventive from the attacks of insects.

The manner of sowing, is broad-cast. When sown with spring corn, clover and other grass seeds are usually put in immediately after the land has been pulverized by harrowing in the corn seed, and are themselves covered by one course more of the harrow. A light harrow would be best for covering clover or grass seeds. When the land is under a fall crop of wheat, or other grain, though the clover and other grass seeds are still sown in spring, the proper period must depend both upon the state of the land and the progress of the crop; and it may be often desirable to break the crust formed on the surface of tenacious soils, by using a harrow before the clovers are sown, as well as afterwards to cover them. Sometimes the roller only is employed at this time, and there are instances of clover and timothy succeeding when sown without either harrowing or rolling. But it is commonly of advantage to the wheat crop itself to use the harrows in spring, if the land is in a dry state, and the wheat plants firmly taken root, but not otherwise; the roller alone, unless the soil is soft and mellow, cannot be depended on, much less, sowing without harrowing. In some cases, clover and grass seeds are sown by themselves in autumn or spring, on grass lands. I have sown them on meadows that were top dressed in the previous fall; I harrowed the land well in spring, when sowing the seed, which succeeded very well, and yielded a crop the same year.

The quantity of seed sown to the acre varies considerably. On rich sandy or loamy soils, well pulverized, two pounds of clover, or less, with about five or six quarts of timothy seed, will be fully sufficient for one acre. Indeed I have had more clover than I would desire in the hay where I have not sown one pound and a half of clover seed to the acre, with timothy seed. Strong clay soil might require more seed; but for any soil that is in a proper state of preparation, two or three pounds of clover, and one gallon and a half of timothy seed will be sufficient, though a less quantity will often do very well. In England they sow from eight to fourteen pounds of clover and about a bushel of rye-grass seed to the acre. The same weight of clover, and a bushel of timothy seed, instead of rye-grass seed, will be sufficient for about seven acres of land in Canada.

When lands are intended for permanent pasture, some white and yellow clover seed might be mixed with the red clover and timothy seed; but the same quantity of seeds will be sufficient for the acre. Clover seed is seldom sown alone in Canada, nor ought it to be. It is generally mixed with timothy seed. If the soil be rich and fertile, the clover will grow up very strong the first year, with very little timothy; the second year there will be considerably less clover, perhaps scarcely any and the timothy will grow up a full crop. This method of sowing will be found most profitable. Severe winters, when the land is not well covered with snow, the clover roots are sometimes destroyed by the frost, and the timothy, being more hardy, comes up in the spring, and will produce a middling crop, though not so heavy a crop the first year, as clover. Where a regular rotation of crops is observed, this plan will answer extremely well, as some land will be seeded down every year, and afford a regular succession of clover and timothy crops. It is inconsistent with all pretensions to good farming to let out land from tillage without seeding it down with clover, or other grass seed. When clover is sowed alone, it will of course, require more seed than when sown with timothy, say about eight pounds to the acre.

In the selection of seeds, particular attention should be paid to their quality and cleanness: the purple colour of the clover seeds denotes that it has been ripe and well saved; and the seed of weeds may be detected in it by close inspection, if there are any; but various noxious seeds of weeds are frequently mixed up with timothy seed, which may by some good judges be discovered, but are not easily separated from them. Red clover seed introduced from France or Holland to England, has been found to die out in the season immediately after it has been cut or pastured, while the English seed produces plants that stand over the second, and in many instances the third year; thus remaining in the latter case four summers in the ground from the time of sowing.

The after culture of clover and timothy consists chiefly of picking off any stones or other hard bodies which may be on the surface in the spring succeeding that in which it was sown, and cutting out by the roots any thistles, docks, or other large grown weeds. After this, if necessary, the surface should be rolled once to smooth it for the scythe. A top dressing of gypsum has been strongly recommended for clover and other herbage plants. It is supposed that the smother of a thick crop of clover or tares continued for any time upon the ground, greatly tends to promote its fertility. This I have proved to be the case.

The clover crop in Canada is chiefly made into hay. Soiling cattle with green clover is not yet much practiced. Soiling is a term applied to the practice of cutting herbage crops green for feeding or fattening live stock. On all farms, under correct management, a part of this crop should be cut green for the working horses, and in many cases for milch cows, particularly in and near towns. Working horses would, if fed in this way, be always conveniently near at hand, and fill their stomachs more speedily than if having to collect their food on a short or scanty pasture.

In feeding cattle with green clover, attention must be paid to prevent swelling, or hoving, which is very apt to take place when they are first put on this food, especially if it is wet with rain or dew; and cattle are exposed to this danger, whether they are sent to depasture the clover, or have it cut and brought home to them; though, if the plants are somewhat luxuriant, the danger is greater in pasturing. After being accustomed to this rich food for a few days, during which it should be given rather sparingly, the danger is much diminished; but it is never safe to allow milch cows particularly to eat large quantities of wet clover. When I put my cows on the after growth of clover in August, if it is very luxuriant, I only allow them to remain about an hour in the day for the first two or three days, and no accident has ever occurred to my stock from eating green clover.

The making of herbage plants into hay, is a process somewhat different from that of making hay from natural grasses. All the herbage tribe ought to be mown when the plants have fully blossomed, and before the seed is ripe, that the full juice and nourishment of the herb may be retained in the hay. By adopting this system, the hay is cut in better season, can be more easily secured, and is much more valuable ; nor is the strength of the plant lodged in the seed, which is often lost. It would be well that the advantage of converting unripe herbage into hay should be fully understood. There is much more saccharine matter in it, and it is consequently greatly more nutritious. A crop of clover of saintfoin, when cut in the early part of the season, may be ten per cent. lighter than when it is fully ripe ; but the loss is amply counterbalanced, by obtaining an earlier, a more valuable, and more nutritious article ; while the next crop will be proportionably more heavy. The hay made from old herbage which has ripened its seed, or nearly so, will carry on stock ; but it is only hay cut from herbage when young, and soon after it has come into flower, that will fatten them. When the stems of clover become hard and sapless, by being allowed to bring their seeds towards maturity, they are of little more value as provender than an equal quantity of the finer sort of straw of corn.

The mode of making clover hay, and that of all herbage plants as practiced by the best farmers in England, and is equally proper for Canada, is as follows : The herbage is cut as close to the ground and in as uniform and perfect a manner as possible, with a sharp scythe ; the stubble after the mowing, ought to be as short and smooth as a well shaven grass lawn. The part of the stems left by the scythe is not only lost, but the after growth is neither so vigorous nor so weighty, as when the first cutting is taken as low as possible. As soon as the swath or row of cut herbage is thoroughly dry above, it is gently turned over (not tedded or scattered,) without breaking it. This is done with a rake or small fork, carefully preventing the swath being broken. The grass, when turned over in the morning of a dry day, is put into cocks in the afternoon. The mode of preparing this is simple and expeditious. If the crop is heavy, a row of cocks is placed in the middle of three or five swaths, or of three narrow ridges. A gatherer and raker on each side will form a row sufficiently large for cocks, which should be neat and well built by another person following those who gather and rake. Five persons may thus be employed about each row of cocks.

It is impossible to lay down any rules for the management of hay after it has been once put into cocks ; one thing however, should always be attended to, not to shake out, scatter, or expose the hay oftener than is necessary for its preservation. If the clover is dry, though not withered, when put into cocks, it may be left in that state for two or three days, and then spread out on the third or fourth day, turned once or twice, and may be put into the stack or barn in the evening, salting it well invariably. If the farmer has old hay on hand, it is a most excellent plan to mix it with the new clover, and by doing so, the new clover may be put up in a greener state than it could be if unmixed, and the old hay will be much improved by the mixture.

It is much easier to save clover hay in Canada than in England, and though put up fresh and green, if well salted, it will not lose the colour nor its fragrant smell. In wet seasons however, clover is difficult to cure well ; but if once in *well made* cocks, without losing its colour, it may be preserved from receiving much injury, by frequently re-making the cocks. Wet seasons are not usual in this climate, and when they do occur, the rains do not continue so long, or so constantly as in the British Isles. I have seen the after-growth of clover in moist, warm seasons, a reasonable crop, but, except for soiling, it would, in most cases, be more profitable to pasture it than mow it a second time. If it is mown a second time for the purpose of making it into hay, it will be a good method to mix it with some good fresh straw that will absorb part of its juice, and cattle will eat the mixture readily.

The produce of the first crop of clover hay, or of clover and timothy, (though there will not be much of the latter the first year,) *on the best soils*, will be from 200, 300 or 400 bundles the acre. This description of hay, however well cured, will not sell for so much in the Montreal market as good timothy hay. If the land is very rich and fertile, it will give a crop of clover the second year as good as the first, and still keep down the timothy, but the third year it generally gives place to the timothy, and very little of the clover remains. Clover, stacked or even kept in a barn till spring, is said to diminish in weight from 25 to 30 per cent.

The value of clover hay in comparison with the straw of peas or beans, and with the finest straw of corn crops, is considered to be in the proportion of two to one. One acre of red or broad clover is said to go as far in feeding horses and neat cattle as three of ordinary pasture ; and when it is cut occasionally, and given to them fresh, it will probably go still much farther, as no part of it is lost by being trodden down.

In England, clover will not perfect its seeds fit for saving early in the year ; therefore, the first growth is taken off either by feeding or with the scythe, and the seed is procured from the heads that are produced in the autumn. The management of a crop of clover with a view of saving seed, is thus given by a cultivator in England. " A moderate bulk of haulm is generally found most productive of seed, and a moderately rich, sharp, dry soil is the best for having moderate haulm. The field may be pastured till the middle of May, or the crop mown about the latter end of May, and then shut up until the ripening of the second crop, or new growth is completed. In Canada, a first crop might very well be cut for soiling or hay, up to the middle of June, and then left for a second crop for seed. August is generally the ripening month, and the maturity of the seed is known by the leaves becoming brown and dropping off. Observe the seed from time to time, and when it has changed from a bright yellow to a deep purple, it is then ready for the scythe. After the crop is cut down, disturb it as little as possible with fork or rake. Form it into small cocks not much larger than muck heaps. Should favourable weather ensuse, nothing more is necessary than to turn these cocks once over, shortly before carting home. And, should the weather prove fickle, these small heaps of withered straw are very soon dried, perhaps in one good dry day, by turning up the bottom, after the top has become a little dried. After remaining some time in the field, the cocks subside considerably and become caked, by which the flowers adhere together and repel the rain ; of course, no loss of top can be sustained by gently turning them to dry. It thus appears that clover for seed is not so liable to be injured as clover for hay. In general from four to six days of favourable weather renders it fit to carry to the stack-yard and stack. It may either be threshed by a light flail, or by a threshing machine, having a particular additional cover introduced below the drum or beater for that purpose. When the seed is completely separated from the haulm, it is cleaned with the clover sieve, well known to sieve makers. The produce is about four or five bushels, or three hundred weight to the acre."

White clover, yellow clover, saintfoin and lucern, when intended for seed, are treated much in the same manner as red clover.

The fertility of the soil must be considerably impaired by a second crop of clover perfecting its seed in this way, but the high value of the seed is a great inducement to the saving of it in favourable situations ; and every farmer who can save seed ought to do so, in order to promote the cultivation of this excellent plant.

LUCERN.

Lucern is a deep-rooted perennial plant, sending up numerous small and tall clover-like shoots, with blue or violet spikes of flowers. It is a native of the south of Europe. It is much grown in Persia and Lima, and mown in both countries all the year round ; it is also of unknown antiquity in old Spain, Italy, and the south of France. It was introduced into England from the latter country in 1657. It is now only cultivated in a few places in England, chiefly in Kent. It has been introduced into the United States, and is highly spoken of as an herbage plant. The objection to this plant in England is, that it is less hardy than red clover, requires more time before it comes to its full growth, great care to keep it from grass weeds, and from these and other reasons, is considered ill adapted to enter into general rotations of crops, or extensive culture. What is called yellow lucern, is a much hardier and coarser plant than the plant first described, is common in several parts of England, but not cultivated any where except on some poor soils in France and Switzerland.

The soil for lucern should be dry, friable, inclined to sand, and with a sub-soil equal to it in goodness. Unless the sub-soil be good and deep, it is in vain to attempt to cultivate lucern. The soil that is dry and rich will be best suited to produce good crops of lucern. The preparation of the soil consists in deep ploughing and minute pulverization ; and the shortest way to effect this is, to trench it over with the spade to two or three feet in depth, burying a good coat of manure in the middle or at least one foot from the surface. This is the practice in the Island of Guernsey where lucern is highly prized. The climate for lucern should be warm and dry; and that of Canada, in summer, ought to answer well, but there might be considerable danger of the roots being injured in winter by severe frost. The season most proper for sowing lucern is as early as practicable in the spring months, as in this way the plants may be fully established before the season becomes too hot.

The manner of sowing lucern is either broad-cast or in drills, and either with or without an accompanying crop of corn for the first year. Broad-cast, with a very thin crop of barley or other spring corn, is generally preferred; first, because lucern is extremely liable to be eaten by the fly, when it first comes up, and against which the growing corn is some protection. The value ot the corn crop is another object not to be forgotten, and is gained in the first year's growth of the lucern, which is very poorly productive the first year, though no corn should be sown with it. The quantity of seed sown in England, when the broad-cast method is adopted, is said to be from 15 to 20 pounds per acre, and from 8 to 12 if drilled. I suppose that about half this quantity of seed would be sufficient in Canada. The seed is paler, larger, and deeper than the clover seed, and great care should be had to procure it plump and perfectly new, as two year old seed does not come up freely. The same depth of covering as for clover will answer. The after culture of lucern, sown broadcast, consists in harrowing to destroy the grass and other weeds; rolling, after the harrowing, to smooth the soil for the scythe, and such occasional top dressing of manure as the state of the plants may seem to require. This top dressing may be either saline or mixed manures. Ashes are greatly esteemed; also gypsum and liquid manure of any kind. A slight coat of manure annually in the spring is the management most approved of. The harrowing is generally commenced the second year, with a light harrow, in the succeeding years with such as are heavier, and the operation should be performed in the spring, and the end of summer; all the weeds should be carefully collected and removed.

The application of lucern is the same as that of clover the first year. The principal and most advantageous practice is that of soiling horses, neat cattle, and hogs. All agree in extolling it as food for cows, whether in a green or a dried state. It is said to be superior to clover, both in increasing the milk and butter, and improving its flavour. In its use in a green state, the same care is necessary to be observed as with green clover, not to give animals too much at a time, especially when moist.

The produce of lucern cut three times in a season, has been stated at from three to five, and even eight tons per acre. In soiling, one acre is considered sufficient for three or four cows during the soiling season; say, however that the produce is equal in bulk and value to a full crop of red clover, then, if continued yearly for nine or ten years, (its ordinary duration in a productive state,) at an annual expense of harrowing, rolling and top dressing, it might be of sufficient value to induce farmers who have suitable soils, to lay down some land under this crop near their homestalls. To save the seed, the lucern may be treated precisely as the red clover, and it is much more easily threshed, the grains being contained in small pods, which easily separate under the flail or a threshing machine, or clover-mill.

The nutritive produce of lucern, according to Sir H. Davy, is $2\frac{1}{3}$ per cent., and is to that of the clovers and saintfoin as 23 to 39. This result does not very well agree with the superior nutritive powers attributed to lucern. Red clover has been proved by experience to produce most luxuriantly in Canada, to be a certain crop, and require no after culture. I am persuaded it will be found more profitable for the farmer than lucern.

SAINTFOIN.

Saintfoin is a deep-rooted perrenial with branch-spreading stems, compound leaves, and showy, red flowers. It is a native of England, and many parts of Europe, but never found except on dry, warm soils, where it is of great duration. It has been long cultivated in France and other parts of the Continent, and as an agricultural plant, was introduced from France to England about the middle of the 17th century. It has since been a good deal cultivated, and its peculiar value is, that it may be grown on soils unfit for being constantly under tillage, and which would yield little under-grass. This is owing to the long and descending roots of the saintfoin, which will penetrate and thrive in the fissures of rocky under strata. Its herbage is said to be equally suited for pasturage and for hay, and that eaten green, it is not apt to swell or hove cattle like the clovers or lucern. Arthur Young says that upon soils proper for this grass, no farmer can sow too much of it ; and in the Code of Agriculture it is said to be " one of the most valuable herbage plants we owe to the bounty of Providence."

The best soil for this plant is that which is dry, deep, and calcarious ; but it will grow on any soil that has a dry sub-soil. Light, sandy, and gravelly soils, and those of a mixed quality, provided they are sufficiently dry, will answer very well, and better than where there is a great depth of mould. It is a plant that is asserted by Marshall, to afford a large produce even on those soils which are of the poorest quality, and on such as are of a more rich and friable nature to frequently produce abundant crops. Still he conceives that it is only in the calcarious soils, as the dry chalk and limestone, or such as have been well impregnated with that sort of matter, that it succeeds in a perfect manner, or becomes durable.

The best preparation which any soil fit for this plant can undergo is, unquestionably, trenching. The usual preparation, however, is the same culture as for clover, ploughing more deeply than ordinary, either by means of a trench plough, or, what is better, because more simple, by the common plough going twice in the same track. The earlier the seed can be put into the ground in spring the better, as from the greater moisture of the suitable soils, there will be a greater probability of its vegetating in a perfect manner. Where the sowing is executed at a late period, and dry weather succeeds, much of the seed will be prevented from growing, and the young plants will be more exposed to destruction by the fly. It cannot however, be sown in Canada sooner than the barley, which is the best grain to sow it with, and this will be sufficiently early.

The manner of sowing is generally broad-cast; some advise its being sown with about half the quantity of barley usually sown for a full crop, which may shade and keep the young plants moist during the first summer, and at the same time not injure it from the crop being lighter. In whatever method it is sown, as the seeds are larger than those of any other herbage plants, they should be covered in with more care, and to somewhat greater depth. In most cases, especially in all the more light sorts of land in which this sort of crop is grown, the use of the roller may be necessary immediately after the seed is put into the ground. The quantity of seed is said to be from three to four bushels the acre, but I should think a much less quantity would be sufficient, though largo the seed is.

In the choice of seed, the most certain method of knowing the goodness of it is by sowing a number of the seeds, and seeing how many plants will be produced by them. It is said to be difficult to find good saintfoin seed to buy, and therefore, farmers should raise their own seed, selecting it from the best and most abiding plants. The external signs of the seeds being good are, that the husks are of a bright colour, and the kernels plump, of a light gray or blue colour, and sometimes of a shining black. The seed may be good though the husks be black, as that is owing sometimes to letting it receive wet in the field. If the kernel, on being cut across appear greenish and fresh, it is a certain sign that it is good; but if it is of a yellowish colour, and friable, and looks thin and pitted, it is a bad sign. Others observe that the best seed is plump, heavy, and bright, and of a yellowish red colour, and that it should always be sown while quite fresh, as old seed, or seeds that have been long kept, never vegetate in a perfect manner. This seed is in England generally from three to five shillings the bushel. The after culture of saintfoin consists in occasional dressing with manure, for which purpose ashes and malt dust are recommended, and the judicious intervention of mowing and pasturing. If sheep be allowed to eat it down too close, they are apt to injure the roots; the farmer will have to guard against this.

In making saintfoin into hay, it is cut immediately on its coming into full blossom; and as it remains but a short time in that state, as much expedition as possible should be employed both in mowing and making the produce into hay. It is remarked that of all other hay plants, it requires the least pains in making. When the season is favourable, the hay-makers may follow the scythe, and having turned over the swaths, throw them into wind-rows the succeeding day after the crop is mown, when it may be immediately formed into cocks, and the whole crop be fit for carting in three days after it is mown. Though it may appear very green, and acquire in the stack or in the barn, a considerable degree of heat, there is no danger to be apprehended, provided the weather has been fair during the hay making; it is so far from receiving injury by heating moderately in the stack or barn, that the contrary state is most to be feared. For this reason, great care is necessary not to suffer the saintfoin to continue long either in the swath or in the cocks, lest the sun and wind should dry it up too fast, and by exhaling its juices prevent the heating in the stack or barn, and thereby render it of little value. If the crop is light, the hay might be made into cocks out of the swaths immediately after being mown, and thus save the hay from being too much dried, together with saving some labour and expense.

In Canada, saintfoin will not be better for mowing it more than once in the season, if the crop be made into hay, particularly if the summer is not moist. The usual duration of saintfoin is eight or ten years; and in England it does not attain its perfect growth until the third year; here, it would attain its full growth the second year. There are instances where the plant has been found growing fifty years after it was sown, and the roots have been traced down into stone quarries from ten to twenty feet in length. Von Thaer found them to attain sixteen feet in length. The great enemy of saintfoin is grass, which forms a close turf on the surface, and thus chokes up the plant.

The quantity of produce in the state of hay, may probably be estimated at from three to four hundred bundles the acre, on the best soils; on poorer and thinner soils it will be much less. The nutritive produce of saintfoin are the same as clover, and is more than one-third greater than lucern.

In saving seed from saintfoin, it should remain on the land until the husks become of a somewhat brownish colour, and the seeds are perfectly plump and firm; as by these means they will not only be better in their quality, but be in less danger of being injured in the field, from the very short time it will be necessary for them to remain, and also less danger of being hurt by heating when laid up for future use. It requires some experience to know at what degree of ripeness it is best to cut the seeded saintfoin, because all its seeds do not ripen at the same time. Some ears blossom before others; and every ear begins to blossom at its lower part, and continues to blow gradually upwards for many days; so that before the flower is gone off at the top, the seeds are almost matured at the bottom. From this cause, if the cutting be deferred till the top seeds are quite ripe, the lower, which are the best, would shed and be lost. The best time to cut is when the greatest part of the seed is well filled, the first blown ripe, and the last blown beginning to be full. The unripe ends will ripen after cutting, and be in all respects as good as those that were ripe before. Saintfoin should never be cut in the heat of the day, while the sun shines out, for then much even of the unripe seed sheds out in mowing. The right time for this work is the morning or evening, when the dew has rendered the plant supple. When the weather is fine, the saintfoin will soon dry sufficiently in the swaths, to be put into small cocks with turning, and from the small cocks for the barn. When the seed is dry, they drop out with the least touch or shaking, so that great care is necessary to be observed in saving the crop reserved for seed. In England, the seed is generally threshed out in the field at once, and the haulm laid up for fodder. This will be found much the best plan, in favourable weather, provided the seed is carefully preserved afterwards from heating, which it is very subject to, unless spread out, and dried perfectly. If the crop can be safely put up in a good state, without shedding, the seed will certainly keep better in the haulm till spring, than in any other way. The produce of seed to the acre is said to be from 8 to 12 bushels. This plant is well suited to the climate of Canada.

There are various other plants that might be cultivated as herbage or for hay, but I do not know of any so valuable or so suitable as those I have described. When those named are extensively cultivated, and farmers desire new varieties, they will find many, though perhaps none so profitable as clover, lucern, and saintfoin.

CULTIVATED GRASSES.

The forage or pasture grasses, are found clothing the surface of the earth in every zone, attaining generally a greater height, with less closeness at the root, in the warm climates, and producing a low, close, thick, dark green nutritive herbage, in the cooler latitudes. The best grass pastures, those which are most productive and nutritive, are such as are found in countries that have least cold in winter, and no excess of heat in summer. Ireland, Britain, and part of Holland and Denmark, may equal or surpass any countries of the world in this respect; but in every zone where there are high mountains, there are certain positions between the base and summit, where, from the equality of the temperature, turf may be found equal to that in marine islands.

The general presence of forage grasses, and the rapidity with which all soils become covered with them when left uncultivated, are the obvious reasons why their culture is but of recent date. This branch of culture appears to have originated in England about the middle of the 17th century, and the grass made choice of was the rye grass, and the next the timothy. John, Duke of Bedford, made the latest and most laborious effort towards attaining a knowledge of the comparative value of all the British, and some foreign grasses worth cultivating. The result is given in an appendix to Sir H. Davy's Agricultural Chemistry, and more at large in a work published by Sinclair in 1825, who was gardener to the Duke of Bedford.

Though grasses abound in every soil and situation, yet all the species do not abound in every soil and situation indifferently. On the contrary, no class of perfect plants is so absolute and unalterable in its choice in this respect. The creeping-rooted and staloniferous grasses will grow readily on most soils; but the fibrous rooted species, and especially the more delicate upland grasses, require particular attention as to the soil in which they are sown; for in many soils they will either not come up at all, or die away in a few years, and give way to the grasses which would naturally spring up in such a soil when left to a state of nature. For the present, a great variety of grasses are not necessary in Canada, except where it is proposed to lay down land for permanent pasture, and even in that case, perhaps it would be as well only to sow clover and timothy on all good lands; and when those plants wear out and decay, allow the natural grasses that are indigenous to the soil to replace them, which they will be sure to do. The clover and timothy are the best grasses that can be used in the system of convertible husbandry, the most suitable system for British America. Clover, saintfoin and timothy, are known to thrive best in a warm climate such as Canada. There are not any herbage plants or grasses cultivated in Britain superior to, or more valuable than these. It would, therefore, be injudicious to recommend the cultivation of any other on good soil, or even on soil of middling quality. Perhaps on very light or inferior soil, some other varieties of grass might be tried for permanent pastures.

In England, the most esteemed grasses are the perennial rye grass, tall fescue, meadow fescue, spiked fescue, hard fescue, floating fescue, sweet-scented soft grass, fertilemeadow grass, creeping soft grass, fiorin, and water meadow grass. The comparative value of all these grasses, with many others have been ascertained by experiments made at Woburn Abbey, England, the seat of the Duke of Bedford. The result of these experiments as regards some of the principal grasses, and of timothy in particular, may be interesting to the reader. The manner in which these experiments were conducted is thus described in the Agricultural Chemistry.

"Spots of ground, each containing four square feet, in the garden of Woburn Abbey, were enclosed by boards in such a manner that there was no lateral communication between the earth enclosed by the boards, and that of the garden. The soil was removed in these enclosures, and new soils supplied, or mixtures of soils were made in them, to furnish as far as possible to the different grasses, those soils which seem most favourable to their growth; a few varieties being adopted for the purpose of ascertaining the effect of different soils upon the same plant. The grasses were either planted or sown, and their produce cut and collected, and dried at the proper seasons, in summer and autumn, by Sinclair, his Grace's gardner. For the purpose of determining, as far as possible, the nutritive powers of the different species, equal weights of dry grasses or vegetable substances, were acted upon by hot water, till all their soluble parts were dissolved; the solution was then evaporated to dryness by a gentle heat in a proper stove, and the matter obtained carefully weighed. This part of the process was likwise conducted with much address and intelligence by Sinclair, by whom all the following details and calculations are furnished. The dry extracts supposed to contain the nutritive matter of the grasses, were sent to me for chemical examination. The composition of some of them is stated minutely; but it will be found from the general conclusions, that the mode of determining the nutritive power of the grasses, by the quantity of matter they contain soluble in water, is sufficiently accurate for all the purposes of agricultural investigation."

The time of flowering is given as it took place at Woburn; in which it is observed, that "to decide positively the exact period or season when a grass always comes into flower, and perfects its seed, will be found impracticable; for a variety of circumstances interfere. Each species seems to possess a peculiar life in which various periods may be distinctly marked, according to the varieties of its age, of the seasons, soils, exposures, and mode of culture."

The soils, as denominated in the column devoted to them, are thus described. 1st. By loam, is meant any of the earths combined with decayed animal or vegetable matter. 2nd. Clayed loam, when the greatest proportion is clay. 3rd. Sandy loam, when the greatest proportion is sand. 4th. Brown loam, when the greatest proportion consists of decayed vegetable matter. 5th. Rich black loam, when sand, clay, animal and vegetable matters are combined in unequal proportions, sand and vegetable matter the greatest.

