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AMERICAN HUSBANDRY.

BEING

A SERIES OF ESSAYS ON AGRICULTURE.

COMPILED PRINCIPALLY FROM "THE CULTIVATOR" AND
"THE GENESEE FARMER."

WITH ADDITIONS

BY WILLIS GAYLORD AND LUTHER TUCKER.

IN TWO VOLUMES.

VOL. I.

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COMPILERS' PREFACE.

IN offering to the agricultural public the present volumes, the compilers feel that a few words in explanation of their intentions and wishes may in this place be necessary and proper. Profoundly impressed with the important influence which the cultivation of the soil exerts on the prosperity of the individual and the nation; confident that in too many cases the most effectual methods of promoting this desired prosperity are not adopted; believing that the systems of farming at present pursued in this country are usually more or less defective, and may be greatly improved by an acquaintance with the advanced methods of more experienced countries, and a thorough investigation by our farmers of the principal points of difference between their husbandry and ours, we have endeavoured, in the papers selected and prepared for these volumes, to embrace such general principles and such courses of practice as will conduce most certainly to benefit and improve the condition and prospects of the tiller of the soil. Very little space has been devoted to mere theories of rural economy, a correct practice from already established facts being considered more important. It has been our wish and endeavour to present such a manual as will be found instructive to all who are engaged in the great undertaking of producing a nation's wealth as well as a nation's bread.

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It will be seen that the first volume, with the exception of a few miscellaneous articles deemed necessary to its completeness, is from the fifth and sixth volumes of the *Cultivator*, and may be considered as the expression of the matured opinions of JUDGE BUEL on the subject of Agriculture. As a proper termination to this volume, we have included the Address prepared by him for delivery before the New-Haven Agricultural and Horticultural Societies, and on the journey to perform which duty his valuable life was closed. A large portion of the second volume, the chapters on the Kitchen and Fruit Gardens included, were written and prepared expressly for this work; the remaining part consisting of papers selected from the volumes of the *Genesee Farmer*. To the whole such notes have been appended, and such alterations and additions generally have been made as were deemed essential to accomplish the object we had in view.

It is not expected or supposed that the theories unfolded or the practices inculcated in these volumes are perfect. The science of agriculture is necessarily progressive, and so, of course, must be the practice. Our object and aim have been to embody as much useful information as possible; to excite inquiry and investigation, and furnish the means for arriving at correct and just conclusions. How far we have succeeded in our design is left for the decision of an enlightened agricultural public.

September, 1840.

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AMERICAN HUSBANDRY.

CHAPTER I.

NEW HUSBANDRY.

Introduction.—Manuring.—Draining.—Good Tillage.—Alternating Crops.—Root Culture.—Fallow Crops.—Rules and Suggestions in Husbandry.—Comparative Profits of the Old and New Husbandry.

To no one individual is the agricultural public of this country more indebted for correct opinions on the important subject of Improved Husbandry than to Judge BUEL; and his influence in bringing the system into repute was deservedly the greater, as the principles he advocated in his writings were most happily illustrated and enforced by his practice. These opinions and principles are imbodyed in the following chapter; and prepared, as the subject-matter was by him, for the purpose to which it is now applied, they may be considered as the result of his settled convictions and his matured experience. The principal features that distinguish the New from the Old Husbandry are here made sufficiently apparent; and the theory is not more beautifully in accordance with nature, than the results are found to be beneficial to the agriculturist.

The introduction and establishment of the New Husbandry in England required many years for its accomplishment ; a long series of experiments ; the writings of many distinguished men ; and the example of individuals of known science and skill. There were old and deep-rooted prejudices to overcome ; the dread of innovation to encounter ; the habits and usages of ages to break up and eradicate, before the improvements, which have proved so essential and vital to the prosperity of that kingdom, could be fixed on their present secure basis. Men bred to the business of farming are proverbially reluctant to submit to changes affecting their modes of proceeding ; and when some of the proposed methods were found to conflict entirely with the courses which they and their fathers had pursued, it is not surprising that such novelties were regarded with suspicion and distrust. Perseverance, however, triumphed over opposition ; and good sense, aided perhaps by national necessities, frowned down illiberality and persecution ; and a return to the old systems of cultivation, it is now universally admitted, would bring speedy ruin, if not absolute starvation, on the whole nation.

The United States have received their agriculture, as well as their codes of morals and laws, from what may well be designated the "Fatherland;" and although the revolution destroyed the sense of servile imitation and dependance that was before so operative, still the changes that were gradually going on in Great Britain were not without their influence on the farming systems of this. There was a material

difference, however, in the state and condition of the two countries, that produced important modifications in the action of these changes. There the population was great, and the quantity of land limited; and the necessities of that population enforced the adoption of the New Husbandry by the strongest of motives, the avoidance of starvation. Here land was abundant; and no serious evils, so far as regarded a supply of bread, could arise; the difficulty to be guarded against was only the deterioration of soil to which the action of the Old Husbandry subjected lands. Of course, little attention, on the whole, was paid to the matter by the great body of American farmers; and although it was well understood that the lands in the older settled parts of the country had lost much of their productiveness, and that the new system would remedy this alarming and increasing evil, still the mass persisted in their ancient habits, depending on migration to new lands in the West when those of the East should cease to reward the labours of cultivation.

That such a feeling was erroneous could be doubted by no reflecting mind; and, fortunately for the country, various causes combined to show the impolicy of such a course. Nature herself, in such an extended country as ours, has interposed checks to the general prevalence of such impressions. The evils and privations necessarily consequent on a removal from an improved district to an unimproved one are not without their influence; experience has also shown, that at great distances in the interior, al-

though all the necessities of life can be produced in abundance, there are comparatively few things that can be grown and forwarded to a distant market with the expectation of profit ; and it was also seen that, if the productiveness of old lands was not equal to that of new, the profits of cultivation were not, in the aggregate, so much inferior as at the first glance appeared. More than all, examples were not wanting of public-spirited and intelligent farmers, who, by adopting a course of husbandry that had succeeded so well abroad, proved most satisfactorily that worn-out lands could be restored to fertility by skilful cultivation ; that the progress of deterioration, so prevalent in the older states, could be checked ; and that the productiveness and consequent value of eastern lands could be so greatly increased as to render a resort to the virgin soils of the West unnecessary to those who were already in possession of eastern farms.

In bringing about this state of things, the names of Livingston, Powel, and Buel have an honourable pre-eminence. Others effectively co-operated ; but it may be said that to these men the high praise is peculiarly due, of calling the attention of the public mind to the advantages offered by the New Husbandry. . Unfettered by habits unfavourable to change, and unaffected by a blind veneration for ancient usages, so pernicious to advances in the cultivation of the soil, these men, and particularly the last named, entered upon the business of agriculture with a determination to avail themselves of whatever light

the experience of others had afforded ; and to apply to the cultivation of the earth the aids that science, and an increased acquaintance with the laws that govern the formation of arable soils, and the growth and improvement of vegetables, could give. In doing this, they necessarily adopted, with such modifications as our climate and country required, the improved husbandry of Britain and Belgium, and this with a success which has constituted a new era in the agricultural history and prospects of the United States. Objections have been made and opposition has been encountered, but in a less degree than was perhaps to have been expected, where established and ancient usages were assailed ; and the rapid extension of the principle and practice of the New System, and the general favour with which it is viewed where best understood, seem to indicate that the improved husbandry has gained a permanent and secure footing among us. Now and then, indeed, an individual may be found who persists in cropping his land according to the old method, until it is so reduced that the crops will not pay for the culture, when he abandons it to the recuperative powers of nature, and proceeds to repeat the same exhausting course on another section of his farm ; but such instances are comparatively rare ; and where the New Husbandry is not avowedly made the basis of the agricultural course, its influence may be traced in many ways, such as in the more general rotation of crops, the increased quantity of roots grown, and the consequent improvement in the numbers and quality of

the cattle and sheep of the country. It is to explain more fully the principles of this system of farming; the reasons which render it preferable to the older methods; and the general outlines of the practice to be pursued, that the following remarks of Judge Buel were penned, and from which the reader will no longer be detained.—*Editors.*

That system of agriculture known by the appellation of the *New Husbandry*, and the general principles of which we propose to point out, is *new* only comparatively, and in contradistinction to the *old* system, which is generally adopted in the first settlement of a country, in some degree as a matter of necessity; but which, being once established, is too often persisted in, with a reckless indifference to ulterior consequences, long after the necessity for it has ceased. This particularly happens in countries like ours, where new and virgin soils are continually inviting to emigration. What we denominate the new system has long been in operation in the valley of the Po, in Italy; indeed, it seems to have been practised there by the Romans in the meridian of their greatness, and in Flanders, and for the last half century in Great Britain; and it has, besides, for some time had many faithful followers in the United States. By the *old* system we mean that which, generally speaking, has impoverished, and is still impoverishing, the soil on our Atlantic border, and which is already causing indications of premature exhaustion and poverty in some portions of the new West. "As much vacant land as this district contains," says a late writer of East Virginia, "there is but little uncultivated [old fields] which, until enriched, will yield any clear profit. Therefore, Eastern Virginia, in its present state, is fully populated, and no increase can be expected *except from the im-*

provement of the soil, and the consequent increased means of subsistence." This remark will hold good in many portions of the older states. By *New Husbandry* we mean the *art* (and to many yet a *mystery*) of progressively increasing the fertility and products of our soils, and the intrinsic value of our farms; and of thereby providing the means of subsistence for our increasing population.

There are no universal rules for doing this. Much depends upon climate and soil, and upon the distance and demands of the market. The products of the soil, as well as the demands for them, vary generally with latitude. Grain, pulse, roots, and grass, are the natural products of higher latitudes; rice, cotton, and tobacco, constitute the staples of more temperate regions; while the productions of the torrid zone vary from both of those before referred to. Though there are no definite rules of practice that will apply to all, yet there are essential requisites to success that have a general application. These are capital, industry, and perseverance, and knowledge to apply them wisely with effect, under the varied circumstances of climate, soil, and market. Great success cannot be expected in any laudable undertaking without persevering industry; and in regard to knowledge, the laws which govern matter, upon which our labours are to be expended, are the same everywhere; and we are endowed with capacities for investigating, comprehending, and applying many of them in aid of labour, the profits of which are in a measure graduated by the intelligence which govern and directs it.

The New System of Husbandry, or the art of increasing the fertility and products of the soil, consists in,

1. Manuring.
2. Draining.
3. Good Tillage.
4. Alternating Crops.

5. Root Culture. And,

6. In substituting Fallow Crops for Naked Fallows.

Most of all these are necessary to good farming, according to soil, climate, and location. They are the distinguishing traits of the new husbandry; and as they are practised with more or less fidelity and judgment, in the same proportion are they likely to advance the condition of our agriculture, and to benefit the commonwealth.

These objects have become so hackneyed from our repeated attempts to illustrate their bearing upon the prosperity of our country, that we almost despair of interesting our readers by what we have to offer; but as we labour in our vocation, and deem the matter in question of deep interest to the farmer, we shall again throw our seed abroad, in the hope that at least a portion of it may fall upon the ground and yield a reasonable increase.

We intend to discuss the several subjects we have named, and shall endeavour to show the *why* and the *how* each of them tends to benefit the farmer, and to advance improvement in our husbandry. In the remarks we shall offer, it will be our endeavour rather to explain the principles upon which the new system is founded, and which have a common application, and to demonstrate their beneficial influence in husbandry generally, than to detail the minutiae of practice, which must, in some degree, ever be influenced and controlled by local causes.

* I. MANURING.

The first requisite to improving the fertility of the soil, is plenty of food for the crop which it is destined to nourish. The meal-chest must be occasionally replenished, or it will not long serve to supply the wants of the family. The kine must have daily her forage or her grain, or she will withhold her accustomed tribute of milk. The field, which yields an annual contribution to the husbandman, will be-

come steril if nothing is returned to replace the crops annually carried off. Philosophers have speculated for ages as to *What constitutes the food of plants?* Without recapitulating the various theories which have had their day upon this point, every farmer can readily respond to the question, from personal knowledge, that it is MANURE—vegetable and animal matters—which constitute the true food of farm crops. Mineral, fossil, and earthy substances may meliorate the soil, and increase its capacities for the healthy development and maturity of plants, or may impart wholesome stimuli to the organs of plants themselves; but vegetable and animal substances, after all, constitute mainly the elementary food of plants: crops on well-prepared grounds are always good when these, in a soluble state, are known to abound; and they are always defective or prove a failure when these are wanting. Farmers should hence regard manure as a part of their capital—as money—which requires but to be properly employed to return them usurious interest. They should husband it as they would their cents or shillings, which they mean to increase to dollars. They should economize every animal and vegetable substance on the farm; and when it has subserved other useful purposes, apply it, by mixing it properly with the soil, to the increase of the coming harvest; put it to interest, that it may return the owner its percentage of profit in grain, roots, and forage, and ultimately in the increase of meat, and in the products of the fleece and dairy. Every load of manure well applied to the farm will increase its products to the value of one dollar. The farmer, therefore, who wastes a load of manure, is as reckless and improvident as he who throws away a bushel of corn in the dearest times. Not only what is denominated manure, as the contents of the cattle and hog yards, and the cleaning of the stable (the amount of which may be greatly increased by stalks, weeds, vines,

and other vegetable matters), may be transformed into farm produce; but the rich earth of swamps, ditches, and waters, the leaves of the forest, urine, soapsuds, &c., are all convertible to a like use. He that will not feed his crops with manure, should not complain if his crops fail to feed him with bread.

As the grain, roots, and forage destined to feed the family and the farm stock require the best care of the husbandman to prevent waste and injury, so does the manure which is destined to feed his crops. Fermentation, if suffered to exhaust its powers upon it, materially lessens its value; the wind and the sun dissipate its virtues, and the rains leach it and waste its fertilizing powers. The same care given to the food of vegetables which should be given to the food of animals, will be richly recompensed in the increased product of the harvest.

Lime, marl, gypsum, and ashes are all beneficially applied to increase fertility under certain circumstances, which it is unnecessary for us here to particularize. Stiff clays are also benefited by the application of sand; light sands are improved by the admixture of clay; while both clay and sand are improved by the addition of marl or other calcareous substances.

If we contrast the common with the improved practice in regard to the management of dung, we shall readily see that the difference in preserving the fertility of the soil is incalculably great: enough to induce poverty in one case, and to enrich the proprietor in the other. Even the best class of our farmers, who are deemed judicious managers, seldom avail themselves of half the resources of fertility which their farms or neighbourhoods afford; not half that are put in successful requisition by the farmers of Great Britain and Flanders. Besides, what manure they do make is in general badly husbanded. They suffer the gaseous portions to waste in the air, instead of being absorbed by and enriching the soil,

and the liquid to course down hill to the highway or the brook. But what shall we say of the mass of our farmers? We have travelled hundreds of miles to the west, and seen great quantities of manure in the yards and about the barns (often the accumulation of years), seemingly considered by the owners rather as an encumbrance or a nuisance than as a source of fertility and of wealth. In the new system of husbandry, the farmer's profits are, in a measure, graduated by the quantity of manure he is enabled to produce from his farm. In the first number of the fourth volume of the *Cultivator*, we gave estimates, from high authorities, of the amount produced upon farms in Great Britain. Dr. Coventry, Agricultural Professor in the Edinburgh University, gives to each acre of straw four tons of manure manufactured by farm-stock. A Berwickshire farmer, quoted by Sir John Sinclair, obtained four cart loads, of 30 to 35 cubic feet each, from every ox wintered upon straw and turnips. Meadow-land is stated to produce from four to six tons of manure to the acre; and the available sources of fertility upon a farm are estimated to be sufficient to give a full supply of manure once in every course of the four-year system of husbandry. Arthur Young, with six horses, four cows, nine hogs, and suitable litter, made 118 loads of dung, 36 bushels each, in a winter. Cattle fed with turnips are computed to make double the manure that those do which are fed on dry fodder alone; and an acre of turnips, with an adequate quantity of straw, has produced 16 cart loads of dung. It will be readily perceived, that by this mode of arrangement, ample means are provided for keeping up the fertility of the soil when put under a four-shift system of husbandry.

What, now, is the common quantity of manure under the old system? Taking our state or our country at large, we are confident the average quantity which is judiciously applied will not amount to

one load an acre, and we are doubtful if it will amount to half a load. Can it be wondered, then, that, under such reckless management, of returning to the soil only a quarter or an eighth of what we take from it of the food of plants, our lands should continue to grow poor till they no longer yield a reward to culture? The cultivated lands in this state are estimated at eight millions of acres. On the supposition that one half of them is appropriated to tillage and meadow (and this is a low estimate), we might produce and apply annually, under the new system of husbandry (and we ought to do so), sixteen million tons of manure, worth to the country, at a low computation, sixteen millions of dollars; whereas we now produce, under the old system, certainly not more than four million tons, thereby suffering an annual loss, independent of the certain and constant diminution in the product and value of our lands; of twelve millions of dollars in the single item of manures! This is not a visionary speculation; it is sober truth; and we ask any intelligent man to show, from facts, a less unfavourable conclusion.

We will merely remark here, in regard to the application of manures, that, if used in an unfermented state, they should be buried with the plough, and applied to a hoed or autumn-ripening crop; if used in a rotted state, they may be blended with the surface, and applied to a summer-ripening crop. We will give two reasons for this practice. Manure fertilizes in two ways: by the gaseous matters which are evolved in fermentation, and which *rise*; and by liquid matters, which *sink*. If used before it has parted with its gases, manure should be buried, that the incumbent soil may imbibe these fertilizing elements. If the manure has been rotted, it has parted with its gaseous matters, and all its remaining fertilizing properties are liable to be carried down by the rains; hence this latter may be deposited near the surface

Again, fresh manures, even in a liquid form,* induce a rank growth of *herbage*; but they do not produce good plump *seed*. Hence, if applied to common small grains, they cause a great growth of *straw* at the expense of the *grain*: fermentation being most rapid at midsummer, when the seed, and not the straw, requires the food. But the autumn-ripening crops, as corn, &c., are in that state at midsummer which requires strong food to perfect their stalks and leaves; and the fermentation of the manure has subsided before the *grain* matures in autumn. Fossil manures, as lime, marl, gypsum, are applied upon the surface or buried superficially, because their disposition is to settle down, and they give off no gaseous food.