English Names.	Height in inches in a wild state.	Time of flowering at Woburn.	Time of ripening the seed at Woburn.	Soil at Woburn.	Natural soil and situation of these grasses.	Kind of roots.	Produce at the time of flowering, per acre, in pounds of each. Grass.	Hay.	Loss in drying.	Nutritive matter.	Produce at the time the seed is ripe, per acre, in pounds of each. Grass.	Hay.	Loss in drying.	Nutritive matter.
Sweet scented soft grass	14	April 29	June 25	Rich sandy loam	Woods, moist meadows.		9528	2441	7087	610	27225	9528	17696	2233
Hard fescue grass	12	July 1	July 20	Light sandy loam	Pasture	Fibrous	18376	8269	10166	1004	19075	8675	10481	446
Meadow fescue do.	30	July 1	July 20	Bog soil & coal ashes	Meadows	Creeping	13612	6465	7146	957	19057	7623	11435	446
Spiked fescue do.	36	July 1	July 28	Rich brown loam	Moist pastures		16335	7146	9188	765	10890	4492	6397	553
Perennial rye grass,	24	July 1	July 20	Rich brown loam	Loamy pastures	Fibrous	7827	3322	4494	3[illegible]5	14973	4492	10481	643
Reed-like fescue do.	40	July 10	July 28	Clayed loam	Hedges		54450	9057	35392	38[illegible]8	51046	12123	38293	2392
Tall fescue do.	36	July 12	Aug 6	Black rich loam	Meadows		51046	17866	33180	39[illegible]8	51046	18866	33180	2392
Floating fescue do.	18	July 14	Aug 12	Strong tenacious clay	Ponds	Creeping	13612	14083	9528	372	- -	- -	- -	- -
Meadow soft grass	24	July 14	July 26	Strong clayed loam	Moist meadows		19057	6661	12395	1191	19057	3811	15246	818
Fertile meadow grass	20	July 14	July 28	Clayed loam	Meadows		14975	7861	7111	10[illegible]	- -	- -	- -	- -
Meadow cat's-tail or Timothy	24	July 16	July 30	Clayed loam	Meadow & pasture	Creeping	40837	17355	23481	1595	40837	19397	21439	3668
Creeping soft grass	30	July 24	Aug 20	Sandy soil	Sandy pasture	Creeping	34031	13612	20418	2392	21099	8439	12659	1153
Reed or water-meadow grass	72	July 20	Aug 8	Strong tenacious clay	Ditches	Creeping	126596	75957	50638	4945	- -	- -	- -	- -
American cock's-foot grass	24	Augt 20	Oct. 30	Clayey loam	Loamy pasture		69423	41654	27769	1898	- -	- -	- -	- -

Table of some of the Grasses experimented on at Woburn Abbey, England, arranged in the order of their flowering.

The produce of lattermath from the rye grass was 3403 and of nutritive matter 53. From the timothy 9528, and of nutritive matter 297. The sweet scented soft grass produced most lattermath, 17,015, and nutritive matter 1129. The tall fescue next, 15,654, and nutritive matter 978. The hard fescue 10,209, and nutritive matter 197. These are the only grasses the lattermath of which is worthy of notice. This produce is given in pounds weight.

It is necessary to observe that most of these grasses were grown under the most favourable circumstances possible, in suitable soil of the best quality; it could not, therefore, be expected to obtain anything near such extraordinary produce from common field culture. However, it is interesting to know what extraordinary care and management is capable of producing. Some of these grasses might not be suitable for the climate of Canada, but this table of experiments may be some guide to farmers who may wish to introduce some of the English grasses which we do not cultivate at present.

On the nutritive produce, Sir H. Davy has made some valuable remarks concerning the mode in which the animal economy is operated upon by the different substances composing the nutritive matter in plants. The only substances which he detected in the soluble matters procured from the grasses are, mucilage, sugar, bitter extract, a substance analogous to albumen, and different saline matters. Some of the produce from the aftermath crops give feeble indication of the tanning principle. In the experiments made on the quantity of nutritive matter in the grasses cut at the time the seed was ripe, the seed was always separated; and the calculations of the nutritive matter from the grass and not the hay. The order in which these substances are nutritive is thus given. "The albumen, sugar and mucilage, probably when cattle feed on grass or hay, are for the most part retained in the body of the animal; and the bitter principle, extract, saline matter, and tannin, when any exist, probably for the most part are voided in the excrement, with the woody fibre. The extractive matter obtained by boiling the fresh dung of cows, is extremely similar in chemical character to that existing in the soluble products from the grasses. The extract of the dung, after being kept for some weeks, had still the odour of hay. Suspecting that some undigested grass might have remained in the dung, which might have furnished mucilage and sugar, as well as bitter extract, I examined the soluble matter very carefully for these substances. It did not yield an atom of sugar, and scarcely a sensible quantity of mucilage."

From these facts it appears probable that the bitter extract, though soluble in a large quantity of water, is very little nutritive; and probably it serves the purpose of preventing, to a certain extent, the fermentation of other vegetable matters, or in modifying or assisting the functions of digestion, and may thus be of considerable use in forming a constituent part of the food of animals. A small quantity of bitter extract and saline matter is probably all that is needed; and beyond this quantity, the soluble matter must be more nutritive in proportion as they contain more albumen, sugar and mucilage, and less nutritive in proportion as they contain other substances.

In comparing the composition of the soluble products afforded by different crops from the same grass, Sir H. Davy found, in all the trials, the largest quantity of truly nutritive matter in the crop cut when the seed was ripe, and least bitter extract and saline matter; most bitter extract and saline matter in the autumnal crop; and most saccharine matter, in proportion to the other ingredients, in the crop cut at the time of flowering.

The soluble matter obtained from the different species of fescue grass afforded a large proportion of bitter extract. The soluble matter of the seed crop of timothy affords more sugar than any of the most esteemed species of English grasses. All the soluble extracts of those grasses, that are most liked by cattle, have either a saline or a sub-acid taste. No difference was found in the nutritive produce of crops of the different grasses cut at the same season, which would render it possible to establish a scale of their nutritive powers; but probably the soluble matters of the aftermath crop are always from one-fourth to one-third less nutritive than those from the flower or seed crop.

The table I have given of the Woburn experiment on grasses, will give all the information that is necessary for farmers in making a choice of grasses and the most judicious period of cutting them, so as to obtain the most profitable returns from the produce of each. As, however, the timothy grass is almost the only one cultivated in Canada, I shall give the remarks on this grass, in the Woburn experiment.

The cat's-tail, or timothy grass, is a native of England, and found both in dry and moist soils. It was first brought into notice by Timothy Hudson, about 1780, who introduced it from Carolina, where it was in great repute. Though it has not hitherto been much cultivated in England, the Woburn experiments present this grass as one of the most prolific for hay. Sixty-four drachms of the straw afforded seven drachms of nutritive matter. The nutritive powers of the straw simply, therefore, exceed the leaves, in the proportion of 28 to 8; the nutritive powers of the grass at the time of flowering, exceed those of the grass at the time the seed is ripe, in the proportion of 10 to 23; and the nutritive powers of the lattermath, those of the grass of the flowering crop, in the proportion of 8 to 10; the value of the straw at the time the seed is ripe, exceeds that of the grass at the time of flowering, in the proportion of 28 to 10. The comparative merits of this grass will, from the above particulars, appear to be very great; and I am well convinced there is not a grass cultivated in England, that would be so profitable to cultivate in Canada as timothy grass. I have seen it grow well on every soil properly prepared for grass seed. This grass has a remarkable quality of having very few leaves when at maturity, or fit for mowing, and these leaves scarcely of any value compared to the straw. The varieties of the fescue grass were the only ones that come up to the timothy in quantity of produce, but neither of these grasses are equal in value to timothy as hay; and there is not any grass that requires less drying to convert it into hay.

The reed, or water meadow grass, is chiefly found in marshes as its natural soil, but will grow on strong clays, and yield, as the Woburn experiments prove, a prodigious produce. In the fens of Cambridgeshire, Lincolnshire, &c., immense tracts that used to be overflowed, and to produce useless aquatic plants, and which, though drained by mills, still retain much moisture, are covered with this grass, which not only affords rich pasturage in summer, but forms the chief part of the winter fodder. It has a powerful creeping root, and bears frequent mowing well. It is sometimes cut thrice in one season near the Thames. It grows not only in very moist ground, but in the water itself. It is a grass well adapted to some of the swamp lands of British America, and would give new settlers, in particular situations, a larger quantity of fodder for cattle than any other grass, and grow where scarcely any other grass would grow. The fiorin grass will produce abundantly on moist rich soils, but is very late in coming to maturity. I have seen it grow very luxuriantly in Canada on moist soil, without any cultivation, and wherever it takes root, it will soon cover the ground to the total exclusion of every other grass.

There are several grasses which afford culms for straw plait, for hats or bonnets; the following are amongst the best: Crested dog's-tail, narrow-lea meadow grass, sheep fescue grass, meadow barley grass, down oat grass, lobed bent grass, and brown bent grass.

The period of cutting the culms of these grasses is when they are in blossom. They are bleached by pouring boiled water over them, and letting them remain in the hot water one or two hours, and afterwards spreading them on a grass plot two or three days. When bleached, they are taken up, washed clean, and put in a moist state in a close vessel, where they are subjected to the fumes of burning sulphur for two hours. Green culms, immersed for ten minutes in a strong solution of acetic acid, and then subjected to the sulphureous acid gas, are bleached perfectly white in half an hour. Green culms, immersed for fifteen minutes in muriatic acid, diluted with twenty times its measure of water, and then spread on the grass, will be bleached perfectly white in four days. The texture of the straw is not in the least injured by these processes. To imitate the Leghorn plait in the most perfect manner, the straws should be plaited the reverse way of the common English split straw plait. In the English plait, the straws are flattened by a small handmill, made for the purpose; but the Leghorn plait has the straws worked without flattening, and pressure is applied after the plait is made. It is essential that these two points should be observed by those who wish to rival the finest Leghorn manufacture. By reversing the common mode of plaiting, the fingers have a much greater power in firmly and intimately knitting the straws; and the round or unflattened state of the straws allows of their being more closely knitted, a circumstance that gives an appearance similar to the rival Leghorn plait.

MANAGEMENT OF LANDS UNDER GRASS FOR MEADOW OR PASTURE.

In a country like Canada, where labour is high, land retained in grass, to a certain extent, might be as valuable to the owners in that state, as they would be in any other. Indeed arable culture cannot be carried on profitably, unless in connection with meadow, pasture and the feeding of stock.

The term meadow includes all such land as is kept under grass for the sake of a hay crop. Where hay is in demand, as near large towns, a great deal of land may be appropriated to hay crops, to supply this demand. The most valuable meadows are such as are naturally rather moist than dry, or are rendered so occasionally by means of irrigation. There are three descriptions of these meadows; those on the banks of streams and rivers; those on uplands, or more elevated grounds, and bog and swamp meadows.

River meadows, or those which are situated in the bottoms of valleys, are in general by far the most valuable. They are the most productive of grass and hay, yielding sustenance for cattle through the summer and the winter, and producing an everlasting source of manure for the improvement of the adjoining lands. The soil is deep, and commonly alluvial, having been deposited by water, or washed down from the adjoining eminences; the surface is even, from the same cause, and, what is of considerable importance, it generally has a gradual declivity or surface-drainage to the river or stream, which almost invariably flows in the owest part of every valley, and which is essential to this description of neadow. The principal defects to which such lands are liable are, the oozing out of springs towards the junction with the rising lands, and the nundations of the river or stream. The former evil is to be remedied y draining; and the latter, in some situations, by embanking, but it is a emedy that cannot often be adopted in Canada; it will be a much beter plan, where the rivers are not very large, to improve the water courses f practicable, by removing obstructions, and straightening them if neessary. Such meadows will generally be stocked with grasses, valuale in proportion as the land is *judiciously* drained; and the culture of iese grasses consists of little more than in keeping these lands judiciousy drained, by open furrows, and drains to carry off the rain water, and n mowing and pasturing by turns, so as to keep the land in good heart ithout laying on manure. These are the most suitable meadows for rigation, and can be executed with much less expense than meadows of loping or uneven surfaces, which are much more difficult to water.

Upland meadows are next in value to those of valleys. In this couny there are not many acres of upland fit for arable culture, kept permaently under meadow, as in England, nor would it be necessary, were a roper system of convertible husbandry adopted. Near towns, permaent meadows might be profitable, and be kept many years producing over, saintfoin and timothy, by top-dressing. The roots of perennial rasses, whether fibrous or creeping, never strike deep into the soil, and us derive their nourishment chiefly from the surface; top-dressing compost, or well rotted manure, would produce the most luxuriant ops, and have done so in England for centuries. Moss will not grow n meadow lands if they are rich. A most effectual way of destroying oss is to harrow the surface well, top-dress with manure, and sow some esh grass seeds.

In a system of convertible husbandry, where lands are only left in ass three years for meadow or pasture, meadows will not require much anure. If laid down in proper condition, lands will give two crops of eadow, and be pastured the third year before they are again ploughed). When land is left six years under grass, by pasturing the third, fourth, and sixth years, it will not require much manure ; but, in any case that meadow is mowed for three years in succession, it would require manure before the third crop is taken off, and every second year afterwards that it produces a hay crop, without pasturing. The best season for applying manure in this climate is from the middle of September to the end of October, if it be practicable, and the land sufficiently dry to bear loaded carts without injury. At this season, the heat of the day is moderate, and will not exhale the volatile parts of the dung, as it would do, if applied when the heat of the sun is more powerful. If the farmer cannot conveniently apply the manure in the fall, by putting out the dung in the field during the winter, it may answer very well to apply it when the snow is gone in the latter end of March or beginning of April, taking care not to cut up the surface by the carts. When manure is applied in spring, it requires to be well rotted, or to be compost manure, and unless put on early, it may as well be reserved to the fall ; but if applied early, the grass will soon grow up over it, and protect it from the effects of the weather.

There is scarcely any sort of manure that will not be useful when laid on the surface of grass grounds. The banks of drains and ditches, turned over with the spade two or three times, will, if spread over grass lands, greatly improve them. Compositions of dung and earth, well mixed and rotted, or of earth and lime, will answer extremely well as top-dressing ; indeed they are the best kind of manure for top-dressing meadows. The quantity of manure necessary, must in a great measure depend upon the circumstances of the land ; and the quantity that is actually applied, will depend upon the facility of procuring it, and the industry and skill of the farmer. Thirty loads of a one-horse cart, of good dung, might do one acre ; but of compost, it will require from 40 to 60 loads ; that is, allowing one load to 35 yards of a ridge 9 or 10 feet wide, at 40 loads, or a load to about 22 yards of the same kind of ridge, at 60 loads to the acre. If the farmer can afford a larger quantity of manure, it may be very profitably applied. I believe top-dressing meadows, when necessary, at the proper season, will give the farmer as good returns as any way that manure can be applied in agriculture. It will be sure to produce clover and timothy without any new seeding.

Bog meadows are of two kinds, peat bogs and earthy bogs. Peat bogs are situated in hollows or basins, which have had no natural outlet for water to drain them perfectly, and have become filled with aquatic plants and mosses. In warm moist climates, these kind of bogs, if they can be properly drained and dressed with a coating of sand, earth or lime, would be most productive in clover or timothy, and other grasses of less value. These kind of lands might be made most valuable in the climate of Canada. In very dry summers the main drains might be dammed up to supply the soil with moisture, and these bogs are generally so level, that moisture may be supplied effectually.

Earthy bog meadows are situated either in hollows or on slopes, and are formed by an accumulation of water in the sub-soil, which not finding a free passage in any one point, spreads under and filtrates upwards through a considerable extent of surface. The grasses on such meadows before they are drained, are of little value ; but by draining, the quality of them will be improved, and better kinds will appear.

HAY-MAKING.

The best time for mowing timothy grass is, when it comes into flower ; this will generally be from the 10th to 20th of July. It should then be mown as soon as possible. The same rule may be observed with regard to all other grasses intended for hay, whether cultivated or natural.

Farmers who do not mow their own meadows, will find it the best plan to let their mowing at a fixed price per acre. The price in Lower-Canada generally, for meadows growing timothy or uncultivated grasses, is from 2s. to 2s. 6d. the acre, without food or drink ; for heavy meadows, where there is much clover, the price of mowing is sometimes double this. In Upper-Canada, also, the price is higher. When the grass is standing, a good mower will cut about one acre and a half, and perhaps two acres in a day ; but I have seen good mowers not able to cut much over half an acre of heavy clover in a day. Mowers should begin their work as early as there is light in the morning, in order that they may take rest in the middle of the day, when the heat is very great, and work again until a late hour in the evening; the grass will cut much better in the morning and evening, than in the heat of the day.

First day.—All the grass mown before twelve o'clock at noon, may be tedded on the same day, strewing it evenly over all the ground. This should be done before dinner. By this regular method of tedding grass for hay, the hay will be of a more valuable quality, and be worth more to the farmer or purchaser. When the grass is suffered to lie in the swath, the upper surface is dried by the sun and winds, and the interior part is not dried, but withered, and is of a different colour. In fine weather, in this climate, the hay tedded in the forenoon should, in the afternoon, be carefully turned, and about three or five o'clock, gathered and raked into rows, and put up into well made grass cocks. I find that a heavy dew falling on hay, after it has been tedded, and partially dried, before it is put up into cocks, is very injurious to it, and changes the colour as much as rain would do. Farmers will, therefore, find it their profit, in good weather, to put up in cocks in the evening of each day all the hay that has been cut before twelve o'clock. Second day.—The business of this day may commence with tedding all the grass cut in the afternoon of the day previous, and all that was mown this morning. Next, all the grass cocks put up the evening before should be shaken out in rows, putting three rows of cocks in each, if it can be conveniently done, raking between the rows immediately, and mixing this raking with the other hay, in order to its all drying of a uniform colour. The next business will be to turn these rows once or twice before dinner. After dinner, if the weather is favourable, and the grass chiefly timothy, all that was put into grass cocks the evening before, and shaken out in the morning, may be carted to the barn or stack. I have frequently done this ; but, of course the farmer's own judgment must determine when the hay is sufficiently dried. One day may dry hay more than three days, though there should be no rain any one of the days ; hay may not be equally well tedded or turned in all cases ; these circumstances will have a material influence on the time it will take to prepare hay perfectly for the barn. The grass tedded in the morning must also be attended to, turned, gathered and raked, and put up in grass cocks, as was done on the first day, and the same operations may go on every succeeding day of hay-making. It is most essential that at haying time farmers have sufficient help to carry on the work regularly. It is better to stop mowing than mow a greater quantity than can be managed properly ; the grass will suffer much less in a growing state than lying on the ground, cut, bleaching under a hot sun in the day, after being exposed to heavy dews at night. Hay thus exposed is not much better than straw. The proportion of hay-makers in England is about twenty men, women and boys to four mowers ; but there can be no certain rule laid down ; the crop the weather, and other circumstances, must guide the farmer in these and other matters, better than any rules laid down in books. In showery and uncertain weather, more help is required than in good weather : and great care is necessary to be observed not to ted out, or scatter out more hay in uncertain weather than can be perfectly well managed. The best way, however, for the farmer in very showery or uncertain weather is, to discontinue mowing until a change to dry weather. In Canada, this delay will seldom be very long. In broken weather, I have seen the hay made into what are called lap-cocks, out of the swath immediately after it is mown ; these are made by hand, in small rolls of the swath, about the size of a bundle of hay, set up together. These kind of cocks dry very readily, and the hay preserves its colour ; it is much better to put hay into lap-cocks than leave it in the swath in showery weather, and the expense will be more than saved in the better quality of the hay. From the lap-cocks the hay may be made into larger cocks, without spreading out, until there is a favourable day for perfecting the drying.

Hay will keep well in stacks well formed, and properly thatched, and secured against wind by straw ropes round the eaves and head of the stacks. The stacks may be built on some brushwood, or inferior hay or straw, to keep the bottom from damage. If the hay is put up in a proper state, sufficiently, but not too much dried, and well salted, it will lie so close and firm together, that it will not suffer more from the weather than it would in barns, except that the outside will be discoloured.

The waste of soft grass, on being dried into hay, is supposed to be three parts out of four, by the time it is put into the barn or the stack, and in a month more, by evaporation, perhaps one-twentieth more. During the winter hay wastes little. It is supposed that hay will weigh about one-eighth part more in winter than in summer. Farmers may from this determine the most advisable time for selling. Timothy grass will not waste in drying into hay more than about one-half its weight, sometimes less. Hay made from natural grasses, of a coarse quality, would be better for going through a sweating, or slight fermentation in the stack, or in small cocks, before it is put into the barn. The woody fibres in coarse hay are thus rendered more palatable and nutritious, and its condition for becoming fodder considerably improved. Salting hay is a practice that ought not to be neglected. It checks fermentation, and hence it will preserve the colour of the hay. Cattle will eat it better, though it should have received damage in curing, than hay of better quality not salted ; it is more healthful for cattle in this climate, and it greatly contributes to preserve the hay from losing weight. From one to two gallons may be applied to the hundred bundles.

During the hay harvest, the constant personal attendance of the farmer is necessary to direct every operation as it goes on, (particularly, if the farm be extensive.) He must contrive and point out the manner in which every person may do his labor to the most advantage. A man of energy will make the most of every hour, and secure his hay while the sun shines ; while one of an opposite description, suffers his hay to be often caught in the rain, and half spoiled, or lets it lie on the field until the sap is dried up by the sun. Indeed, an indolent man is very unfit for an extensive farmer, and will never improve his circumstances by farming in Canada.

The after grass on meadows, is generally fed off. In this climate, in very dry seasons, there is very little after grass, except on meadows that are situated in valleys, or low grounds. In seasons that are moderately moist, the produce of after grass is considerable, but seldom worth mowing for a second crop of hay.

PASTURES.

Not much of the lands of Canada can be termed *rich old pastures*. Any lands that could be ploughed were seldom allowed to continue in grass a second year. The farmers have been so much attached to the system of arable culture, there was no great chance that pastures should become old and rich. Perhaps it was not necessary they should. This system, however, has been unfavorable to the due improvement of stock ; indeed, it was impossible that stock could be brought to any degree of perfection, on poor pastures that were only allowed to continue in grass of one year's natural produce, or on such pastures as were unfit for cultivation. Under these circumstances, stock must have degenerated, and their improvement is impossible until a different and more judicious system of agriculture is introduced. The plan of convertible husbandry, I have submitted, would perhaps improve the food of animals sufficiently, without making it necessary to keep land fit for the plough in permanent pasture : but, on all lands that require very considerable expenditure of capital, to prepare them for the plough, it will generally be most profitable for the farmer to allow them to remain in permanent pasture in such a country as this, where abundance of land of good quality is to be had by purchase at a low price.

There are various sorts of grass lands, if once improved, that ought not to be broken up ; as water meadow, lands apt to be overflowed, and lands near large towns where the produce of grass land is always in demand for the pasturage of cattle, and to supply hay, which cannot be profitably brought to market from any great distance, from its being a bulky commodity, and often selling at a low price.

Farms are not sufficiently extensive, or properly subdivided, at present, to enable farmers to keep their stock of different ages, or for different purposes, in separate enclosures, though this management would be highly desirable, and is essentially necessary for the profitable improvement of stock. It is in many cases proper to intermix animals, but it should be always in the power of the farmer, to keep them, or any class of them, separate, when he found it necessary. Cattle that are put to fatten on grass, should be as little disturbed as possible. Driving them to and from the pasture with milch cows, or other stock, morning and evening, is injurious to them, and it is equally so, to restrain them in the pasture when the other stock are driven home, if accustomed to be with them, as they will be inclined to fret, and not rest or feed when separated from the other cattle. Water should, if possible, be provided in every field under pasture, and also shelter and shade, either by a few trees, or by a portable shed, which may be moved with the stock from one enclosure to another. All weeds of every description, in pastures, should be carefully mowed on or about the first of July.

It is difficult to estimate accurately, what stock lands will feed or keep well to the acre, so much depends upon the soil, its richness or fertility, when seeded down. Were those lands that are favorably situated in fertile valleys, in many parts of both provinces, allowed to become old pastures, they would support or fatten a suitable stock of animals, sufficiently numerous on a given quantity of land, to pay the farmer as well as if the same land were in tillage, and I believe much better. Equally favorable results will, I hope, be obtained from the land that may be alternately pastured, in the proposed system of convertible husbandry, if farmers will only keep their lands in a constant state of fertility, and always sow clover and grass seed when letting them out for pasture.

PLANTS CHIEFLY GROWN FOR CLOTHING.

The plants used as food for men and animals are by far the most generally cultivated in all countries. The flax for clothing, and hemp for other purposes, are partially cultivated in the Canadas, but not to the extent that is desirable, and would be profitable. Large premiums have been long offered, by the London Society of Arts, Manufactures, and Commerce, for encouraging the cultivation of hemp in British America, and I have no doubt but it might be cultivated with great success in Canada, if mills were erected for breaking and preparing it ; the soil and climate is suitable for growing hemp. As flax is, however, a plant necessary for our domestic manufactures, every farmer ought to sow some, to supply his own family with one of the most useful articles for their summer clothing—*good home manufactured linen.*

FLAX.

In Zealand, a province of Holland, remarkable for the fineness of its flax, the soil is deep and rather stiff, with the water almost every where at the depth of a foot or a foot and a half from the surface. In Ireland the moist stiff soil yields much larger quantities of flax,and far better seed than can be obtained from light lands. These facts might be some guide to farmers here.

Flax, if intended to be pulled green, might be placed in a rotation as a green crop, and come in place of a part of the summer fallow. In that case the land might be early ploughed in the fall, so that the soil may be duly mellowed by the winter frosts. If necessary, it should be again ploughed in the spring, and the surface be reduced perfectly fine by harrowing, previous to sowing the seed, water furrowing the land, and removing all stones, roots, &c., that may remain on the surface. The seed should be sown as early as the land can be prepared in the spring. The quantity of seed depends on the intention of the crop. When the the crop of seed is intended to be taken, thin sowing is preferable in order that the plant may have room to throw out lateral shoots, and to obtain air at the blossoming and filling seasons. But when the plant is pulled green for flax, the seed should not be sown thin, for the crop then becomes coarse and unproductive. In Ireland the usual quantity sown to the English acre, is from eighteen to twenty gallons; here a much less quantity would be required. When the crop is intended for seed, one third less seed may be sown. The seed brought from Holland is found to produce much better crops of flax in Ireland than seed brought from America. I believe this must be greatly owing to the difference of climate, that of Holland approximating to that of Ireland more than the climate of America does. When the soil is made perfectly fine, the seed is then sown, harrowed in, and ought to be rolled.

In Ireland when the crop is intended for flax, it is pulled while green, immediately after the seed is formed, and when the bottom of the stalk begins to turn yellow, as the flax is much finer and of better quality when the plant is pulled at this stage of its growth, than when allowed to advance more towards maturity. When pulled it is tied into sheaves like corn, and carried off immediately to be watered in bogs where turf has been dug out. In this country, where it may be inconvenient in many situations to water-steep flax, what is called in England dew-rotting, may be adopted instead. This is nothing more than spreading the flax on the field, and exposing it to the influence of the weather until the stalks arrive at that state in which the woody parts separate most easily from the boon, or fibre. Where it can be water-steeped, however, it will be found the preferable mode, and in standing pools, or in pits made for the purpose in swamps or bogs, the flax may be steeped, placing weights on planks over the flax to keep the whole firmly under water. Clear soft water is the best for steeping flax. The period the flax should remain under water depends upon various circumstances; as the state of ripeness in which it was pulled, the quality and temperature of the water, &c. The most certain rule by which to judge when flax is sufficiently watered, is when the boon becomes brittle, and the hard or woody parts separate easily from it. In warm weather, six or seven days will be sufficient for it to remain in the water. It is better to give it too little of the water than too much, as any deficiency may be easily made up by suffering it to lie longer on the grass, whereas an excess of water admits of no remedy.—Bleaching flax is the next operation, the intention of which is to rectify any defect in the watering process, and carry on the putrefaction process to that point where the fibre will separate from the bark or woody part of the stem with the greatest ease. In performing this operation, the flax is spread very thin on the grass, in regular rows, the one being made to overlap the other a few inches, with a view of preserving it as much as possible from being scattered about with the wind. The time allowed for bleaching is regulated by the state of the flax, and seldom exceeds twelve or fourteen days in Ireland, but will not require so many in Canada. It must be repeatedly examined, and when found that on being broken and rubbed between the hands, the fibre easily and freely separates from the woody parts, it may be bound up in sheaves, and secured for future dressing and manufacture.