Individuals, it is true, are but units; yet the aggregation of units makes millions, and the aggregation of individuals constitutes nations. We should all act as though individual example had an imposing influence upon the whole. In the matter which we have just discussed, every farmer may be assured that, by adopting our suggestions, he will unquestionably promote his own interest, and, by his example, benefit society.

Having shown that manures are indispensable to good husbandry; that they constitute the food of plants; and that they may be greatly increased by good management, we proceed now to the next requisite in the new system of husbandry, viz.:

* Col. Le Courteur (see Farmer's Magazine) tried stable manure and liquid manure, the latter diluted, upon his wheat. The grain tillered much, or gave a great growth of straw and grass; but the product in grain was diminished. When the liquid manure was applied a second time, by being poured upon the growing wheat, the straw was very rank; but the plants produced only a few ears of wheat, and those were very defective in grain.

II. DRAINING.

Few improvements of modern date are likely to become more beneficial to the northern section of the union than systematic draining. In the first place, it will reclaim and render highly productive large tracts of land, which are now unproductive of anything useful, by reason of the water which constantly covers or saturates them. In the next place, it will improve the lands that are wet, and render them far more manageable and productive in grain, roots, and the more nutritious grasses, by carrying off the superfluous water. When there is an excess of moisture in the soil, ploughing can be only imperfectly performed, and not until late in spring: the benefit of manure is thereby lost, and the cultivated crop is light, and more subject to vernal and autumnal frosts than it would be if the land were laid dry.

The soil, in regard to vegetable nutrition, may be compared to the animal stomach, which digests; and the spongeoles or rootlets of the plant, to the lacteals of the animal, which absorb, and take up, and propel the digested food to the elaborating organs (the lungs in the one and the leaves in the other), where this food undergoes its last preparation, and is fitted to become a part of the organic matter of the animal or vegetable. We all know that when the animal stomach is from any cause out of order, so that the food taken into it is not properly digested, the subsequent processes of nutrition are arrested; and if the cause be not removed, the animal sickens, and ultimately dies. So with the soil. If the vegetable matter deposited there to feed the crop be not decomposed or rotted, and resolved into a liquid or gaseous form, so that it can be taken up by the spongeoles, the plant will become sickly and unproductive, and the processes of healthy nutrition be at a stand. Hence the accumulation of vegetable matters in swamps, marshes, and other localities habitu-

ally saturated with water, and their great fertility when thoroughly drained and exposed to the influence of all the agents of putrefaction; and hence the necessity of draining the wet grounds on our farms before we can expect to make them profitable by culture. Coarse and aquatic plants, it is true, do grow in wet grounds and in water; but few of the cultivated crops, however, are found to thrive where the ground is not dry and permeable to the influence of the sun and atmosphere.

It is not enough that the surface of a soil be dry: it must be so to the depth to which the roots of plants penetrate for food, at least fifteen to eighteen inches, to ensure a healthy growth of vegetation. It is the extremities of these roots which gather the food, and which are constantly elongating while the plant grows; and if roots extend into a wet stratum, the food which they take up is either too much diluted, or not otherwise adapted to a healthy vegetation. Nor is this all: the water injures or destroys the fibrous parts of the roots, and unfits them for the performance of their functions.

We have published ample directions in the Cultivator for the various modes of draining, and have pressed upon the notice of our readers the importance of this branch of improvement. Yet we have a few remarks to offer here on the particular advantages which under-drains possess over open drains in certain situations.

The object of draining being to carry off the surplus water before it saturates the surface soil, impedes early tillage, and injures the crop, it should be our first care to ascertain the cause of wetness, and where the deposite or fountain is which is the source of the evil. Where water rises through the subsoil or lower strata, in spouts or springs, as well as where, falling upon a flat surface, it collects and reposes upon an impervious subsoil, under-drains are decidedly best, at least to collect the surplus waters

into a main open drain. They are not only best because the most efficient, but they are the most durable, most economical, and waste no land.

They are the most efficient. They can be made to reach, by digging and boring, the depôt of water or water stratum, and thus to carry it off before it approaches the surface, or pasture of plants. Open drains do this but seldom or but imperfectly, because they are not often carried deep enough, and are continually liable to obstructions, which impair their efficacy.

They are most durable. An under-drain, laid in the most approved mode, with stone or tile, will last an age, if not a century. Whereas open drains are but temporary in their beneficial effects without periodical repairs:

They are the most economical. A good under-drain generally costs no more than a good open drain, which effects a like purpose, and probably not so much, as the former can be carried down with nearly perpendicular sides, while the latter must be dug with sloping banks, and must embrace a width of surface corresponding with its depth: the deeper the drain, the broader it must be at top. The cost of the stone or tile is in a manner counterbalanced by the difference in excavation. And, when completed, the under-drain will require no annual repairs, while the open one will be a constant drain upon the labour of the farm, requiring bridges, and frequent scouring and cleaning. If under-drains cost sometimes the most, they are unquestionably the cheapest in the end—provided they are well made.

Under-drains waste no land. They may be multiplied at every twenty feet, as they sometimes are upon stiff flat clays, without excluding the plough or the scythe from a foot of the surface. Open drains, on the contrary, if made of suitable dimensions, require a breadth of three or four feet, and the plough is excluded from as much more at their sides.

We draw no comparisons, nor do we need any, between the products of a field of habitually wet soil, or the trouble and expense of managing it, and the same field after it has undergone a thorough drainage and amelioration. Every farmer, we presume, has noticed the vast disparity in both. If there is one to whom it is not familiar, let him make the trial, and he will be astonished at the result, and at his own want of forethought in not having made it before.

III. GOOD TILLAGE.

When thorough draining has been effected upon lands to be benefited thereby, there is another operation which is calculated to aid in the efficiency of manures and in the increase of farm products. This is good tillage—a perfect pulverization of the soil, and the keeping it free from weeds, which retard the growth of the crop, and rob it of its food. Good tillage is important not only as it serves to exterminate weeds, to facilitate the digestion of vegetable food, and to mix and to incorporate this food with earthy elements; but as it breaks and mellows the soil, and enables the roots of plants to range freely in search of this food. Every farmer must have observed, that where tillage has been but imperfectly performed, as is sometimes seen about stumps and rocks, and near fences, the crop is comparatively feeble and light. This cannot be owing to the poverty of the soil, because the plough, as it rises to the surface in these places, deposits and accumulates there the best and finest mould of the field. The feebleness of the grain arises from the imperfect tillage which those spots receive. The old practice of carrying the main furrows to the extremity of the field, and of dispensing with head-lands, is a bad and slovenly one, and ought to be everywhere exploded. The cut and cover practice is still worse, as it leaves one half, and sometimes two thirds of the soil undisturbed by

the plough. We remember well, that when we followed the plough in our boyish days, and knew nothing of the philosophy of ploughing, our aim was to go over much ground and show a ploughed surface, regarding the complete breaking up of the soil as of minor importance. There will always be a great many *boys* at the plough until the importance of *good* ploughing is better understood. Good ploughing consists in breaking or turning every inch of the soil; and good tillage requires that the harrow and roller should finish, if the plough has failed to effect it, a complete pulverization of the soil. A green sward becomes pulverulent as the roots of the grasses decay, and is best without a second furrow, because this turns again to the surface, to the wasting influence of the sun and winds, the vegetable matter buried by the first ploughing, and which, if left buried, would contribute largely to the sustenance of the crop. As the roots of the grasses decay, the soil becomes loose and porous, and is permeable to moisture, air, and heat. Hence the advantage of fallow crops over naked fallows, and of depositing seeds upon the top of a clover lay: the sod then imparts fertility to the soil, while it enables it to derive important advantages from the co-operation of external agents.

Good tillage requires that, wherever it is practicable, as in the culture of drilled and hoed crops, the surface soil should be *kept* clean and pulverulent while the crop is growing, for the same reason that the soil is required to be made so before depositing the seed, viz., to facilitate the decomposition of the vegetable food, to stimulate the organs of the plants, and increase the growth and product of the crop. There is no better expedient for preventing the evils of drought upon a soil, than that of keeping the surface mellow and clean. Atmospheric air and dew, both always charged with the nutritive food of plants, settle into such a surface as into a sponge, and impart

to the roots of plants both aliment and stimuli. Dews falling *upon* a hard surface are evaporated by the first rays of the morning sun ; but they *penetrate* a loose surface, and moisten and fructify it. Hence the high repute of the drill husbandry, which enables the cultivator to keep his crops clean, and the surface of his soil mellow and open.

Good tillage has reference to *depth* as well as quality of tilth. " There are many plants, the roots of which are found at fifteen to twenty and even thirty feet under ground—sainfoin and lucerne, for instance : even red clover will strike down to nearly three feet if the soil be a fertile loam ; and some of our commonest vegetables, if it be friable or sandy, push their tap roots to about the same depth. The roots of wheat will penetrate as far as eight inches into the earth ; and when sown on the crown of ridges, they have been found at the depth of twelve. We may therefore assume the depth of twelve inches as the utmost vegetable limit of corn land. Provided the soil be open and fertile, the nearer its depth approaches to twelve inches, the greater number of plants may it therefore be supposed capable of furnishing with support."—*Brit. Husb.*, vol. ii., p. 49, 50. Soils should be ploughed as deep as the substratum will admit, at least once in a course of crops, if this can be reached with the force of an ordinary team ; and when the surface soil is superficial, it should be deepened, as fast as fertility can be imparted, by turning up, at suitable intervals, some portion of the subsoil. The atmosphere imparts to this apparent inert earth more or less of the elements of fertility. Baron Von Voght increased vastly the value and products of his farm, by increasing the depth of its mould (krume or vegetable pasture), in this way, in the period of sixteen years, from three to fourteen inches. Land that in the outset would not yield him fourteen bushels of rye to the acre, was by this mode of improvement brought to

yield twenty-four bushels of wheat; and the improvement was not confined to a part, but extended to the whole farm, comprising some hundred acres. The reader is referred for a detail of these improvements, and an account of the baron's excellent system of husbandry, to No. 1, vol. ii., of the *Cultivator*. And it has just been announced to us in a foreign journal, as one of the greatest improvements of the age in rural affairs, that a plough has been invented which breaks and pulverizes the subsoil without turning it to the surface. Its advantages to agriculture are thus described by Le Fever in *Loudon's Magazine* :

"Smith's subsoil plough seems calculated to render the most sterile and unproductive soil fertile and profitable. Mr. Smith's most ingenious invention, by breaking the subsoil without bringing it to the surface, renders it pervious to both air and water. The same chymical changes which take place in a fallow, owing to its exposure to the action of the winds and rain, are thus brought into operation in the subsoil, while the surface soil is in the ordinary course of cropping; and when, after a few years, by a greater depth of ploughing, the subsoil is mixed with the upper soil, it is found to be so completely changed in its nature as to be capable of producing every kind of corn."

Jethro Tull and his disciples maintained that the great secret of inducing fertility consisted in minutely dividing and pulverizing the soil by culture; and John Taylor, the arator of Virginia, and an excellent practical as well as scientific farmer, considered the atmosphere as the great storehouse of vegetable food, where this food exists in a gaseous form. The good tillage we advocate embraces all the advantages of Tull's and Taylor's theories, without lessening the importance which we attach to barn-yard manure.

The deep ploughing of dry land, or the breaking

up and stirring of the subsoil, promotes fertility by increasing the power of the land to absorb water by cohesive attraction. "The power of soils to absorb water from air," says Davy, "is much connected with fertility. This power depends in a great measure upon the state of division of its parts; the more divided they are, the greater their absorbent power. When this power is great, the plant is supplied with moisture in dry seasons; and the effect of evaporation in the day is counteracted by the absorption of aqueous vapour from the atmosphere, by the interior parts of the soil during the day, and by both the exterior and interior during the night." The soil imbibes caloric earlier in the spring, and retains it later in autumn, in proportion as it is dry and deep; a matter of high consideration in cold climates, where the length of the summer scarcely suffices to mature the crops. The quality and dryness being the same, a soil is fertile and durable nearly in proportion to the depth of the tillage which it receives: six inches giving nearly double the pasture for plants that a three-inch stratum does; and a twelve-inch tilth greatly exceeding in productiveness one of only six inches. Von Thäer calculates this difference in proportionate degrees in lands which contain a vegetative stratum of soil of four, six, eight, and twelve inches in depth, provided, of course, that it be all of equal quality. If, therefore, each seed were to produce a plant, it would follow that ground which contains eight inches of depth of fertile mould might be sown with double the quantity of that which consists of only four inches. He however admits, that this principle cannot be carried to that extent, because the action of the atmosphere must ever afford that superiority to the surface, that a cubic foot of mould, if divided into two square feet, will always produce a greater number of plants than if the seed were sown upon one foot superficial; but he assumes the value of the land to be increased in the

proportion of eight per cent. for every inch of mould beyond the depth of six to ten inches, and to be diminished in the same proportion, from six to three inches, in soils of a thinner staple.—*Principes Raisonnés d'Agriculture*, vol. iii., p. 138, s. 735. These considerations have been hitherto but little regarded in our practice, though they constitute an important feature in the new system of husbandry.

Good tillage demands also the extirpation of weeds. Every plant growing upon a soil tends to impair its fertility, and weeds generally more than cultivated crops, because they are commonly the most hardy and the greatest consumers of vegetable food. They are particularly prejudicial to crops in a dry season, as they exhaust the soil of moisture in proportion to their superficies, or the surface of their stems and leaves; some species transpiring their weight of moisture every twenty-four hours. The drill culture and deep ploughing both lessen the evil of weeds; the first tends to destroy them, and the latter to bury their seeds so deep as to prevent the plants getting ahead of and choking the young crop. Clean tillage has been too much neglected in our practice. Many crops are diminished a fourth, a third, and even a half by pestiferous weeds, which are permitted to seed and propagate upon the land.

Good tillage requires good implements, and these to be kept in order, that the farm-work may be economically done, and well done, and done at the proper time. The disparity between the old and the new implements of culture is great, not only in the time employed, but in the manner in which they do the work, and in the power which is required to perform it. The old plough requires a four-cattle team and two hands to manage it; and the work ordinarily was, after all, but half executed. The improved plough is generally propelled by two cattle, requires but one man to manage it, and, when properly governed, performs thorough work. Harrows and other

implements have undergone a like improvement. Besides, other new implements, which greatly economize the expense of tillage, are coming into use, as the roller, cultivator, drill-barrow, &c.; so that a farm may now be worked with half the expense of labour that it was wont to be worked with forty years ago, and better worked withal. Mind, likewise, where it is put in requisition, and enlightened by science, is doing ten times more in aid of agricultural labour than it formerly did.

If we revert to old, and, in most cases, to present practices, we shall perceive that thorough tillage has not been sufficiently attended to. Our implements have been defective, and the manner of using them often imperfect. Good ploughing is all-important to good farming, and still there is no labour upon the farm that has been more imperfectly performed than this has generally been. Light soils seldom require but a single ploughing for the seed, if well executed; but, if badly executed, two ploughings are too little. Our implements are, however, daily improving, the importance of good tillage is becoming more and more apparent, and our practical knowledge is increasing.

IV. ALTERNATION OF CROPS.

Alternation of crops is an essential requisite in good farming, and forms a part of it wherever it is considered to have arrived at any degree of perfection. It is this which gave to Flemish husbandry a pre-eminence over that of every other country, long before the new system had obtained a footing in Great Britain. It is principally this which has converted the county of Norfolk, and other districts in England, from the poorest and least productive into the most wealthy and populous portions of that country. It is this alternating system which has contributed, in a great measure, to the astonishing improvements recently made in the agriculture of Scotland;

and it is this which constitutes the pioneer marks of improved husbandry in our own land.

In the preceding sections we have suggested the importance and the modes of making our lands rich and dry, and of subjecting them to good tillage. Let us now inquire under what method of management they are likely to make us the largest returns, without diminishing their intrinsic value.

It is palpable to every observing farmer, that the old mode of permanently dividing our grounds into meadow, plough, and pasture lands is a most wretched system of exhaustion, both to the land and its occupant. The tillage ground deteriorates with the scanty manuring it gets, till it ceases to make a return for the expense of culture, or till it is thrown into old fields or commons. The meadow-grasses run out, mosses and weeds come in, the soil becomes too compact and impervious for the ready admission of the great agents of vegetable decomposition and nutrition, and the free extension of the roots of the finer grasses; and as all is carried off, and little or nothing brought back, the soil is annually becoming poorer and less profitable. The pasture is the only portion of such a farm that is improving; and even in this, bushes, brambles, and noxious weeds are too often permitted to choke and destroy the better herbage.

It is equally apparent, that we cannot take two or more arable crops of the same kind from a field in successive seasons without a manifest falling off in the product. The reason of this may be found in an immutable law of nature, which has provided for each species of plants a specific food suited to its organization and its wants. Thus some soils, for instance, will not grow wheat, although abounding in the common elements of fertility, and although they will make a profitable return in other farm crops, in consequence of their being deficient in the specific food required for the perfection of wheat. One fam-

ily or species of plants requires a different food from that which another family or species requires ; and it seems to be also a law of nature, that what is not essential to one family or species shall be left in the soil, or returned to it through the excretory organs of the growing crop. Of course, the specific food for any class or species continues to accumulate in the soil, the general fertility being kept up, till the return again to the field of this particular crop. Thus it is supposed to require ten or a dozen years for the specific food of flax to accumulate sufficiently for a second crop after one has been taken from a field. Even the specific food of clover becomes exhausted by a too frequent repetition of it in the same field ; it being found necessary, in Norfolk husbandry, to substitute for it, in every other course of crops, other grass seeds, so that this may not be repeated oftener than once in eight years. There are exceptions to the rules of practice which these laws inculcate. Some soils seem natural to wheat, others to oats or grass ; and successive crops of these are taken without apparent diminution of product. Yet it is better to regulate our practice by general laws than by casual exceptions. In the cases noted as exceptions, there is probably so great an accumulation of the specific food of the particular crop, that it has not been *exhausted*, though it evidently must have been *diminished*. It is in accordance with the natural laws we have noticed that the grasses in our meadows change ; that the timber trees of the forest alternate—new species springing up as the old ones decay or are cut down ; and it is in accordance with these laws that the alternation of crops has been adopted in all good farming.

To simplify and render the subject still more plain, the generality of tillage crops have been grouped into two classes, differing essentially in their character, culture, and exhausting influence upon the soil. These two classes are denominated *culmiferous* crops

and *leguminous* crops. The first is so named from *culm*, the stalk or stem of grains or grasses, usually jointed and hollow, and supporting the leaves and fructification. Our intention here is not to embrace the grasses. Culmiferous crops are termed robbers, or exhausters of the soil. This class includes wheat, barley, oats, rye, Indian corn, tobacco, cotton, &c. These are particularly exhausting during the process of maturing their seeds. If cut green, or when in blossom, they are far less so. Leguminous crops, literally, are peas, beans, and other pulse; but here the class is intended to embrace all which are considered as ameliorating or enriching crops, as potatoes, turnips, carrots, beets, cabbages, and clover. These latter are not only less exhausting than the culmiferous class, as most of them do not mature their seeds, and all, on account of their broad system of leaves, draw more or less nourishment from the atmosphere; but they improve the condition of the soil, by dividing and loosening it with their tap and bulbous roots. For these reasons they are called ameliorating or enriching crops; and as they generally receive manure and drill culture, they are peculiarly adapted to enrich and fit the soil for the culmiferous class.

Good husbandry enjoins that culmiferous and leguminous crops should alternate, or follow each other in succession, except when grass is made to intervene; and it matters little which crops are selected from the two classes. The good judgment of the farmer may here be exercised to determine which are likely to be to him the most advantageous. It may be proper, however, to note two exceptions to this rule; Indian corn may, under certain contingencies, be made to precede or follow another grain crop to advantage, and oats may sometimes be profitably sown as a fallow crop, to supersede a naked fallow, preparatory to a crop of wheat or rye. Some soils, it is true, are more favourable to one kind of crop than another; as, for instance. calcareous clays and

strong loams are better adapted to wheat than silicious gravels and sands; while the latter are better fitted to carry Indian corn, turnips, and clover, than clays. In other respects, such as the exhaustion of the ground, it is a matter of little interest with the farmer what crops of each class are chosen to alternate with each other.

Farm stock seems necessarily to be embraced in the system of alternate husbandry. Cattle convert the bulky products of the farm into meats, butter, cheese, &c. These concentrated products are carried to market at comparatively trifling expense. Cattle also furnish labour, and manufacture into manure the straw, stalks, and other offal and litter of the farm, necessary to keep up its fertility; for without manure the soil will grow poor, and its products annually diminish. Manures, we repeat, are the main source of fertility to our soils, and the substantial food of our crops. Our supply of these will depend on the amount of stock we feed upon the farm; and the amount of stock we can keep profitably will again depend upon the fertility of the soil, and the consequent abundance of its products. So that grain and grass husbandry, and cattle husbandry, are reciprocally and highly beneficial to each other. It is maintained by practical men, that grounds under good tillage will yield as much food for cattle, in roots, straw, &c., as the same grounds would yield in grass, thus leaving the grain as extra profit.

Clover, which we have classed with ameliorating crops, merits a farther and distinct notice. We find that clover was cultivated at an early period by the Flemings, and constituted an important item in their excellent system of husbandry. Its introduction into Britain is of comparatively modern date. Forty years ago its culture may be said to have commenced in the United States; but its progress was slow till within the last few years; and even now, large portions of our country are practically ignorant of its

improving and enriching qualities. Its benefits have been great wherever it has been introduced, accompanied with the use of gypsum; and the two combined have hitherto been the principal basis of good husbandry. But their benefits are capable of being far more widely extended. We consider the use of clover for cattle food, great as it is, but of secondary importance to the farmer; its most profitable use being to feed crops and ameliorate the soil. No green crop is so serviceable for the latter purposes; and we are satisfied from experience, that the practice of habitually sowing it with small grains for these objects, where it is not intended to stock with grass-seeds, is an excellent one on all grounds adapted to its growth. Upon this subject we quote as follows from Chaptal:

“Artificial grass lands [constituting a part of the alternating system, and in contradistinction to natural and permanent grass-lands] ought now to be considered as forming the basis of agriculture. These furnish fodder, the fodder supports cattle, and the cattle furnish manure, labour, and all the means necessary to a thorough system of cultivation.”*

V. ROOT CULTURE.

The advantage of root culture to the soil in the alternating system has been already briefly alluded to; but this culture possesses higher claims to our notice than the bare influence it has in ameliorating the soil: it constitutes, otherwise, a valuable source of fertility to the farm and of profit to the farmer. It trebles the amount of cattle-food, and doubles the quantity of manure. Potatoes constitute a great portion of the bread and meat of the Irish peasantry,

* See Chaptal's *Chymistry applied to Agriculture*, embracing also the most valuable parts of Sir H. Davy's work on the same subject, and an admirable *Treatise on the Use of Lime as a Manure*, by M. Puvis, with introductory remarks by Professor Renwick, published by Harper & Brothers, 1839.

feed their cows, fatten their pigs and poultry, and form an article of foreign commerce. The turnip has long been made an important crop in German husbandry. The beet has become so important in France as to engage the attention of her scientific men and of the government in extending its culture. The field culture of the carrot has long been profitably pursued among the Flemings. And as it regards Great Britain, whose example in husbandry is deservedly held up for our imitation, her best writers on rural matters, and her best practical farmers, all concur in saying, that her pre-eminent success in modern husbandry has been in a great measure owing to the introduction of turnips as a field-crop in that island. We will here quote a passage from the New Edinburgh Encyclopædia in corroboration of what we say:

“The introduction of turnips into the husbandry of Britain occasioned one of those revolutions in rural art which are constantly occurring among husbandmen, and, though the revolution came on with slow and gradual steps, yet it may now be viewed as completely and thoroughly established. Before the introduction of this root, it was impossible to cultivate light soils successfully, or to devise suitable rotations for cropping them with advantage. It was likewise a difficult task to support livestock through the winter and spring months; and as for feeding and preparing cattle and sheep for market during these inclement seasons, the practice was hardly thought of, and still more rarely attempted, unless where a full stock of hay was provided, which only happened in a very few instances. The benefits derived from turnip husbandry are, therefore, of great magnitude: light soils are now cultivated with profit and facility; abundance of food is provided for man and beast; the earth is turned to the uses for which it is physically calculated; and, by being suitably cleaned with this preparatory crop, a bed is provided

for grass seeds, wherein they flourish and prosper with greater vigour than after any other preparation."

Few of our readers are probably apprized of the fact, that English beef, so highly extolled, and of which John Bull so vauntingly boasts (and perhaps no people have better beef), is mostly winter-fattened upon turnips and straw, very little hay being used. This will account for the high value which the turnip culture has obtained in Great Britain.

All the above-named roots are well adapted to our soils and climate ; and where their culture has been undertaken with spirit and managed with judgment, success has been certain. The great objection to this culture has been, the labour which is required to secure these roots from the frosts of winter ; and yet the labour and expense required for this purpose are perhaps no greater than we expend in securing our grain and forage, if they are as great. Where cellars are not at command or not adequate, these roots may all be securely preserved in pits in dry situations, due precaution being had to covering and ventilation. It is the novelty of the labour, rather than the amount, and a want of practical knowledge and confidence of success, which intimidate and deter us. We *do* save our potatoes, and we *can* save other roots in like manner. Assuming the average product of hay at a ton and a half to two tons per acre, and of beets and ruta бага at 600 bushels ; and allowing a bushel and a half of the latter (90 lbs.) to be equal, for farm-stock, to twenty pounds of hay, an acre of the roots will go as far in the economy of feeding as nearly three acres of meadow, to say nothing of the tops, which will go far to repay the extra expense of cultivating the roots ; while the ground in the one case is ameliorated and improved, and in the other impoverished. These roots, besides, may be used as a substitute for grain for working cattle and for pigs. The three acres of grass gives less than 9000 pounds to the manure-yard, while

the one acre of ruta бага or beets gives 36,000, or four times as much as three acres of grass-land.

VI. SUBSTITUTION OF FALLOW CROPS FOR NAKED FALLOWS.

Fallowing is the mode of preparing land (generally greensward) by ploughing it a considerable time before it is finally ploughed for wheat and rye, to be sown in autumn. A naked fallow is such as receives no intermediate crop between the first ploughing and seeding for the main crop; a fallow crop is one that intervenes between these two processes. In England, fallows are generally broken up in autumn, receive repeated ploughings during the ensuing summer, and are sown in autumn, or cropped with turnips, and sown the third year with barley. In the United States, naked fallows are more often broken up in June or July, receive repeated ploughings, and are sown in September. For fallow crops, old swards are broken up in autumn, and clover lays in the spring; the first receive one or more ploughings in the spring, and, immediately after, the seeds which are to constitute the fallow crop. Clover lays receive the fallow crop upon the first furrow, or with but one ploughing. Naked fallows, in England, occupy the ground a year; and if they are sown with tares or rye, as they often are, to be fed off in the spring, they are termed bastard fallows. With us, fallow grounds lay idle but part of a season.

There is no agricultural writer of note, and very few good farmers, who now contend for the propriety of naked fallows, except on stiff clays or wet grounds, which can only be worked in the summer, and this for the single purpose of cleaning such soils from root-weeds. We subjoin two or three quotations in corroboration of this fact:

“Fallowing was necessary as long as grains only, all of which exhaust the soil, were cultivated; during the intervals of tilling the fields, a variety of

herbs grew on them, which offered food for animals, and the roots of which, buried in the soil by the plough, furnished a great part of the necessary manure. But at this day, when we have succeeded in establishing the cultivation of a great variety of roots and artificial grasses, the system of fallowing can be no longer supported by the shadow of a good reason. The ease with which fodder may be cultivated, furnishes the means of supporting an increased number of animals; these in their turn supply manure and labour; and the farmer is no longer under the necessity of allowing his lands to be fallow."—*Chaptal*.

"It is already acknowledged, that it is only upon wet soils, or, in other words, upon lands unfit for the turnip husbandry, that a plain summer fallow is necessary."—*New Edinb. Encyc.*

"As there is only one good reason for fallowing, namely, to destroy weeds; and as this can be done full as well by fallow crops, that is, by crops that require frequent hoeing and cleaning during their growth, no fallowing ought to be permitted in a good system of agriculture."—*T. Cooper*.

We have quoted in the last number of the fourth volume of the *Cultivator*, the practical example of the late Chancellor Livingston, showing an increased profit of nearly two hundred per cent. resulting from substituting fallow crops for naked fallows, besides an increase of cattle-food, upon one hundred acres of arable land, of sixty-five tons, and the manure from sixty-five cattle which this extra food would keep. In page 88 and 104 of the same volume we have given Greig and Beatson's systems of managing clay farms, in which naked fallows are dispensed with, and the profits doubled by substituting fallow crops. These evidences might be greatly multiplied were it necessary; but we have so many examples and illustrations in every quarter of our country, that he who will may profit by his own

observation and inquiry. The expense of the summer fallows may be saved, and a very valuable extra crop obtained, by the new mode of practice.

In regard to what are the best fallow crops, much will depend upon the soil. Upon stiff clays, oats and peas are recommended, which, although not cleansing crops, succeed well upon an undecomposed sod. Potatoes also answer well; and if they do not ripen early enough for winter grain, they prepare the ground remarkably well for spring wheat. Clays should be broken up in autumn if intended for a fallow crop, that the frost may break up and pulverize the soil, and that the decomposition of the sod may commence earlier in the spring. The late John Lorrain, of Pennsylvania, who was an excellent practical farmer as well as a gentleman of science, recommended that, in ploughing for grain after a fallow crop, the furrow should be superficial, so as not to turn up the vegetable matter of the sod, but to leave it where the roots of the ensuing crop will most need it. Upon light soils, Indian corn, beans, peas, potatoes, turnips, or other roots, constitute good fallow crops, particularly if preparatory to spring wheat and barley.

We have now gone over the ground we proposed to examine. We have endeavoured to explain what we mean by the *New System of Husbandry*; to develop its principles, and to show WHY and WHEREFORE it is superior to the old or common system. We have, we think, demonstrated,

1. That the *fertility* of the farm may be kept up and augmented by the manures it can be made to furnish;
2. That the *condition* of the farm may be much improved by thorough draining;
3. That the *capacities* of the farm can be fully developed only by good tillage;
4. That the *profits* of the farm are materially aug-

mented by alternating crops, and a system of mixed husbandry ;

5. That the *cattle-food* and *manures* of the farm, the main sources of fertility and profit, may be greatly increased by the cultivation of roots ;

6. That the *labours* of the farm may be economized, and its products farther increased, by substituting fallow crops for naked fallows.

And, finally, that, were these several improvements generally introduced into our agricultural practice, they would render our farmers more independent, bring industry into better repute, and essentially promote the prosperity and happiness of all classes of society.

There is no doubt that most of our impoverished farms may, under the system of management we have been describing, and with the auxiliary and available aid of lime, marl, gypsum, swamp-earth, ashes, &c., be progressively improved in fertility, and rendered productive and profitable. We have the strongest grounds for this belief. The like has been done in Great Britain, in the Netherlands, in Germany, in France. Worn-out lands have there been renovated and rendered very valuable. They have been so in the United States. They are now undergoing this improvement in the valley of the Hudson. The partial introduction of the New Husbandry has, within a few years, doubled the surplus agricultural products of most of the counties between Albany and New-York ; and yet the improvement has there been but begun.

The same management which our subject suggests for the renovation of old lands, will perpetuate the fertility of those which have been newly brought under culture. Although the soils of the great secondary formation of the West will not so soon become impoverished as those of primitive and transition formations ; and although fertility may be more readily restored to them when they have become ex-

hausted, yet the same general laws govern in all. Deterioration will progress in all soils which are cropped, unless there is returned to them, in the form of manure, some equivalent for what is being constantly carried off.

RULES AND SUGGESTIONS IN HUSBANDRY.

We shall now proceed to give some rules and suggestions in husbandry, of general application, to enable farmers, and particularly novices in the art, to judge of the character and qualities of their soil, its adaptation to particular crops, the causes of its deterioration, and the means of perpetuating its fertility; or, if worn-out or impoverished, of restoring it to its pristine vigour. The facts and suggestions which we shall give are the results of our reading and our practice; and though they may not in all cases prove to be sound, we think that in the main they will be found to be so.

The essential elements of a good soil are sand, clay, lime, and vegetable or organic remains. Magnesia, iron, and other matters are often found blended with the preceding; but, in general, they are not considered as exercising a great influence on its fertility, except they exist in more than ordinary proportions.

2. The presence of sand, clay, and vegetable matter in a soil is deemed essential to all crops; and lime, in some of its forms, is considered indispensable to many crops, and particularly to wheat.

3. The presence of sand and clay is readily detected by the experienced eye; that of vegetable matter by the consistency and colour of the soil; and that of carbonate of lime by drying a portion of soil, and pouring upon it some acid having a stronger affinity for the base than the carbonic acid, as muriatic acid, or even strong vinegar: if it contains lime, effervescence will ensue; and the proportion may be ascertained by very simple modes of analysis

4. Sand is the most essential of the earthy ingredients of a soil, and generally most preponderates; though where it exceeds eighty per cent. the soil is virtually barren. Clay is next in proportion; but where it is in excess, the soil becomes stubborn, is hard to be worked, and more or less unproductive. Lime exists in the smallest proportion; and from two to ten per cent. of this in the upper or tillable stratum is deemed sufficient for all the purposes of profitable husbandry. When in excess, it induces barrenness. A calcareous soil is considered conducive to the health of the neighbourhood. Organic matter, that is, vegetable or animal, is indispensable in a soil. It is the food of plants. Yet even this is frequently found in too great quantity, as in peat earth, which is often infertile till mixed with earthy ingredients, or brought in contact with fermenting materials.

5. When an excess of sand, clay, lime, or vegetable matter is discovered to exist, the fault may be remedied by an admixture of the deficient element or elements. When one of the elements is found wanting, it may be supplied by art. Thus a load of clay upon an arid sand, or a load of sand upon a stubborn clay, or a few bushels of lime, or marl, or ashes upon a soil deficient in calcareous earth, are often of more ultimate service than a load of barnyard dung. But,

6. Both dung and lime are consumed by the growing crops; and, if the crops are carried off the land, it must be periodically replenished with the same substances, or it will often become deficient in these material elements of fertility.

7. The sand and clay of the soil may be likened in their offices to the stomach of the animal; the lime and salts to the gastric juices, which assist to dissolve the food in the animal stomach, and to the condiments, as salt, pepper, &c., which we employ to stimulate and aid the organs and process of di-

gestion ; and the organic matter in the soil to the food itself, which feeds and nourishes the animal system.

8. If the crops grown upon a soil are permitted to rot upon and return to it again, its fertility is not impaired, but improved. Nothing is lost, but something gained, from the fertilizing influence of the atmosphere. But when all the crop is carried off and nothing returned, deterioration must take place : the vegetable food must undergo a continued diminution. This is a plain exposition of the cause of lands *wearing out* ; and, at the same time, it explains the necessity of applying manures to keep up their fertility.

9. All the elements of a good soil being present, its fertility and consequent profit will in a measure depend upon its exemption from an excess of water, which, like fire, is a good servant, but a bad master. This excess may arise from spouts and springs bursting up from below, or from surface waters, where the ground is level or nearly so, settling and reposing upon a tenacious subsoil, or from waters flowing from higher grounds. Hence the importance of draining. We do not know of any farm crop which thrives well upon a soil that is habitually wet, either upon its surface or within the natural range of its roots. Water-meadows and rice profit by periodical floodings ; but even these are injured by habitual wetness.