The dressing of flax consists in various operations, such as breaking, by which the woody part is broken, scutching, heckling and combing, by which the fibre is separated from the woody part. These operations must be executed by hand, where there are no flax mills.

Mr. Lee's method of breaking flax and hemp without dew or water rotting, was invented in 1810. I have seen some of his samples that were laid before the Farmer's Society in Ireland; they were very fine and silky in appearance, and much stronger than water rotted flax. The invention of Mr. Lee, has been brought to greater perfection by a new patent machine of Messrs. Hill and Bundy. These machines are portable, and may be worked in barns or any kind of out house ; a great part of the work is so light that it can be done by children and infirm persons ; and such is the construction and simplicity of the machine, that no previous instruction or practice is required. Their introduction into Canada would be very desirable, and would be well calculated for work-houses. The woody part of the flax stalk is removed by a very simple machine ; and, by passing through a machine equally simple, the flax may be brought to any degree of fineness equal to that used in France and the Netherlands for the finest lace and cambric. The original length of the fibre, as well as its strength remains unimpaired ; and the difference of the produce is said to be immense, being nearly two thirds ; one ton of flax being produced from four tons of stem. The expense of working each ton obtained by this method is only five pounds. The glutinous matter may be removed by soap and water only, which will bring the flax to such a perfect whiteness, that no further bleaching is necessary, even after the linen is woven ; and the whole process of preparing flax may be completed in six days. The produce of flax, in fibre, varies considerably. Before being sorted, the gross produce of fibre is from three hundred to half a ton the English acre.

When the crop of flax is intended for seed, it must not be pulled until the seed be ripe. The seed pods are separated from the stalk by a process called rippling, and it is considered best to perform this operation immediately after the flax is pulled, as the easiest time to do so, and dry the seed afterwards. The operation of rippling is performed by forcing from the stalk the pods containing the seed by means of an iron comb called a ripple, fixed on a beam of wood through which the flax is drawn repeatedly until the seed is separated from the stalk. A large sheet is generally spread under the ripple to receive the seed, which must be dried by the sun perfectly before it is threshed. When the seed is threshed and cleaned, it must be carefully stirred, and prevented from heating.

As the making of flax-seed jelly is an agricultural operation, I shall here describe it. The proportion of water to seed is about seven to one. The seed having been steeped in part of the water for 48 hours previously to the boiling, the remainder of the water is added cold, and the whole boiled gently about two hours, being kept in motion during the operation, to prevent its burning in the boiler. Thus the whole is reduced to a jelly-like, or rather a gluey or ropy substance. After being cooled in tubs, it is given with a mixture of barley meal, bran and cut chaff; a bullock being allowed about two quarts of the jelly per day, or somewhat more than one quart of seed in four days, that is, about one-sixteenth of medium allowance of oil-cake.

HEMP.

The culture, management, and use of hemp, are nearly the same as those of flax. When grown for seed, it is a very exhausting crop; but when pulled green, it is considered a cleaner of the ground. The soils suitable for hemp are those of the deep black putrid vegetable kind, which have a situation low and somewhat inclined to moisture, as well as the deep mellow, loamy or sandy sorts. But the quantity of produce is in general much greater on the former than on the latter, though, according to some, of an inferior quality. Mellow, rich, clayey loams do well, and nothing better than old meadow land.

The season of sowing may be the same as for flax, and the quantity of seed may be about two bushels to the acre, but something less if the soil be very rich. It is generally sown broad-cast, and it is necessary to keep the birds from it until fairly up.

In hemp, the male and female flowers are in different plants, a circumstance which has some influence on its culture and management. When the crop is grown entirely for its fibre, it is pulled when in flower, and no distinction made between the male and female plants. But as it is most commonly grown both with a view to fibre and seed, the usual practice is to pull the male plants as soon as the setting of the seed in the females shows that they have effected their purpose. As the female plants require four of five weeks to ripen their seed, the males are thus pulled so long before them.

In the operation of pulling the males, the pullers walk in the furrows between the ridges, and reach across to the crown of the ridge, pulling one or two stalks at a time, and carefully avoiding to tread down the female plants. The male stalks are easily known by their yellowish hue and faded flowers. They are tied in small bundles, and immediately carried to the watering pool, in the manner of flax.

The operation of pulling the females commences when the seed is ripe, which is known by the brownish or grayish hue of the capsules and the fading of the leaves. The stalks are then pulled and bound up into bundles, being set up in the same manner as grain, until the seed becomes as dry and firm as to shed freely; great care should be taken in pulling not to shake the stalks rashly, otherwise much of the seed may be lost. It is advised that, after pulling the seed, hemp may be set to stand in shocks of five sheaves, to dry the seed; but, in order to prevent any delay in watering, the seed-pods may be cut off with a chopping knife, and dried on canvas exposed to the air under some shed or cover. This last method of drying the seed will prove of great advantage to the hemp, as the seed and pods, when green, are of such a gummy nature that the stems might suffer much by sun-burning or rain, which will discolour and injure the hemp before the seed can be sufficiently dried upon the stalks ; besides, the threshing out the seed would damage the hemp in a considerable degree.

Hemp is watered, bleached, and grassed in the same manner as flax. Grassing is omitted in some places, and drying substituted ; and in other districts, watering is omitted with the female crop, which is dried and stacked, and dewed or bleached the following spring. On the Continent, hot water and green soap have been tried ; and there as in the case of flax, it is found that steeping for two hours in this mixture is as effectual in separating the fibre from the woody matter as watering and grassing for weeks.

The produce of hemp in fibre is said to vary from three to six hundred per acre ; in seed, from ten to twelve bushels. Hemp might, if cultivated extensively, become a very valuable produce for exportation.

The Society of Arts, Manufactures and Commerce, have offered large premiums for the cultivation of hemp in Canada. Several samples of hemp of Canadian growth were sent to England some time back, and were placed under the examination of the best judges, by whom they were considered defective, rather from the faulty mode of preparation than from any inferiority in the material itself. Some was found to be of as great a length as the Italian hemp, which is longer than that from the Baltic, but the whole was mixed together without any regard to length or quality. The Russian hemp, on the contrary, is always carefully assorted into different classes, which of course obtain very different prices in the market. Surely if hemp is worth cultivating, farmers might readily attain proper methods of preparing and assorting it. It is supposed that England imports from Russia alone, annually, the hemp produced from 50,000 acres of land, and in time of war, it was about double that quantity. It is calculated that the sails and cordage of a first rate man-of-war require about 180,000 pounds of rough hemp for their construction, equal to the average produce of about 80 acres of land.

THE HOP.

Of the plants grown expressly for use in the brewery, the only one of any consequence is the hop. The hop is a perennial-rooted plant, with an annual twining stem, which on poles or in hedges, will reach the height of from twelve to twenty feet, or more. It is a native of Britain and most parts of Europe, and is very successfully cultivated in Canada. The female blossoms are the parts used ; and as the male and female flowers are on different plants, the female only is cultivated. When the hop was first used for preserving beer is unknown ; its culture was introduced into England from Flanders, in the reign of Henry the 8th.

The hop has been cultivated extensively in many parts of England, but not much in Scotland or Ireland. Hops are not considered advantageous in an agricultural point of view, because much manure is abstracted by them while little or none is returned. They are an uncertain article of growth, often yielding large profits to the cultivator, and often making an imperfect return, not much more than sufficient to defray the expenses of labour. Hops are exposed to so many diseases and casualties, that there is considerable uncertainty in cultivating them. The soils most favourable to the growth of hops are clays and strong deep loams; but it is also of great importance that the sub-soil should be dry and friable; a cold, wet, tenacious, clayey understratum being found extremely injurious to the roots of the plants, as, when they penetrate below the good soil, they soon become unproductive, and ultimately decay.

Bannister says, that though a dripping summer is by no means kindly to the welfare of the hop, yet since the vine, in a healthy state, is very luxuriant, and furnished with a large abundance of branches, leaves, fruit, &c., it follows that the demand of moisture from the soil must be proportionably great to preserve the plant in health and vigour; and for this reason the ground ought not to be deficient in natural humidity. Hence we generally find the most luxuriant vine growing on deep and rich land, as moulds, &c.; and in these grounds it is common, he says, to grow a load on an acre. But it is to be observed, however, that the abundance of fruit is not always in proportion to the length of the vines; since those soils which, from their fertility, cause a large growth of vine, are more frequently attacked by the blast, than land of a shallower staple where the vine is weaker and less luxuriant.

But though rich moulds generally produce a larger growth of hops than other soils, there is one exception to this rule, where the growth is 18 or 20 hundred per acre. This is on the rocks in the neighbourhood of Maidstone, in Kent, a kind of slaty ground, with an understratum of stone; on these rocks there is a large extent of hop garden, where the vines run up to the tops of the longest poles, and the increase is equal to that on the most fertile soil of any kind. The most desirable situation for a hop plantation is ground sloping gently towards the south or south-west, and screened by means of high grounds or forest trees, from the north or north-east. At the same time it ought not to be so confined as to prevent that free circulation of air, which is indispensably necessary where plants grow so close together, and to such a height. A free circulation of air, in a hop ground, not only conduces to the health and vigour of the plants, but also prevents the crops from being blighted.

It is supposed in England, that fields which lie in the neighbourhood of marshy or fenny levels, are seldom favourable to the growth of hops, as such grounds miscarry in a blasting year. In Worcestershire and Herefordshire, hops are very generally grown between the rows of fruit trees in dug or ploughed orchards.

In preparing the soil previously to planting, considerable attention is necessary, by fallowing, or otherwise, to destroy all weeds, and to reduce the soil to a properly pulverized state. Dung should also be applied with a liberal hand. Planting a crop of potatoes, or sowing carrots on the soil, would be a good preparation.

The mode of planting is in rows, making the hills six feet distant from each other, in order to give a free circulation of air, which will be more likely to prevent blasts, mildew, moulds, and other accidents. If the hops are planted too close, the vines are disposed to house or grow together at the tops of the poles, whereby the hops are so over-shadowed as to be debarred the influence of the sun, and prevented from arriving at half their growth.

The ordinary season for planting is in spring; but if bedded plants, or such as have been nursed for one summer in a garden are used, I believe they might be safely planted in autumn, and then some produce might be had in the succeeding year. It is, however, when dressing and pruning the vine in spring, that cuttings are generally taken for a new plantation.

The plants or cuttings are procured from the old stools, and each should have two eyes or points; from the one placed in the ground springs the root, and from the other the stalk. They should be made from the most healthy and strong binds or stalks, each being cut to the length of five or six inches. The mode of performing the operation of planting in Kent, England, is as follows:—After the land is properly prepared, they strike furrows with the plough at equal distances of six or eight feet; when finished, they repeat the same across in an opposite direction, which will divide the piece into six or eight feet squares. The hills are made where the furrows cross each other; small pits are formed by taking out a spit, or spade's depth of earth; and the earth below is generally loosened; a certain quantity, about half a bushel of dung is laid in each pit; then the earth that was formerly taken out is again replaced, and so much added as to form a small hill. On this hill, five, six or seven sets, procured from the roots or shoots of the old stock, are dibbled in. The plants are placed in a circular form towards the top of the hill, and at the distance of five or six inches asunder from each other. They are made to incline towards the centre of the hillock, where another plant is commonly placed. When the rows are planted in this way, ploughing and horse hoeing can be executed in the after culture.

An interval crop can very well be taken in the first summer of a hop plantation. Beans are grown in England in the intervals for the first two years if the hop plants are raised from cuttings put down in the plantation, without having been previously planted for a year in beds in a garden. Some are of opinion that onions or carrots only should be grown in the intervals. I have seen Indian corn raised here in the intervals, and by a person who understood the raising of hops better than most farmers in the province.

Hoeing in hop plantations is in England performed by a horse implement. When the hop-stools are formed in the angles of squares, the intervals may be hoed both lengthwise and across, and thus nothing is left to be performed by manual labour but cutting any weeds which may rise in the hills.

Stirring the soil between the rows may be effected with the plough, to any desirable depth; the surface can also be changed at discretion. Once going and returning would effect this, either by the paring or cleaning out; that is, forming either a ridgelet or gutter between the rows, both lengthwise and across. Twice or thrice going in the same direction would also succeed, and would be the preferable mode of covering in manure.

In the application of manure, various modes are adopted ; some always use well rotted stable dung, others compost of earth and dung. In laying it on in England, many prefer the autumn to the spring, and heap it on the hills without putting any between the rows ; others put it all between the rows, alleging that laying on the hills encourages insects, exposes the dung to evaporation and loss, and sometimes, when mixed with earth, hinders the plants from coming up. A great deal will be found in favour of, and against each of these modes, in the numerous works on the culture of the hop, which have been written within the last three centuries ; but it must be obvious to any person generally conversant with vegetable culture, that well rotted stable dung must be the best kind for use for the hop, and the spring the best season for laying it on, and that it ought to be turned into the soil between the rows with the plough. Thirty cart-loads of dung to the acre, once in three years, is considered sufficient in England. Some prefer giving it ten or twelve loads every year. By the latter end of spring the young shoots will have made considerable progress, and the earth is then drawn up to their roots from the surrounding intervals, in order to strengthen them ; and whether any kind of crops are grown on the intervals or not, the land must be kept perfectly clean.

In dressing the hop plants, the operations of the first year are confined to twisting and removing the haulm. The operation of twisting is confined to such plants as are not expected to produce a crop that season. It is usually performed when the vines have grown to some length, by twisting the young vines into a bunch or knot ; so that, by thus discouraging their growth, the roots are enabled to spread out more vigorously, and to acquire strength previously to the approach of the winter season. Removing the haulm takes place about the end of September, and consists simply in cutting it over with a sickle, and carrying it off the field for litter or burning. After this operation, some add cupping, or covering the hills with compost.

The first year's dressing of hops expected to produce flowers, consists in what is called in England, picking. This operation is generally commenced as early as the state of the soil will permit in spring, by spreading out the hills, in order to give opportunity to prune and dress the stocks. The earth being then cleared away from the principal roots, the remains of the former year's vines are cut off, together with the shoots which were not allowed to attach themselves to the poles in the former season, and also any young suckers that may have sprung up about the edges of the hills ; so that nothing is allowed to remain that is likely to injure the principal roots, or impede their shooting out strong and vigorous vines at the proper season. After the roots have been properly cleaned and pruned, the hills are again formed with an addition, if not every year, at least every second or third year, of a proper quantity of compost, or even rotted manure, previously laid near the hop ground for the purpose. At this season, such sets are procured as may be wanted for the nursery or for new plantations.

The yearly operation of stacking, or setting the poles, commences at whatever time in spring the shoots may have risen two or three inches. The poles generally used in Canada are straight, slender cedar, from fifteen to twenty feet long. These poles may be set three or four to a hill, and should be so placed as to leave an opening to the south, to admit the sun-beams. They may be fixed by making deep holes or openings in the ground, with an iron crow. Into these holes the root ends of the poles are put, when, if the earth is rammed hard about them, they will very seldom alter from the position in which they are placed, except on occasions of very violent gales of wind. Great care is necessary in placing the poles, and no less judgment and experience in determining what ought to be the proper height. When very long poles are set in a hop ground, where the stocks are too old or too young, or where the soil is of indifferent quality, the stocks are not only greatly exhausted, but the crop always turns out unproductively, as, until the vines reach the top, or rather till they overtop the poles, which depends on the strength of the stocks and the quality of the soil, the paternal branches on which the hops grow never begin to shoot out or make any progress. The chief art in poling a hop-ground is, first, to pitch the hole to a proper depth, about twenty inches ; next, to set down the pole with some exertion of strength, so that being well sharpened it may fix itself firmly at the bottom ; thirdly, that the tops of the poles may stand in such a direction as to lean outwards from the hill, to prevent as much as possible the housing of the vine ; and, lastly, to tread the earth closely to the pole with the foot. For want of regard to these particulars in the labourer, a moderate blast of wind will loosen the poles, so as not only to occasion a double expense, but the hazard of injuring the future crop, by tearing asunder the vines, which often become twisted together, or, as it is termed, housed, at the extreme part of the poles.

With respect to the species of wood proper for poles, it is suggested that the hop appears to prefer a rough soft bark, to one which is more smooth and polished ; hence there cannot be any wood better adapted for poles than cedar. In regard to the size of the poles, hops, likewise, it is well known, have their instinctive choice or approbation with respect to the thickness of their support, embracing, with greater readiness, a pole that is moderately small, than one which is thick at the bottom. The ordinary circumference of poles, at the thickest end, may be set down at from eight to ten inches, tapering to the size of a walking cane at the top. Different grounds require different lengths of pole ; to stand ten or twelve feet above the hills, would, perhaps, be sufficiently high for the best lands in Canada.

Wires of copper or iron have been tried as substitutes for wooden poles in the north of France, but are not considered so good as wooden poles. The wires are stretched horizontally in the direction of the row of plants, the first wire five feet from the ground, the second one foot above that, and so on, say to the height of fifteen feet. The plants are led to the lowest wire by short sticks, and left to twine up, or along others at pleasure.

Tying the shoots or vines to the poles is the last operation in the after culture of the hop. This requires the labour of a number of persons. In England, women are generally employed, who tie them in different places with withered rushes, but so loosely as not to prevent the vines from advancing in their progress towards the tops of the poles. When the vines have got out of reach from the ground, proper persons go round with standing ladders, and tie all such as appear inclined to stray. One important part of this operation is selecting the shoots. In England, it is considered a good plan to extirpate the most forward vines, from experience that these early shoots will produce little, if any, fruit, and rather tie up the second, or less forward vines. It is found there, that when the vines are strong, vigorous and luxuriant, early in the season, the crop is more subject to be injured by blasts, which generally occur some time in the month of May, than when the growth of the vine is more protracted.

Hops are known to be ready for pulling when they acquire a strong scent, and the seeds become firm and of a brown colour, which, in ordinary seasons, happens in the first week of September. When the pulling season arrives, the utmost assiduity is requisite on the part of the planter, in order that the different operations may be carried on with regularity and despatch, as the least neglect, in any department of the business, proves in a great degree ruinous to the most abundant crop, especially in precarious seasons. Gales of wind at that season, by breaking the lateral branches, and bruising the hops, prove nearly as injurious as a long continuance of rainy weather, which never fails to spoil the colour of the crop and render it less valuable.

As a preparation for pulling the hops, frames of wood, in number proportioned to the size of the ground, and the pickers to be employed, are placed in that part of the field which, by having been most exposed to the influence of the sun, is soonest ready. These frames, which are called bins or cribs, are very simple in their construction, being only four pieces of boards, nailed to four posts or legs, and, when finished, are about seven or eight feet long, three feet broad, and about the same height. A man always attends the pickers, whose business it is to cut over the vines near the ground, and to lay the poles on the frames to be picked. Commonly two, but seldom more than three poles are laid on at a time, six, seven or eight, women, girls and boys, being ranged on each side. These, with the man who sorts and lays down the poles, are called a set. The hops, after being carefully separated from the leaves and branches or stalks, are dropped by the pickers into a large cloth, hung all round within side of the frame, on tender-hooks. When the cloth is full, the hops are emptied into a large sack, which is carried home and laid on a kiln, to be dried. This is always done as soon as possible after they are picked, as they are apt to sustain considerable damage, both in colour and flavour, if allowed to remain long in the sacks, or even in heaps, in the green state in which they are pulled. In very warm weather, and when they are pulled in a moist state, they will often heat in five or six hours ; for this reason the kilns should be kept constantly at work, both night and day, from the commencement to the conclusion of the hop-picking season. To set on a sufficient number of hands in the picking season, is a matter of prudence, that the kiln or kilns may never be unsupplied with hops ; and if it is found that more hops are picked than can be conveniently dried off, some of the worst pickers may be discharged ; it being very prejudicial for the green hops to continue long undried. In a moist season, the kilns will take a much longer time to dry the hops than in a dry picking time ; it will, therefore, require the greatest attention of the planter to preserve the hops from being spoiled in a wet season.

Donaldson asserts, that diligent hop-pickers, when the crop is tolerably abundant, will pick from eight to ten bushels each in the day, which, when dry, will weigh about 112 pounds. In Canada, hops are generally picked at so much for each row, according to the length of each row, and the goodness of the crop. There is no want of labourers at that season, particularly as the quantity of hops cultivated in Canada is not very great.

The operation of drying hops is not materially different from that of drying malt, and the kilns may be of the same construction. The hops are spread on a hair cloth, or tiles, from eight to ten, and sometimes twelve inches deep, according to the dryness or wetness of the season, and the ripeness of the hops. A thorough knowledge of the best method of drying hops can only be acquired by long practice. The general rules are, to begin with a slow fire, and to increase it gradually till, by the kiln, and the warmth of the hops, it is known to have arrived at a proper height. An even steady fire is then continued for a few hours, according to the state and circumstances of the hops, till such time as the ends of the hop-stalks become quite shrivelled and dry, which is the chief sign by which to ascertain that the hops are properly and sufficiently dried. They are then taken off the kiln, and laid in a large room or loft till they become quite cool. They are then in a condition to be put into bags, which is the last operation the planter has to perform previously to sending his crop to market. The hops should be left some time in a heap on the loft or stowing room after being taken off the kiln ; for the hops, when first taken off the kiln, being very dry, would, if put into the bags at the time, break to pieces, and would not draw so good a sample as when they have lain some time in the heap ; whereby they acquire a considerable portion of toughness, and an increase of weight. Hops are generally dried in Canada with charcoal.

The bagging of hops is thus performed in England : In the floor of the room where the hops are laid to cool, there is a round hole or trap, equal in size to the mouth of the hop-bag. After tying a handful of hops in each of the lower corners of the hop-bag which serves afterwards for handles, the mouth of the bag is fixed securely to a strong hoop, which is made to rest on the edges of the hole or trap ; and the bag itself being then dropped through the trap, the packer goes into it, when a person who attends for the purpose puts in the hops in small quantities, in order to give the packer an opportunity of packing and trampling them as hard as possible. When the bag is filled, and the hops trampled in so hard as that it will hold no more, it is drawn up, loosened from the hoop, and the end sowed up, two other handles having been previously formed in the manner mentioned above. The brightest and finest coloured hops are put into pockets of fine bagging, and the brown and more inferior hops, into coarse or heavy bagging. The former are chiefly used for brewing fine ales, and the latter by porter brewers. The proper length of a bag is two ells and a quarter, and of a pocket nearly the same, being one ell in width. The former, if the hops are good in quality, well cured, and tight trodden, will weigh about two hundred and a half ; and the latter, if of the Canterbury pocketing, about one hundred and a half. If the weight either exceeds or falls much short of this medium, it induces a surmise that the hops are either in themselves of an inferior quality, or have been injudiciously manufactured in some respect or other. Mr. Fallance's apparatus for packing and preserving hops, is an hexagonal case of wood, eighteen feet long and two feet in diameter, with a piston, or rammer, to be worked by a screw or other means, so as to compress the hops more closely than has hitherto been done. When the case is full, a lid is fastened down by iron plates and nails, and any crack or joint that may appear is filled with cement, so as to exclude the air. With this precaution, Mr. Fallance states, hops may be preserved for half a century.

The stripping and stacking the poles succeeds to the operation of picking. It is of some consequence that this business be executed as soon as possible after the crop is removed, because the poles will receive far less damage from the weather when set up in a stack, than when dispersed about the ground with the vine on them. The operation of stripping may be performed by women and boys, being nothing more than tearing off the binds or vines. These may be burned on the ground, or tied up into small bundles, brought home and formed into a stack, to answer the purpose of heating ovens or boilers. At this time such poles as are deemed unfit for future service should be carried away, that the planter may have an early knowledge of the number of new poles that will be wanting ; and thus the business of providing poles may be completed in winter time, when the horses are not greatly engaged about other labour. The good poles are stacked up in conical piles, from two to five hundred in a pile, and well put up so as not to be readily blown down by wind or storms.

The produce of the hop crop is liable to very considerable variations, according to soil and seasons. From two or three to so much as twenty hundred weight, is obtained from an acre in England ; but from eight to fourteen hundred weight is considered a good average crop, according as the soil may be very good or middling. The produce of the hop in Canada, in favourable years, and cultivated equally well as in Kent, would be fully as great as is generally obtained in England.

To judge the quality of hops, as the chief virtue resides in the yellow powder contained in them, which is termed the *condition*, and is of an unctious and clammy nature ; the more or less clammy the sample appears to be, the value will be increased or diminished in the opinion of the buyer. To this may be added the colour, which it is of very material consequence for the planter to preserve as bright as possible.

The duration of a hop plantation on good soil may be for twenty years, or more, but in general they begin to decline about the tenth year. It is the practice of the most successful planters not to continue the hop plantation longer than ten years, and then to make a fresh one. Making new plantations, however, is a very considerable expense.

In growing hops in connection with a farm, regard should be had to the extent that can be manured, without detriment to the other tillage lands. On the whole, the hop is an expensive and precarious crop, the culture of which should be well considered before it is entered upon, and particularly the certainty and extent of the market for its sale.

The use of the hop in brewing is to prevent the beer from becoming sour. The young shoots may be eaten early in spring as asparagus. The herb will dye wool yellow. In Sweden, a strong cloth is made from the stalks ; for this purpose they must be gathered in autumn, soaked in water all winter ; and in March, after being dried in a stove, they are dressed like flax. They require a longer time to rot than flax. If not completely macerated, the woody part will not separate, nor the cloth prove white or fine. A pillow filled with hops, was prescribed for the use of George the 3rd, in his illness in 1787.

The hop is a plant very liable to become diseased, and is often greatly injured by insects and vermin at the roots, and on the vines and leaves ; so much so, that unless prevented, the crop will frequently be destroyed altogether. It must be the planter's care to guard against these casualties, and to make himself thoroughly acquainted with the diseases the hop is subject to, and the habits of the vermin that ravage the plants, in order to provide all the remedy that is possible ; and, if he does not do this, better he should never attempt to raise a hop plantation.

The hop cannot be profitably cultivated in Canada to a greater extent than will be sufficient to supply our own consumption ; there is not much probability of a foreign market for any part, and very trequently considerable quantities of hops are imported here from the United States. The hop, therefore, cannot under present circumstances, be cultivated to any great extent.

AGRICULTURE.

PART V.

BREEDING, REARING, AND MANAGEMENT OF FARM HORSES.

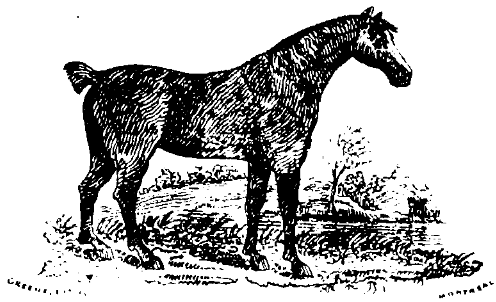
The horse family are by far the most important among the brute creation, as servants to man. In a wild state, the horse is, in general, of an inelegant form, and extremely untractable ; but, when domesticated, he becomes docile, yet bold and intrepid, and is highly attached to man. In no country has his various qualities, both for the turf, the field, and the road, been brought to such perfection as in England ; and, with the exception of the pure Arabian, there can nowhere be found a breed to compare with the English race horse. The subject of thorough-bred horses is, however, beyond the scope of this treatise, which, being intended for the use of farmers, is proper to confine to a description of draught horses best suited to agricultural purposes ; and a variety of saddle horse that might be useful and necessary for the occasional use of farmers, for the saddle, and for light work ; these may be ranked under the denominations of Canadian horse, Suffolk punches, and the improved English hackney, or a variety of horses possessing their qualities. The two former have been already described ; it only remains to describe the latter.