10. Fertility depends much, also, upon the quality and properties of the subsoil. If this be defective or come too near the surface, its faults may be corrected, and the tilth deepened, by bringing it up, in small portions at a time, with the plough, to the meliorating influence of the atmosphere, and by blending it with the upper stratum.

11. If a soil, under proper management, does not return good crops, or if the crops are found annually to diminish, it is a sure indication that there is a deficiency in one of the primary elements of a good

soil, that the subsoil has a malign influence, or that there is an excess of water. It is the province of the manager to search out the cause of the evil, and to apply the proper remedy, be it lime, manure, deeper drainage, or deeper tilth.

12. Grain-crops are the greatest exhausters of the fertility of soils, on account of their narrow system of leaves, and the great quantity of nutriment they extract from it to mature their seeds. The remark extends to the narrow-leaved grasses, converted into hay, when they are permitted to ripen their seeds in the field.

13. Indian corn, tobacco, and beans may be embraced in the second class of exhausting crops; for although they have broad leaves, and are supposed to derive much of their nourishment from the atmosphere, they are, nevertheless, gross feeders, and are bulky crops, and leave very little upon the soil to compensate for what they take from it. But great economy in feeding these crops may be effected by applying to them the long manure of the yard and stables, instead of summer-yarding it, as many farmers are wont to do. These crops will feed upon what is otherwise lost in the yard, the gaseous matters; and these afford exactly the food that the crops named want, and at the very time they want it.

14. Roots come next in the order of exhausting crops; but they compensate, in a measure, for what they take from the soil, by the meliorating influence they have upon it, in dividing, pulverizing, and freeing it from weeds, by means of their roots and the culture they demand.

15. Green crops, that is, clover, buckwheat, rye, oats, &c., *ploughed under as food for plants*, are enriching crops, and powerful auxiliaries to the fold yard, but they are too seldom resorted to for this purpose.

16. Depasturing with cattle, and particularly with sheep, enriches a soil. According to Van Thaer, it

adds 20 per cent. annually to the fertility of an ordinary soil, though probably for a limited period. This results from the fact that the crop is returned to the soil in the droppings and urine of the animals which graze it.

17. Lime and clay are essential in a wheat soil. Indian corn delights in a rich, dry sandy loam. Turnips excel on dry sandy soils. Rye is impatient of wet. Barley does best on a clay loam, as do beets, carrots, and peas. Oats and potatoes find a congenial bed in cool moist grounds, though for the latter the surface stratum should be light or mellow. Of the grasses, the tap-rooted, as clover, lucerne, &c., require a deep soil, permeable to their long roots, and free from water; the fibrous-rooted, as the tall-oat, orchard, &c., thrive upon soils that are shallower; and the rough-stalked meadow, red-top, bent, and some of the festuca family, are congenial to, and often natural in, moist or swampy grounds. The timothy, or meadow cat's-tail, the main dependance for winter forage in the Northern states, adapts its roots, it is said, to its location; being fibrous-rooted upon dry, and bulbous-rooted upon moist grounds; and, therefore, adapted to any situation.

18. Where arable and mixed husbandry prevail, the natural fertility of a farm cannot be kept up or increased from the resources of the farm stock without resort to an alternation or change of crops. Although the diminution of fertility may be imperceptible in some extraordinary cases, and although some soils seem naturally and peculiarly adapted to certain crops, yet, where the same crop is grown on one piece of ground in successive years, deterioration as certainly goes on as the sun shines by day. Whether, according to the modern theory of certain European philosophers of high repute, the excrementitious matter thrown into the soil by a growing crop is poisonous to its species; or whether, as we maintain, each species requires and exhausts, or par-

tially exhausts, a specific food in the soil, suited to its particular wants, we will not now stop to inquire; but it is a fact established by general experience, that an annual change of crops upon a field, while under tillage, tends very much to economize its fertility, and to increase the profits of the labour bestowed upon it. Hence,

19. It has been laid down as a sound rule in farming, that two white, or grain, or culmiferous crops should not be made to succeed each other in the same field; but that each of these should be alternated with, or followed by, a green, a grass, a root, or a leguminous crop.

20. Where the soil of a farm will admit of it, a good course is to alternate, 1, roots or Indian corn, with long manure, upon the sod; 2, grain, with grass-seeds; 3, grass for two years. The poorer the soil, the oftener should it be returned to grass, particularly to clover and pasture.

21. Geologists refer to three distinct formations as constituting the crust of the earth: the *primitive*, containing little or no lime or organic remains; the *transition*, containing lime and organic remains; and the *secondary*, abounding extensively in both these elements of fertility. Their natural relative fertility is in the reverse order in which they are named, the secondary being the best, and embracing most of the great basin of the Mississippi, and the country drained by its tributary streams. We say nothing of alluvial formations deposited by the ocean and streams. These partake of the character of the country from which they are brought, and are more or less fertile, according to the fertility of the districts from which their soil is derived, and the force of the currents by which their deposits have been made; a rapid current leaving only the coarser or heavier materials, while the lighter and richer matters do not subside until the current becomes slow and less agitated. A sluggish current, therefore, deposits the richest soil.

22. The three great formations which we have mentioned possess, it is well known, characteristics different from each other. They grow, naturally, many plants peculiar to each, and they are adapted to different branches of husbandry, or to different farm-crops. The primitive will not generally grow good wheat, but is suited to grass, oats, potatoes, &c. The transition is adapted to natural grasses, and to most of the arable crops, particularly to the cereal class; and the secondary to the cultivated grasses, to roots, and particularly to wheat.*

23. There are other circumstances in regard to the location of a farm demanding the consideration of the master, which refer to latitude and elevation. Plants have their natural zone or climate, beyond which they do not grow or thrive but imperfectly. There is a difference in every degree, or sixty miles of latitude upon tide-water, of five or six days in the forwardness of natural vegetation in the spring, and nearly a like difference in the blighting indications of autumn. But what is of equal importance, but less generally regarded, is the difference in climate produced by altitude. Three hundred feet of eleva-

* An able writer in the *Edinburgh Quarterly Journal of Agriculture*, in reference to these formations, terms the primitive, which, it seems, comprises the most elevated lands in Scotland, the region of heath and coarse herbage; the transition, the natural region of the grasses; and the secondary, the region of cultivated grasses, and particularly adapted to arable and alternate husbandry. He assigns to each a particular and distinct breed of cattle. To the first, or higher region, a thick-haired, small, hardy breed; to the second, or middle region, those of larger size; and to the third, or lower region, those that are most sensitive to cold, gross feeders, and that acquire the greatest weight. He goes on to show, from numerous examples, that these several breeds are the most profitable in the various districts assigned them; and that they are manifestly improved, in most cases, by a judicious cross with the improved short-horns. There is much good sense in the writer's remarks; and, although the descriptions of the three formations as to elevation does not fully apply in the United States, the facts we have copied afford useful suggestions to the American grazier.

tion is considered equal to one degree of latitude in its influence upon temperature. Hence it does not follow, that because a crop will thrive and ripen in a given latitude upon tide-water, it will thrive and ripen equally well in the same latitude at a higher elevation. On the contrary, to be better understood, we say that, other things being alike, the climate on tide-water, in latitude 42° , is similar to that of a place elevated three hundred feet above tide-water in latitude 41° , or of a place nine hundred feet above tide-water in latitude 39° ; so that the table-land of Mexico, in latitude 16° , at an elevation of seven thousand and eight hundred feet above the ocean, should possess about the same mean temperature, and produce the same natural and artificial growth, as Kingston upon the Hudson, though the extremes, both of heat and cold, are probably greater at the northern than they are at the southern point.*

* "All the western part of the intendency of Vera Cruz," says Humboldt, in his *New Spain*, "forms the declivity of the Cordilleras of Anahuac. In the space of a day, the inhabitants descend from the regions of eternal snow to the plains in the vicinity of the sea, where the most suffocating heat prevails. The admirable order with which different tribes of vegetables rise one above another, by strata, as it were, is nowhere more perceptible than in ascending from the port of Vera Cruz to the table-land of Perote. We see there the physiognomy of the country, the aspect of the sky, the form of plants, the figures of animals, the manners of the inhabitants, and the kind of cultivation followed by them, assume a different appearance at every step of our progress.

"As we ascend, nature appears gradually less animated, the beauty of the vegetable forms diminishes, the shoots become less succulent, and the flowers less coloured. The aspect of the Mexican oak quiets the alarms of travellers newly landed at Vera Cruz. Its presence demonstrates to him that he has left behind him the zone, so justly dreaded by the people of the North, under which the yellow fever exercises its ravages in New Spain. This inferior limit of oaks warns the colonist who inhabits the central table-land how far he may descend towards the coast, without dread of the mortal disease of the *vomito*. Forests of liquid amber, near Xalapa, announce, by the freshness of their verdure, that this is the elevation at which

These data are assumed from recollection, and may not be precisely correct.

24. The means of preserving and of augmenting the fertility of the soil are sufficiently indicated in the preceding suggestions. They consist mainly in manuring, draining, the admixture of earthy materials, and the alternation of crops.

25. Stable and fold-yard dung is most profitably applied in an unfermented or partially fermented state, and to hoed and autumn-ripening crops. Fermentation diminishes the fertilizing properties of manure. If this fermentation takes place in the soil, the gases, the volatile portion which first escapes from the putrifying mass, are retained in the mould, and serve to feed the crop. If fermentation takes place in the yard or upon the surface, the gases are wasted, and the dung undergoes farther loss from the rains which ordinarily leach it. Long manure should be spread broadcast, and well buried by the plough.

26. Short manure, or that which has undergone fermentation, is most beneficial when harrowed in upon arable lands, or spread upon the surface of grass-grounds.

27. Old meadows may be kept in a productive

the clouds, suspended over the ocean, come in contact with the basaltic summits of the Cordillera. A little higher, near La Bandarila, the nutritive fruit of the banana-tree comes no longer to maturity. In this foggy and cold region, therefore, want spurs on the Indian to labour, and excites his industry. At the height of San Miguel, pines begin to mingle with the oaks, which are found by the traveller as high as the elevated plains of Perote, where he beholds the delightful aspect of fields sown with wheat. Eight hundred metres higher (two thousand and six hundred feet), the coldness of the climate will no longer admit of the vegetation of oaks; and pines alone cover the rock, whose summits enter the zone of eternal snow. Thus, in a few hours, the naturalist, in this miraculous country, ascends the whole scale of vegetation, from the heliconia and the banana plant, whose glossy leaves swell out into extraordinary dimensions, to the stunted parachyma of the resinous treea."

state, in ordinary cases, by a triennial top-dressing with manure or compost; or may be renovated and restored to a productive state by the modes we have already recommended in the Cultivator.

28. Composts are economical when made to absorb fertilizing liquids which would otherwise be wasted; or to decompose inert vegetable matter, as peat, earth, &c.

29. Lime, gypsum, marl, and ashes are powerful auxiliaries when applied to proper soils or suitable crops. Observation and experience will be the best guides in their application. They should all be applied to the surface, or but superficially covered.

30. All vegetable and animal matters constitute the food of plants when they are rendered soluble, or capable of being dissolved in the water of the soil.

31. Bone-dust, horn-shavings, poudrette, woollen rags, urine, and animal carbon or burned bones, are concentrated manures, and should be used sparingly and with great care upon or near the surface of the soil. Pigeon and hen's dung partake much of the character of the preceding, and require precaution in their use. We think the best mode of applying the two first named is to mix ashes with them or long manure, just before they are put upon the soil, whereby they are brought speedily into a state of fermentation and decomposition.

32. The best guards against drought are keeping the soil deep, rich, clean, and mellow on the surface.

33. The more cattle that are well kept upon a farm, the more manure; the more manure there is applied, the greater the product and the profit, and the greater the means of sustaining an increased stock of animals upon it. All of these advantages are increased when root-crops are made to enter largely into the system of culture.

COMPARATIVE PROFITS OF THE OLD AND NEW HUSBANDRY.

[We add, at the close of this chapter, the following statement, given in the London Farmer's Magazine from the pen of an eminent English agriculturist, as exhibiting some of the reasons that induce the adoption there of the New System, and the comparative profits resulting. That more labour on a given number of acres is required under the new system than under the old, is apparent; but the increase in productiveness is in a still greater ratio, and so are the ultimate profits. By keeping but few acres under cropping, and doing the work of those few acres in the best manner, the farmer gains some important advantages; he can retain more land in grass, and, of course, can raise more stock; he is not wearing out his soils by improvident culture; he receives a far greater interest on the capital invested in his farming operations; and when, in the course of rotation, his fields are seeded to grass, they are clean, in good tilth, and will not only produce great crops of pasture or grass, but be in fine order for their course in the production of grain crops.]

It may be proper to premise that my farm consists of about 200 acres, comprising 30 of wood, 42 of pasture, and the rest arable. Of the arable, 85 acres are of good mixed soil, well adapted to turnips and barley, but not considered equal in value to the best wheat land; the remainder consists partly of a hungry gravel and partly of clay, of very inferior quality. It is cultivated on the Norfolk, or four-course system.

1. I diligently collect litter of every kind, seaweed, furze, fern, leaves of trees, &c., for bedding my yards, in addition to the straw grown on the land. In the last twelve months I have brought in about 50 wagon-loads of these materials: each wagon load gives employment to about three men for a day; the total, therefore, being 150 days.

2. This increase of litter would avail little or nothing if I did not keep an extra number of live-stock; for I observe that many farmers do not even make their straw into good muck. I therefore fat about 40 hogs and four or five head of horned cattle every winter; enough, in short, to consume half my Swedish turnips, which are carried into the yards for this purpose. The drawing, topping, and carting, together with the time occupied in looking after the stock, may be estimated at one man's employment during the winter months, equal to 150 days.

3. The removal of one half the turnips would injure the succeeding barley crop if I did not lay on, at the time of sowing the turnips, an extra quantity of manure, say 25 single horse cart-loads per acre, about 10 loads more than the usual allowance. This I am enabled to do, partly by the great quantity of litter in my yards, partly by placing a bottom of earth or chalk under every dung-heap, and a thin covering of the same materials over the top. The practice of carting all my dung twice, first from the yards to bottoms prepared in the fields, and then on the land when wanted for use, of course employs many hands, as well as the turning the composts, and mixing the materials together. I believe I do not overrate the number of cart-loads transported annually on my farm at 2400; whereas on the same number of acres, a farmer who moved his dung only once, carrying it immediately from the yard, at the rate of 10 loads per acre for turnips, and the same for wheat, would transport only 600 cart-loads annually. The extra 1800 loads may give about 112 days employment, and

the turning of the compost about 20 more ; making together 132 days.

4. I have introduced this year the Norfolk practice of dibbling wheat. This occupies two men and six children for 30 days, at the rate of half an acre per man per day. Computing the six children equal to one man, the dibbling gives extra employment of 90 days. The expense is paid in the saving of seed, to say nothing of the increased produce, which is estimated by the best Norfolk farmers at a sack per acre.*

5. Extra weeding, throwing ditches, draining, &c., may occupy about 80 days.

Let us now recapitulate—

Collecting litter	150 days
Feeding stock in yards	150
Carting earth and dung	132
Dibbling wheat	90
Extra weeding, draining, &c.	80
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Total	602

At 300 working days in the year, this is equal to two labourers extra, winter and summer, employed on a farm containing only about 120 acres of arable land.

It is not easy to estimate with precision the increased amount of produce which a farmer may expect to obtain in consequence of such an increased outlay in labour ; the less so as that increased produce does not make itself felt the first, second, or third year to the full extent : indeed, I have heard an intelligent farmer say, that he has observed a progressive improvement in his land during no less than *twenty* years, from persisting in a system of high cultivation. I beg leave to introduce here the estimate of Von Thaer :

* A sack is four bushels.

On a farm of 913 acres of good barley land.

	Under the old system, two crops and a fallow.	Under the improved or alternate system.
Produce in cattle	. 1,210—\$1008	11249—\$5,995 20
Produce in grain	. 894— 4291 20	2030— 9,744
Gross produce . . .	. 1104— 5299 20	3279—15,739 20
Expenses of cultivation . . .	. 537— 2577 60	1051— 5,044 80
Nett produce . . .	. 567— 2721 60	2228—10,694 40

The last line comprises rent, profit, interest on capital, tithes and taxes of any description, the object being simply to show the *comparative* results of the two systems of cultivation. The system is not founded on speculative views, but on extensive and accurate observation during a long series of years by a man well acquainted with the practical business of agriculture. Indeed, I may observe in passing, that there is no work in the English language to be compared with Von Thaer's, so far as my knowledge extends. I am not surprised at the low estimation of works on agriculture among practical farmers. Instead of containing, as they ought to do, a digest of all that is necessary to be known by a single competent hand, such works consist, for the most part, of loose collections of suggestions, speculations, experiments, and observations; correct and incorrect, authenticated and unauthenticated; thrown together apparently almost at random, without order or discrimination.

It will be seen, on comparing Von Thaer's numbers, that his estimate of the expenses and produce on the two systems of cultivation respectively is in round numbers as follows: On the improved system the expenses of cultivation is *double*; the gross produce is *triple*; the nett produce is *quadruple*.

This statement, however, being expressed in so general and abstract a form, and resting, as it does, on the authority of an unknown author, is not likely,

I fear, to weigh much with the majority of farmers. Let me then endeavour to bring the question home to them by a statement of a different kind. I suppose it will hardly be disputed that, by means of the system of high cultivation which I have described, a farmer may be expected to get per acre at least one sack of wheat, one of barley, a quarter of a ton of clover hay, and three tons of turnips additional. Let us compute the value of these items :

4 bushels of wheat at 56s.	l. 1 8 0	—	\$6 72
4 bushels of barley at 30s.	0 15 0	—	3 60
1-4 ton of hay at 3l.	0 15 0	—	3 60
3 tons of turnips at 5s.	0 15 0	—	3 60
	<hr/>		<hr/>
	4) l. 3 13 0	—	4) \$17 52
	0 18 3	—	4 38
Average per acre			
This on 120 acres amounts to	l. 109 10 0	—	\$525 60
The labour of the extra hands through the piece at 11 shillings per week, amounts to	l. 57 04 0	—	\$274 56
I charge nothing for horse labour, since the carting of dung, litter, &c., is performed at times when the team would otherwise be standing still. But as there is some additional wear and tear of carts and wagons, let us estimate this at	10 00 0	—	48 00
	<hr/>		<hr/>
	67 04 0		322 56
Extra profit arising to the occupier	l. 42 06 0	—	\$203 04

The result of this computation, if correct, ought surely to encourage every farmer to be liberal in his expenditure in the article of labour ; and if not correct, I hope some one will point out where I am wrong. The actual produce of the present year, in my own case, is as follows: my wheat, so far as yet threshed, averages from nine to twelve sacks per

acre ; the last is the produce of a new variety, which proves very prolific. My barley has yielded, on an average, twelve sacks per acre. I have, however, one field of barley not yet threshed, from which I do not expect to get more than nine sacks per acre, the soil being a poor gravel. The general character of the land I have already described.

CHAPTER II

ON THE NECESSITY AND MEANS OF IMPROVING OUR HUSBANDRY.

Report by Judge Buel.

WE cannot be too often reminded of the contrast which exists between good and bad husbandry ; nor too often admonished to search into the causes of this difference, and to apply the needful remedies. The difference does not consist alone in a single crop or a single season : the soil in the one case is becoming more and more exhausted of fertility, and losing its intrinsic value ; while in the other its relative worth is on the increase, and the difference in product is consequently annually increasing.

We will illustrate our proposition by a comparison between American and Scotch husbandry now and sixty years ago. Sixty years ago the agriculture of Scotland was in a wretchedly low and unproductive condition, while the products of our yet unexhausted soil were abundant. But sixty years ago the spirit of improvement fell upon Scotland ; her agricultural society was instituted, and commenced its useful labours, and was soon after greatly aided by the organization of a national board of agriculture ; agricultural surveys were made and published

of every county ; the best practices of every district thus became known to the whole nation ; men of fortune and science turned their attention to the encouragement and improvement of this parent art ; and the consequence has been, that a wonderful and salutary change has come over that land, fraught with abundance and with blessings. The value of land has in consequence been enhanced three and four fold, and its products have been increased in a proportionate ratio. " In fertile districts," says Sir John Sinclair, " and in propitious seasons, the farmer may confidently expect to reap from 32 to 40 bushels of wheat ; from 42 to 50 bushels of barley ; from 52 to 64 bushels of oats, and from 28 to 32 bushels of beans per statute acre. As to green crops, 30 tons of turnips, 3 tons of clover, and from 8 to 10 tons of potatoes per statute acre, may confidently be relied on. In the most favourable seasons the crops are still more abundant."

Now what has been our progress in agriculture during the last sixty years ? Has it not been retrograde ? We have, to be sure, obtained abundant crops from our rich virgin soils, and when these, under bad management, have become exhausted, we have occupied and exhausted others in their turn. But what is the condition *now* of the lands that were cultivated by our fathers half a century ago ? Do *they* produce the average crops which are given above as the products of Scottish husbandry, under all our favourable circumstances even of climate and of civil liberty ? Are our crops *half* as large ? Nay, are they more than a *third* as large ? Do we get from our old districts an average of more than 10 to 13 bushels of wheat, of 14 to 17 of barley, or of 17 to 21 bushels of oats per acre ? At the close of the last and in the beginning of the present century, the surplus products of our Northern agriculture were *exported* to an immense amount. Now* we *import* the

* In 1838-39.

agricultural products of Europe to avert the evils of famine! The cause of this remarkable difference in the surplus products of the soil may be partially owing to unpropitious seasons, but is mainly to be sought for in the neglect of our agriculture, both by the people and the government. In Europe, governments and influential individuals have bestowed spirited attention upon the improvement of agriculture, as constituting the basis of national prosperity and independence. While with us, improvement in husbandry has been considered a minor concern; it has at least not received the consideration of the statesman or the political economist. Party politics, and local or personal schemes of aggrandizement, have so much engrossed the attention of the men who *ought* to lead in these matters, and who *do* lead in every other public improvement, that the humble claims of agriculture have failed to attract their notice or engage their attention, although it constitutes the base which supports the whole superstructure of civilized society. If we would preserve the superstructure with its embellishments, we must take care to make strong and permanent this foundation. Our farmers, too, seem generally indifferent or spiritless in regard to the general improvement of our agriculture, either because they mistake their duty and true interest, or that, under the influence of a strange fatuity, they fear they shall sink as others rise.

We should consider our soil as we do our free institutions—a *patrimonial trust, to be handed down UNIMPAIRED to posterity*; to be *used*, but not *abused*. Both are more easily impaired than they are restored; and both belong, in their pristine vigour and purity, as much to our children as they do to us. In some of the once populous and fertile districts of the old Continent, the productiveness of the soil has been recklessly wasted by men, whose descendants have consequently become poor and wretched, and

their country almost a desert. In other portions, where the fertility of the soil has been sedulously preserved for ages, the population has continued prosperous, wealthy, and happy.

It is undeniably true, that our general system of farming is bad; that, in most parts of our country, the natural fertility of the soil has been gradually diminishing, and its products becoming less; that the evil is increasing; and that, without a radical reform, we shall, in the North, not only cease to have surplus products to pay for the foreign commodities which long habit has rendered necessary to our convenience, but lack a supply even of bread-stuffs for our own population. To what degrading dependance will this course of things in a few years reduce us, unless prompt and efficient means are adopted to check our downhill course in the products of agricultural labour! With the finest country in the world, a population almost entirely agricultural, exempt from the enormous burdens, as tithes, rents, and poor-rates, which press like an incubus upon the agricultural labour of Europe, and dependant on foreign supplies for the means of subsistence!! The idea is humiliating, is alarming, to all who look to the ultimate prosperity and happiness of our country. Our maritime commerce depends upon contingencies which we can neither foresee nor control. Venice and Genoa, and Portugal and Spain, have each in turn had their "days of commercial prosperity;" they successively rose to opulence and power, and successively sunk, the victims of corruption, into effeminacy, vice, and despotism. Manufactures too, as we have had abundant cause to know, are but a precarious dependance for national greatness. Commerce and manufactures are the shaft and capital of the social column, of which agriculture constitutes the base; and without this base they can no more withstand the shocks and revolutions of time, than could the short-lived

glory of the nations we have named. Great Britain now wields the trident, and the world is made tributary to her workshops. But, great as she is in commerce and in manufactures, these are considered secondary and auxiliary to her agricultural greatness. Land is the basis of her national wealth ; it is the surplus marketable produce of her soil, says Sir John Sinclair, that is the source of all her political power, and of the personal enjoyment of her citizens ; and there is no source of domestic industry or of foreign commerce, he adds, that can in any respect be put in competition with the improved cultivation of her soil. The agriculture of Great Britain employs but two thirds of her population ; and yet the surplus products of her soil suffice to feed and support the other third, and to assist in supplying our deficiencies.* Our population is at least five sixths agricultural, yet during the last two years we have had to import about ten millions worth of breadstuffs to supply our deficiency in this first element of life ; and even in the most favourable seasons, the exports of the surplus products of our northern soil have been merely nominal.

We will state one fact, derived from official documents, which will demonstrate, beyond the power of refutation, our downward course in this great branch of national industry. It is this : the average increase of breadstuffs, passing from our canals to tide waters, from the great grain district of the West (the Flanders of America), has amounted to three

* The reader must not infer from this that Great Britain has ordinarily a surplus of agricultural produce beyond her own wants. In favourable seasons she produces about enough to feed her population ; but is obliged to import breadstuffs, sometimes to a large amount, when there is a partial failure of crops. That Great Britain, with her limited territory and dense population, should occasionally have to do this, must be expected ; but the circumstances of our own country are so entirely different, that it must be owing mainly to bad husbandry that we should ever be subject to such necessity.

and three quarters per cent., while our population has increased in the ratio of six per cent. per annum! If such has been the deficiency in our grain-growing, new and fertile districts, to meet the wants of our increasing population, how much greater must that deficiency have been in the exhausted soils of old settled districts? Many portions of our country, which once exported grain, have, by bad husbandry, become dependant upon the comparatively new settlements, or upon foreign supplies, for this indispensable necessary of life. This remark will apply to almost our entire Atlantic border. Will any mathematician tell us how long it will require, according to the disproportionate ratio of increase between our population and our means of subsistence, to reduce us to a state of absolute dependance, or to a state of national want and famine?

It is apparent, from the examples of improvement which are witnessed in many districts of our country, that we can improve the general condition of our agriculture if we will adopt a wise and energetic policy. Nay, we have a demonstration of the practicability of doing it in the now palpable benefits of the law to improve our agriculture, passed in 1819. That law involved an expenditure of 40 or \$50,000, and expired in 1824. It was found fault with by many from political motives, and by more from a spirit of envy in those who either had not the enterprise or the talent to compete successfully for the rewards which it gave to industry and skill. And besides, the law, in some instances, was badly, we may almost say corruptly, executed. Yet, under all the disadvantages of want of organization, of inexperience and abuse, has not that expenditure been like manure spread upon our soil? Did not that law excite a laudable emulation among the whole farming community, and bring into action more skill, more industry, and more improvement? Has it not been instrumental in greatly improving our farm

stock, our farm implements, and modes of culture ! Has it failed to increase the farm products of any one county, of a respectable population, to the amount of the total expenditure ? Or has it failed to return into the treasury, every year, the gross amount of that expenditure, in the form of canal tolls upon the increased productions of the soil ? We do not put these questions because *we* have any doubts in the matter, but to bring the subject home to the calm and deliberate consideration of those reflecting men whose duty and interest it is to scan, to judge, and to act wisely upon a question of momentous importance to our country. If these men think with us, that the law of 1819 has amply remunerated the state for its expenditure on the increased tolls on our canals, and that it has added millions to the value of our annual agricultural products, they will not hesitate to renew that policy which has been productive of so much public good. The improvements of the last eighteen years might have been respectable without the aid of that law ; but it was *that* which gave a new impetus to improvement. The fairs and exhibitions which it produced taught our farmers that there was yet much to learn in their business ; that they could improve in their farm stock, in their farm implements, in their seeds, and in their modes of culture ; and many of them resolutely determined to profit, and did profit, by the lessons of instruction which they then imbibed. And when the spirit of improvement has begun, it is like civil revolution ; it seldom retrogrades. One improvement leads to others as naturally as the active mind, having attained to one branch of knowledge, aspires to other and higher branches. Our Southern brethren say we are in advance of them greatly in agricultural improvement. If this is so, we owe it to the law that was passed, upon Gov. Clinton's recommendation, in 1819.

It requires no science, and very little art, to wear

out and exhaust the most fertile soil. The process is simple : take from it all you can by close cropping for a few continuous years, and return to it nothing in the form of manure, and the work is done, or far advanced. In this business we have shown ourselves to be no mean adepts. But it does require science, and art, and perseverance, and capital, to restore fertility to a soil which has become exhausted. This we have not yet sufficiently learned, but it should be our next lesson ; and the sooner we begin, the sooner shall we profit by it.

Agricultural improvement is slowly developed, at least to superficial observers. It requires years to renovate the fertility of an exhausted soil, to improve the stock of a farm, or to realize the benefits which result from draining, from alternating crops, and from root culture. We are much in the habit of calculating upon *immediate* gains, without looking to remote and ultimate benefits. We saw not the change when the law of 1819 was in force, because its benefits were but partially developed. But we now hear the remark from hundreds, that the appropriation of 1819 was one of the most beneficial to the state that has ever been made by the Legislature. The popular vote of the state would never have sanctioned the construction of the Erie and Champlain canals ; and yet the wisdom of the measure is now sanctioned by an enlightened world. Although the construction of these canals may have operated prejudicially to some individuals and districts, yet the benefits which have resulted to the whole state have amply compensated for any personal inconvenience or injury they may have caused. So with the law to encourage agriculture ; many did not foresee its benefits, who now acknowledge that they are palpable and important. We must judge of public measures by their fruits ; and, before we are competent to do this, the seed must germinate, the plant grow and blossom, and the fruit mature.

This is particularly the case in all measures to improve agriculture. It is the province of wisdom to look ahead; to sow the useful seed, and wait the coming harvest for the recompense. We must sow in the spring, and cultivate well in the summer, if we would gather an abundant harvest in autumn.

We may, too, almost lay it down as a maxim, that THE MENTAL AND MORAL CONDITION OF AN AGRICULTURAL DISTRICT IS IN THE RATIO OF ITS IMPROVEMENT IN HUSBANDRY. To borrow the spirit of a political saying, *as goes agriculture, so goes the state*. There is certainly much truth in the remark, that where the farming is slovenly and bad, ignorance, indolence, and vice most generally abound; and that, where agricultural improvement is most advanced, the population are most industrious, most intelligent, and most moral. Knowledge begets a love of knowledge; and when a man has acquired enough of it to convince him of its utility in his business, he considers it a part of his farming capital, and he is anxious to increase his stock of it as the readiest means of improving his condition in life, independent of the mental pleasures which it imparts. But, not having acquired the requisite degree to enable him to appreciate its value, or to show him the defects of his system of management, he plods on, with listless indifference, in the ways of his fathers; and as great success nowadays seldom rewards such labours, he too often becomes spiritless and dissatisfied, and relaxes into indolence, of which vice is too frequently the concomitant.

Under the existing state of things, how does it become us to act! What are we to do! Shall we fold our arms, leave agriculture to decline farther or to shift for itself, and depend upon more propitious seasons and other Providential interpositions to supply our wants! Shall we depend upon the cotton, rice, and tobacco of the South, which constitute our almost entire exports, to pay for the foreign

commodities which we consume in the North? Or shall we, animated by the enterprise and love of independence which were wont to animate our fathers, take it resolutely in hand to provide abundantly for ourselves, by encouraging and enlightening agriculture, elevating its character, and stimulating it to new efforts by suitable honours and rewards?

As regards the means of improvement, much has been done and much is doing by the agricultural periodicals of the day. The first of these was established at Baltimore; by John S. Skinner, in 1819; and we can now enumerate nearly twenty that are diffusing light, awakening enterprise, and inciting to industry in every section of our country. Probably one hundred thousand farmers are now deriving instruction and improving their practice from the perusal of these journals; and it is not extravagant to say, that the benefits they are dispensing to the nation are equivalent to millions of dollars every year. But what is one hundred thousand compared to the gross agricultural population of the union? and how much greater would be their benefits if these journals had access to every farmhouse, or even to every schoolhouse, in the state? Besides giving much that is useful in the science, or the first principles of husbandry, they are continually advising their readers of every improvement which is being made in the practical operations of the farm; of new seeds and plants, and the mode of cultivating them, and of every improvement in labour-saving machines.

By concentrating, as it were in a focus, the practical knowledge of the country, and then scattering it, like the solar rays, into every corner of the land, to fructify the earth, thus rendering it subservient to the benefit of all, some individuals have been enabled to obtain a clear profit of fifty, one hundred, and even one hundred and fifty dollars on an acre, who had never obtained a profit of thirty dollars before. And the benefits of these splendid results are not confined

to the individuals who effected them: they are heralded in the agricultural journals; become known all over the country; and every new and successful effort at improvement soon has its fifty, its hundred, and its thousand imitators. Suppose, for instance, what we hope will yet prove true, that an individual should discover an effectual preventive of the ravages of the Hessian fly or grain-worm—instead of only benefiting him and a few neighbours, or becoming gradually known, as in olden times, the knowledge of it would now be spread in a few days, by the agricultural periodicals, into every corner of the land, and the advantages of the discovery would thus amount to millions in a single year. So with every other improvement in husbandry. It is not the province, nor is it the study of news journals and literary editors to deal extensively in agricultural concerns. They seldom publish even the incidental notices which are designed to subserve the interests of husbandry without a special request, and a fee in the bargain, as though *they* had no personal interest in the progress of agricultural improvement. We must infer from these premises, that every man will promote his own interest, and benefit the public, by patronising and endeavouring to extend the circulation of our agricultural papers. They tend to no possible evil, while they are certainly calculated to do much good.

Another means of facilitating agricultural improvement is to introduce class-books into our common schools for the senior boys, which shall teach those elementary principles of science which are indispensable to the successful practice of agriculture. A boy may be almost as easily taught to analyze soils, and to comprehend the leading principles of animal and vegetable physiology, as he can to commit to memory pages of matter, the knowledge of which seldom serves him any useful purpose in manhood. We must begin in youth if we would bring about any material improvement in the habits of society. The

good seed that is sown in the springtime of life is never lost: it will ultimately sprout, and grow, and give its increase, as surely as the grain which we deposite in a fertile soil. The tree *will* grow as the twig is bent. Youth is the season to get instruction in the principles of the business which is to constitute the employment of life; and the more knowledge boys acquire in these principles before they start in life for themselves, the more likely they are to prosper and become useful to society. The time that the senior boys in school devote to the business of the farm, will give to studies which are connected with their present and future business an interest and an influence which will be as abiding as life.

But we would go farther in the business of agricultural instruction; we would establish schools to teach simultaneously both the theory and practice of agriculture. We would carry something of the theory into the primary schools, and much of the practice into the schools of science. Veterinary schools, to instruct in the anatomy and management of domestic animals, have long been established in Europe; their usefulness has been highly extolled, and their numbers are increasing. Switzerland, Prussia, and France have also their schools, in which the science and practice of agriculture are taught to hundreds of young men, who are thereby enabled to manage their estates with greater benefit to themselves and the public, or to obtain honourable and lucrative situations as managers for others. We give bounties on our fisheries, to make them a nursery for seamen; but we give none upon agriculture, which is the best nursery of freemen. We spend millions annually to protect our commerce; but we give nothing to improve agriculture, which is the basis and support of that commerce. We protect our manufactures by a heavy tariff; yet agriculture, which furnishes the raw materials, and buys the fabrics which the manufacturer consumes and vends,

is left to protect itself. We have expended nearly three millions in this state to aid in educating almost exclusively professional and other gentlemen; but we have given nothing exclusively to educate our agriculturists, who constitute the great mass of our population. And yet there is probably no employment in life capable of being more benefited by a professional education (in which a professional education would conduce more to the public prosperity) than that of managing our farms. A proper knowledge of soils, manures, vegetables, and animals; of the agency of caloric, of moisture, of the atmosphere, and of light, in the economy of vegetable and animal growth, is of the greatest use to the farmer, and yet in what existing school can be acquired this knowledge, during the period of life in which he ought to obtain his practical information?