The improved hackney, is derived from a judicious mixture of the blood breed, and sometimes the hunter, with mares of substance, correct form, and good action. In the hackney, as safety is as requisite as speed, it is necessary to look particularly to the fore parts to see that they are high and well placed ; that the head is not heavy, nor the neck disproportionably long or short ; that the legs stand straight, (that is, that a perpendicular line drawn from the point of the shoulder should meet the toe,) and that the elbows turn out ; and although a perfect conformation in the hinder parts is necessary to the hackney, it is in some measure subordinate to the same perfection in the fore parts ; whereas in the racer and hunter, but particularly in the former, the form of the hinder is even of more consequence than that of the fore parts. This description of horse would be very suitable in some situations for many purposes, though not *generally* necessary for farmers.

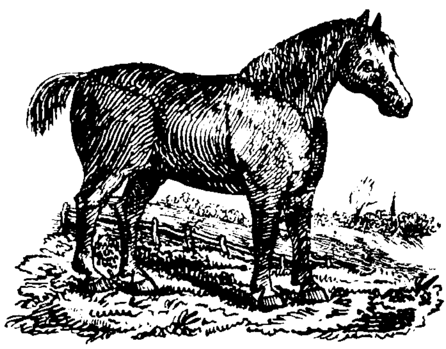
In the breeding of horses, the entire attention should not, as is too commonly practiced, be confined to the stallions. So far as experience has hitherto shown, it has in most instances been found that nearly as much depends upon the mare, as upon the horse, in regard to the form and other good qualities of the progeny. It is the opinion of the best judges, that no idea can be more erroneous than the too common one of breeding a good hunter or saddle horse from a blood stallion and a draught mare, or to suppose that the qualities of each will be so equally blended in their offspring as to constitute a happy medium between both, thus producing a colt in which the speed and liveliness of the sire shall be combined with the strength and consistency of the dam. The most judicious observers have remarked that there is very frequently a perceptible degeneracy even from the worst of the two ; the mongrel breed rarely possessing, in any considerable degree, the power or size of the one, or the spirit, activity, and fine bone of the other. Instead of attempting such violent crosses, it is considered more advisable, when the mare has any good points, to select a stallion as similar as possible in form, as thus there will be a probability that the foal will possess them in still greater perfection. But, notwithstanding the general truth of these axioms, persons here breed from mares of every description, when the most prudent course would be to choose a stallion as free as possible from any defects observable in the mare, or, in other words, possessing those properties in which the mares are peculiarly deficient. It is inattention to the peculiar qualities of sire and dam, and the disregard to the necessary requisites of country and keep, that has, and will, cause the production of horses that, from certain deficiencies in shape, strength, action and constitution, bear no proportional value to the expense and trouble they occasion the farmer ; and, being peculiarly adapted to no one particular purpose, become an unprofitable burden to their owners, and year after year consume food which might be much more advantageously applied to the feeding of neat cattle and sheep. With every possible skill in horses, and their management, few farmers in Canada will find it very profitable to breed any other description of horses but those fit for agricultural purposes. In some favourable situations and circumstances it may be prudent, and not unprofitable, to breed race horses and hunters ; but, the generality of farmers will do well to give all their attention to that description of stock that is suitable for his own purpose or that of his neighbour, for labour, or for furnishing the necessaries of life.

The general criteria of the qualities of a horse are derived from inspection and trial. His outward appearance among judges affords a pretty just criteria of his power, and a moderate trial usually enables the same judgment to decide on the disposition to exercise such powers.

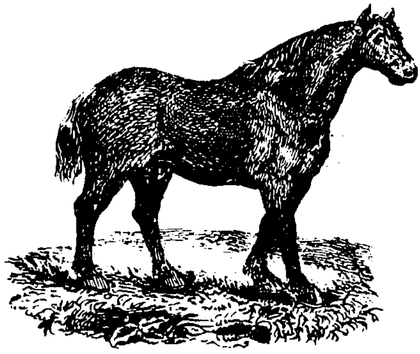
As a general principle, dark are preferred to light coloured horses, except in the instance of black, which is supposed to have few very good horses. Gray are also, in some degree, an exception to the rule, for there are many good grays. Bay and brown horses are the most esteemed colours. Hardihood is generally derived from the form of the carcase, which should be circular or barrelled ; by which food is retained, and strength gained to perform what is required. Such horses are generally good feeders. Hot; fiery horses are as objectionable as horses



IMPROVED ENGLISH HACKNEY.



SUFFOLK PUNCH.



CANADIAN HORSE.

of good courage are desirable. Hot, fiery horses, seldom last long. A good couraged horse moves with readiness, carries one ear forward, and one backward ; is attentive and cheerful, loves to be talked to, and caressed even when on a journey, and in a double harness will play with his mate. Good couraged horses are always the best tempered, and, under difficulties, are by far the most quiet, and least disposed to do mischief.

The criteria of a Hackney.—If it be necessary that the hackney be well formed behind to give him strength, and to propel him forward, it is even of more consequence that he be well formed before ; and in this kind of horse the hind parts are in some measure subordinate to the fore, as safety is preferable to speed. The head in the hackney should be small, and well placed on a neck of due length and substance to make a proper *appui* for the bridle, and that proper resistance to the hand, so pleasant to the feel, and so necessary for ease and safety. The shoulders should be oblique and well furnished with muscle, but not heavy, and the withers in particular should be high. The elbows should be turned rather out than in, and the legs should stand out straight, and by no means fall under the horse, for it betokens a stumbler. The pasterns should neither be too oblique, which bespeaks weakness: nor too straight, which wears the horse out, and is unpleasant to the rider. The carcase should be round, or the horse will be washy and weak ; the loins straight, wide, and ribbed home, the thighs of good substance ; and although the being cat-hammed, or having the hocks turned inwards, is defective in beauty, it often bespeaks a trotter.

The criteria of a horse peculiarly adapted to the labour of agriculture, are thus given by Culley :—" His head should be as small as the proportion of the animal will admit, his nostrils expanded, and muzzle fine ; his eyes cheerful and prominent ; his ears small, upright, and placed near together ; his neck rising out from between his shoulders with an easy tapering curve, must join gracefully to the head ; his shoulders being well thrown back, must also go into his neck, (at what is called the points,) unperceived, which perhaps facilitates the going much more than the narrow shoulder ; the arm or fore thigh, should be muscular, and tapering from the shoulder, to meet a fine, straight, sinewy, and bony leg ; the hoof circular, and wide at the heel ; his chest deep, and full at the girth ; his loins, or fillets, broad and straight, and body round ; his hips, or hocks by no means wide, but quarters long, and the tail set on so as to be nearly in the same right line as his back ; his thighs strong and muscular, his legs clean and fine-boned ; the leg bones not round, but what is called lathy or flat."

According to Brown, both strength and agility are required in a plough horse ; and it is not size that confers strength, the largest horses being often the soonest worn out. A quick even step, an easy movement, and a good temper, are qualities of the greatest importance to a working horse ; and the possession of them is of more avail than big bones, long legs and a lumpy carcass. To feed well is a property of great value ; and this property, as all judges know, depends much upon the shape of the barrel, deepness of chest, strength of back, and size of the hips or hocks with which the animal is furnished. If straight in the back, and not over short, high in the ribs, and with hocks close and round, the animal is generally hardy, capable of undergoing a great deal of fatigue without lessening his appetite, or impairing his working powers ; whereas horses that are sharp pointed, flat-ribbed, hollow-backed, and wide set in the hocks, are usually bad feeders, and soon done up when put to hard work. All farmers should be aware that compactness of shape is the best adapted to hard work and bottom ; and that over-limbed horses are apt to tire sooner than those of a lighter make, particularly in a country where the roads are generally soft in spring and fall, and where horses of a quick movement are required to go on the ice and snow in winter.

The only material distinction between the form of a brood mare and a stallion is, that she ought to be rather longer in the body ; and of the two, it has been considered by good judges, that the mare should be the largest, or at least larger than the usual proportion between them. The cart mare, therefore, when intended to supply draught colts, ought to have a large body in proportion to her height, and to be full in the flank, as an earnest of her becoming a good nurse. Her constitution should be healthy and vigorous, her temper gentle and tractable, and she should be free from all hereditary defects ; for on the good qualities and strength of constitution united in the sire and dam, will, in a great measure, depend the future health, strength, and usefulness of the colt.

The period of gestation in mares is about eleven calendar months, and the time of putting them to the horse varies from April to May. The result of experiments made by M. Tessier, on the gestation of mares, is as follows :—Of 278 mares, 23 foaled between the 322nd and 330th day, mean time 326 ; 227 between the 330th and 359th, mean time 344½ ; 28 between the 361st and 419th, mean time 390. There was, therefore, between the longest and the shortest period an interval of ninety-seven days.

At several well managed farms in England, the whole work is done by mares and oxen. Of the mares, all that are fit, are put to the horse, of which three are reckoned upon an average to rear two foals, allowing one in three for casualties. Moderate work, so far from being prejudicial while they are with foal, is of service in enabling them to bring forth with greater ease, and may be continued with safety to the very eve of their foaling.

Mares should be put partly to hard meat a few days before the weaning of the foal, and entirely so after their separation, as it assists in drying off the milk ; and if again in foal it strengthens them, and helps to prevent them from slinking. Care, however, should be taken to keep their bodies open, for which purpose mashes of bran should be given nightly, until they are in a proper state.

The age at which horses should be allowed to breed is not determined by uniform practice, but it would seem to be an improper practice to allow animals of any kind to propagate, while they are themselves in a raw unformed state, and require all the nutriment which their food affords, for raising them to the ordinary size of the race to which they belong. It is, therefore, considered advisable not to employ the stallion until four years old, or the mare until she is a year older. If this be the best mode of breeding animals, and I am convinced it is, how different is it from the usual practice in Canada, where all descriptions of animals, good, bad, and indifferent, are allowed to go at large, and breed at all ages. It is no wonder that our stock of horses, neat cattle, and sheep, so managed, should greatly degenerate, and until a better system be adopted, our stock of animals never can be brought to profitable perfection. At present it is scarcely possible to allow mares of any age to leave the stable in summer, without having them breed from, perhaps, the most inferior colts or horses that are in the neighbourhood. Other animals are in general equally exposed, from the nature of the fences, which are insufficient to keep the male stock separate, particularly stallions and bulls. It is to be regretted that it should require Legislative enactments to put a stop to practices that are manifestly so injurious to the improvement of agriculture ; and without some severe law to meet what may be considered an *unqualified evil*, the profitable improvement of our native or imported stock will be impossible. I term it an unqualified evil, because it reduces the value and usefulness of all our domestic animals, and consequently the gross returns of agriculture, without producing any good whatever.

Three months before a stallion is sexually employed, it is recommended to feed with sound oats, peas or beans, or with coarse bread and a little hay, but a good quantity of wheat straw ; that he should be watered regularly, and have long continued walking exercise every day, but not be over heated. From twelve to twenty mares is considered as many as a horse should serve in a season ; but men differ on this point.

Colts, after being weaned, should be fed with good sweet hay, and a small quantity of oats, Indian corn or bean-meal, daily during the winter, and in the following summer should have a range of good pasture. The second winter they require to have abundance of good hay, and carrots would be a most excellent substitute for oats.

Castration is commonly performed in England when the colt is twelve months old, and it should not be longer deferred in Canada. It is unnecessary to describe the operation, as it is always performed by a farrier.

The process of training horses for the saddle or the plough, is one of considerable nicety ; for both, the chief and best means are, gentleness and patience. The horse is an animal of much observation, capable of great attachment, and of equally strong resentment ; if treated with kindness he becomes docile ; but severity generally fails of its object, and renders him untractable. From the moment of its being weaned, the foal should be accustomed to the halter, and to be wisped over, and occasionally tied up ; but this should be done by the same person who feeds it, and that care should seldom be entrusted to lads, who will probably teaze the animal and teach it tricks, or to any hasty, ill-tempered man, who would be likely to ill-treat it. The colt will thus early become accustomed to be handled, and will consequently occasion much less trouble than if it had been previously neglected. Colts should be led about and accustomed to obey the rein in turning and stopping, which they will very soon learn. When first put to draw in harness, care should be taken not to whip or force them, or use any violence, but quietly to walk them, until they become accustomed to the draught. The Canadian horses are remarkable for their gentleness and tractability, and are much easier broke to the draught than English horses.

The support of horses forms a most material portion of farming expenditure; therefore, a few observations on the subject may be interesting, especially as leading to a calculation of their value, as labouring cattle, when compared with oxen.

Though the methods of stable keeping are various here, they are not so much so as in the British Isles. An estimate of the expense cannot be formed with precision. However, the consumption of oats, hay, and other matters, by a well fed farm horse, may be very accurately calculated. Though the farmer raises the food for his horses, this food is worth to him what it would bring in market, deducting the expense of carriage, and sale, or what it would produce by feeding it to other animals. Hay should always be worth four dollars the hundred bundles, on the farm, to feed cattle, and oats one shilling the minot for the same purpose. It has frequently, and probably will again, be worth double that price in market. Potatoes should be worth from six pence to ten pence, or perhaps more, and carrots nearly the same price, on the farm, for feeding cattle or swine. By these prices the expense of keeping horses may be readily estimated.

Well fed farm horses in England, are allowed to consume 80 Winchester bushels of oats, and 16 bushels of beans yearly, with about 21 pounds of dry hay daily in winter, and green food the four summer months. In Canada, horses will require to be kept in the stable about eight months in the year on dry hay; the other four months they may be fed on green food, or pastured. From one bundle, to one bundle and a half of hay, and sometimes more, will be consumed daily by a farm horse; and two bushels of oats in the week is not too much for a horse kept at constant work. As a substitute for oats, carrots or potatoes may be given occasionally. Hence, the annual charge for keeping a horse, at the lowest prices that the food is worth on the farm for other purposes, including four months summer feeding by soiling or pasturage, and the black-smith's bill, would be about 10*l.* or 11*l.* currency. When the horse food could be disposed of at a much higher rate, the expense would be increased in proportion. Pea straw may be substituted occasionally for hay, but this will not reduce materially the above estimate. In Kent, England, horse teams are sometimes kept entirely on short cut straw and unthreshed oats, given in the manger; the oat sheaves being estimated to produce about seven bushels of grain weekly for a team of four horses, or, if clean corn be given, four of oats and two of beans. Some farmers give two quintals of bran in the week to four horses, with cut straw, mixed with a small portion of saintfoin hay cut into chaff, without any grain. In the south of Europe, and particularly in Spain, where many fine horses are bred, hay is generally unknown, and the horses are fed on straw, (only partially cut,) with barley. It is considered an excellent practice to allow a mash of bran to horses at least once in the week, when they are kept on hard meat, it will keep the body in a good state.

It is not necessary that farm horses should be groomed like hunters; much use of the curry-comb is rather prejudicial in winter to horses that are constantly employed at slow work or standing in the market for many hours together in all kinds of weather, for it will deprive them of too much of the long coat with which nature provides them, as a protection against the inclemency of the season; but this argument will by no means hold good against the necessary cleanliness. It will be found a good plan to oil and stop the hooves occasionally; and not shoeing sufficiently often, is mistaken economy. Stables should be kept not only clean, but sweet; for horses have a strong dislike to every offensive smell. In this country, Canadian horses particularly, are not subject to that most unsightly and stubborn disease, grease, or runnings from cracks in the heels, so exceedingly troublesome in many horses in the British Isles. The *glanders* is another most fatal disease horses are subject to in Britain, which I believe is unknown here.

ASSES AND MULES.

These are little employed in this country, though if reared with care, and properly treated, they might be rendered serviceable to farmers. A gentleman in England used four asses to the plough, and they ploughed an acre in the day, driven in hand with reins by the ploughman. The Earl of Egremont formed a team consisting of six male asses, who were able to bring a chaldron and a quarter of coals, weighing over three tons and a quarter, in a waggon. They had no oats, and lived chiefly on furze, holly, and bramble leaves.

Mules are a mongrel kind of animal, partaking of the nature of the horse and the ass. They are hardy, strong, and sure-footed, live to a great age, and may be maintained at much less expense than horses. They are the only beasts of burden used in the south of Europe; and in Spain and Portugal, they are employed both for the saddle and in gentlemen's carriages. For the latter purpose, they are bred of a very large size, and sell at much higher prices than horses, as they not only live longer, and are much less subject to disease, but are found to go through more work, and to stand it better. The common load for Spanish mules, besides a heavy pack saddle, is 280 pounds, or 20 stone, and with this they will travel for days together, at the rate of from 30 to 40 miles. Their only food is barley, or Indian corn and straw, upon which they are kept in excellent condition; and when not ill-treated, will continue to labour for 30, or even 40 years. In Lisbon, a pair of carriage mules have been known to fetch as much as 250 moidores, equal to 337*l.* 10*s.*; and a good pair can seldom be obtained under 150 moidores or about 200*l.*

These animals might be rendered very serviceable for many purposes for which horses are employed; they are more hardy, and require much less keep. A gentleman who had a considerable number of them in England, says, "that so far from meriting the character they bear for restiveness, when such a disposition was shown, it was owing to ill-treatment, and the perverseness of their managers; that they have a strong sense of injuries received, and act accordingly; but that, when managed with humanity and gentle treatment, no animal is more docile, or more easily governed." Mules in the south of Europe, fully come up to the character here given of them. By importing a few of the largest and best description of asses, farmers might breed mules, and give them a fair trial. In many situations, I believe they would be found to answer a good purpose.

NEAT OR HORNED CATTLE.

The neat or horned cattle used in agriculture are included under the species of Bos, the ox and the buffalo ; the latter, however, is not used in Britain or in Canada. These animals are more universally used as beasts of draught and burden than the horse, and have the additional advantage of furnishing excellent food and other valuable products. There is scarcely a country in which the ox or the buffalo is not either indigenous, or naturalised and cultivated, while in many parts of the world the horse is wanting.

The male ox is the bull, and the female the cow. The bull and cow inhabit various parts of the world, and are domesticated every where. In most countries they are the mere creatures of soil and climate, the natural habits little restrained, or the form little improved for the purposes of milking, fattening or for labour. It is almost exclusively in Britain that this race of animals has been ameliorated so as to present breeds for each of these purposes, far superior to what are to be found in any other country. Notwithstanding this, however, much certainly remains to be known regarding the nutriment afforded by different kinds of herbage and roots ; the quantity of food consumed by different breeds, in proportion as well to their weight at the time, as the ratio of their increase ; and the propriety of employing large or small animals in any given circumstances. Even with regard to the degrees of improvement made by fattening cattle generally, no great accuracy is commonly attempted ; machines for weighing cattle themselves and their food, from time to time, not being in general use in any part of Britain.

The varieties of the European cow are innumerable. The pliancy of their nature is such that they have been formed into many diversities of shape, and various qualities have been given them, very different from the original stock. The *uris*,or cows of Lithuania, are almost as large as the elephant ; while some of those on the Grampian hills are little above the size of a goat ; and cows are found of every variety of form between the one and the other They are not less varied in their shapes. The *bison*, which is a species of the cow family, and which readily propogates with our cows, wears a strong shaggy mane, like a lion ; a beard like the goat ; as much hair under its neck and breast as covers its fore legs ; a hump upon its shoulders, nearly as large as that worn by the camel, (sometimes forty or fifty pounds in weight,) with a tail that scarcely reaches to the top of its buttock ; and it resembles the lion much more than it does our domesticated cows, or other varieties of its own species.

The diversity of qualities in the cow family is also very great. Our cows are so grovelling and inactive, that they scarcely know the road from their stalls to their pastures ; while those of the Hottentots are so tractable as to be intrusted with the charge of other animals, and keep them from trespassing on the fields of grain, or other forbidden ground. They also fight their master's battles, and gore his enemies with their horns. Our dairy cows are so feeble and inactive, that they are hurt by travelling twice a day, even slowly, one mile from the byre to the pasture; while those of Tuscany are used as riding animals, and in drawing carriages. Those of Hindoston draw the coaches, and maintain their rates with horses at full trot; and the Hottentots teach their cows to hunt down the elk antelope. Cows of the wild neglected breed can with difficulty be removed from one enclosure or one hill to another, while those on whom due attention has been bestowed, are docile, and submit to perform all sorts of labour. Some cows will yield more milk per day than others will give in ten, perhaps in twenty days. These are not so many different species of animals, but all of them one and the same species, all capable of generating with each other a perfect offspring. All these varieties have been formed from the parent stock, partly by the diversity of soil and climate, or other accidental or adventitious circumstances, and partly, of late, by human skill and industry.

From the European variety have been formed the different breeds cultivated in Britain, and also our Canadian breeds. After what I have already said of some of the breeds that are and might be cultivated to the greatest advantage here, it is unnecessary to describe them now. There are, however, two breeds of cattle much esteemed in Britain, the Devonshire, and Ayrshire, which I have not described, and as both breeds have been introduced into Canada, it is proper to notice them.

The Devonshire cattle are of a high red color, (if any white spots they reckon the breed impure, particularly if those spots run one into another,) with a light dun ring round the eye, and the muzzle of the same color, fine in the bone, clean in the neck, horns of a medium length, bent upwards,thin-faced, and fine in the chops, wide in the hips, a tolerable barrel, but rather flat on the sides, tail small and set on very high; they are thin skinned, and silky in handling, feed at an early age, and arrive at maturity sooner than most other breeds. They are considered a model for all persons who breed oxen for the yoke. I have known gentlemen in Ireland to import them from England to breed oxen for labour from them; though the weight of the cow is usually from 30 to 40 stone, and the oxen from 40 to 60. The north Devonshire variety in particular, from the fineness in the grain of the meat, is held in high estimation in Smithfield.

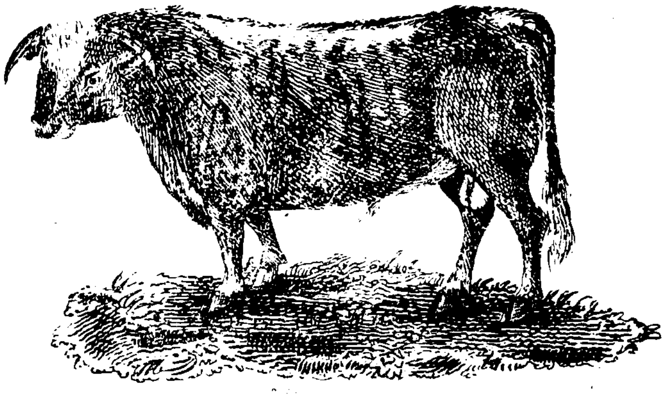
The Devon cattle are extremely well adapted for feeding and draught, but not equally so for the dairy or milk. The peculiar nature of the animal disposes it to the accumulation of fat, rather than to the production of milk. For the purposes of labour, this breed can no where be excelled for docility, activity, or hardihood, in proof of which no stronger circumstance can be adduced, than that it is a common day's work in Devonshire,on fallow land,for four steers to plough two acres with a double furrow plough; and that a general use is thus made of them, and for most of the other purposes of draught in the country where they were originally found, and in others to which they have been since transplanted. This breed is supposed to be one of the original breeds of England, and one of those which have preserved most of their primitive form. For labour and feeding, I believe they would be a very suitable breed of cattle for the British provinces in North America.

The Ayrshire breed are much esteemed in Scotland for the dairy or fattening, and are generally of handsome shape and moderate size. According to Aiton, " the size of the Ayrshire improved dairy cows varies from 20 to 40 stone, English, according to the quality or abundance of their food. If cattle are too small for the soil, they will soon rise to the size it will maintain, and the reverse, if they are larger than it is calculated to support." The same author says, (in his Agriculture of Ayr,) that this breed of cattle not only for the dairy, have no parallel, under similar soil, climate, and relative circumstances, but also in feeding for the shambles. They have been improved in their size, shape and qualities, chiefly by judicious selection, cross-coupling, feeding and treatment, for a long series of time. The usual produce of butter from these cows, is said to be half their own weight, (meaning the four quarters,) in a year ; but this requires that the pasture be good, and the cow otherwise well kept the whole season over. From what I have seen of this breed, I should prefer them decidedly to the larger breed of English cattle that have been imported here ; and the bulls of this breed, would be a judicious cross with the Canadian cows. Those that have been hitherto imported are not the most superior animals of the Ayrshire breed.

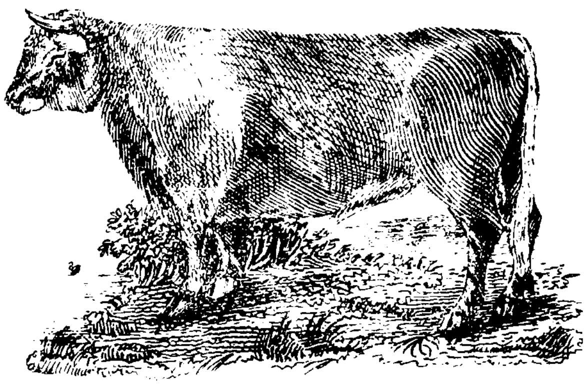
In every part of British America, it is quite possible to raise an improved and useful stock of cattle from those already in the country ; all that is required to accomplish this is, careful selection for breeding, by judicious crossing, feeding and proper treatment. It is by this kind of management that cattle have been improved in the British Isles, and they never can be improved by any other means in the British colonies. The farmer who knows what is the best shape and size for animals to possess in order to their producing most profit to him, may improve his stock to the required shape and size, from the materials already in the country, at any time he chooses to give due care and attention to their breeding and feeding. Farmers must have very little knowledge of stock, who expect to produce the requisite or desired improvement in the shape or size of their animals, by purchasing a superior male animal of any species as a cross with their own stock without adopting any improvement in the care and keep of the progeny produced from this cross, the want of which keep and treatment is, perhaps, the only cause that the stock he has already is inferior to those he is desirous to cross with. A very considerable knowledge of stock, and their proper management, is necessary for farmers in order to their becoming successful breeders or feeders of neat cattle and sheep.

The criteria of excellence in neat cattle in general are thus given by an eminent breeder, Mr. Wilkinson, of Linton, near Notingham, England.—(*Remarks on cattle*, 1820.) This will apply to cattle of any size, in any country.

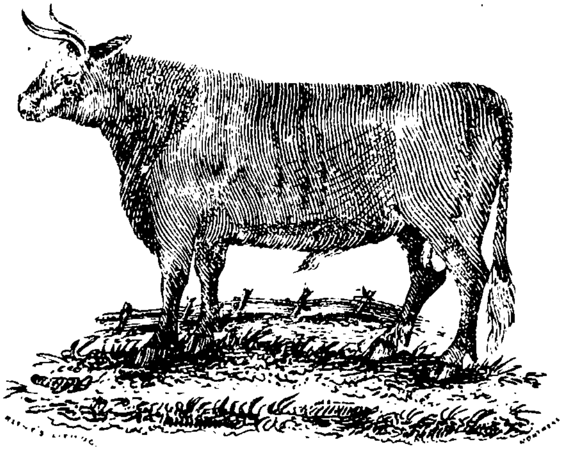
" The head ought to be rather long, and muzzle fine ; the countenance calm and placid, which indicates a disposition to get fat ; the horns fine ; the neck light, particularly where it joins to the head ; the breast wide, and projecting well before the legs ; the shoulders moderately broad at the top, and the joints well in, and when the animal is in good condition, the chine so full as to leave no hollow behind it ; the fore flank well filled up, and the girth behind the shoulders deep ; the back straight,



LONG HORNED.