All impressions of general reform, to be successful, must be first made upon the ductile minds of the young. The old are apt to be too obstinately wedded to their juvenile habits and prejudices. Men are prone to grow up in the creeds in which they are early instructed—be they Christian, Mohammedan, or pagan—be they those of good or bad husbandry. And if our youth are instructed in the first elements of agriculture, and taught to consider it, what it truly is, an employment calculated, above all others, to promote individual and national prosperity and happiness, they will aspire to honour and distinction in its labours; and will not so generally press to the cities, to the bar and the counter, for the means of gratifying a laudable ambition. Society, too, will reap an abundant reward from the change. We will illustrate this by an historical fact. Ernest, former duke of Saxe Gotha, had his people instructed by compendiums of every kind of useful knowledge, including music and drawing, that were put into the hands of youth in all the country schools, and which in a few years entirely changed the face of his prin-

cipality; and "it is amazing," adds our author, who wrote some years afterward, "to observe the different irradiations of genius in this and the adjacent circles." The effect was alike beneficial in the improvement of the soil and the mind. And the example of Saxe Gotha probably led to the excellent system of school instruction in agriculture which has since been introduced by Prussia and most of the German states.

It has been stated, as an objection to the establishment of agricultural schools, that they would be only accessible to the rich. This objection, even if well founded, would not go to lessen their value to the state: for if we could convert a few hundred drones, as the sons of rich men may generally be termed, into working bees, the public, as well as the young men themselves, would certainly be gainers by the transformation. The complaint is, that we have too many consumers and too few producers. This would tend to restore an equilibrium: for the examples of the rich, be they good or bad, have an imposing influence on the middling and lower classes; and thus to improve the habits and morals of the rich, would be the surest way to improve the condition of society generally. Hence, therefore, if agricultural schools can be made instrumental in annually converting a few hundred of the idle and dissipated sons of wealth (or, rather, in preserving them from vicious and wrong habits) into wholesome, industrious farmers, agricultural pursuits will become more respectable and be more followed; and we venture to predict, that then we shall not long continue to do, what we have done—import potatoes from Ireland and Germany, hay and oats from Scotland, eggs from France, and breadstuffs from all the countries of Europe, including the dominions of the autocrat of Russia and of the Grand Turk.

But it is not exactly true that the rich alone would find access into agricultural schools, were such es-

tablished. The rich rely upon their paternal wealth, and have not often the ambition to become useful, at least by the habits of manual labour, which would be rigidly required in such schools. These schools would be filled with the youth from all classes of society, who aspire to fortune and independence by a manly exercise of their mental and physical powers. Young men of this description, even from the poorer classes, do obtain admission into literary institutions, and they would into agricultural ones with still greater facility, since the terms of admission here would be more reasonable, and with an equal prospect of distinction and usefulness in after life. But, whether these schools were filled from the rich or the poorer classes, or, as we have supposed, from all classes indiscriminately, a certain and great public good would result from their establishment: the pupils would go to swell the producing classes of society with habits of application and usefulness, minds imbued with scientific knowledge, bodies hale and robust, and hands practised in all the manual operations of the farm.

[NOTE.—The foregoing just and forcible remarks on the necessity of improving our husbandry, are from a paper read by Judge Buel before the State Agricultural Society in 1838. A few remarks relating to the agricultural periodical, the *Cultivator*, are omitted, as not precisely in place in this volume, however just in themselves. It is to be regretted that we have no correct or authentic means of determining the amount of any given article of produce at different periods of time; still there can be little question that the opinion above expressed, that there is a decided falling off in the quantity of grain produced per acre in the older settled parts of our coun-

try, is correct ; and there is little room for doubt that the same result will follow in the newer districts, unless a more rational mode of culture is introduced and practised. That course has been pointed out in a lucid manner in Chapter I. of this volume. In a few words, it consists in draining, tillage, manures, roots, and a rotation of crops. The ruinous practice of exhausting our lands by continued cropping must be abandoned ; roots and clover must take their places with the grains ; and a better and more economical system of making and managing manures must be adopted before our agriculture can rank with that of the most favoured nations.—*Editors.*]

CHAPTER III.

ROOT CULTURE.

The Potato.—Manures.—Early Potatoes.—Choice of Kinds.—Mode of Planting.—Harvesting the Crop.—Sorting the Crop.—Wintering the Crop.—Culture.—Beet.—Carrot.—Parsnip.—Turnip.—Introductory Remarks.—METHODS OF FEEDING ROOTS.—Report by Judge Buel.—Col. Meacham on the Carrot and Ruta Baga.

I. THE POTATO.

EVERY farmer cultivates the potato, but few farmers cultivate it as profitably as they might. The average crop does not probably exceed one hundred bushels an acre.* It may be made to exceed three

[* We are inclined to think that Judge Buel has underrated in this place the average of the potato crop in this country. In some instances in which the quantity on considerable tracts has

hundred bushels the acre, and without increasing materially the expense of culture. It is a reproach to us, that this root is brought three thousand miles—from England, Ireland, and Germany, to supply the wants of our city population. Let us try to do better. It is in the hope that we may contribute to increase our average product, so as to supply the demands of our own market, that we give the following directions for its culture.

Soil and preparation.—A mistaken notion prevails with many, that the best potatoes are grown on a warm, sandy soil. The reverse of this is true. The best potatoes, as to quality, are believed to be grown in the west of England, Ireland, Nova Scotia, Maine, and other high latitudes, and particularly in humid climates. In a dry season, the quality and quantity are with us not as good as they are in a moist and cool one. The potato zone does not extend south of New-York: that is, its quality deteriorates south of that latitude; and it probably has the most congenial climate between 42° and 45° . If these assumptions are well founded, then it should be our aim to plant upon a cool and moist, though not wet soil, which approximates nearest to the temperature of the best potato-growing districts elsewhere. The potato will grow anywhere if there are vegetable matter and moisture, but it will be inferior upon dry sands, and stiff or wet clays. It does best in loams or reclaimed swamps; and it pays well for a good dressing of long manure, and should, if practicable, be planted on the first furrow of a grass ley. If the sod is old and tough, plough deep in September, hav-

been ascertained, it has averaged from 150 to 200 bushels per acre. In the county of Susquehanna, for example, the average for the whole county was about 175 bushels per acre. Some towns have given over 200, and a few, perhaps, have fallen below an average of 100 bushels. There is, however, no room for doubt, that the average is much less than it would be with a better system of cultivation.—*Eds.*]

ing first spread the manure, if to be had at the time ; but if the ley is one of clover, of one or two years old, the ploughing may be postponed till spring. If ploughed in September without manure, this may be spread upon the ground just before planting, and buried with a light furrow, so as not to turn up the vegetable matter of the sod. In our practice of always sowing clover with small grains, we seldom fail of having a tolerable grass ley for the corn and potatoes which are to follow ; and its value to the crop doubly compensates for the cost of the clover-seed. The potato has a system of roots, which strike deep if the soil will permit, to collect food for the plant. A decomposing sod, with the manure which should accompany it, turned with a deep furrow, affords the best aliment for the plant, and is deposited where the roots naturally seek it, and where it remains cool and moist. The stolens have a different office to perform. They require more air and heat, shoot horizontally, and, if buried deep in culture by the plough, will produce a new set near the surface. So that a rich, deep soil, having a good sod and a mellow surface, is best adapted to this plant. Harrow thoroughly before planting.

Manures.—The value of manures to the potato crop can scarcely be overrated ; and, indeed, a large crop is seldom obtained without this auxiliary. Long or unfermented manure is preferable to that which is rotten. And remember, this manure does not become more impaired in value for the crop which is to follow the potato than if it were summer-yarded. We prefer applying it broadcast, with an unsparing hand, previous to the last ploughing ; and we approve of Mr. French's practice, of sowing plaster upon the manure instead of afterward applying it to the growing plants.

Seed.—A thousand and one experiments have been made, and with various results, to determine the relative value of large, medium, or small seed—of cut

or whole tubers. We think the majority of these experiments is in favour of medium, or a little more than medium sized roots for seed, cut into sets of two or three eyes. On the principle that like produces like, such a seed will produce a crop of the most desirable size for the table. Each eye forms a distinct plant, like a kernel of corn; and the size of the tuber, and not of the set which is taken from it, will give character to the product. If the variety has a dwarf habit of growth, more sets may be put in a hill, or they may be planted nearer in the drill, than where the growth is tall, or where the tops send out many lateral shoots. Rich ground will also sustain a greater number of plants than poor ground. The Rohan, and we are told, also, the forty-fold, require thin planting. The object should be to give the plants a good pasture, and not to have the tops so thick as to exclude the solar rays from the soil.

To produce early potatoes, or to bring a crop to early maturity, it is advised to gather the seed before it has attained maturity, to expose it some days to the influence of the sun, and to select the top ends for the earlier crop. We have a strong illustration of the correctness of these conclusions in Loudon's Gardeners' Magazine. A correspondent of that journal made the experiment: he dug every other row of a potato patch for seed while the vines were fresh, and exposed them in the sun until they had become green. In February he cut them crosswise, leaving the bottom and top in separate sets. He cut those which had been suffered to ripen in a similar manner, and planted the four kinds in alternate rows. They were all planted on stable litter, and covered with about three inches of earth. A part of each kind received no subsequent earthing. We give the result in the writer's own words.

"The early potatoes not earthed up grew close around the stock or stem, like eggs in a nest, and so near the surface of the ground that they might be

picked off with the finger, leaving the stock or stem uninjured, to produce more potatoes from the runners. From the eye-sets of the unripe tubers we had a supply every day for a fortnight, when those of the bottom sets came into use for another fortnight; at that time, potatoes from the eye or top sets from the ripe seed came into use, and were succeeded by potatoes from the bottom sets of the ripe seed. Those kept for seed, or the table, were earthed up as usual, and each row produced almost as large a crop as any two rows not earthed up—the luxury of an early potato being a greater object than the quantity.”

Choice of sorts.—There is a difference of nearly one half in the nutritious or fattening properties of different varieties of the potato. Those which are best for table are best for market and best for farm-stock, though their yield is generally less than that of the coarser varieties. Those in the highest esteem are the Pink-eyes, Mercers, Sault St. Marie, St. Helena; and almost every district has its other favourites. The Rolian, we think, will ultimately obtain the ascendancy, on account of economy in seed, its yield, and its intrinsic merits.*

Mode of planting.—Three modes are practised: in hills and in drills, as a distinctive crop, and in alternate double or treble rows with Indian corn. The propriety of planting in hills or drills depends upon the condition of the soil; if it has been thoroughly subdued by the plough, drills are to be preferred, as

* The following remark is in this connexion worthy the attention of the practical agriculturist. “The first point to which I wish to direct the attention of the cultivator of the potato is, *the age of the variety*; for it has long been known, that *every variety cultivated gradually becomes debilitated, and loses a large portion of its powers of producing*; and I believe that almost every variety now cultivated in this and the adjoining counties has long since passed the period of its age at which it ought to have resigned its place to a successor.”—T. A. KNIGHT.—*Farmer's Instructor*, i., 193, published by Harper & Brothers.

they are cultivated with the least expense, and generally give the largest product, though they in general demand the most labour in gathering the crop. The practice of raising potatoes with corn, by alternating two or three rows of each, has been eminently successful where it has been conducted with spirit: the product of the mixed crop has been greater than where each has had a separate department of the field. We omit to notice the Irish mode of planting in beds, as involving an economy in land which we do not require, and an expenditure of labour which we cannot afford. The seed should not be buried more than three or four inches, and the covering should be least in wet ground.

Culture.—The culture of the potato, to be profitable, should be almost wholly performed with the plough, cultivator, and harrow; little other labour being required with the hand-hoe than may be barely sufficient to destroy the weeds which these implements do not reach. In the first place, the seed may be covered with the plough, whether in hills or in drills. In the next place, the harrow should be used, before the plants are above ground, to reduce the ridges made by the plough in planting, to pulverize the surface, and to destroy the young weeds. In the third place, the cultivator or the plough, turning a superficial furrow *from* the plants, may be introduced when they are not more than six inches above the surface. In the fourth place, the plough may be used to turn a light furrow *to* the plants, so as to give their stems an earthing of three or four inches; but the plough should run twice nearly in the same track, that the ridges upon which the crop grows may be rather flat and broad than pointed—rather concave than convex—calculated rather to retain than to throw off water. Here the hand-hoe may be of use in gathering around the stems a portion of the earth raised by the plough, in destroying weeds among the plants, and in perfecting the earth-

ing or hilling process; for the crop should receive no farther earthing after the plants are in blossom, when the stolens have shot forth, and the tubers began to form. Earthing after this time causes a new set of stolens near the surface, and a growth of a new set of tubers, which, in a measure, rob the original ones of their food. We have seen, by the experiments quoted in raising early potatoes, that the natural place for throwing out stolens, or roots which produce the tubers, is the point of the stem which first comes to the light and atmosphere; that if this point is covered in due time with two or three inches of mould, stolens are protruded into it which produce the potato; but that, if this earth is wanting, the stolens cannot protrude, but the potatoes grow at the surface around the stem. After the earthing process described, no farther care is required than to destroy weeds, which may be done with the hoe, or, if long omitted, by the hand.

In harvesting the crop, although we have made much progress in improvement, much remains to be done. The hoe, the dung-fork, the spade, the potato-hook, and the plough, followed by the harrow, have each their several advocates. From our experience, we should choose the last first, and the first last, where the crop is in drills; and we should prefer the hook where it is in hills. With the potato-hook, when the crop has been in hills, we have thrown out fourteen bushels of pink-eyes in an hour, and twenty-seven bushels of the Rohan, though in neither case did we gather the potatoes; but in both the digging process was thoroughly done. Lawson & Son's potato lifter, figured and described in vol. v., p. 114 of the Cultivator, seems to be calculated to abridge the harvest labour of this crop.

Sorting the crop.—This is an economical process, though little attended to, and may be more profitably done before the crop is housed or pitted than afterward. There is a portion of the crop, often a fourth

or a third, which is small, and unfit for the table, for market, or for seed, but which is as good as the large size for farm-stock, and which can be economically used for this purpose, in fattening hogs and beef cattle, in autumn and winter. If they are separated at the harvest, they are always in readiness; if not, the sorting is tedious, or is neglected, and the small potatoes are the last that remain, either for the table or for seed. With us the work is a trifling affair. We have a wire sieve or riddle, the meshes of which are of a size to admit those of a given size, appropriated to swine or cattle, to pass through. As the crop is brought home, a peck is thrown into the riddle, and, by shaking it half a minute, the sorting is completed.

Wintering the crop.—The best mode of preserving potatoes in perfection through the winter is to bury them in shallow pits, in a dry and porous soil (a side hill is the best), where they will be free from water, and to cover them first with straw, and then with earth, and, if convenient, coarse manure over the earth, so that they shall be secure from frost. Whether put in pit or cellar, they should be dry, that is, free from external moisture. Potatoes put into the cellar should be kept as cool as possible without freezing, and air should be excluded by a light covering of mould or sand. A dry, warm atmosphere will speedily impair their good properties.

In using potatoes, they are improved by boiling, especially for pigs. The potato belongs to a family of poisonous plants, the *solanum*; the boiling or steaming of which is believed to expel the deleterious, and to improve its nutritious properties. To neat cattle and horses they may be fed raw with manifest advantage. In cooking them for the table, it is preferable to do it by steam. The mode of doing it is simple. Take a piece of sheet iron, of the size of the bilge of your pot or kettle; perforate it with half inch holes; then clip off two parallel sides

so as to admit it into the mouth of the vessel ; put it in ; put some water *under*, and some potatoes *over* this perforated iron ; and, as the water boils, the potatoes will be steamed and prepared for the table : or, if to be boiled, put them into the vessel while the water is cold, that they may heat through as the temperature of the liquid is increased, so that the inside may cook as well as the outside ; and, when they are near being done, turn off the water, remove the cover, and leave them to dry over a moderate heat.

We will close this article, already longer than we had intended, by giving the culture, expense, product, and estimated profit of two crops raised by ourselves, in different years, upon the Albany barrens, the soil a sand-loam.

Culture.—The field was in clover. We applied twenty-five loads of long manure, in May, to an acre, and dropped it at suitable distances for spreading ; marked out two lands of equal breadth, twenty feet ; and, having the seed prepared, proceeded to planting, which occupied three men, a boy and team, three half days. One man took charge of the team ; a second raked the manure into the furrow, and trod it down as he went on ; and a third spread the manure, and, with the boy, dropped the seed. The rake followed the first furrow, and the manure from two and a half feet surface was drawn into it, and the sets or seed dropped at eight inches distance on the manure. The plough followed and turned three furrows, or made three bouts. In the mean time, the manure and seed were deposited in the first furrow of the second land, to which the plough followed, and in this way they alternated till the planting was completed. The ground was then rolled, harrowed as the plants began to break the surface, and subsequently ploughed between the rows, and hand-hoed once. About half the field was a dry sand-knoll, which suffered severely from drought ; and the crop here was but a little more than fifty per cent. of the other half. The product was ascertained by the ag

ricultural committee; and, as stated by them, embraced the average of the entire acre.

EXPENSE OF EXPERIMENT I.

Man and team 1½ days, ploughing in seed	\$2 00
Two men and boy planting same	2 00
25 loads of manure, at 75 cents	18 75
25 bushels seed, at 50 cents	12 50
Rolling, harrowing, and ploughing	1 00
Hand-hoeing once	1 50
15 days taking up crop (a long time)	11 25
Rent	5 00
	<hr/>
	\$54 00

PRODUCT.