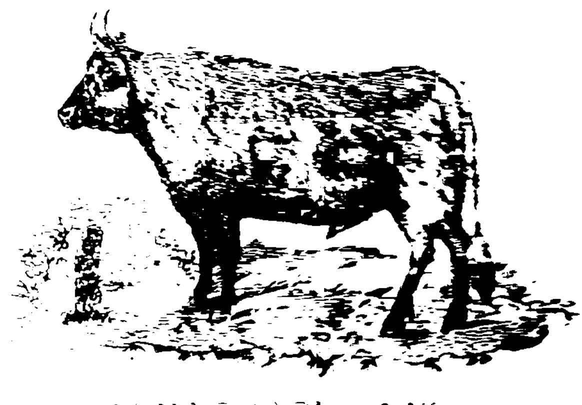


SHORT HORNED.

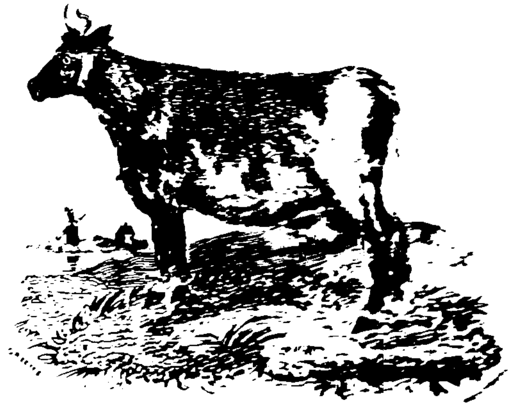


DEVONSHIRE BREED.

AYRSHIRE COW.



CANADIAN OX.



CANADIAN COW.

wide, and flat; the ribs broad, and the space between them and the hips small; the flank full and heavy; the belly well kept in, and not sinking low in the middle, but so formed that a cross section of it would resemble an oval, whose two ends are of the same width, and whose form approaches that of a circle; the hips globular, wide across, and on a level with the back itself; the hind quarters, that is, from the hips to the extremity of the rump, long and straight; the rump points flat, and coming well up to the tail; the twist wide, and the seam in the middle of it so well filled that the whole may very nearly form a plane perpendicular to the line of the back; the lower part of the thigh small; the tail broad and flat towards the top, but the lower part thin; the legs straight, clean, and fine-boned; and when the animal is in fine condition, the skin of a rich and silky appearance."

These may truly be said to be the most material points for the formation of true symmetry in cattle; there may be others of a minor consideration, which will be readily suggested by attention and experience.

The shapes most approved of for a milch cow, are nearly as follows: Head small, but rather long, and narrow at the muzzle; horns fine and clean; neck long and slender, tapering towards the head, with no loose skin below; shoulders thin; fore quarters light; hind quarters large, and heavy in the flank; back straight, broad behind, the joints rather loose and open; carcass deep, wide over the hips, buttocks broad and fleshy; tail long and small; legs small and short in proportion to her size, with short firm joints; udder capacious, broad and square, neither fleshy, low hung, nor loose; teats not very short or small, all pointed outwards, and a considerable distance from each other; the milk veins large and prominent; skin thin, loose and silky; the head, bones, horns, and all parts of least value small, and the general figure well proportioned. On the other hand, a cow with a thick head, short neck, prominent back bone, slender chest, belly tucked up, light hind quarters, thin buttocks, small udder, or fleshy bag, short slender teats, is to be avoided as totally unfit for the purposes either of the dairyman or the breeder. Such are the criteria of the nearest approach to excellence in neat cattle, confirmed by the experience of the first farmers in the British Isles.

BREEDING OF NEAT CATTLE.

The objects to be kept in view in breeding cattle are, forms well adapted for fattening, for producing milk, or for labour; and experience has proved that it is very difficult to combine all these desirable properties, in an eminent degree, in the same race. That form which indicates the property of yielding the most milk, differs materially from that which is known from experience to be combined with early maturity and the most valuable carcass; and the breeds which are understood to give the greatest weight of meat for the food they consume, and to contain the least proportion of offal, are not those which possess, in the highest degree, the strength and activity required in the beasts of labour.

It was generally considered in the British Isles, that a disposition to fatten, and a tendency to yield a large quantity of milk, cannot be united. The form of the animal most remarkable for the first, is very different from that of the other ; in place of being flat in the sides, and big in the belly, as all great milkers are, it is high-sided and light-bellied ; in a word, the body of the animal well adapted to fatten is barrel-formed, while that of the milker is widest downwards. This rule will certainly be found correct as regards large sized cattle, but not generally so with small, or those of middling size ; and it will be ever found that a larger numerical proportion of small sized cattle possess the true criteria of excellence for milk and the dairy, than those of the larger size. I have fattened cows in the Old Country, and found that good milkers, if they could only be dried, (which was often difficult,) fattened well and kindly. It is reasonable to suppose that a cow accustomed to produce a large quantity of milk, cannot lay on much fat, while she continues to produce it ; but when this produce is no longer taken from her, that she is suffered to become dried, and is in good health, the nutriment which before was necessary for the produce of the milk, will then be converted into beef and tallow. I admit that some cattle are unfit for the dairy, that would be very suitable and profitable for feeding or labour ; but I am convinced that cows good for the dairy, will also fatten well when dried. If farmers will select for breed and the dairy, only such heifers as possess the criteria of excellence for that purpose, fattening those that are unfit for milk, they may have the most excellent stock for every purpose. While every description of the heifer kind is allowed to breed, it is no wonder the stock should degenerate. For the consideration of farmers, the following is given from the reports of select farms in England, in 1830. A report of one in Hampshire states that, " the stock in general best adapted to this land are, the Alderney, and the smaller race of Norman cows. The Devonshire and larger breeds require richer pasture ; and although they are kept in condition, the milk they give is by no means in proportion to the bulk of food they consume. The Normandy and Alderney cattle appear to be less affected by the quality of the herbage."

There can be no doubt that particular breeds are best adapted to particular situations, on which ground breeders of cattle should endeavor to find out what breed is most profitable and best suited to their situations, and to improve that breed to the utmost. In order to have good cattle of any breed, particular regard must be paid in selecting those that are the most complete and perfect in their form, shape, and other qualities, and to breed from them.

Bulls should not be often employed before they are two years old. The females, in most instances, bring their first calf at the age of two years ; but this is not a good practice if the heifers are not of a reasonable size, from being properly kept ; however, they should be kept so as to admit of their having calves about the first of June after their second year, and provided they are properly kept afterwards, their growth will not perhaps be injuriously affected by breeding thus early.

The most desirable period for putting cows to the bull is midsummer, in order that they may be dropped in the beginning of spring, and have the whole of the grass season before them. Except in situations where the fattening of calves is an object of importance, about the first of April is probably the most advantageous time ; as the calves, having all the season before them, become sufficiently strong for enduring the change to a less agreeable food in the ensuing winter. A calf newly we seldom thrives well during that period, unless it is pampered with b food than usually falls to the share of young animals. But while l are suffered to go at large, as they generally are in Canada, cows 1 of course calve at all seasons of the year. It is highly desirable that practice should be discontinued, except where cows are kept for da near towns. Bulls might very well be confined in a yard or stall, and on green food at certain periods. Twenty or thirty cows are consid sufficient for one bull.

The period of gestation with cows has been found, upon an averag a great number of experiments, to be about 40 weeks. M. Tes communicated to the National Institute of France the following obse tions on this subject :—Of 160 cows, 14 calved from the 241st to 266th day ; 3 on the 270th ; 50 on the 280th ; 68 on from the 280t the 290th ; 20 on the 300th ; and 5 on the 308th. Cows seldom b more than one calf at a time. I had two cows in Canada that produ two calves each at a time, and in both cases they were the smallest c of the Canadian breed in my possession.

REARING OF NEAT CATTLE.

The mode of rearing calves is various. There can be no doubt the most natural mode is that of allowing them to suck their dams ; this is not certainly the best or most profitable mode, and the fir calves I have ever seen, were reared on skim milk. Bullock calves the long horned breed, so fed, I have repeatedly seen sold at a year (in Ireland, 100 in a lot, at from 7*l.* to 9*l.* sterling each, during the l war.

When calves are reared on skim milk, it should be boiled, and suffe to stand over until it cools to the temperature of that first given by cow, or a trifling degree more warm, and in that state it should be gi to the calf. Milk is often given to the calf warmed only, but that meth will not succeed so well as boiling it. If the milk is given over cold will cause the calf to purge. When this is the case, two or three spo fuls of rennet put in the milk, will soon stop the looseness. If, on t contrary, the calf is bound, pork-broth is a very good and safe thing put in the milk. One gallon of milk per day will keep a calf well at fi The usual allowance is about double that, after the first eight or t days, and this is increased with the age of the animal, though not ve greatly. When the calf is about thirteen weeks old, it will do very w upon grass, without milk. A small quantity of oats and bran, abou pint of each, given to the calf at mid-day would be of great service wh the calf is capable of eating it ; they should also be enticed to eat h and have it constantly before them. The calf should have its portions milk at fixed hours of the day, at eight o'clock in the morning, and fc in the afternoon, and be regularly served at these hours or he will n thrive. It has been found by experiments, that it is not absolutely n cessary to give milk to calves after they are one month old : to we them gradually, two quarts of milk, with the addition of flaxseed boil in water to make a gruel, given together will answer ; and by diminis ing the milk gradually, the calf will soon do without any. Hay-tea will do, with the like addition of two quarts of milk, but it is not so nutritious as flaxseed. The method of making hay-tea, is to put such a portion of good sweet hay as will be necessary into a tub, then to pour on a sufficient quantity of boiling water, covering up the vessel, and letting the water remain long enough to extract the virtues of the hay.

In summer, calves may be reared on sweet cheese whey only. The Duke of Northumberland's receipt is, to take one gallon of skimmed milk, and to about a pint of it add one ounce of common treacle, stirring it until it is well mixed, then to take one ounce of linseed oil-cake finely pulverized, and with the hand let it fall gradually, in very small quantities into the milk, stirring it at the same time with a spoon or ladle, until it is thoroughly incorporated; then let the mixture be put into the other part of the milk, and the whole made as warm as new milk when first taken from the cow, and in this state it is fit to be given to the calf. The quantity of powdered oil-cake may from time to time be increased, as the calf becomes accustomed to it. Another method is, to boil one quart of flaxseed in six quarts of water, for ten minutes, and then mix the jelly with a small quantity of hay-tea; on this calves are reared without any milk. It will be good for calves in summer when there is grass, to put them on sweet rich pasture after they are eight or ten days old. The time of performing the operation of castration in horned cattle, as in all kinds of live stock, except horses, is while the animal is yet very young, and just so strong as to endure this severe operation without any great danger of its proving fatal. The males accordingly are cut commonly from a week to a month old, and the females, if castrated or spayed, from one to three months old. This operation ought not to be neglected at this age.

Calves should have good pasture from the time they are weaned till the winter, and during the winter should have abundance of good sweet hay, on which they will thrive without any other food. They should have a house to themselves, with a rack or manger for the hay, and a small yard if convenient, to keep them separate from the larger stock. I think it unnecessary to mention roots, such as turnips, potatoes or carrots, as food for calves; farmers who may have abundance of these vegetables will find more profitable consumption for them in fattening full grown stock; and calves will not require them if they get a sufficient quantity of good hay.

FATTENING CALVES.

It is said that the most advantageous stock for suckling calves for the butcher, is that sort of cow which gives the greatest quantity of milk, richness of quality being not so great an object, or so well adapted to the desired purpose. In England, the large Holderness cows are preferred in this view, not, however, to suckle calves of the same, *but of a smaller breed*; and the Devon calves were supposed to surpass all others as sucklers, whether for quickness of proof or beauty of the veal.

The method of fattening calves in Canada, is to allow them to suck their dams. The period which is necessary for fattening calves in this way must be different, according to circumstances; but it is generally from six to nine weeks. In situations where milk is considered a va ble article, calves will not pay for fattening. I think the method ado in Holland for fattening calves is much better than to allow them to s the cows; it is the following:—The pen in which the calf is kept i narrow that it cannot turn round, so that it can only go backwards to end of the pen, which is also short, and forwards to the door: the h is kept in total darkness, and the pen kept perfectly clean and l When the suckler comes to administer the milk, a small hole is ope sufficiently big to admit its head to be thrust out, and which is made i door-way; as soon as the animal perceives the light, it advances tow it, pushes out its head, which the suckler puts into the milk pail; being taught to drink the milk, it very soon gets fat, and much qui than by either of our modes, when the calf is usually tied up, or is mitted to run about in an open place. The Dutch farmers hang piece of chalk near the door, for the animal to lick; and when the is about to be removed, the pen is so contrived, as to height, that w the door of the suckling house is open it falls down on the tail of the and the animal walks into it, and is secured. The floor of the D calf pens is of lattice work, so that it always lies dry. By this me the quantity of milk that is necessary to fatten the calf perfectly ma given, whether its own mother had had that quantity or not. If the becomes costive, a little pork or mutton broth will give it ease; and begins to purge, a small quantity of rennet used in coagulating milk cure the disease. Barley meal, and flaxseed boiled into a jelly, are en to calves in the course of fattening, and answers well. Some b should be drawn from the calf once or twice during the last week or days of fattening it.

The price of fat calves varies according to the goodness of the yo animal, and the time of the year they are disposed of. In the Mont market, a well fed calf of six or eight weeks old, will bring from si eight dollars; and at a month old, from three to five dollars. The lowing is a comparative estimate of the several applications of milk, to the feeding of veal, and of making of cheese and butter, in the co of Gloucester, England. This estimate will be found to apply corre in Canada, except in the prices of the articles.

"In feeding calves for the butcher, it generally takes seven week feed them to about a hundred each; and they consume the follo quantity of milk in the seven weeks: about 10 gallons the first week the second, 20 the third, 24 the fourth, 27 the fifth, 30 the sixth, an the seventh; so that it takes 159, or say 160 gallons of milk to pro 112 pounds of veal. The average money value of the above mode converting milk into a marketable commodity will stand thus:

100 gallons of milk produce 112 pounds of cheese of the best quality, which at 6d. per pound is - - -	2	16	0			
And 5 lbs. of whey butter, which at 8d per pound is		3	4			
Value of 100 gallons of milk converted into cheese,				2	19	4
100 gallons produee of milk butter, 34 lbs at 10d per	1	18	4			
And of cheese of the worst quality, 74 lbs at 3d per		18	6			
Value of 100 galls. when made into butter and cheese				2	6	10
160 gallons produce 112 lbs. of veal, which at $7\frac{1}{2}$d per lb. is - - - -	3	10	0			
But calves when dropped, generally sell for 10s. which being deducted, - -	0	10	0			
Leaves, as the value of 160 gallons of milk,	3	0	0			
And therefore the value of 100 gallons in feeding veal is, - - - - - -				1	17	6

Thus, making cheese of first quality is more profitable than either making milk-butter and inferior cheese, or feeding veal."

The above prices will not be obtained in Canada ; but, were cheese to be made good, it would come nearer to the above prices than the veal will do, which will seldom bring more than three pence the pound. Though the calves may not be so large here as in England, yet the same quantity of milk will produce as many pounds of veal here as there, if the calves are judiciously managed. I have no doubt but the milk of Canadian cows, fed on good pastures, will be fully as rich as milk in England, if we could only have these good pastures throughout the summer.

FATTENING NEAT CATTLE.

The fattening of cattle requires considerable and constant attention, and the grand object is to fatten quickly. An animal, when in a state of rearing, only requires so much food as will keep it constantly in good condition, without forcing it; but when fattening, it should have as much good food as it can be induced to eat, without surfeiting ; otherwise, animals of all species may be kept for months with a view of fattening them, without gaining a pound of meat.

Hitherto the fattening of cattle has been greatly neglected in Canada, both in summer and winter. I wish it were possible for me to persuade farmers to introduce extensively this most necessary branch of husbandry, at least to the extent that would fully supply our own wants. If protection from foreign competition is necessary, surely all *reasonable* protection will not be withheld. *I maintain that Canada is able to supply every want of her population in butchers' meat, cheese, and butter, in the most ample manner ; and that her agriculture can never be in the most healthful or prosperous state until she does supply it to the fullest extent.* Her arable culture cannot be profitably maintained without adopting a rotation of crops, in which a diversity of species of plants shall be introduced ; and to consume the portion of these crops which is only adapted to the feeding of cattle, the stock of cattle must be increased, as well as to supply manure for arable culture, without which crops will not be raised generally that will pay the expense of production.

The food on which cattle fatten on in summer is grass, on pa in winter, on hay, oil-cake, potatoes, grain, and on wastes of d ries. To these may be added carrots, parsnips, and Swedish tu The age at which cattle may be profitably fattened depends upo manner they have been reared, and the properties of the breed in reg a propensity to fatten earlier or later in life, and on the circumstan their being employed in breeding, in labour, for the dairy, or reared for the butcher. In the latter case, an improved breed will be fo for the shambles at three years and a half old ; and when they a worked, they should never be kept longer than to be four years old will not pay for their keep whatever they may sell for, when kept lo I have seen oxen sold in Montreal, at seven years old, that neve been worked : and the most of the large coarse cattle on this cont are seldom brought to great perfection until they are five or six yea which must leave the farmer's profit small indeed, considering that have to be fed in houses, or sheds, five or six months of the ye dried food. An animal that could be well fattened, and brought to from 700 to 1000 pounds dead weight at three and a half or four old, would pay much better than one of double that weight at six or years old, besides the risk of death, or other accidents. No cattl pay in this country that cannot be brought to maturity at an early a

In stall feeding cattle, it will be found much the most convenien better way for stock to have separate stalls for each. This will pr the weaker from being cowed by the stronger, and allow all to ea own food without fear. A domineering spirit is remarkably pre amongst horned cattle ; there will scarcely be one in a flock that wi strive to have the mastery over all those weaker than itself, and t one of the chief causes of the difference in the condition of a lot of l after a winter's keep. Cows inclined to butt, should have their tipped, or the sharp points cut off. In feeding cattle in yards in w it would be a good method to keep the master beasts tied up in stalls, or the weaker animals will not be allowed to eat much fro cribs.

Cattle that are grass-fed in summer, should, if possible, be sepa from store cattle, and milch cows ; they should have a sufficient s of good pasture until fat ; and if they have, and were put on the gr good condition, they will be fat in three months. In stall feeding in ter, an abundant supply of nutritive food regularly given, and to kee animals clean, are the chief points. If the animals are put up in the dition that every farmer ought to have them, they will soon get fat potatoes are given they should invariably be steamed or boiled. bushel steamed, will be better than two bushels, or more, in a raw One bushel of steamed potatoes in the day, given in three parts, w sufficient for an animal of 1200 or 1400 pounds live weight, with hay. One hundred bushels of potatoes given in this way, will fatten well of 1,000 pounds dead weight ; and animals of a less size, s have less, nearly in proportion. One gallon of ground oats, barley dian-corn meal, given in warm water at mid-day, would be an exc substitute for one-third of the daily portion of potatoes. Carrots parsnips, contain about one-third of the quantity of nutriment fou potatoes; hence, if these roots should be fed to cattle, they will require about three times the quantity they would of potatoes. All kinds of inferior grain may be applied to the fattening of cattle. The offals of distilleries may be profitably employed in fattening cattle. The chief point to be observed in using this food, is to supply the cattle with as much as they will eat without surfeiting, and to keep them perfectly clean about their mangers, and well littered. This cleaning is necessary three or four times in the day, or perhaps oftener. It is said that one of the quickest and most certain methods of fattening cattle in the stall is, by feeding with bran and linseed oil mixed; the proportion for an animal of moderate size, would be two pecks, or four gallons of bran in the day, divided into three feeds; and half a pint of oil to each feed, mixed well with the bran, the proportion to be increased for large cattle. A cow or heifer of three years old, will be as easy to fatten as a bullock of four.

It is generally found, and I have experience of the fact, that heifers or young cows of a good kind, if fatted, will produce more beef per acre, or if stall fed, for the food they consume, than oxen will do. Farmers will find a vast difference even in stock of the same breed, in their propensity to become fat. When a farmer is fully convinced, that he has a beast of any species, that is not disposed to take on fat, or is an *ill-doer*, he should dispose of the unthrifty animal the earliest opportunity; the first loss he will find to be the best.

I believe it may be ascertained very nearly the profitable weight of fat animals, by weighing them before they are slaughtered. I have taken a fat animal from the stall, drove it about five miles, and then weighed it. The weight was near 1300 pounds, and the butcher to whom I sold the animal, gave me a return of the dead weight, of beef, fat, offal, including the hide, which was near 900 pounds. Hence the difference of weight was not entirely a third. If an animal is a long time without food when weighed, it will of course make a considerable difference between it and one weighed from the stalls; but I believe a third will be very near the difference of live and dead weight in animals that are fit for the butcher.

MANAGEMENT OF COWS KEPT FOR THE DAIRY.

Milch cows are kept for the manufacture of butter and cheese, for the suckling of calves for the butcher, and for the immediate use of milk. Where butter and cheese are the principal objects, such cows should always be chosen as are known to afford the best milk and cream, and in the largest quantity, of whatever breed they may be. But the weight of butter to be made from a given number of cows must always depend on a variety of contingent circumstances, such as the size and goodness of the beast, the kind and quantity of the food, and the distance of time from calving. As to the first, it need scarcely be mentioned that a large cow will generally give a greater store of milk for a month or two after calving than one of a smaller size; though cows of equal size differ as to the quantity of cream produced from the milk of each; it is, therefore, on those cows whose milk is not only in large abundance, but which from a peculiar inherent richness, yields a thick cream, that the butter dairyman is to place his chief dependance; and when a cow is deficient in either of these, she should be parted with, and

and her place supplied by one more proper for this use. As to the s cond particular, namely, the kind and quality of the food ; those w would wish to profit by a dairy, ought to provide for their cows hay o superior goodness, to be given them in the depth of winter, and this in unlimited degree, that they may always feed till they are perfectly sat fied.

The profit of dairy cows depends very much on the goodness of t pasture, and the suitableness of the stock. The vales of Buckingha shire and Oxfordshire, are said to produce the sweetest butter in En land ; 'and though the grass on other lands should be equally luxuria the cow of the same breed, and the cream in like abundance, yet it found a decided preference still remains in favour of the vale-fed cow for, as a fattening beast will on rich land thrive much quicker than thin soils, though the herbage be much shorter on the former than on t poor ground, so will cows give a larger store of milk, and that of a mo nutritious quality, when fed on deep fertile meadows, than if depastur on those of inferior goodness of quality. Great care should be taken n to over stock pastures. Milch cows should always have a full bite close, short, fine grass. In England, long overgrown grass is found give a rank flavour to the cheese and butter, and is avoided.

Cows should be kept constantly in good condition, as, if they are ev suffered to become very lean, and that in the winter season, it is impo sible that they can be brought to afford a large quantity of milk, by g ting them into perfect condition in the summer months. Where co are lean at the period of calving, no management afterwards is ever c pable of bringing them to afford for that season anything near the p portion of milk that they would have done if they had been supported proper condition during the winter. Food of the most nourishing a succulent kinds should, therefore, be given in suitable proportion in t cold inclement months, and the animals should be kept warm, and w supplied with pure water. If cows are in good condition, they may milked to within a very short period of their calving, say a month or t at most. When cows are expected shortly to calve, they ought to lodged at night in a separate house sufficiently large, for a week previo to calving, as it may be the means of saving the life of the calf, perha of the dam.

A milch cow is in her prime at four or five years old, and will genera continue in a good milking state till ten years old, or upwards ; but t depends much upon the constitution of the animal. Cows should not kept longer than they yield profitable returns for the food they consur Cows of large size will yield a great store of milk on pastures where grass is in sufficient abundance, but as these large cows require a mo ample provision than would fall to their share on the generality of fa in Canada, it would seem that they should not be kept by farmers wh lands are not of the most fertile kind ; for, on ordinary keep, a small c will yield a fairer profit than one of a large breed, which, being even England only fit for the best kind of land and the most luxuriant pastu would be starved, where a Canadian cow would find an ample supply food.

Those who would have the greatest advantage from cows, either calf-feeders, milk-sellers, or dairy-men near towns, should always have a bull to run with the herd. Bulls should seldom be kept longer than five or six years old ; after this age, they are apt to contract vicious dispositions, and become very unmanageable. Whenever this happens, they should immediately be castrated, and put to fatten. In the vicinity of towns, cows kept for milk may be fed with brewer's or distiller's grains, from half a bushel to one bushel per day. To mix these grains with bran or pollard, at the rate of two gallons of grains, to one gallon of bran, will be a good method. Three gallons of this mixture wet with warm water, will make a good feed for a cow, and two or three such feeds in the day will be amply sufficient. It will answer a good purpose to mix chaff, or cut hay with grains, and if the chaff or cut hay could be steamed conveniently, previous to mixing it with the grains, it would make it much more valuable food. If potatoes are given, they should be steamed. Potatoes are more useful for fattening cattle, than for milch cows. Carrots or beets, are good for milk, and may be given to cows, at the rate of one bushel a day, with a feed of grains or bran at mid day. With a sufficient quantity of good hay, cows with this feeding will yield abundance of milk, provided they are a good kind for milk. Bran, or ground oats, or barley, or Indian-corn meal, unsifted, may be substituted for grains if they cannot be conveniently had. Three gallons of bran, or one gallon and a half of the unsifted meal, will be sufficient for a cow in the day, made into a mash with warm water. These will give more and richer cream, than the grains will do. Farmers at a distance from town will not require to feed store stock so highly. The inferior grain, chaff, potatoes and carrots, will afford him ample food for his stock, by managing judiciously, and boiling or steaming this inferior grain, chaff, &c., which may be mixed with cut hay or straw. In all situations, it is most essential that the cows should be kept warm and clean, and be regularly attended to in feeding, milking, &c. Farmers should endeavor to turn the cows out to grass in spring in good condition, in order that they may " start well," for if cows are not in good condition when turned out to grass, it is a long time before they get into full milk.

THE DAIRY AND ITS MANAGEMENT.

The manufacture of butter and cheese is of necessity carried on where the milk, or raw material, is at hand. The subject therefore forms part of farm management more or less on every farm ; and the principal one on dairy farms. In most of those counties where the profit of the cow arises chiefly from the subsequent manufacture of the milk, the whole care and management of the article rests with the house-wife, so that the farmer has little else to do but to superintend the depasturing of his cattle ; the milking, churning, and in short the whole internal regulation of the dairy, together with the care of marketing the butter, when the same is made up wholly for home consumption, falling alone upon the wife. In this department of rural economy, so large a portion of skill, of frugality, cleanliness, industry, and good management, is required in the wife, that without them the farmer may be materially injured. This observation will, indeed, hold good in many other parts of business which pass through the hands of the mistress in a farm house ; but there is none in which he may be so greatly assisted, or so materially injured, by the good conduct or want of care in his wife, as in the dairy.

Experienced dairy-men admit that the quality of their cheeses differs materially in the same season, and without being able to assign a reason. The cheese of Gloucester differs much from the cheese of Cheshire, though both are made from fresh milk, the produce of cows of the same breed, or rather in both counties, of almost every breed, and fed on pastures that do not exhibit any remarkable difference in soil, climate, or herbage. Even in the same district, some of what must appear the most important points are far from being settled in practice. One would think the process of salting the cheeses the most simple of all, and yet it is sometimes, (indeed generally in Canada,) mixed with curd ; in other instances poured into the milk, in a liquid state, before being coagulated ; and still more in England, never applied at all till the cheeses are formed in the press, and then only externally.

The dairy house for general purposes should consist of three separate apartments, the milk room, the dairy or working room, and the cheese or store room. The properties requisite in a good milk house are, that it be cool in summer, and moderately warm in winter, so as to preserve if possible a temperature nearly the same throughout the year, or about 50 degrees ; and that it be dry so as to admit of being kept clean and sweet at all times. This can only be obtained in Canada by having the milk house partly under ground, or well banked with earth on the outside of the walls, and if possible, under the shade of trees, so that the sun can have no influence on the roof or walls in summer, and the frost must be entirely excluded in winter ; the latter, however, cannot be done effectually unless by keeping a stove and fire in the milk house, or changing it into the dwelling house at that season.

CHEESE-MAKING.

The production of cheese includes the making of rennet, the selection of a colouring matter, the setting of the curd, and the management of the cheese in the press.

The application of any kind of acid will cause milk to coagulate, as well as the infusion of several plants. The maw, or stomach of a young calf that has been killed before the digestion is perfected, is almost universally preferred as rennet. The bag or maw, is cleaned and salted in different ways in different districts ; but the following method described by Marshal, is considered the best.

" Take a calf's bag, maw, or stomach, and having taken out the curd contained therein, wash it clean, and salt it thoroughly inside and out, leaving a white coat of salt over every part of it ; put it into an earthen jar, or other vessel, and let it stand three or four days, in which time it will have formed the salt and its own natural juice into a pickle. Take it out of the jar, and hang it up for three or four days, to let the pickle drain from it ; re-salt it, and put it again in the jar, cover it tight down with a paper pierced with a large pin, and in this state let it remain until wanted for use. In this state it ought to be kept for twelve months ; it may, however, in case of necessity, be used in a few days after it has received a second salting ; but it will not be so strong as if kept a longer time. In order to prepare the rennet for use, take a handful of the leaves of sweet-briar, the same quantity of the leaves of the dog-rose, and the like quantity of bramble leaves, boil them in a gallon of water, with three or four handfuls of salt, about a quarter of an hour ; strain off the liquor, and, having let it stand until perfectly cool, put it into an earthen vessel, and add to it the maw, prepared as above. To this add a good sound lemon, stuck round with about a quarter of an ounce of cloves, which gives the rennet an agreeable flavour."

The strength of the rennet thus prepared will increase in proportion to the length of time during which the bag remains in the liquor ; the quantity to be used for the purpose of coagulating milk, can therefore be ascertained only by daily use and occupation. In general, however, it may be stated, upon the average, that somewhat less than half a pint of wine measure will suffice for 50 gallons of milk, for which quantity in Gloucestershire, the practice is to employ about one-third of a pint. Throughout the whole process of preserving rennet, too much attention cannot be given to cleanliness, and sweetness ; for if it be kept too long, so as to become foul or tainted, the cheese will invariably become affected by it.

Spanish arnatto, is unquestionably the best ingredient of the kind for colouring cheese. The usual mode of applying it is to dip a piece of the requisite size in a bowl of milk, and rub it on a smooth stone until the milk assumes a deep red colour. This infusion is to be added to the milk of which the cheese is intended to be made, in such a quantity as will impart to the whole a bright orange colour, which will become the deeper in proportion to the age of the cheese.

Setting the curd.—The proper season for making cheese is from the beginning of May till the close of September, or in favourable seasons till the middle of October. A certain elevation of temperature is requisite to the coagulation of milk, and it may naturally be supposed to be nearly that of the stomach of milk-taking animals. Marshal is of opinion that from 85 to 90 degrees of heat, and two hours of time, are the fittest for coagulation.

Climate, season, weather, and pasture, may require that these limits should sometimes be violated. Milk produced from poor clays will require to be coagulated at a higher temperature than that which is procured from rich pastures. In some dairies the milk is heated to the proper temperature ; but the most approved practice is to mix boiling water in such a proportion as shall render the milk of a proper degree of heat to receive the rennet ; for this the thermometer should be used to determine. In hot weather the milk in the cow's udder is liable to become agitated by their running about, or being driven too great a distance ; so that if rennet be put to it in this state, the curd, instead of coming in one or two hours, will require three, four, or five hours, and will be so spongy, tough, and in every respect so imperfect, as to be scarcely capable of being confined in the press or vat ; and when released from the press, it will heave or split, and be good for little. Whenever, therefore, cows are discovered to be in this state, which perhaps can scarcely be avoided during very hot weather, where cows are pastured abroad in unsheltered grounds, or where water is not within their reach, it will be advisable to add some cold fresh spring water to the milk as soon as it is brought into the dairy. The quantity to be mixed, in order to impart the proper degree of heat, can in this case only be regulated by experience and the use of the thermometer. The effect of the water thus added will, in both cases, be to make the rennet take effect much sooner, and consequently to accelerate the coagulation of the milk.

The proportion of rennet and time requisite for coagulation have been already mentioned ; too much rennet ought not to be put in, otherwise the cheese will be ready to heave, as well as become rank and strong ; the same effect will also be produced if the rennet be made with bad or foul materials, or if it be too strong to operate in the given time, (two hours.) During the process, the milk ought to be covered so as not to lose more than five or seven degrees of its original heat. One or two handfuls of salt added previously to mixing the rennet, will promote coagulation. Some put in a bowl, which is an absurd, ancient custom, and injurious rather than useful.

When the coagulation has taken place, the curd is broken or cut with a cheese knife, which causes the whey to rise through the incisions, and the curd sinks with the more ease. After a short time the cutting is repeated, still more freely than before, and is continued until the curd is reduced to small uniform particles. This operation will require three quarters of an hour ; the cheese tub is again covered with a cloth, and is allowed to remain for the same time. When the curd has sunk to the bottom of the vessel, the whey is taken off by the hand, or by means of a skimming dish ; another quarter of an hour should now be allowed for the curd to settle, drain, and become solid, before it is broken in the vat, as it prevents the fat from being squeezed out through the fingers, and of course contributes to improve the quality of the cheese. Sometimes, in addition to the skimming dish, a semicircular board and weight, adapted to the size of the tub, are employed. The curd is again cut as before, in order to promote the free separation of the whey, and pressure is again applied till it be wholly drawn off. Great attention is requisite in conducting this part of the business ; and if any particles of slip curd should be seen floating in the whey, it might be carefully laded off with the whey, as it will not incorporate with the solid curd, but dissolving in the cheese, causes whey springs, as already mentioned, and materially impairs its soundness. If the whey be of a green colour, when loaded or pressed out, it is a certain criterion that the curd has been properly formed ; but if it be of a white colour, it is equally certain that the coagulation is imperfect, the cheese will be sweet, and of little value, and much valuable caseous matter will be completely thrown away. In the counties of Norfolk and Suffolk, the cheese manufacturers have recourse to a somewhat different method for extracting the whey, which is worthy of notice : when they think the milk sufficiently coagulated, they lay a strainer in a basket made for the purpose, in which they put the curd, and suffer it to remain there for some time to drain, before they break the curd ; when the curd is sufficiently drained, it is put into two or three separate vessels, and is broken with the hand as small as possible. During this part of the process, salt is scattered over the curd, and intimately mixed with it; the proportion, however, has not been correctly ascertained, and is regulated by experience.

Management in the Press.—The breaking and salting completed, a cloth is spread over the cheese vat, and the broken curd being packed into it, and covered up with the cloth, a smooth round board is laid over the vat, which is usually filled to the height of one inch above the brim, to prevent the curd from shrinking below its sides, when the whey is squeezed out.

The whole is then put into a press for two hours; and as it is of the utmost importance that every drop of whey should be expressed, skewers are thrust into the cheese through the holes in the lower part of the vat, to facilitate its escape. The two hours expired, the cheese is taken out and put into a vessel of warm or hot whey for an hour or two, in order to harden its skin. On taking the cheese out of the whey, it is wiped dry, and when it has become cool, is wiped with a clean dry cloth, of a finer texture, and again submitted to the press for six or eight hours. The cheese is now turned a second time, and is taken to the salting room where it is rubbed on each side with salt; after which it is wrapped in another dry cloth, of a finer texture than either of the preceding cloths, and is again pressed for twelve or fourteen hours; if any edges, these are paired off, and the cheese being laid upon a dry board, is turned every day. In the salting room, cheese should be kept warm until it has had a sweat, or has become regularly dry and somewhat stiff; as it is warmth that ripens cheese, improves its colour, and causes it when cut to have a fleaky appearance, which is the surest sign of superior excellence.

Management in the Cheese-room.—After the process of salting and drying are completed, the cheeses are deposited in the cheese room or loft, which should be airy and dry; but on no account should hard and soft cheeses be placed in the same room, for the dampness or moisture arising from the latter will cause the hard cheese to chill, become thick coated and often spotted. Throughout the whole process of cheese-making, the minutest attention will be requisite, for if the whey be imperfectly expressed, or the rennet be impure, or the cheese be not sufficiently salted, it will become rank and pungent. For this defect there is no remedy; the imperfect separation of the whey will cause cheese to heave or swell, as well as run out at the sides.

In order to prevent as well as to stop this heaving, the cheese must be laid in a moderately cool and dry place, and be turned regularly every day. If the heaving be very considerable, the cheese must be pricked on both sides in several places, particularly where it is most elevated, by thrusting a skewer into it; by this pricking, though the heaving will not be altogether prevented, a passage will be given to the confined air; heaving, or swelling will consequently be considerably reduced, and the cavities in the cheese will be less offensive to the eye. Another remedy for heaving in cheese consists in applying a composition of nitre and bole armoniac, which is vended in the shops under the name of cheese-powder. It is prepared by mixing one pound of saltpetre with half an ounce of bole armoniac, thoroughly together, and reduce them to a very fine powder. About a quarter of an ounce of this is to be rubbed in a cheese when put a second and third time into the press, half on each side of the cheese at two different meals, before salt is rubbed on, that the cheese may be penetrated with it. This preparation is very binding, and sometimes proves serviceable; but the nitre is apt to impart an acid taste; and if too much be applied, and the cheese be exposed to too great heat, the quantity of air already confined in it will be increased by fermentation, and the cheese will swell much more than if no powder had been rubbed in. The greater care, therefore, will be necessary whenever this remedy is adopted.

Hard and spoiled cheese may be restored in the following manner:—Take four ounces of pearlash, and pour sweet wine over it until the mixture ceases to effervesce; filter the solution, dip into it clean linen cloths, cover the cheese with them, and put the whole into a cool place, or dry cellar. Repeat this process every day, at the same time turning the cheese, and if necessary, continue it for several weeks. Thus the hardest and most insipid cheese, it is affirmed, has frequently recovered its former flavour.

Cheese-making in Cheshire, is said to have remained stationary for many years. The best size is considered to be sixty pounds. The cows are milked during summer at six o'clock, morning and evening. The evening's milk, (of suppose twenty cows,) having stood all night in the coolers, or brass pan, the cheese-maker, about six o'clock in the morning, carefully skims off the cream from the whole of it, observing first to take off all the froth and bubbles, which may amount to about a pint; this not being thought proper to be put into the cheese, goes to the cream tub to be churned for butter, and the rest of the cream is put into a brass pan. While the dairy woman is thus employed, the servants are milking the cows, having previously lighted a fire under the furnace, which is half full of water. As soon as the night's milk is skimmed, it is all carried into the cheese tub, except about three or four gallons, which is put into the brass pan, and immediately placed in the furnace of hot water, and is made scalding hot: the half of the milk thus heated in the pan is poured into the cheese tub, and the other half is added to the cream, which, as before observed, was skimmed into another brass pan. By this means the cream is liquified and dissolved, so as apparently to form one homogenous or uniform fluid, and in that state it is poured into the cheese tub. But before this is done, several pails or vessels full of new milk will generally have been poured into the cheese tub, or perhaps the whole morning's milk. Care is taken to skim off all the air bubbles which may have formed in pouring the new milk into the cheese tub. The night and morning's milk, and melted cream, being thus all put into the cheese tub, it is then ready to receive the rennet and colouring, or, in the terms of the art, to be set together. The rennet and colouring being put into the tub, the whole is well stirred together, a wooden cover is put over the tub, and over that a linen cloth. The usual time of coming is one hour and a half, during which time it is frequently to be examined; if the cream rises to the surface before the coming takes place, as it often does, the whole must be stirred together so as to mix again the milk and cream, and this as often as it rises, until the coagulation commences. A few smart strokes on different sides of the tub, with the ladder, &c., will forward the coagulation, if it is found to be too long in forming.

The curd is in the next place broken by the knife and hands, and then left half an hour to subside ; then it is gently pressed, the curd broken by the hand, and the whey ladled out of the tub as it drains from the curd. Afterwards the curd is broken in a brass pan and salted, and next put into the cheese vat, and pressed with a 60-pound weight till all the whey is removed. It is then again broken, washed with warm whey, and finally put into the press under a weight or power of about 1400 pounds. After being 48 hours in the press, it is put into the salting tub, where it remains three days, covered with salt ; it is then taken out and placed on the salting benches, where it is turned once a day ; it is then washed in warm water with a brush, and wiped dry with a cloth ; in two hours it is smeared over with whey butter, and then put to the warmest part of the cheese room. In the cheese room it is well rubbed, to take off the sweat or fermentation which takes place in cheeses for a certain time after they are made, and turned daily for several days, and smeared over with whey butter ; afterwards it is turned daily, and rubbed three times a week in summer, and twice in winter. These cheeses require to be kept a long time ; and if not forced by artificial means, will scarcely be sufficiently ripe, or in perfection, under two or three years. The quantity of *Spanish arnatto* necessary to colour a cheese of 60 pounds, is a quarter of an ounce. The Dutch make their cheese nearly in the same manner, excepting that they substitute the marine acid, or spirits of sea-salt, which imparts to Dutch cheese the peculiarly sharp and salt flavour for which it has long been remarked, and that they leave out the cream.

Much of what passes as double Gloucester, is made in Somersetshire, by the following simple process :—When the milk is brought home, it is immediately strained into a tub, and the rennet added, in the proportion of about three table spoonsful to a quantity sufficient for a cheese of 28 pounds, after which it remains undisturbed for two hours, when it becomes curd, and is broken. That done, three parts of the whey is warmed, and afterwards put into the tub for about twenty minutes ; the whole whey is then again put over the fire, made nearly scalding hot, and returned into the tub, to scald the curd, for about half an hour, after which part of the whey is again taken out, and the remainder left with the curd until it is nearly cold. The whey is then poured off, the curd broken very small, put into the vat and pressed, remains there nearly an hour, and is then again taken out, turned, and put under the press until evening, when it is turned and put in again until next morning. It is then taken out of the vat, salted, put into it again with a clean dry cloth round it, and remains in the press till the following evening, when it is again taken out, salted, put into the vat without a cloth, and pressed till the next morning ; it then finally leaves the press, and is salted once a day for twelve days.

The management of a dairy in Gloucestershire is thus given : " It is acknowledged by every one at all acquainted with the subject, that the quality of cheese does not depend upon the superior richness of the soil or the fineness of the herbage; for cheese of the first quality is frequently made from land of an inferior description, and from herbage of a coarse nature. Nor does the quality of the cheese depend on the breed of the cows, for cheese of the best quality is made from the milk of cows of all the different breeds that are to be found in the country ; we think it principally depends on the management of the cows as to their food, &c., of the milk in converting it into cheese, and of the cheese, till it is fit for market.

The following circumstances are injurious to the quality of cheese :— Allowing the cows to get rank or ill-flavoured grass or hay, these conveying a bad flavour to the milk and cheese ; allowing the cows to run and heat themselves ; driving them far to be milked, which makes the milk froth much in milking ; carrying the milk from the place of milking to the dairy, and allowing it to remain long after it is milked, before it is set with the rennet.

The greatest dependance is upon the dairy maid ; and the chief art of making cheese of the finest quality lies in her management. The superintendence of the dairy invariably devolves upon the farmer's wife.

The management of the dairy should be conducted with the greatest regularity. Every operation should be performed precisely at the proper time. Either hastening or delaying the execution of it will cause cheese of an inferior quality to be made of milk from which the best may be obtained. A dairy maid is selected for skill, cleanliness, and strict attention to her business. Her work commences at four o'clock in the morning and continues without intermission till bed-time.

The dairy house should be kept at a temperature of between 50 and 60 degrees ; and the drier it is kept the better, as both milk and cream retain their sweetness much longer in dry than in damp air. Every time, therefore, the dairy is washed, it is dried as quick as possible.

Around two sides of the dairy there are broad shelves, made of elm, for putting the vessels that hold the milk and cream, and the newly made cheese upon. On another side there is a frame with three large stone cheese-presses. In the middle of the north side is the door ; and in the corner, on the left, is the stair leading up to the cheese lofts ; and behind the door is a single cheese press, which is generally used in pressing the cheese the first time, before it is cut down and put through the mill. In the middle of the floor stands three leaden vessels, large enough to hold all the whey of one " meal," or milking ; and by the side of these stands the cheese tub.

Above the dairy there are two cheese lofts, around the sides of which there are broad shelves for holding cheese ; and in the middle stands a frame for holding two rows of boards, called here " cheese-tacks," which being only about eight inches apart, contain a much greater quantity of cheese than could be disposed of on the floor. The stair to the cheese lofts is of oak, and seems to be the pride of the dairy maid, for it is dried, rubbed and polished so smooth, that it is dangerous to walk upon ; but this sort of pride is encouraged only as evincing attention to cleanliness.

Along the north side of the dairy there is a shed which communicates with the dwelling house. In this shed the utensils are kept upon a stand for the purpose, the cream is churned, and other work performed, nothing being done in the dairy, but the making of the cheese, and the making up of the butter.

Opposite to the door of the dairy, and detached from the shed, is a wash house, with a pump well at the door of it. In this wash house, the water and the milk are heated in boilers for the purpose ; and all cleaning work is performed.

Utensils.—The milking pails are made of maple, on account of the lightness of the wood, and its cleanliness of appearance ; they hold about six gallons each, and the cheese tub is of a size large enough to hold the whole of the milk ; the ladder, the skimming dish and the bowl, are of maple ; the sieve for straining the milk is about fifteen inches in diameter, and has a hair cloth bottom.

There are a number of cheese vats, sufficient to hold all the cheese made in four or five days. They are made of elm, and turned out of the solid. That which gives five cheeses to the hundred, is considered the best size for double Gloucester, the inside diameter of which is fifteen inches and a half, and depth two and a half. Round boards called "suity boards," made of elm, of the diameter of the cheese vats, and thicker in the middle than at the edges, are occasionally necessary to place on the cheeses, when in the press, if the vats are not quite full. Without the assistance of these boards, the cheeses will be round in the edges, (a proof of not being well pressed,) and not so handsome. The cheese presses are made of stone, as being considered the cleanest material for the purpose, and of steadiest pressure. They weigh about seven hundred each ; they are raised by a block and pulley ; and the whole apparatus is painted white.

From the whey leads, which are oblong, and about eight inches deep, there are leaden pipes which convey the whey into an under ground cistern, near the pig-houses, where by means of a pump, it is raised when wanted for the pigs. Leaden keep the whey longer sweet than wooden vessels, and are much easier kept clean. This is done by scouring them with ashes of wood, and washing them well every time they are emptied, which is every 36 hours.

Tin vessels are used in preference to earthenware for holding the milk that is set for the cream, and also for holding the cream. Those used for cream hold about four gallons each, and are made with a lid for the convenience of shifting the cream from one of these into the other. This is done once every day during summer ; and there is a wooden slice, or knife, always kept in the cream vessel, with which the cream is frequently stirred during the day, to prevent a skin from forming on the top of it, which is injurious to the quality of the butter. The skimming dish, used for taking the cream off the milk, differs from that used in cheese-making, being made of tin, with holes in it, to let the milk run out that may be taken up with the cream.

The butter scales, prints, and butter boards, are of maple. The boards for making up the butter in half-pound rolls are about one foot long and nine inches wide. The barrel churn is made of the best oak, and great attention is paid to its cleanliness. The butter-milk is never allowed to remain in it ; but it is washed, scalded, and put up to dry as soon as the butter is taken out.

Milking.—This is performed in three separate courts, to which the cows come from their several fields. The milking should be as near as possible at equal divisions of the day, commencing at about four o'clock in the morning, and three in the afternoon. To each milker eight cows are assigned, and one man carries the milk from all the milkers to the dairy. The milking should be finished in an hour. The dairy maid sees that the milkers do their duty, and that all the cows are milked clean ; for the milk that comes last is the richest ; and, besides, if the cows are not clean milked, there will be a gradual diminution of the milk perceptible daily ; for these reasons the greatest care is taken that the cows are clean milked.

Cheese making.—The cheese tub being put in its place in the dairy, the ladder is put across it, and a large thin canvass cloth covers the whole tub and ladder, to catch any of the milk that may drop from the pail, and to prevent dirt from falling into the tub. Above this, and upon the ladder, is placed the sieve, through which the milk is strained. If the milk should not be of the temperature of 85°, a portion of it should be put into a deep tin, kept for the purpose, and placed in a furnace of hot water in the wash-house, by which means the whole is warmed to a proper degree. It is of the utmost moment to attend to this ; for if the milk is not warm enough when the rennet is put into it, the cheese will be tender, and will bulge out in the edge, which spoils its appearance, and a great quantity of sediment of small curd will be found in the whey leads, which is so much curd lost. If, on the other hand, the milk is too warm, it will cause the cheese to "heave" or ferment, which injures both its appearance and quality.

When the milk is sufficiently warm, the colouring and the rennet are put into it. The colouring, or annatto, is put in by rubbing a cake of it on a plate amongst the milk until, from its appearance, it seems coloured enough. One pound of annatto, at five shillings, is sufficient for half a ton of cheese.

The rennet being added immediately after the annatto is put in, the tub is covered with a woollen cloth for at least an hour. Rennet or runnet is made from the stomachs of calves, called here "vells." Irish vells are the best : they are cured and sent to England, and sold by the grocers to the dairy farmers. They should not be used until they are twelve months old, for if they are not old, the rennet made from them causes the cheese to "heave," and become full of "eyes" or holes. The rennet is prepared from them, by adding to every six vells two gallons of brine and two lemons. The lemons do away with any disagreeable smell, and give the rennet sweetness and agreeable flavour. Twenty or thirty gallons of it are made at a time, as it is found to be much better when made in large quantities. It should never be used till it has stood at least two months.

When the curd is sufficiently firm for breaking, it is gently and slowly cut with a three bladed knife, down to the bottom of the tub, (the knife being about fourteen inches long,) both ways, or at right angles, and round the sides of the tub. The cuts should be about an inch apart. When it has stood five or ten minutes to allow it to sink a little, and the whey to come out as clear as possible, some of the whey is dipped out of it with the bowl, and the curd is cut a second time with the three bladed knife, very slowly to begin with, for, if the cutting is done hurriedly, a great sediment of a very small curd will pass through the sieve, and be found in the whey leads, and there will also be an increase of the quantity of whey butter, which should have been in the cheese, and the value of the butter, thus obtained, will not compensate for the waste of curd, and for the loss of credit which the cheese will sustain for the abstraction of butter from it. The cutting being therefore performed very slowly at first, and with the strokes of the knife at considerable distance from each other, is gradually quickened, and the strokes are taken nearer and nearer every time. At last, one hand with the skimming dish, keeps the whole in motion, turning up the lumps suspended in the whey, while the other with the knife is in constant motion, cutting them as small as possible, and this operation is continued till no more lumps are brought to the surface, and the whole mass is reduced to one degree of fineness. This process may occupy a quarter of an hour.

The curd is now allowed to stand a quarter of an hour, and being thus sufficiently settled, the whey is taken from it with a bowl, and poured through a very fine hair sieve, placed over the whey leads. When the greater part of the whey has been separated from it, the dairy maid beginning at one corner, goes round the tub, cutting the curd into lumps and laying them on the principal mass, by which operation the mass is carried all round the tub, and most of the remaining whey escapes between the cut fragments as they lie and press upon each other. From time to time the whey is taken from the tub and put through the sieve into the whey leads.

The curd is then put into vats, and pressed down with the hand. The vats being covered with cheese cloths, about one yard and a quarter long, of fine canvass, are placed in the press for half an hour, when they are taken out and the curd cut in slices, and put into a mill fixed on the top of the tub, which tears it in very small crumbs, as small as vetches. This mill, which is of Mr. Hayward's construction, is a great improvement in making cheese, as it not only saves the dairy maid the most laborious part of the process, that of squeezing and rubbing the curd into small crumbs with her hands, but as it allows the fat to remain in the cheese, which the hand squeezes out.

In its pulverized state, it is customary with most dairy maids to scald the curd with hot whey; but cheeses are considered richer when made without scalding the broken curd; it is, therefore, without scalding it, put into the vats, and pressed closely together with the hand, in filling them. In making double Gloucester cheeses, particular care is taken to press any remaining whey from the curd as the vats are being filled, and they are filled as compactly as can be done with the hand, being rounded up in the middle, but just so much so that the whole can be pressed into the vat. Cheese cloths are then spread over the vats, and a little hot water is thrown over the cheese-cloths, which tends to harden the outside of the cheese and prevent it from cracking. The curd is now turned out of the vats into the cloths, and the vats being dipped into whey to wash away any crumbs of curd that may cling to them, the curd inverted, and with the cloth around it, is again put into them. The cloths are then folded over and tucked in, and the vats put into the press one upon another. The bottoms of the vats are smooth and a little rounded, so as to answer the purpose of cheese-boards, which, therefore, are only wanted for the uppermost vats, or when the other vats are not quite full. The vats are allowed to remain under the press about two hours, when they are taken out and dry cloths are applied, which with double Gloucester cheeses should be repeated some time in the day.

Salting and Sealing presses.—The vats, when the clean cloths are given, as just mentioned, are changed from the single press to the one next to it, and placed in it one upon another as before. They remain in this place, in the press ; those made in the morning, and those made in the evening are, in their turn, displaced by those made the following morning, the cheeses of the last making being always placed lowest in the press, and those of the other makings rising in it according to the priority of making.

The same order is observed in the other two presses, the last or newest making in each being lowest, and each making having next above it that which was made last before it.

The cheeses pass through the three presses in this order, advancing a step in their progress at each "meal" or making, till at last, in four or five days, they come out of the presses and are put upon the shelves. They are generally salted at the end of twenty-four hours after they are made, though this is done by some at the end of twelve hours. The salting should never be begun till the skin is all closed, for if there be any crack in the skin of the cheese at the time of salting, it will never close afterwards. The salting is performed by rubbing with the hand both the sides and the edge of the cheese with finely powdered salt. The cheese, after this, is returned to the vats, and put under the press, care being always taken, according to what has been said, to put the newest cheese lowest in the press, and the oldest uppermost. The salting is repeated three times with the single, and four times with the double, Gloucester, twenty-four hours being allowed to intervene between each salting. After the second salting, the cheeses are returned to the vats without the cloths, that the marks of the cloth may be effaced, and the cheese may get a smoothness of surface, and "keenness of edge," which is a peculiarity in Gloucestershire cheese. The double Gloucester remain in the press five days, and the single four ; but in damp weather they should remain longer. The quantity of salt generally used is about three pounds and a half to one cwt. of cheese.

The cheese-room.—When the cheeses are taken from the salting presses, they are put on the shelf in the dairy for a day or two, where they are turned once in twelve hours. They are then taken to the cheese loft, to make way for the new ones. In the cheese room, either on the floor or on the cheese rack, they are turned once in every day, and in general, in a month from the time they were taken out of the vat, they are ready for cleaning, which is done by scraping them with a common knife. The dairy maid in doing this, sits down on the floor, takes a cheese in her lap and with the knife scrapes both sides and edges clean, taking off the scurf they may have contracted. The cheese, if intended for the London market, as is generally the case when it has been thus cleaned, is rubbed all over with a paint made of Indian red, or of Spanish brown, or a mixture of both, and small beer. It is rubbed on with a woollen cloth. After being painted, it is turned over twice a week, and oftener in damp weather, and as soon as the state of the paint will permit, the edges of the cheese and about an inch of each side are rubbed hard with a cloth, at least once a week.

Making of the butter.—The milk as it comes from the cows, is strained through a hair sieve into tin vessels, which are about four inches deep; it is allowed to stand twelve hours, when the cream is taken off with the skimming dish and put into the cream vessels, and the milk is warmed and carried to the cheese tub; the cream is shifted into fresh cream vessels once a day, and is also stirred frequently during the day with the wooden knife, that is always kept in each of the cream vessels. This continued shifting and stirring of the cream prevents a skin from forming on the top of it, which is injurious to the butter.