359 bushels large potatoes, at 50 cents . .	\$179 50
71 do. small do., at 12½ cents . .	1 88
	<hr/>
	\$188 38
Deduct charges	54 00
	<hr/>
Nett profits in experiment 1	\$134 38
At 2s. a bushel, the nett profit would have been . .	45 25

EXPERIMENT II.

Culture.—This crop had been preceded by wheat. It had 25 loads of long manure spread and ploughed in. The ground was then harrowed, furrowed or listed with two and a half feet intervals, the seed dropped at eight inches, covered with a plough, a furrow on each side, and the ridges rolled. The after culture consists of two horse and hand hoeings. The crop was harvested with the plough and potato-hook. The product was determined by the agricultural committee.

EXPENSE.

One ploughing	\$2 00
25 loads manure, at 75 cents	18 75
25 bushels seed, at 50 cents	12 50
Harrowing, furrowing, rolling, and horse-hoeing . .	3 00
Planting and covering, 3 days	2 25
Hand-hoeing, 2 days	1 50
Taking up crop	9 00
Rent	5 00
	<hr/>
	\$54 00

PRODUCT.

183 bush. merchantable potatoes, at 50 cts.	\$191 50	
97 do. small do., at 12½ cents	9 62½	
	<hr/>	\$201 12½
Deduct charges	54 00	
	<hr/>	
Nett profits		\$147 12½
At 2s. per bushel, the profit would have been about	52 00	

In these estimates the whole manure is charged to the crops. Deducting one half, as is customary, the profits would have been \$9 37 1-2 more in each experiment.

II. BEETS,

Of whatever variety, whether for sugar or for cattle, require the same soil and the same culture. The mangold-wurzel or scarcity-beet has hitherto been the principal kind cultivated for farm-stock, though the blood-beet occasionally, and the sugar-beet recently, have both been grown for this purpose.

Beets, like all tap-rooted plants, require a deep soil, as it seldom happens that the roots enlarge much in the subsoil, or below where the earth is moved by the plough or spade. Moist loams, either of sand or clay, suit them best; though they grow on all soils not wet or very stiff, provided they are made rich and mellow. The mangold-wurzel will do better on poor lands than the other sorts.

The deeper the ground is ploughed, the more thoroughly it is pulverized, and the more intimately the manure is incorporated with the earthy matters, the better is the prospect of a crop. Pulverization is particularly necessary to the germination of the seed. The harrow should therefore be efficiently used before the seed is deposited in the soil.

The manner of planting the beet, of whatever kind, is in drills, which may be done either by the drill-barrow or the hand. Mangold-wurzel should be in rows twenty-seven to thirty inches apart, and the

plants, when out of the reach of insects, thinned to twelve or fifteen inches in the row, as the object is to obtain large size. The table and sugar beet may be sown in rows from twelve to twenty-four inches apart, and left to grow at six to ten inches in the rows, the object being not great size, but good quality: it being found that the quality of medium or small-sized roots is better, both in regard to flavour and saccharine matter, than that of very large roots. Some prefer soaking the seed, and some even sprouting it before it is sown; as it is husky, and, in case of dry weather, frequently does not germinate. But if the seed is put into fresh-ploughed ground, planted early in the season, and a roller passed over the surface after it is covered, or the ground pressed with the hoe or foot, it seldom fails to grow. The seed should be covered from three fourths to an inch deep; and as the young plants are liable to be destroyed by the grub, and even the turnip-fly, it is advisable to sow thick, say from three to four pounds of seed to the acre.

In the after-culture, the objects are to keep the crop clean and the soil mellow. The first dressing may be light, with a cultivator, where the breadth between the rows will admit: but when the plants are well established, the cultivator or small plough should be run deeper, and this operation may afterward be repeated to advantage. The crop should be harvested as soon as it has ceased growing, which is known by the under leaves turning yellow; as, if left in the ground longer, the roots deteriorate in value.

Mangold-wurzel is the German name: mangold a *beet*, wurzel a *root*. Their culture was introduced into England, from Germany, about 1820, and more recently they have attracted considerable attention in this country. In 1830, the Doncaster Agricultural Association, an institution which has rendered vast service to the farming interest, sent abroad a

circular among the best English farmers, with a view of collecting all the information upon the culture and use of this vegetable which was likely to be useful. Nineteen answers were received from large growers of the root, and the society published, in a condensed form, their purport. The report states that

“The answers are from every description of soil, the greatest number (nine) from sand, not, it appears, because that kind of soil is most favourable to it, but because, on sands, fallow crops of all sorts are more generally grown than any other; six are from peat, four from clay, four from chalk or limestone.

“The method of sowing appears to be drilling or dibbling on ridges, from twenty-seven to thirty inches apart, and afterward singling out the plants in the rows at about sixteen or eighteen inches from each other: the period of sowing any time between the middle of April and end of May; on cold soils earlier than on warm.

“The tops and leaves should be ploughed into the land immediately.* In comparing the quantity of manure used for Swedish turnips and mangold-wurzel, it appears from the answers of those farmers who have tried mangold-wurzel longest, that both require nearly an equal quantity, ten or twelve two-horse cart-loads per acre. With respect to the comparative product of the two crops, it appears to be in favour of mangold-wurzel in the proportion of about one fifth. The greatest weight obtained is by Mr. Simpson, of Babworth—54 tons. Of our correspondents, ten decidedly prefer mangold-wurzel, two give a partial preference to Swedes, and the rest have not expressed an opinion.

“The feeding properties of mangold-wurzel and Swedes are an important part of our investigation.

* After the roots are harvested.

Lord Althorp alone has tried their comparative merits, and he gives them a decided preference over the Swede. In this opinion his lordship is supported by Mr. Kelk; but seven of our correspondents are of the opinion that the Swedish turnips will feed quicker. Five of our correspondents say it is beneficial to milch cows, and two of the Norfolk farmers say it is apt to injure the butter.

“To sum up, the advantages of mangold-wurzel are these:

It is more sure to plant, being very little liable to the fly or grub.

It will produce more weight.

It is off the land earlier.

It is useful as a change of fallow crop when the land is tired of turnips.

It will grow on land where turnips cannot be raised.

It is better spring food.

“On the other hand, in favour of the Swedish turnips it may be said,

That the weeding and singling out are less expensive.

There is more time for fallowing in the spring.

The succeeding crop is better than after mangold-wurzel.

Perhaps cattle feed best on Swedish turnips when they are fed alone.”

Mangold-wurzel is relished by every description of stock; though, in feeding it to neat cattle, it is recommended to commence with small feeds, and, when it produces bad effects, to change the animal's food for a few days. Charles Poppy, an enthusiast in this culture, and whose pamphlet is before us, particularizes twenty-six uses to which this root may be profitably applied.

The British farmers speak highly of this root as a food for young calves. It is cut small, and fed to them after they are a fortnight old with wonderful benefit.

The value of this crop is certainly great in the economy of the farm. Estimating the product at twenty tons an acre, it will give 746 bushels of sixty pounds each; which, at the rate of two bushels a day, would keep a cow, with the addition of a little straw or chaff, 373 days, or somewhat more than a year. Two tons of hay, the average product of an acre, would keep the same animal, allowing a quarter of a hundred per diem, but 160 days, or about one third of the time that the wurzel from an acre would keep her; while the animal would be better in flesh and milk on the roots than she would be on the hay.

In storing and keeping the mangold-wurzel in winter, the same precautions must be taken, and the same means adopted, as are required for securing potatoes and ruta-baga. If deposited in pits, these should be narrow, and ventilating holes made in the crown of the pits. They are more liable to be injured by frosts than the ruta-baga.

III. THE CARROT.

The soil best adapted to the growth of the carrot is a deep sand-loam. The preparation of the ground consists in ploughing to the depth of a foot, the application of rotten manure, to be well incorporated with the soil (except long manure has been applied to the previous crop), and complete pulverization. Ploughing the fall previously is recommended.

The kind of carrot best adapted to field culture is the long red. The seed should be of the preceding year's growth. The best mode of culture is in drills; though in Suffolk, England, sowing broadcast is preferred. We have modern drill-barrows adapted to the sowing of this seed, though the sowing it by hand is not a tedious process, as a man may go ahead in sowing in this way as fast as another drives a barrow. The difference consists in making the drill with the hoe and covering the seed. As the

seed is of peculiar lightness, it is apt not to vegetate well if the surface is light ; and the practice has obtained with large growers of preparing it beforehand, by mixing five pounds of seed with a bushel of sand or fine mould a week or two beforehand, and of moistening and turning the mass frequently ; by this means not only do all the seeds grow, but the plants come up quickly, and get the start of weeds. Two pounds of seed is enough for an acre when sown in drills, though five pounds are often sown on an acre broadcast. Von Thaer uses poudrette instead of mould in the preparation of his seed. The drills should be eighteen inches apart, and the plants thinned to six or eight inches. The seed should be sown early in, or by the middle of May.

The after-culture of carrots consists in keeping them free from weeds, and the surface of the soil open ; and as the rows are too near to admit of the plough or cultivator, the hand-hoe must be depended on.

The best mode of harvesting the crop is that adopted by Col. Meacham ;* turning the earth from the row with the plough, and then drawing them with the hand.

The ordinary yield of carrots is less than that of ruta-baga or mangold-wurzel : the average may be stated at 400 to 500 bushels the acre, though the product has exceeded 1000. They are so hardy, that in the south of England they are permitted to stand out during the winter ; but with us they should be gathered and secured, like other roots, in October.

The carrot is eaten by all sorts of farm-stock, but is particularly useful for horses and milch cows, serving as a substitute for grain with the former, and increasing and improving milk when fed to the latter. Mr. Burrows, one of the greatest growers of this root, has fed ten cart-horses with them du-

* See Col. Meacham's letter at the close of this chapter.

ring the winter months and up to June, along with hay, and without the addition of grain. Such does he consider their economy in horse-feeding, that he states, as demonstrated by his experience, that with the assistance of lucerne for soiling in summer, a workhorse may be kept the entire year round upon the produce of only one acre of land. Mr. Burrows feeds seventy pounds a day to a horse, cut or whole, and mixed with chopped hay; reducing the quantity somewhat in the short days of winter, and increasing it a little in the spring months. Other growers feed only forty or fifty pounds a day. An acre of carrots, yielding 600 bushels, fed fifty-six pounds a day, would therefore be equivalent to 300 bushels of oats, fed half a bushel a day, to a working horse.

To save seed, select the best roots, and keep them in sand in the cellar till spring; plant them out early, and the seed will be ripe in August. Preserve it on the seed-stalks till wanted.

IV. THE PARSNIP

Is generally believed to be more nutritive than any of the roots we have treated of, and the product to be greater than that of the carrot or potato, with the advantage over them both that the parsnip is not injured by frosts. Yet its culture as a field-crop has hitherto been very limited.

The parsnip may be grown on stiffer land than the other roots we have named, provided it has a rich, deep tilth. It requires the same treatment as the carrot, though we would prefer intervals of eighteen inches between the rows, as in good soil the tops grow large. The Jersey variety is preferred, on account of small growth of top. Sow early, at the rate of four or five pounds of seed to the acre, and keep the crop free from weeds.

V. THE TURNIP.

The turnip culture, it has been remarked, effected
I.—H

as great and beneficial a revolution in British husbandry as did the introduction of the steam-engine and spinning-jenny in British manufactures. This crop has there proved a great source of wealth and fertility. It constitutes by far the most important material for making beef and mutton, as well as for enriching or keeping up the fertility of the soil. From an experience of twenty years in the culture and use of this root, we are persuaded it is destined to become the means of great improvement also in American husbandry, when our farmers shall become more familiar with its culture, and mode of preservation and feeding.

In the fourth number of the third volume of the *Cultivator* we gave particular directions for the cultivation of this root, with several illustrative cuts, and for preserving and feeding them to farm-stock and in our March number of the present volume we have given an estimate of the product and value of the Swede, compared with other crops which we cultivate for feeding and fattening cattle. It would be superfluous to repeat these details here, inasmuch as they may readily be referred to ;* yet, as we have many patrons who may not possess our third volume, we will give some brief directions.

The Swedish turnip or ruta-baga has a manifest advantage over all other varieties of turnip as cattle-food, being the most nutritive in its properties, and retaining its soundness and richness much the longest. The common varieties, if drawn, as all turnips must be with us, become pithy or spongy before mid-winter, and lose much of their value ; while the Swede rather improves by keeping till February, and may be fed in a perfectly sound state till June. And it possesses, moreover, one quality, not known, that we recollect, in any other root, that of increasing in nutritious matter with increase of size, the largest roots being specifically heaviest and richest.

* See also *Farmer's Instructor*, ch. Root Culture, p. 204, *et seq.*

The reverse of this happens with other roots, particularly with beets; those of medium or diminutive size being found to contain a much greater proportion of saccharine matter than very large ones. For table use, the early rock-turnip may be sown in the garden, the common flat or green-top for autumn and early winter, while the yellow Aberdeen should be chosen for late winter and spring use, being the best keeping variety, when the ruta-baga is either not liked or not to be had.

All kinds of the turnip prefer a sandy and dry soil; and the ruta-baga, in particular, requires a rich one. We have been accustomed to raise the common varieties as a second crop, *i. e.*, of sowing upon a grain stubble, with a single ploughing and harrowing, after the grain is harvested, from the 25th of July to the 1st of August, brushing or lightly harrowing in the seed. The plants must be thinned and cleaned with a hoe. They should not be left to stand nearer than six or eight inches. If sown broadcast, they yield more, and are of a more suitable size for the table than if raised in drills.

A grass ley is best for the Swede. If an old sod, it should be ploughed in autumn or early in the spring; and it should be manured and completely pulverized on the eve of being planted. If a young clover ley, the manure may be spread, ploughed under, the ground harrowed, and the seed immediately put in. We usually select the latter. We cut the clover by the 25th of June, and manure, plough, and sow the crop within the ensuing seven days. The seed is generally sown with the drill-barrow, at the rate of a pound to two pounds an acre. It is preferable to sow thick on account of the fly, and as the crop may be readily thinned when the plants are out of danger.

The turnip-fly often commits great depredations upon the crop. This was particularly the case the last season. We cannot recommend any certain

preventive. It has, however, been stated, that mixing the seed with sulphur several days before it is to be sown, and then sowing the sulphur with the seed, has preserved the crop from the fly. If this is so, it is owing to the juices of the young plant becoming impregnated with the subtle properties of the sulphur, which is obnoxious to every species of insect. Another mode, which has been successfully tried, is that of collecting the weeds in piles around the field when the seed is sown, and, when the plants are coming up, to put brimstone and fire upon the piles on the windward border, which will continue burning, ordinarily, for some days, and the smoke of which expels or destroys the fly.

In the after-culture of the Swede there is great economy in taking time by the foretop—in destroying the weeds while they are small. The cultivator or hoe should be passed through as soon as the rows can be well discerned, and as nigh to the plants as possible. One day's work is worth more in destroying small weeds than four days' work is in destroying large ones, which overtop and choke the plants. The objects which should be aimed at are to keep the crop clean, to thin the plants to eight or ten inches, and to keep the surface of the soil mellow. With a timely use of the cultivator, and repeated once or twice, these objects may be effected without much aid from the hand-hoe.

The labour of harvesting the ruta-baga is less than that of any other root, except perhaps the mangold-wurzel; and, indeed, the remark will apply to the labour of culture without any qualification. Other root-crops require attention nearly two months longer than this does, and at a season, too, when their growth is slow, and the labour, consequently, tedious and expensive.

The turnip should be the last crop gathered, because it grows the longest, is least liable to suffer from frost, and is most apt to be injured by ferment-

ation when collected in heaps for winter. If buried in pits, the roots should be raised above the surface of the ground, and laid up to terminate in a ridge; so that when they are covered with straw and earth, the heated or impure air of the pit will concentrate at the ridge on the top, where it should be suffered to pass off freely through holes made for this purpose.

The cost of raising the ruta-baga is less than that of raising corn or any of the other roots. The average product may be stated at 600 bushels, and it is often double this quantity. The root is an excellent food for every species of farm-stock, and is very extensively used for fattening both beef and mutton. Milch cows fed with ruta-baga should have daily access to salt; and should the milk retain any flavour of the turnip, it may be got rid of by turning a pint of hot water into a pailful when it is drawn from the cow. Tops that are undergoing fermentation, and roots decayed or unsound, should be given only to hogs.

THE TURNIP FLEA

Is one of the greatest scourges to British husbandry. The Farmers' Magazine contains a learned article upon this insect (*Haltia rumorium*), giving us its natural history, and containing an examination also of the various remedies which have been recommended to prevent its destructive ravages, embracing the applications of lime, sulphur, soot, urine, fumigation, &c. Although these remedies, or some of them, are admitted to have had partial success, yet none of them, in the opinion of the writer, Mathew M. Milburn, can be depended upon with any degree of certainty. He thinks Mr. Poppy's plan of protecting the Swede valuable, which is to drill between the rows the common turnip, which the flea seems to prefer to the Swede, and when the latter has acquired the rough leaf, to plough up the

common turnip: yet he concludes by saying, that if attention is paid to the following particulars, he thinks the crop may be generally saved.

"1. Hasten the germination of the seed by all natural means, as applying some portion of stimulating manure, sowing when a proper degree of moisture exists, and in close connexion with the manure, to secure at once the benefit of it to the roots, if possible, making most of the season when favourable.

"2. Sow a liberal quantity of seed, never less than three pounds, and sow it in drills, which will hasten the vegetation after it has come up.

"3. Clear the land perfectly, that no weeds may spring up to impede the growth of the plants, and give the soil a liberal supply of manure suited to its character.

"4. As a preventive, rid the soil by hand-weeding, horse-hoeing, &c., as much as possible of weeds.

"5. Select good seed, and test it before sowing, to see how many germinate, and in how little time."

METHODS OF FEEDING ROOTS.