In summer, or in hot weather, several gallons of cold water should be put into the churn, and allowed to remain an hour in it to cool the churn, before the cream is put into it. The cream is strained through a coarse canvass cloth kept exclusively for that purpose, and then put into the churn. The operation of churning should, in summer, or in hot weather, be very slow, otherwise, the butter will be very soft when taken out; but in winter or in cold weather, and particularly in frosty weather, the churn should be prepared for receiving the cream by putting hot water into it, and allowing it to remain for half an hour to heat the churn; and then the operation of churning should be performed quickly, and now and then the air that escapes from the cream in churning, should be let out of the churn, or it will make the cream froth, and lengthen the process of churning very much.

When the butter is taken out of the churn, it is customary with most people to wash it with cold water before salting it; it has been found by long experience, that butter retains its sweetness much longer when no water is used in making it up. When it is taken out of the churn, it is well worked with the hand, which presses out most of the milk; it is then beaten with a cloth, or rather a cloth is repeatedly pressed down upon it, which absorbs all the remaining milk. When this is properly performed and no trace of butter-milk remains, it is salted to the taste with finely powdered salt, which is well mixed with it by working it in with the hands. It is then weighed into half pounds, and made up in rolls, about nine inches long. The process of making butter from cream of whey is the same as that just described.

The quantity of milk butter made on this farm is about 16 pounds per cow, and that of whey butter about 25 pounds per cow per annum; 2½ pounds of salt are used to a hundred of butter.

Characteristics of true Gloucester Cheese.—The marks of true Gloucester cheeses are: the blue coat which arises through the paint in their sides, and the yellow golden hue of their edges; a smooth, close and wax-like texture; a very mild and rich flavour; not crumbling when cut into thin slices, nor parting when toasted, with the oily matter they contain, but softening, without burning. If cheese has been soured in the making, either from being too long in hand, or from want of attention in scalding the utensils, nothing will cause it to assume the blue coat. If the curd is salted, when ground down before being put into the vats, the salt has the effect of giving a skin to each of the particles of the curd it comes in contact with, which prevents them intimately uniting ; and, although the curd may be pressed together to become a good cheese, yet it never becomes a smooth, close, solid mass, like that which is salted after it is made, but is of a loose texture, and crumbles when cut ; and although it may be equally fat, yet, in toasting, the fat melts out of it, and the cheesy part burns. The skin of the cheese, too, is not tough and solid, but hard and brittle, and, when examined, seems to be formed of many irregular portions, something like Mosaic work."

In the dairy above described, the milk of 100 cows is manufactured. Stilton cheese is commonly made by putting the night's cream to the milk of the following morning with the rennet, and as soon as the curd is come, it is taken out whole, and put into a sieve, gradually to drain. While it is thus draining, it is pressed till it becomes dry and firm, and is then removed into a wooden box or hoop, adapted to its size ; this sort of cheese being so very rich, that it would separate or fall to pieces, were not this precaution adopted. Afterwards it is turned every day on dry boards, cloth binders being tied round it, and which are made tighter as occasion may require. After it is removed from the box or hoop, the cheese is closely bound with cloths, which are changed daily till it becomes sufficiently compact to support itself; when these cloths are taken away, each cheese is rubbed over every day once, and if the weather be moist or damp, twice, for two or three months with a brush, which is also done every day to the tops and bottoms of the cheeses before the cloths are removed. Sometimes it is made in a net like a cabbage net, which gives it the form of an acorn. Stilton cheeses are not sufficiently mellowed for use, until they are two years old ; and will not sell unless they are decayed, blue, and moist. Wine is added to the curd, in order to produce a rapid advance to ripeness.

Cream cheese is, in fact, little else than thick sweet cream dried, and put into a small cheese vat about an inch and a half in depth, having holes in the bottom, to allow any whey that may exude, to pass, and having rushes, or the long leaves of Indian-corn, so disposed around the cheese as to admit of its being turned without being handled. This kind of cheese requires to be kept in a warm situation, and to be particularly guarded against frost.

It is the opinion of the most experienced dairymen, that from nine to twelve months are requisite to ripen cheese of any kind, from fourteen to twenty pounds weight.

The Parmesan cheese is made in Lombardy, near Lodi, where the cows are fed on the plains of the Po. The peculiar qualities of this cheese depend more on the manner of making than on anything else. The cows are allowed to pasture only four or five hours in the twenty-four ; and the rest of the time they are stalled, and fed on hay. Both the pasture and hay are chiefly from irrigated lands. The cheese are made entirely of skimmed milk, half of which has stood for sixteen or seventeen hours, and half of that which has stood only six. The milk is heated, and coagulated in a caldron. Without being taken out of the caldron, the curd is broken very small by an implement, consisting of a stick with cross wires ; it is again heated, or rather scalded, till the curd, now a deposition from the whey, has attained a considerable degree of firmness ; it is then taken out, drained, salted, and pressed, and in forty days it is fit to put on the cheese loft. The peculiar properties of this cheese seem to depend upon the mode of scalding the curd ; though the dairymen pretend that it also depends on the mode of feeding the cows, and I believe it does.

A great variety of cheese is made in Switzerland. The most celebrated are the *Schabziezer*, and *Gruyère*. The first is made in the canton of *Glarùs*. It is readily distinguished by its marbled appearance and aromatic flavour, both produced by the bruised leaves of the melilot. The dairy is built near a stream of water ; the vessels containing the milk are exposed to the temperature of 46 degrees, for five or six days, and in that time the cream is completely formed. After this is drained off, the caseous particles are separated by the addition of some sour milk, and not by rennet. The curd thus obtained is pressed strongly in bags, on which stones are laid ; when sufficiently pressed and dried, it is ground to powder in autumn, salted, and mixed with either the pressed flowers, or bruised seeds of the melilot trefoil. The practice of mixing the flowers or the seeds of plants with cheese, was common among the Romans, who used those of thyme for that purpose. The entire separation of the cream or unctious portion of the milk, is indispensable in the manufacture of the cheese. The unprepared curd never sells for more than three half pence the pound, whereas, prepared as *Schabziezer*, it sells for six pence or seven pence.

The *Gruyère* cheese of Switzerland, is named after a valley, where the best is made. Its merits chiefly depend on the herbage of the mountain pastures, and partly on the custom of mixing the flowers of bruised seeds of *melelôtus officinàlis* with the curd before it is pressed. The mountain pastures are rented at so much per cow's feed from the 15th of May to the 18th of October ; and the cows are hired from the peasants, at so much for the same period. On the precise day both land and cows return to their owners. It is estimated that 15,000 cows are so grazed, and 30,000 hundred of cheese made fit for exportation, besides what is reserved for home use.

Westphalia cheese is of the skim-milk kind. The cream is allowed to remain on the milk until the latter is in a sub-acid state ; it is then removed, and the milk placed near a fire spontaneously to coagulate. The curd is then put into a coarse bag, and loaded with ponderous stones to express the whey ; in this state it is rubbed between the hands, and crumbled into an empty clean milk vat, where it remains from three to eight days, according as the cheese is intended to be strong or mild. During this part of the process, which is called mellowing, the curd undergoes the putrid fermentation, and acquires a coat or skin on the top, before it is taken out of the vessel, and kneaded into balls or cylinders, with the addition of a considerable portion of carraway, salt, and butter, or occasionally, a small quantity of pounded pepper and cloves. When over-mellowed, a third part of fresh curd, likewise crumbled into small pieces, is superadded, to prevent its putrid tendency. As the balls or cheese do not exceed three or four ounces each in weight, they soon dry in the open air, and are then fit for use. Some think this cheese preferable to the Dutch, Swiss, and even Parmesan cheese; it is sometimes to be had in London, but not very common.

Devonshire scalded or clouted cream.—The milk is put into tin or earthen pans holding about ten or twelve quarts each. The evening meal is placed the following morning, and the morning milk is placed in the afternoon upon a broad iron plate heated by a small furnace, or otherwise over stoves, where, exposed to a gentle fire, they remain until after the whole body of cream is supposed to have formed on the surface, which being gently removed by the edge of the spoon or ladle, small air bubbles will begin to rise, that denote the near approach of boiling heat, when the pans must be removed off the heated plate or stove. The cream remains upon the milk in this state until quite cold, when it may be removed into a churn, or, as is more frequently the case, into an open vessel, and moved by hand with a stick about a foot long, at the end of which is fixed a sort of peel from four to six inches in diameter, and with which about twelve pounds of butter may be separated from the butter milk at a time. The butter in both cases being found to separate much more freely, and sooner to coagulate into a mass, than in the ordinary way, when churned from raw cream that may have been several days in gathering, and at the same time will answer a more valuable purpose in preserving, which should be first salted in the usual way, then placed in convenient egg-shaped earthen crocks, and always kept covered with pickle made strong enough to float and buoy up about half out of the brine a new laid egg. This cream, before churning, is the celebrated clouted cream of Devon. The scalded skim-milk is found much richer and better for suckling calves, and makes far better cheese, than the raw skim-milk does. Three gallons of milk, managed in this way, is said to produce one pound and a quarter of butter, and the skim-milk is valued at one penny farthing the quart for making cheese, or feeding. When cheese is to be made of the skim-milk, the milk should not be heated so far as to produce bubbles under the cream.

Cheese is sometimes made without pressing, by putting the curd into a bag, or net, in which it is suspended, and frequently shifted, till it is sufficiently dry and solid. The cheeses are small; about five pounds each. They make potato cheese in Germany thus prepared. Mealy potatoes are selected; they half dress them in steam, for by bursting them their flavour is diminished; they peel them, and grate or beat them into a fine pulp. To three parts of this mass, they add two parts of sweet curd, knead and mix them, and allow them to stand three days in warm, and four or five days in cold weather; they are then formed into small pieces, like the Westphalia cheese, and dried in the same manner.

In Gloucestershire, it is found that the best land does not always produce the best cheese; oftentimes the reverse. If it has either been much manured with dung, or sheep feeding, the quantity of milk will be increased, but the quality materially altered. This is probably owing to the introduction of plants, which did not grow there before, or to the destruction of some that did. The cause does not originate with the cow, but with the herbage on which she feeds. The same cow, on two pastures, separated only by a hedge, will give milk of different qualities; from one shall be made fine,rich,and close cheese, while from the other shall be made rank, heaving, hollow, unpleasant to the taste, and unfit for the market. Two grounds adjoining each other were alternately used for the pasture of cows; while they were on one, excellent cheese was made; but when on the other, it was difficult to make any tolerably good. The latter had been lately well dressed with manure.

On some farms, pastures have for time immemorial been appropriated exclusively to cows for the dairy. The dung of the cow, being of a cooling nature is considered the best manure for cow pastures. Among the plants which are useless, or unfavorable to the making of good cheese, are white clover, the different kinds of crow-foot, and garlic.

The produce of cheese in some parts of England, where the whole milk and cream is used, is from three to five hundred, long weight of 120 lbs. from each cow. Three hundred weight of cheese, is, however, considered a good produce from an ordinary cow in the season; and of skim-milk cheese, the quantity does not average more than two hundred weight. The whey is applied to feeding calves and hogs, and greatly augments the returns of the dairy.

MAKING AND CURING BUTTER.

In dairies where cheese is made partly from skim-milk, the milk drawn from the cows in the evening is strained into creaming dishes, which should never be more than from two to three inches deep, and of about a gallon and a half or two gallons in capacity. The cream will be removed next morning, or in about ten hours. This cream is put into the cream barrel, where it may remain from three to seven days before it is churned. Cream that is removed from the milk in about ten or twelve hours after it is drawn from the cow, will always make the sweetest butter. Cream allowed to remain several days on the milk before it is skimmed off, will seldom make very sweet butter,though the quantity may be increased. In many dairies the whole of the milk is churned without separating the cream; the milk is kept in the churn, or in barrels for two or three days until it begins to get sour. From this mode, the greatest quantity of butter is obtained,and if properly managed, the quality will be good, particularly from the milk of Canadian cows, which I have known to produce one pound of butter from two gallons and a half of milk manufactured in this way.

In the process of churning, great care is required. A regular stroke in upright or pump churns, and a regular motion in those of the barrel or turning kind, must if possible, never be deviated from. A few hasty, irregular strokes or turns, has been known to spoil what would otherwise have been excellent butter. To those who have been accustomed to see cream churned without being properly prepared, churning may, perhaps, appear to be severe labour for one person in a large dairy: but nothing is more easy than the process of making butter when the cream is duly prepared.

The best time for making butter, during summer, is early in the morning, before the sun acquires much power; and if an upright or pump churn be used, it would be well to have it plunged about a foot deep into a tub of cold water, where it should remain during the whole time of churning, which will very much harden the butter. In very hot weather, it may be necessary to pour some cold water into the cream, if the churn cannot be placed in cold water. During winter, the temperature must be kept up to a certain degree, and if the dairy is too cold, the cream must be heated to about 55°, by mixing hot water with it, placing the churn in hot water, or by some other means. The temperature of the milk or cream, during the operation of churning, should not exceed 65°, or it will be injurious as well to the quality as to the quantity of the butter. As soon as the butter is made, it must be separated from the milk, and be put into a clean dish, or tub, the inside of which should be previously rubbed with common salt to prevent the butter from adhering to it. The butter should then be pressed and worked with a flat wooden ladle or skimming-dish, having a short handle, so as to press out all the milk that may be lodged in the cavities of the mass. If the milk is not entirely removed, the butter will infallibly spoil in a short time. Cold water is often used in washing the butter, though the practice is generally disapproved of; however, I believe it will be found necessary in Canada in very hot weather, where the dairy is not of a proper temperature, and has not an ice house attached. When water is applied it must be carefully worked out of the butter. If the farmer has an ice house, or a good well, when the butter is soft, after being churned, by placing it in the ice-house, or hanging it in a vessel in the well, close to the water, it will become hard in a few hours, and may then be made up with, or without salt, in rolls, or figures on butter moulds, for the table or market. When so made up it may again be placed in the ice-house or well until wanted.

In salting or curing butter, wooden vessels are preferable, and these vessels should be made of ash, boiled for four hours, to free it from all acid. The casks should be rendered as clean and sweet as possible before they are used, well rubbed with salt, and the cavity between the bottom and sides filled in with melted butter.

An excellent composition may be made for preserving butter, by reducing into a fine powder, and carefully mixing together, sugar and nitre, of each one part, and two parts of the best common salt. Of this one ounce should be thoroughly mixed with each pound of butter, or in that proportion, as soon as the butter is perfectly freed from the milk; and the butter must be immediately put into the firkins, being pressed so close as to leave no air-holes, or any kind of cavities within it. If the vessel is not filled at once, the butter should be covered closely with a piece of fine linen, and over this a second piece of linen, dipped in melted butter, to exclude the air as much as possible. These linen covers should be carefully replaced whenever more butter is put in the cask, until it is filled. The two covers are then to be spread over it, and a little melted butter should be poured all round the edges, so as to exclude the air. A little salt should then be strewed over the whole, and the wooden head firmly fixed down. Butter thus cured does not taste very well for the first fortnight, but after that period it acquires a rich marrowey taste, and will continue sweet for some years. I have cured butter in this wry.

If this butter should, after being opened, be long in using, a strong brine of common salt should be poured when cold, upon the butter to prevent any rancidity which might be occasioned by constant exposure to the air.

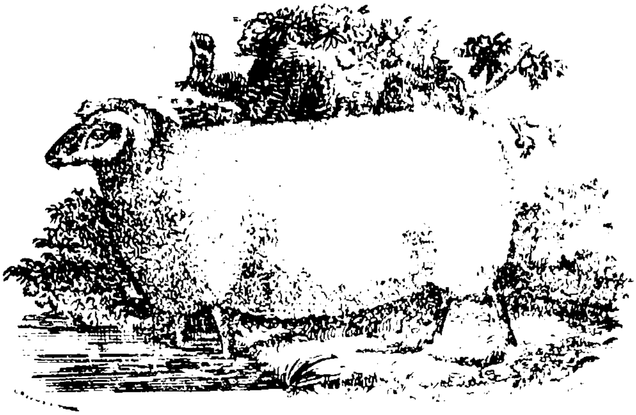
When butter is to be exposed to the heat of a warm climate, it should be purified by melting before it is salted, and packed up. For this purpose let it be put into a proper vessel, and this be immersed in another containing water. Let the water be heated until the butter be thoroughly melted ; let it continue in this state for some time, when the impure parts will subside, leaving at the top a perfectly pure transparent oil. This, when it cools, will become opaque, and assume a colour nearly resembling that of the original butter, only somewhat paler, and of a firm consistence. When this refined butter is become a little stiff, but while it is still somewhat soft, the pure part must be separated from the dregs, and be salted and packed up in the same manner as other butter ; it will retain the salt better than in its original state. It may be preserved sweet without salt, by adding to it a certain portion of fine honey, perhaps one ounce to a pound of butter, and mixing them together thoroughly, so that they may be perfectly incorporated. Butter might in this way be preserved sweet in long voyages, it is supposed, without any danger of spoiling.

I have seen as good butter made in Canada, as in Ireland ; and I believe that with proper management, it may be made here of as good quality as any that is made in the British Isles. I am not aware of any circumstance connected with our climate, soil, or cattle, that should prevent us from making good cheese. All that is necessary is, that we should give the same care and attention to the dairy, and the process of cheese-making, that is given to it in England. There is nothing to prevent our adopting the same process here. Our milk is sufficiently good, and as it is in our power to give our dairies the proper temperature for manufacturing cheese and butter, it will be our own fault if we do not make this branch of our agriculture as profitable as it might, and ought to be.

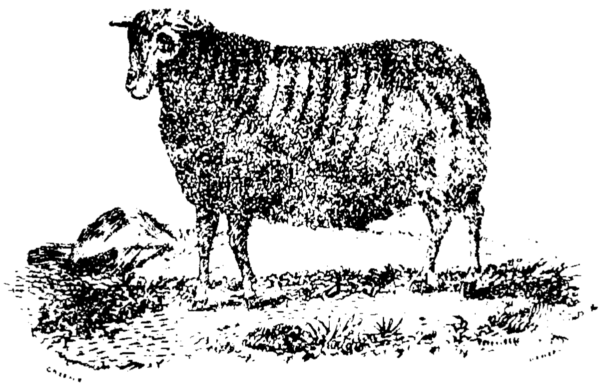
BREEDING, REARING, AND FATTENING OF SHEEP.

Of the various animals given by a bountiful Providence for the benefit of man, there is none of greater utility than the sheep. The sheep affords us food and clothing ; and in manufacturing their wool, persons may be employed in productive labour in the winters in Canada, when they would otherwise, perhaps, be unproductive consumers. Sheep properly managed, and in suitable situations, might constitute a material part of a farmer's live stock and profits in these provinces. But to make them profitable, our present stock of sheep require improvement, and must be managed very differently from what they generally are at present. From our limited pastures, and the kind of fences which forms our enclosures, a breed of sheep of a quiet disposition would be very necessary for us, and be much better adapted to the circumstances of this country, than a wild breed that run through or over the fences at pleasure, unless restrained by yokes or ties, which will never allow them to attain perfection, or produce mutton or wool, in quantity or quality that would make them as profitable as they ought to be to the farmer.

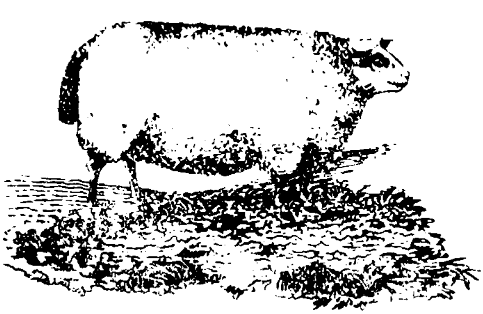
The New-Leicester, or Dishley breed, portrayed in the plates, are



LEICESTER or DISHLEY BREED



SOUTH DOWN.



TEESWATER BREED.

much approved of in England, and I can state from experience, that they are capable of being brought to a great weight, on a smaller proportion of food than any other breed that were known in Ireland. They are of a quiet disposition, and those that are well woolled would be very suitable sheep for all farmers determined to feed and manage them judiciously as any stock must be to make them profitable. They are, however, considered in England a tender breed of sheep.

The Teeswater breed, portrayed in the plates, are another variety of the old long-woolled sheep of England, and are said to arrive at a greater weight than any other breed in the kingdom, and produce a fleece of about eleven pounds. The ewes are singularly productive of lambs, twins being not only common, but three, and even four being sometimes produced at a birth. The value of this species of stock may be in a great degree estimated by its aptitutde to increase in flesh at an early age, and when no particular means of fattening are said to be used, of which the following account of four, fed by a Mr. Mason, of Chilton, affords a fair specimen.

Lambs. Wt. 15th Augt. 1803.	Shearlings. Wt. 4th Oct., 1804.	Gain.	Two Shear. Wt. 15th Oct., 1805.	Gain.
Average. 88 lbs.	Average. $202\frac{1}{2}$ lbs.	Average. $114\frac{1}{2}$ lbs.	Average. $235\frac{1}{2}$ lbs.	Average. 33 lbs.

Thus the weight gained from five months to one year and seven months old, is $114\frac{1}{2}$ pounds, or at the rate of 1 pound 15 ounces per week; and from that age to two years and seven months old, the gain is only 33 pounds, or 10 ounces per week. Of two four-shear sheep of this kind, one killed at Darlington, weighed 62 pounds per quarter, the other 54 pounds. A wether, three years old, killed in January, weighed 59 pounds per quarter, and a lamb, five months old, weighed 22 pounds per quarter. (See Agricultural Survey of Durham and Yorkshire.) This breed, would of course, require abundant keep at all seasons, or they could not be profitable. Long woolled sheep are, however, much the most suitable for our climate and our wants, provided the staple of the wool is fine, and close grained, not coarse, open and curley.

The South-Down, delineated in the plates, is a favourite breed in England, for their sweet mutton, and fine wool; but the quantity of wool is small, seldom over 3 pounds on sheep of two years old. They are considered the most valuable breed in England for short pastures, and exposed situations. I have no doubt but the quantity of wool might be increased, though the fineness of the fleece would be diminished. This appears the result of experiments to increase the quantity of wool of this breed in England, according to evidence given before a Committee of the House of Lords, in 1828. But as *extremely* fine wool is not necessary for our present manufacture, the weight of the South-Down fleece might be increased without in any degree diminishing its value to us.

The Herefordshire, or Ryeland breed, are small, white-faced, and hornless; the wool growing close to their eyes; are light in the bone; have small, clean legs; and possess great compactness and symmetry of form. The mutton is excellent, but small, and the wool very fine, averaging only about two pounds per fleece. Though a tender breed, they are capable of subsisting on a small quantity of food. They have been crossed in England with the Spanish sheep; the produce are termed *Merino Ryeland*, and the wool *Anglo Merino*. This cross detracts from the beauty of the Ryeland's form; but the fleece is much improved both in weight and quality, and the carcass is considerably increased. The Ryelands have also been crossed with the new Leicester breed, but it has not succeeded well, according to the Agricultural Survey of Herefordshire.

The Canadian sheep, are a horned breed, the wool rather coarse and open, and the form of the animal entirely different from what the most experienced judges consider perfection of shape in sheep for producing the most profitable returns in mutton and wool for the food they consume. The breeding and management of these sheep has certainly been greatly neglected hitherto; in fact, they may be said to be in a state of nature, so far as regards breeding. The best breed in England can be maintained in perfection only by cutting at a proper age all males not necessary or fit to breed from, and by rejecting from the breeding ewes all such as are coarse and of defective shape, and selling them to the butcher.

The climate of Canada may be less favourable for sheep than England or Ireland; but in Saxony and Hungary, where the finest wool in Europe is produced, the sheep are regularly housed during winter, and are kept during that season on dry fodder. In Hungary this housing commences early in October.

The following is the return of wool and mutton from some of the breeds in England:

	Average wt. of fleece in pounds.	Average wt. of wethers per qr. in pounds.	Years old when killed.
Dishley, or New-Leicester, long wool, white face and legs.	6	22	2
Tees-Water, long wool, white face and legs,	9	28	2
Lincolnshire, long wool, white face and legs,	9½	25	3
Romney Marsh, do. do.	7	24	2½
Herefordshire, or Ryelands, short wool, do.	2½	14	4½
South-Down, short wool, Gray faces and legs,	3	18	2

With respect to the selection of sheep, as an article of live stock, the same principles of symmetry of form and other requisites in the formation of a good breed of neat cattle, which have been already specified, are equally applicable. The farmer should also carefully examine the nature of his land, and his various sources for supplying food; he may then proceed to obtain a breed, which, after mature consideration, he has reason to believe is best calculated for him. The introductory view that has been given of some of the most esteemed breeds, will probably afford some guide to his choice. The following particular point demands attention; and, as in all cattle, the male has the greatest influence, it is proper to specify those requisites which are considered essential to a good ram.

"The head of a good ram," says Mr. Culley, "should be fine and small; his nostrils wide and expanded; his eyes prominent, and rather bold and daring; ears thin, his collar full from his breast and shoulders, but tapering gradually all the way to where the neck and head join, which should be very fine and graceful, being perfectly free from any coarse leather hanging down; the shoulders broad and full, which must at the same time join so easy to the collar forward and chine backward, as to leave not the least hollow in either place; the mutton upon his arm, or fore thigh, must come quite to the knee; his legs upright, with a clean fine bone, being equally clear from superfluous skin and coarse hairy wool, from the knee and hough downwards; the breast broad and well formed, which will keep his fore legs at proper wideness; his girt or chest, full and deep, and instead of a hollow behind the shoulders, that part by some called the fore-flank, should be quite full; the back and loins broad, flat, and straight, from which the ribs must rise with a fine circular arch; his belly straight; the quarters long and full, with the mutton quite down to the hough, which should neither stand in nor out; his twist, (i. e. the junction of the inside of the thighs,) deep, wide, and full, which with the broad breast, will keep his fore legs open and upright; the whole body covered with a thin pelt, and that with fine, bright, soft wool."

Such is the description of the animal recommended by Mr. Culley, who observes, that the nearer any breed of sheep comes up to it, the nearer they approach to excellence of form, and all experienced judges will be of the same opinion. Such animals may be purchased, but the farmer who makes the purchase, and is desirous that the progeny should possess the same excellence of form, must adopt the same management and care in feeding and breeding, which has brought different breeds of stock to so great perfection in England, or he never will obtain the desired results.

The characteristic marks of an ewe, should be the same as those of the ram, and also with regard to the breed; for, with sheep, as with other cattle stock, no certain degree of excellence can be attained, unless the female is equally well bred with the male. This, however, is impossible to be obtained under present circumstances. We must endeavor by crossing and selecting, to improve our breed of sheep, and this we may accomplish by care and attention. Ewes should not be let to breed before they are about 18 months old. In the county of Galway, Ireland, where, according to Wakefield, are to be found the finest flocks of sheep in the world, the ewes are seldom allowed to breed until they are two years and a half old.

Ewes bring forth one, two, and sometimes three lambs, after a gestation of five months, or twenty weeks. According to M. Tessier's experiments on gestation, out of 912 ewes, 140 lambed between the 146th and 150th day; 676 between the 150th and 154th day; 96 between the 154th and 161st day. The most prolific sort of sheep are the Tees-water. An ewe of this breed, belonging to Mr. Eddison, brought forth twenty lambs in five years, of which number the first nine were yeaned in eleven months, viz: 1st year, 4 lambs; 2nd year, 5; 3d year, 2; 4th year, 5; 5th, 2; 6th year, 2; all yeaned within sixty months.

The best time for yeaning in this climate would be from the 15th of March to the 15th of April, consequently the rams should not be admitted to the ewes before the middle of October. There must necessarily be a great loss of lambs here, from allowing the rams to remain constantly with the ewes; hence, they bring forth lambs at a much too early period of the year, when the cold is extreme, and the sheep houses and yards not of the very best construction for the safety of the young lambs. The general improvement of the breed of our sheep stock cannot be accomplished until the whole system of their management is changed. In the first place, all attempts will be in vain while rams of all ages, sorts and sizes, are permitted to go at large. To prevent this, is the first step that is necessary in any plan of improvement that may be proposed, and no means, by crossing or otherwise, can be successfully adopted to produce a good breed of sheep until this is done. If all the males are cut, except those necessary for breed, (and one ram is sufficient for 50 or 60 ewes,) the farmer might readily separate him from the ewes, or at least prevent copulation until the proper time, by a cloth properly fitted on them.

During the period of gestation, ewes require great attention. In the breeding of cattle, it is a maxim which ought to be steadily kept in mind, that nothing can be more prejudicial to the females than to fatten them during gestation; and with respect to ewes in particular, this rule should be more carefully observed than with regard to any other animals; for if they be fed too high while they are going with lamb, they will undergo great difficulty and pain in yeaning; but, nevertheless, it is necessary they should be so kept that they will not be deficient in strength at that critical moment, and have a sufficient supply of milk for the support of the lamb. In Hungary, they have sheep sheds, well constructed, and divided by little racks, into such spaces as are necessary for the division amongst the flocks. Racks are also arranged around the whole, so that all the sheep can conveniently feed at them. The floor is covered with straw, continually removed, and a dry and warm bedding is obtained. The sheep are fed on dry food four times a day, and watered twice a day. In summer they are put into these sheds in the day time when it rains, or when the heat is oppressive. The ewes always lamb in the house. On these occasions the ewe is placed in a little pen by herself, where she remains unmolested. These pens are about three or four feet long, and two feet wide, and are formed by means of hurdles. Owing to this care, they are said never to lose a lamb. In constructing the sheep sheds, they allow for each ewe, two and a half feet square, which will be sufficient for the hay rack, and the partition required during lambing. All wetness and moisture is considered injurious to the sheep; but they are taken to water, if not in the pasture, twice every day in the summer; they are also supplied with salt. For fourteen days before the coupling season, during its continuance, and for fourteen days after, a ram is fed with four pounds of oats daily. In the lambing season small troughs are placed in each pen, in which the ewes get water, with a small quantity of barley meal, which is found greatly to increase their milk.

The quantity of dry food given to each sheep is about five pounds weight in the day ; $1\frac{1}{4}$ lbs. of good hay, and $3\frac{3}{4}$ of good straw, given in four parts. At the period of lambing, and for some days previous, the quantity of hay is increased, and the straw diminished. Young sheep get about one pound less food in the day. Carrots or potatoes are excellent food for ewes after lambing. In Hungary, sheep are sometimes almost entirely fed on potatoes in winter. About four pounds of potatoes to full grown sheep are given in a raw state, cut with an iron instrument, and mixed with a small quantity of barley meal and chopped straw or hay, wet with a little salt water, and distillery wash. This is given to them in three meals in the day, allowing to each animal about $5\frac{1}{3}$ lbs. of nourishment in the 24 hours. This would be about one minot of potatoes for fifteen sheep, or two of carrots. Count Magnis found that $4\frac{1}{2}$ lbs. of clover, cut straw, chaff, and potatoes, were sufficient for a full grown ewe, $5\frac{1}{2}$ pounds for a ram, or full grown wether, and $3\frac{1}{4}$ for a lamb. Of this food given by Count Magnis, the proportion of potatoes was not much over one pound for each sheep.

The castrating of lambs may be performed at any time from the age of a fortnight to a month old ; the younger the lamb, the less danger of much inflammation taking place. The operation should be performed in fine weather, when not too warm ; and the lambs should be kept dry and sheltered for a few days, until the inflammation is gone off. Lambs may be weaned at about three months old, or the first of August; Ram lambs may be allowed a month longer. They should be separated to some distance, if possible, from the ewes when weaned, though the farmer should have to send his lambs to a farmer at a distance and take his in exchange for a few weeks, until the ewes are dried of milk. Lambs should have an abundance of food after weaning, the after grass of clover would be very suitable. Docking, or cutting off the tails of the lambs, is a general pracice in England, Ireland, Spain, and Saxony. No doubt docking gives the animal a square handsome appearance on the hind quarter ; but in this country, where flies are so extremely troublesome to sheep in summer, it is a species of cruelty to deprive them of their tails, which would appear to have been given them for defence against these annoyances. In the cold of winter, a long bushy tail is a very considerable protection and warmth to the udder of the ewes. The farmer who will take the trouble to understand perfectly the economy and management of sheep, will be able to determine for himself whether he should dock their tails or not.

The shearing of sheep, and the profit thence derived from the wool, form a very considerable article of rural economy. The most proper time for this must be regulated according to the temperature of the weather. If the weather be hot, the latter end of May is a good time for shearing or clipping these animals. An early sheering is preferable to a late one, when the weather and other circumstances will admit of the operation being performed safely ; because the new wool will not only gain time to get ahead, but the animal will also be secured considerably from the attacks of the flies, to the depredations of whom they become so liable by delaying the operation of shearing to a late period of the summer. Previous to shearing, the sheep ought to be well washed, in order to remove the dust and other filth which they have contracted ; this is usually performed in the British Isles by men standing in the water, who have the sheep handed to them, and they wash the wool completely, not allowing the head of the sheep to get under water. The Farming Society of Ireland recommended, that when much dirt had fastened itself at the points of the wool, and the haw and yolk could not be dissolved in cold water, a large tub should be filled with water at about blood heat, in which to place the sheep, till all the wool should be well washed and softened, and that the sheep should be river-washed directly after. This process, the society observed, would not be so troublesome as might be supposed ; for the heat of the animal will keep nearly a sufficient warmth in the water, which will at all events be produced, by occasionally putting in a few pails full of hot water. This method is the more necessary where sheep are housed for many months as in Canada. It is said the extra labour required to wash sheep in tubs with warm water and lye, or soda,would be amply repaid, by carrying out the washing and applying it as manure ; the quantity of rich animal soap it would contain, must make it one of the most fertilizing applications which could possibly be used. When sheep are not kept in great numbers, some clean cold water should be poured on the sheep after being washed in the tub ; this should be done with the sheep standing on the ground, and the water should be squeezed out of the wool as much as possible.

Sheep may be shorn, or clipped, in three or four days after washing, or at any time the wool is perfectly dry. A shearer may shear twenty-five or thirty sheep in a day. When the animal is wounded, the part may be anointed with its excrements,or with a mixture of linseed oil and rosin. If the weather should happen to be cold or wet after shearing, the sheep should be housed and fed under shelter while it is cold. In Ireland, when the fleece was shorn, it was spread at large, with the outside uppermost, upon a platform of boards ; the coarse part about the tail and hind-quarters were separated from the fleece, the fleece was then carefully folded and rolled, beginning at the hinder part and folding in the sides or belly wool, as the rolling proceeds. When arrived at the shoulders, the wool of the the fore part is to be rolled back to meet the other, instead of having a binder twisted from the wool, as was the practice in many cases; the most approved plan was to secure the whole by a pack-cord band, in the common way in which parcels are tied up. Thus the fleece is kept much tighter together, and unfolds itself with more regularity under the hand of the sorter. This method would be found very profitable for all farmers who may have wool to sell. The coarse and inferior wool that is separated from the fleece may be sold separate, or made into coarse cloth for horse covers, or other purposes. Wool of long staple, or what is termed combing wool, will be most suitable for our present wants, as it is best adapted for making cloths of a long and even nap, and moderate degree of fineness. Should we be able to export wool, and require it of any particular quality,we must endeavor to produce such wool as will suit the market, if our climate and other circumstances will admit of our doing so.

A soft pile is an essential requisite to constitute a good fleece, as is also a felting quality in all wools which are wrought up into such cloths as are submitted to the action of the fulling-mill. These qualities are said to be wanting in much of the British wool; and the Saxon wool, and some of the New South Wales, particularly excel in these properties. The climate, soil, and mode of feeding sheep, is said to have considerable effect on the quality of their wool, and of this there is no doubt. Mr. Bakewell was of this opinion, but considered that the soft quality of the wool, may be secured in every situation by *greasing the sheep*; and that this will greatly contribute to counteract the effects of climate and soil, where they are unfavorable to this quality of wool; and further, that it preserves the sheep from any injurious effect from the change of climate, and from any sudden change of temperature after shearing. Butter and sulphur, made into an ointment, is recommended to be applied to the roots of the wool immediately after the sheep are shorn. Another ointment made with one pint of tar and four pounds of butter, (which quantity will be sufficient for twelve sheep) is recommended. I have made use of both these ointments with good effect in Ireland, and have found it to improve the quality and quantity of the wool, and destroy insects. Oil (not train oil) mixed with warm water, is good to rub the skin of sheep, after shearing, and is less objectionable than other ointments, because it will not discolour the wool.

When sheep are allowed to go on the young grass in spring, their tails and udders should have the wool well clipped away from them, in order that they may be preserved in a perfectly clean state, until shorn. When farmers have market convenient for selling fat lambs, it is a great advantage to have them early, and the ewes on which they are suckled or fattened, must be fed with nutritive food to give them an abundance of milk.

Wether sheep may be brought to a profitable fatness on grass at eighteen months old. For winter feeding they will answer well at this age so as to be sold out in spring when two years old. Sheep that are fattening in winter should be kept separate from store sheep, and should have a full supply of roots, grain, or edible refuse of the brewery and distillery. Potatoes should be given boiled or steamed, and mixed with a small quantity of ground oats or barley; this food, with hay, will fatten a sheep in less time than any other food, and I believe at less expense. In feeding sheep, it would be found to answer a good purpose to have the troughs in which they get their food raised a little from the floor, or railed off so as only to admit the sheep to put their heads through to their food, as in hog sties. This would prevent waste, as sheep are very apt to get into the troughs and soil the food with their feet. In England they have a contrivance denominated a tumbril; it consists of a circular cage or crib, which may be made of osiers, willows, or other pliant brushwood. The whole is about ten feet in circumferance, and closely wattled to the height of about one foot, above which it is left open for the space of eighteen inches; it is then wattled again to the height of eight or ten inches, and an opening about eighteen inches in diameter is left at the top for putting in the roots, or other food, whether green or dry, on which a cover may be placed when necessary. The staves, or stakes, which form the skeleton of this utensil, are ten inches asunder, which is sufficient space to admit the sheep to get at the food, and twelve sheep may feed at the same time at each tumbril. This simple construction effects a material saving of provender, and the stronger sheep cannot drive away the weaker, or trample on, or spoil the food.

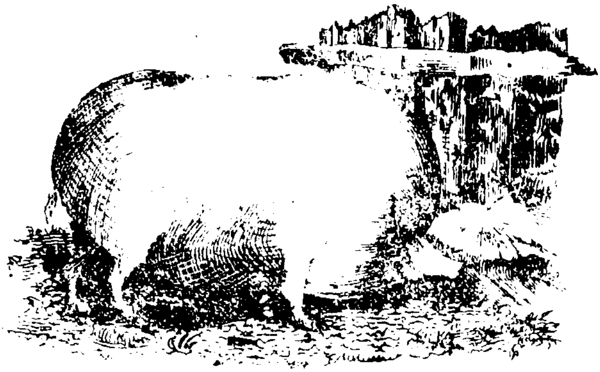
Prince Esterhazy is said to possess a flock of 300,000 sheep, fed on his estates, situated chiefly in Hungary. The superintendance and management of these flocks are conducted on the best principles, and with the greatest regularity; monthly reports are sent from all the distant farms of the state of the flocks, the food, &c. to Eisenstade, where a board of directors are appointed to superintend and give instructions to the different persons in charge of farms. A ram of the Spanish Merino breed has been sold at a public sale in Hungary, for 800*l.* sterling, and within a few hours after being sold, the purchaser was offered 1250*l.* sterling for the same ram. At these public sales, according to Dr. Bright, from 100*l.* to 300*l.* have been commonly paid for a ram.

Sheep, to be profitable, require great care and attention, particularly by having good fences, and sufficient grass in summer, and warm houses properly divided and arranged, and abundance of food for them in winter. The farmer who is not disposed to provide these indispensable requisites, and feel duly interested in keeping his flock in suitable condition at all seasons, had better not keep sheep.

SWINE.

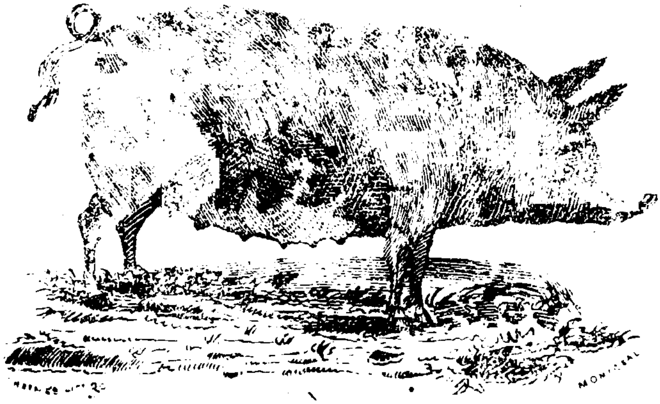
The common hog is found in a wild or domestic state, in almost all the temperate parts of Europe and Asia, and in many parts of Africa, and the South Sea Islands. Hogs seem to enjoy none of the powers of sensation in eminent perfection. So imperfect is their feeling, that they have been known to suffer mice to burrow in the fat of their backs, without discovering any uneasiness, or appearing to notice it. The form of the hog is inelegant, and his carriage equally mean as his manners. His unwieldy shape renders him no less incapable of swiftness and sprightliness, than he is of gracefulness of motion. His appearance is always drowsy and stupid. He delights to bask in the sun, and to wallow in the mire. An approaching storm seems to affect his feelings in a very singular manner. On such an occasion, he runs about in a frantic state, and utters loud shrieks of horror. Hogs are infested with lice, and subject to many disorders. The sow brings forth in the beginning of the fifth month after conception, and has often two litters in the year. Hogs, when suffered to see the natural term of life, live from fifteen to thirty years. Their size and strength continue to improve until they are five or six years old.

The hog is in a very considerable degree beneficial to mankind. His flesh is pleasant, substantial and nutritious. Pork takes salt better than the flesh of any other animal, and is in consequence, preserved longer, and makes an important article of naval stores. The hog, in British farming, is viewed as a subordinate species of live stock, and chiefly valuable as consuming what would otherwise be lost. It is supposed, however, that fed on the offal of mills, breweries, distilleries, and dairymen, they would return a greater weight of meat, (many think double the weight,) than could be obtained from any other cattle. Were green crops introduced



CHINESE BREED.

WOBURN BREED.



ESSEX HALF BLACK PIG.

in Canadian agriculture to the extent which is necessary, the rearing and feeding of swine might be carried on to a great and profitable extent, not only for the full supply of our own wants, but for exportation.

I am not aware that any of our stock require to be improved so much as our swine. The greater portion of this stock in Lower-Canada, are of a very inferior description, long in coming to maturity, and difficult to make fat. The introduction of a few of the Chinese breed, would be a good means of improving the swine here. They are a short legged breed, with the belly hanging to the ground ; the flesh is white, and of excellent flavour. I know this species to be easily fattened. The fineness of the bone, and the broad, though also deep form of the chest, denote in this, as in other species, a disposition to make fat with a moderate consumption of food. The size of hogs, as of other animals, should be chosen with a view to the food provided for their maintenance, and not because it is possible to raise the individual to a great, and probably unprofitable weight. The smaller breeds of swine are the most esteemed for using fresh, or pickling, and are, beyond all doubt, most profitable for farmers in general, and for all those who keep a hog to consume kitchen, or other offals.

The Berkshire breed are much esteemed in England ; they have been introduced here, by the Montreal Agricultural Society, but they have not multiplied greatly.

The spotted Woburn breed, introduced by the Duke of Bedford, would be one of the most profitable in England to import for the improvement of our swine here. They are hardy, well formed, prolific, and fatten quickly. The Essex half black pigs, are reckoned among the finest breeds ; they are of fine bone, broad and deep in the belly, full hind quarters, and light offal, feed remarkably quick, and the quality of the meat is excellent.

In choosing the boar and sow, regard should be had to their perfection of form, that the sow should have a large capacious belly, and not be too much inclined to obesity. A fat sow will never have a numerous progeny, or be a profitable breeder for a farmer. The age of the boar should not be less than twelve months, as he will then be nearly at his full growth ; nor that of the sow less than ten months. They should not be allowed to farrow in winter, as young pigs are exceedingly tender, and can with difficulty be preserved in very cold weather. The pregnant swine should be separated from the herd for some time before she is expected to farrow, carefully watched, and littered with a small quantity of short straw. Too much straw is improper, both at the time of farrowing and for a week afterwards, as the pigs are apt to nestle beneath it unperceived by the sow, and are thus in danger of being smothered when she lies down. A breeding sow should be well fed while nursing, and it is advantageous early to accustom the pigs to feed from a low trough, on milk or other liquid food, mixed with meal or bran. Such of the pigs of both sexes as are not to be kept for breeding, are in England usually castrated or spayed, when about a month old, and the whole may be weaned at the end of six or seven weeks. To prevent swine from digging in the soil, the best method is to cut the two tendons of their snouts with a sharp knife, about an inch and a half from the nose. This may be done with little pain, and no prejudice to the animal, when about two or three months old. If they are prevented from turning up the soil by this means, or by ringing, store pigs can be well kept in summer on clover. A small enclosure of clover, well fenced, to prevent the swine from leaving it, would greatly contribute to their food, when other food is least plentiful. When swine are confined in sties, such as have been already described, they should be kept perfectly clean and well littered ; and those not kept for breed should, from the time they are weaned, be plentifully supplied with food. As most farmers keep cows, the sour milk, or cheese whey, will be excellent food for swine, and cannot be better applied than to that purpose. Boiled potatoes, or carrots, mixed with a small quantity of the meal of beans, barley, Indian-corn, or peas, will be found more profitable food for hogs than any one of these articles of food would be, given separately. Great care is required in feeding, that no more food be given at a time, than the swine can eat ; they should be fed frequently and sufficiently, but no more. The offal of distilleries would be very useful in feeding swine, provided the swine are kept clean in properly constructed sties, and the food supplied regularly. It would be necessary, however to give some better, harder, and more nutritive food occasionally, such as small corn, peas, beans, or Indian-corn. The flesh of hogs fattened entirely on the offals of distilleries, is generally very soft. I believe peas are the best of all food for swine, but they are the most expensive.

By experiments that have been made, in *fat hogs*, every twenty pounds of live weight, when killed, produce from twelve to fourteen pounds of clear weight. When the hogs do not exceed 160 pounds, the weight will be twelve pounds ; if they be of a larger size, they will average about fourteen pounds. The farmer may by weighing his hogs while alive, be enabled to ascertain the profitable weight when dead.

As this spring has been so unusually late, and the sowing so protracted in consequence, I am induced to make some remarks here, on the sowing of wheat, however out of place it may be. It would appear to me a matter for considerable regret that farmers in this province are so much disposed to sow wheat on soils not properly prepared, or in a state of sufficient fertility to produce a fair average crop, in the most favorable seasons. Were farmers to substitute rye, oats, and in some cases barley, a good crop of these species of grain would be almost certain, and would as certainly be more profitable than a crop of wheat that would be below a fair average. The sowing of wheat is also frequently persevered in to such an advanced period of the spring as to afford scarcely a chance of reaping a good crop, however favourable the season. In many situations artificial means may be applied successfully to hasten the fitness of the land to receive the seed sufficiently early in spring, by judicious ploughing and perfect draining ; but in the lower sections of this province, in the neighbourhood of Quebec, the climate will often prevent early sowing of wheat, however industrious and attentive the farmer may be in preparing and drying the soil. In this case, a different species of grain or other crops should obviously be substituted, that would not require so long or warm a season to bring them to maturity. If wheat cannot be sown in the month of April, a good crop can scarcely be expected in ordinary seasons, and much less in those that may happen to be wet and cold. In extremely favourable seasons, late sowing may succeed, but it will be more safe and profitable for a farmer to cultivate such crops as will be likely to succeed in ordinary seasons, than to incur the risk of sowing wheat late, in expectation of an extraordinary favorable season. I do not propose that a farmer should sow any other grain than wheat, when he can do so with a reasonable prospect of reaping a fair average crop; but otherwise, a crop of oats will be more profitable, and afford a larger quantity of good nutritive food, if he should require it for his family, than wheat grown under circumstances known to be unfavourable to its production in perfection. I have this spring proved beyond all question, the necessity and utility of sowing wheat early, and the inexpediency and unprofitableness of sowing it late. I am persuaded that it would be greatly the interest of farmers to encourage the manufacture, and consumption of oat-meal. It is known to be a healthful and nourishing food, and would be found in those parts of the province unfavorable to the growth of wheat, a good substitute for the flour of wheat, as human food, and in all parts of the country its occasional use would be a saving of our more saleable, and valuable grain, and hence greatly increase the farmer's profits.

When I commenced this treatise I expected it would not exceed 300 pages at most; I find however, that I have passed the utmost limits I first laid down, and have concluded the fifth part without being able to include all which I proposed. The diseases of live stock, and their cure, is yet to be treated of. I would also wish to offer a few observations on the clearing and cultivation of new land; the value of labour and land, and the probable profits of agriculture in different sections of British America, and some general remarks on matters which I conceive to be connected with the prosperity of agriculture, and the interest of farmers in these provinces. Circumstances prevent me from entering fully on these subjects for the present. The ensuing winter, I propose to publish a supplement, which shall comprise them and all that I think to be further necessary to make my book interesting, and useful to farmers. I shall use all possible industry to enable me to give correct tables of the selling value of cultivated farms in the British Provinces of North America, their situation, extent, soil, state of cultivation, and farm buildings, with the wages of labour in the different localities.

I have stated what I conceived to be the best modes of cultivating the different species of crops, on cleared farms, the expenditure of labour necessary in the cultivation and harvesting of crops, and the cost of keeping labouring cattle. It only remains for me to give some idea of the usual wages of labour, and the price of produce, to enable a farmer to calculate the returns or profits he will be likely to obtain from a given quantity of land, under good management in ordinary seasons.

For the last fifteen years, I have not observed any great variation in the wages of labour in the neighbourhood of Montreal or Quebec. During all that period, labourers were to be had at from five to seven dollars a month, and their board, during spring, summer, and harvest. As high as eight dollars might be occasionally paid to good mowers. If men were hired by the year, the wages varied from 12*l.* 10*s.* currency, to 18*l.* or perhaps as high as 20*l.*, to good workmen. Properly qualified ploughmen have been paid higher wages, but they are not always to be had. Men hired by the day, without board, got generally about half a dollar. These prices apply only to agricultural labourers, and this wages all paid in cash. In the Eastern Townships, and in Upper-Canada, the wages is generally much higher, but not in all cases paid in cash. The *nominal* difference may be one-third more, or perhaps over that.

The price of produce has varied exceedingly during the period above stated. The value of wheat is influenced by the price in England. It has however, seldom been sold less than a dollar the minot in Lower-Canada for several years past. The price in Upper-Canada is generally less by a fourth or a fifth in their principal markets. Barley has sold for the last few years from half a dollar to as high as four shillings and six pence the minot; the usual prices may be stated at from half a dollar to three quarters of a dollar the minot. Oats, at from a quarter of a dollar to half a dollar. Peas, from two shillings to five shillings, but generally about three shillings and six pence. Indian-corn, from three to five shillings ; and potatoes from one shilling to two shillings and six pence the minot. Hay, from two dollars and a half to as much as sixteen dollars the hundred bundles ; the price is generally five to eight or nine dollars. In Quebec the average price of hay is much higher than in Montreal. Straw, from two dollars to six the hundred bundles, but seldom more than three or four dollars. In Upper-Canada, the prices of barley, oats, peas and potatoes, are generally fully as high as in Lower-Canada. Hay is rather higher in price, and Indian-corn much lower. Beef varies in price from two and a half to six dollars the 100 pounds. The latter price may be obtained by the farmer in spring for well fatted beef. Pork sells from four and a half to six or seven dollars the 100 pounds. Mutton of well fattened sheep, would in spring sell for four to five pence the pound, or perhaps more ; but mutton of ordinary quality sells for two to three pence during 6 or 8 months of the year. Veal and lamb sells in the usual proportion to other butchers' meat. The cheese made in Canada hitherto was not of first quality. It is seldom kept over so long as English cheese is usually kept before it is used, and from the manner it is generally made, it would not be fit to keep long ; but the defect in our cheese may be reemdied whenever the farmers' wives take the trouble to learn how tom ake good cheese, and of good materials. The common cheese made in the country sells fresh at three to four pence the pound. There is much good butter made in Canada, but there is also a large proportion of it ill made, and of course, ill tasted. This may be remedied by care and attention, good milk houses, removing the cream from the milk before it becomes too old, stirring the cream frequently after it is removed, and when the butter is churned, by separating effectually the butter-milk from the butter. The present price of fresh butter is in summer from six pence to ten pence the pound, of sixteen ounces. In winter, fresh butter does not sell much over the latter price, from the large quantity of good salt butter brought to the markets of Montreal and Quebec from a distance, which sells from seven to ten pence the pound. On some occasions it exceeds these prices ; salt butter of inferior quality sells as low as five pence and six pence the pound.

The value of land in the neighbourhood of Montreal and Quebec, is not easy to determine. On the island of Montreal, within ten miles of the city, cleared farms, with reasonably good buildings, cannot be purchased readily for less than from 6*l*. to 10*l*. currency the French arpent, and often sell for much more. Off the island, at a greater distance from town, say twenty or thirty miles, farms are sometimes sold for less than the buildings upon them cost, but this happens only in peculiar circumstances and is no general rule. The price of farms near Quebec is perhaps somewhat lower than at Montreal, though farm produce is generally higher. The lands in the neighbourhood of Quebec are not equal in quality to those near Montreal, nor are the seasons so favourable for agriculture, particularly for the production of wheat, the spring being considerably later. In Upper-Canada the price of land is rather higher than in the Lower Province, though I cannot assign any reasonable cause for this circumstance, except that the soil is generally considered to be of superior quality to that of Lower-Canada. The latter province, however, has its advantages in the healthfulness of its climate, better command of labour, and having the best markets for buying and selling : and though the winters may be longer and more severe in Lower than in Upper-Canada, the crops are not more subject to failure or casualties, in the Lower Province than in the Upper.

It ought not to be necessary to remind farmers how much it will be their interest to encourage the consumption of the produce of agriculture to the full extent of the wants of the population, and to raise for export all that they can find a market for. Any article for our own consumption that can be directly manufactured in Canada from the raw produce of agriculture, ought surely be preferred to that of any other country. There are various manufactures not made from agricultural produce which in our present circumstances we will find cheaper to buy than to make, particularly while we have a thin population, and abundance of fine land, the produce of which we can give in exchange for these manufactured goods. So long as this exchange can be continued on its present footing, it will be no less for our interest than that of England, to continue it, and I presume to maintain that the advantages arising from this trade between England and this colony are perfectly reciprocal. The manufactures that we can make from the produce of our own agriculture, cheaper than we can buy them, are : butcher's meat, cheese, and butter, spirits and beer. We might also make wine from currants, and other berries, that might be cultivated to any extent, of infinitely superior quality to three-fourths of the wine we import, and making this wine is worthy the attention of every farmer's family. The mode of manufacturing various kinds of home-made wine, I shall treat of in the supplement. Our wool we should manufacture, and could do so, into cloth sufficiently good for any farmer in Canada. Flax could be manufactured for our own wants to a very considerable extent. Perhaps these are the only or principal articles for our own consumption, that it would be expedient to encourage particularly, the manufacture of at present.

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PART FOURTH.

PART FIFTH.