[The following paper is a report made to the State Agricultural Society by Judge BUEL, as chairman of a committee appointed to report on the best vegetable or root crops for feeding cattle, &c., and embraces much valuable information on the subjects of which it treats. As a matter of course, much of the information communicated is derived from foreign sources, as at that time American farmers had had but little experience either in the cultivation or feeding of roots. Now there are many among us who are able to corroborate, by their own experience in feeding roots, as well as in their cultivation, the general correctness of the positions advanced by Judge

Bael, and add their testimony to the necessity and importance of still farther extending this culture in the United States.]

The culture of roots, as farm-crops for feeding and fattening domestic animals, is of such recent introduction, and so limited among us, and the few experiments that have been made to ascertain the relative value of these roots have been so loosely managed, that the committee do not possess the data that they could desire to make a satisfactory report, adapted exactly to our practice. But they are nevertheless satisfied, from the numerous experiments which have been made in Europe, in a climate very similar to our own, and from the partial ones which have been made among us, that the culture of roots is destined to effect here, what it has effected elsewhere, a great and salutary change in husbandry; not only as furnishing the easiest and cheapest means of feeding and fattening domestic animals, but as an important source of fertility to the farm; and of securing the main point—ultimate profit—to the owner or cultivator.

Under these strong impressions of the advantages of encouraging and extending root culture, your committee proceed, with the limited means at their command, to fulfil the duties assigned them by the society.

The Highland Agricultural Society of Scotland have recently awarded liberal premiums for experiments in fattening neat cattle; *first*, upon different kinds of roots, as the potato, turnip, and mangold-wurzel; *second*, upon raw and cooked food; and, *third*, upon roots entirely, and a mixture of roots, grain, pulse, and oil-cake. These experiments have been made with a view of accurately ascertaining the comparative value of each kind of root and other food, and the economy of each mode of feeding it. The experiments have been numerous. They have

been made upon ten to thirty head of cattle at a time, and they have been continued from three to six months. The animals were weighed or measured at the time of starting the experiment, at the close of it, and generally at intermediate periods, particularly when the food was varied ; and the quantity of roots and other food given was accurately noted ; so that the result has indicated the relative value of each kind of food in the fattening process, and the best mode of feeding it. The committee proceed to state, in a summary way, the results of some of these experiments.

1. *The relative value of different roots.*

Mr. Howden, with a view to the experiment, set apart the product of two acres of mangold-wurzel, amounting to fifty tons, five acres of Swedish turnips, being 140 tons, and two acres of potatoes, weighing 29 tons 4 cwt. The experiment was made with 21 head of cattle, which received, in addition to the roots, a few distillers' grains and a little straw. The following table shows the roots appropriated to each lot, and the monthly increase of the animals in girth. The abstract is made from the prize essays of the society, which cannot now be referred to ; but the impression is, that in all the experiments which we quote, the roots fed to each lot was precisely the same in weight. Lot No. 1 was fed from the product of one acre of potatoes, one acre of mangold-wurzel, and one acre of Swedish turnips ; No. 2 from one acre of potatoes and two acres of Swedish turnips ; and No. 3 from one acre of mangold-wurzel and two acres of Swedish turnips.

Date.	Lot No. 1.	Lot No. 2.	Lot No. 3.
1831, Nov. 30	35 feet 8 inches.	35 feet 9 inches.	35 feet 8 inches.
Dec. 30	36 " 6 "	36 " 7 "	36 " 6 "
1832, Jan. 30	38 " 2 "	38 " 4 "	38 " 2 "
March 1	39 " 7 "	39 " 8 "	39 " 6 "
" 30	40 " 8 "	40 " 10 "	40 " 6 "
April 30	41 " 4 "	41 " 7 "	41 " 3 "

Twenty-eight tons of mangold-wurzel and Swedish turnips were withdrawn to feed other stock.

On the 30th of January Mr. Howden took a pair of cattle out of each lot, and fed No. 1 with potatoes and water, No. 2 with Swedish turnips, and No. 3 with mangold-wurzel. The following shows their relative increase in three months.

Date.	Lot 1, Potatoes.	Lot 2, Swedish turnips.	Lot 3, Mangold-wurzel.
1832, Jan. 30	10 feet 8 inches.	10 feet 5 inches.	10 feet 4 inches.
April 30	11 " 6 "	11 " 3 "	11 " 2 "

When the cattle were sold, the purchasers agreed that the lot fed on Swedish turnips were from 7s. to 10s. (\$1 68 to \$2 40) a head better than the other lots. The average advance upon the original value of each was £6 12s., and the cost of the grains being deducted, there remained £120 (\$576) in return for the eight acres of produce consumed, or \$72 for each acre.

From the above statement it would seem there is no great difference in the fattening properties of the three kinds of roots; and that, so far as measure or weight is concerned, it matters little which are employed in feeding. We will note here, for future reference, the product per acre of each kind of roots, upon Mr. Howden's ground, adding the product in bushels of 56 lbs.

The potatoes gave	12 tons 4 cwt., equal to 488 bushels.
The mangold-wurzel	25 tons " 1000 "
The ruta-baga	28 tons " 1120 "

2. *The comparative economy of feeding raw or prepared food.*

In 1833 the society offered a premium of 30 sovereigns for the best report, founded on actual experiment made for that purpose, on a number of oxen or heifers, not fewer than six, the animals to be of the same breed, age, and sex, and the term of feeding not less than three months. Several reports were re-

ceived and published in 1834. From these we abstract the following :

Mr. Walker made his experiment with six two-year old heifers and four two-year old steers. Each parcel was divided into two lots, and fed on like food, except that one half received their food raw, and the other half in a steamed or cooked state. The food consisted of Swedish turnips, potatoes, and crushed beans, with a little salt and straw. At the end of three months, it was found that the three heifers fed on steamed food had gained 48 1-2 stone,* or 679 lbs., and the three heifers fed upon raw food had gained 45 1-2 stone; but the quantity consumed by the first lot exceeded that of the latter.

Cost of feeding on steamed food	.	.	\$67 40
“ “ on raw food	.	.	50 17

The first cost more than the last	.	.	\$17 23
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Deducting the first cost, and the price of fattening from the price paid by the butcher, there remained a profit on the three heifers fed with steamed food of 9s.; while the profit on the three fattened with raw food amounted to £3 10s. 6d. By a like estimate, the loss on the steers fed with steamed food was 3s. 8d. and the profit on those fed with raw food 10s. 6d.

Andrew Howden made a like experiment with 18 cattle in six lots. Their increase and expense of keeping for three months, from the 20th March to the 20th June, were as follows :

	Incr. in lbs.	Expense.
Three heifers on raw turnips	392	\$33 12
“ on steamed turnips	532	42 72
“ on raw potatoes	600	49 68
“ on steamed potatoea	572	49 68
Three steers on raw potatoes and corn	722	54 16
“ on boiled potatoes and corn	689	54 40

John Baswell fed ten horned cattle. The expense

* A stone is 14 lbs.

of keeping the five cattle on raw food was \$154 10, while that of the cattle on prepared food was \$164 40. On being slaughtered the two lots appeared to be very similar, but the particular weight is not mentioned.

3. *Relative economy of feeding with turnips alone, or with turnips and other more expensive food.*

Robert Stevenson was the successful competitor for the society's premium. He took 18 oxen; their live weight was ascertained at the beginning, at the end, and at intermediate periods of the experiment, which continued 119 days. The cattle were divided into three lots of six beasts each, and a correct account was kept of the weight of food consumed by each lot. Lot 1 was allowed linseed-cake, bruised beans, and bruised oats, in addition to turnips, and during the last 24 days of the experiment, 20 lbs. of potatoes were given per day to each. Lot 2 received the same allowance except the linseed-cake and half the potatoes. And lot 3 was fed upon turnips alone. The cost of the keep of each animal, during the 119 days, was as follows:

Total cost of feeding one beast of lot 1	.	\$24 62	.
do. do. do. of lot 2	.	18 48	.
do. do. do. of lot 3	.	9 27	.

The improvement in live weight was as follows:

First lot increased in weight	.	108 stone
Second do. do.	.	101 "
Third do. do.	.	49 "

Abstracting the cost of feeding from the value of the increased weight, the loss and profit would stand as below:

Loss on feeding lot 1	.	.	.	\$18 00
Profit on feeding lot 2	.	.	.	9 53
Profit on feeding lot 3	.	.	.	12 26

"Thus, when turnips alone were used, a profit of twenty-two per cent. was realized; where beans and

oats were used along with the turnips, the profit was diminished to eight and a half per cent. ; but when still more expensive food was tried, that is, grain and linseed-cake, along with turnips and potatoes, a loss was sustained of no less than 12.316 per cent."

Lot 1 were the largest oxen. They were fed each with 132 lbs. per day of Swedish turnips ; lot 2 were fed each with 120 lbs. of the same per day ; and lot 3, being the smallest, received but 115 lbs. per day, and for twenty-four days but ninety-two pounds.

Lot 1 cost 8.968 cents for every pound of increased live weight.

Lot 2 " 7.94 " " " "

Lot 3 " 6.78 " " " "

The turnips were estimated at eight cents per cwt. ; the potatoes at 36 cents per cwt. ; oats and beans at 84 cents per bushel, and linseed-cake at one and a half cent per pound.

"In conclusion," says Mr. Stevenson, on this part of the subject, "we give it as our opinion, that whoever feeds cattle on *turnips alone*, will have no reason, on the score of profit, to regret their not having employed more expensive auxiliaries to hasten the fattening process."

It would seem pretty evident, from the foregoing experiments, that ruta-baga and mangold-wurzel are the best root-crops for feeding cattle. The profit of cultivating and feeding these roots will be more manifest, if we compare their product to the acre with that of hay, potatoes, and the coarse grains which we feed to fattening animals. To enable the committee to make this comparison, they assume the following as the average products of crops, and attach to each of these an estimate of their marketable value. Both the product and the prices will greatly vary ; but those assumed are deemed sufficiently correct for comparison.

An acre of grass	2 tons at \$10	.	\$20 00
do. corn	40 bushels at 75 cts.	.	30 00
do. oats	30 do. at 37½ cts.	.	11 25
do. buckwheat	30 do. at 50 cts.	.	15 00
do. potatoes	150 do. at 25 cts.	.	37 50
do. ruta-baga	600 do. at 25 cts.	.	150 00
do. man.-wurzel	600 do. at 25 cts.	.	150 00

Estimating the cost of the roots, in labour, at twenty dollars an acre more than that of the hay, oats, and buckwheat, it still leaves a great disparity in the profits; and considering the cost of culture equal to that of Indian corn, there is a manifest advantage in the turnips and mangold-wurzel over the corn-crop as a material for cattle food. Good beef cannot be made on hay alone in winter: and those who do not feed roots must resort to some more expensive food, as the meal of Indian corn, oats, buckwheat, &c. The turnips and mangold-wurzel, on the contrary, with the aid of perhaps a little straw, will serve of themselves to feed and fatten animals.

In this matter the chairman can speak from experience. He purchased four oxen a little before Christmas, and kept them till some time in April; after a short time, they ate each two bushels a day of ruta-baga: they would eat very little else, though laid before them, not even linseed-cake. They made good beef, and afforded a handsome profit on the turnips consumed.

If we now assume that an ox will require a quarter of a hundred of hay per diem to keep him in good condition, and that it will require an addition of four quarts of corn meal, or eight quarts of crushed oats or buckwheat per diem to fatten him; and if we consider 112 pounds, or two bushels of roots, equivalent to a ration of hay and grain, then the several crops will feed an animal as below.

One acre of grass and half an acre of corn will feed	160 days.
One and a half acres of mangold-wurzel or Swedish turnips will feed	450 days.
One acre of grass and one acre of oats or buckwheat will feed	160 days.

Two acres of Swedish turnips or mangold-wurzel	
will feed	600 days.
One acre of potatoes will feed	75 days.
One acre of Swedish turnips or mangold-wurzel	
will feed	300 days.

Making very liberal allowance for the difference in the expense of raising these crops, and for any error the committee may have made in fixing the daily rations, or in the produce of each to the acre, they think that no doubt can for a moment be entertained, that the Swedish turnip and the mangold-wurzel are decidedly the best crops that can be raised for feeding cattle.

The committee have no doubt that the sugar-beet and carrot offer advantages nearly or quite equal to the roots above recommended. Their product and nutritive properties are very similar, and the expense of culture is not very dissimilar. The sugar-beet is probably richer in nutriment than the mangold-wurzel, though its product is ordinarily less. The carrot may require more labour in the culture; but it is superior as food, particularly for horses.

Arthur Young highly extols the carrot. Upon the product of three acres of this root, he assures us he kept, for more than five months, twenty work-horses, four bullocks, and six milch cows; nor did the animals during that period, he adds, taste any food except a little hay. Our enterprising fellow-citizen, Col. Meacham, of Oswego, has gone largely into the culture of carrots as cattle-feed, as well as many of his neighbours; and they speak highly of the profits of the culture.

Some very satisfactory experiments have also been made among us, on a limited scale, in cultivating and feeding the sugar-beet. There seems to be little doubt, from the high state of perfection and of profit which the business has arrived at in France and Germany, that the culture of this beet will soon

be extensively gone into in this country for the purpose of making sugar ; and if so, the residuum of the beet will form an important item in the material for fattening cattle.

There are other advantages resulting from root culture which should not be overlooked. It tends greatly to increase the quantity of manure on the farm, to meliorate the texture of the soil, and to furnish excellent alternating crops in convertible husbandry. In selecting for culture, the farmer should choose the roots that are best adapted to his soil. The turnips prefer a dry, sandy soil ; the beet a clay loam.

As to the best means of cultivating these crops, the committee summarily remark, that the product and profit will materially depend upon the following contingencies ; viz., that the soil be dry ; that it be rich ; that it be deeply worked ; that it be thoroughly pulverized ; and that the after-culture be well managed. The implements necessary to cultivate them advantageously, in addition to the plough and harrow, are the drill-barrow and cultivator. The season for sowing the beet is from the 10th to the 20th May ; and for the Swedish turnip from the 10th to the 25th June. The drill or row culture is decidedly the best. A detail of the whole process of culture would occupy too much space for this report ; and it is unnecessary, as these processes are already understood by many, and have been minutely described in the agricultural periodicals of the day. The committee will merely recommend, in conclusion, that the roots be always cut previously to being fed to cattle, for which purpose machines may be procured at a moderate charge, which will cut a bushel in from one to three minutes. If cut, the roots will be eaten entirely ; if not cut, a portion is apt to be rejected and wasted.

The chairman has received a communication from Col. Meacham, stating his mode of cultivating the

carrot, the product, and manner of using the crop. He cultivates them in drills from 20 to 24 inches apart; he gets one thousand bushels an acre, at an expense of \$25 to \$30; he kept six work-horses on them from November, 1836, to June, 1837, without grain, and they remained in good plight, and performed as well as he ever had horses perform; and he thinks they are worth double as much for stock as ruta-baga.

Upon the subject of the carrot culture, which is perhaps less understood among us than that of the beet and turnip, the committee will add, that this root thrives best in a sandy loam, light, moist, but not wet, and of great depth; in which the plough, going to the beam, brings to the surface nothing that is not fit for vegetation. The ground should be ploughed immediately preceding the sowing. In Suffolk, England, they sow 8 lbs. seed, broadcast, to the acre; and the crop is from 400 to 500 bushels. To horses they are considered superior to any other food. Two bushels of carrots and one of chaff is the per diem allowance to a horse; or seven bushels of carrots and one bushel of oats is the allowance for a week. They are also profitably fed to all other farm stock. They are raised in Suffolk without manure, at an expense of 9d. (18 cents) per bushel. The yield of the carrot is often from 700 to 1000 bushels the acre. The crop is gathered by making a deep furrow near to the drill; when a man seizes, draws the top to the furrow, and pulls them up with great facility.

Another root, the parsnip, is deserving of notice, though its partial culture hitherto will hardly entitle it to be classed among field-crops. It is believed to be the most nutritious root of any that have been named; is as easily cultivated as the carrot or the beet: and has this advantage over all the others, that its value is not impaired by frost.

From the preceding views, the committee do not hesitate to recommend the extension of root culture

as the most ready means of keeping up the fertility of our farms and of increasing the profits of their cultivation.

CARROT AND RUTA-BAGA CULTURE.

'The following is a brief account of my method of cultivating the carrot and ruta-baga. My opinion in regard to profit is in favour of the carrot. As to the relative value, I have entertained the opinion that the same weight of carrots is worth, for stock, nearly double that of the ruta-baga. I fed my work-horses on carrots from November, 1836, till June, 1837, three span; they remained in good plight, and performed as much as I ever had any within that length of time; they ate no grain; nothing but hay and carrots, thrown whole into the manger. I have raised one thousand bushels of carrots or over, yearly, for three years past, on an acre of land.

In 1836 I raised between two and three thousand bushels of ruta-bagas. They produced from six to seven hundred bushels to the acre. They grew very large: the largest one weighed thirty and a half pounds. The land was stony and gravelly, made mellow and ridged high with the plough, two and a half feet or over apart from centre to centre. The seed was planted about the 10th of June, which I found to be late enough. Method of planting: one man goes forward with the hoe, and makes marks for the seed in the centre of the ridges, about twenty inches apart, which is very quick done, nearly as fast as a man would walk; another man follows as fast with the seed, and drops from four to five seeds into the place with his thumb and fore finger, and covers them at the same instant with the remaining three fingers. In this way I think a smart man would drop the seeds and cover two acres a day.

The same year, 1836, I raised one acre of carrots, which produced over one thousand bushels. I measured one rod of the ground where the carrots ap-

peared to be the best: the produce of this rod was at the rate of over fifteen hundred bushels per acre. Multitudes of carrots from this acre measured four and five inches in diameter at the butt: the longest one that we found measured over two feet. The soil was deep, gravelly, and stony, originally covered with large sugar maple, interspersed with heavy bass and hemlock. I cannot admit that the whole expense of labour on the one acre of carrots, including the harvesting, was over thirty or thirty-five dollars. The land on which they grew had been occupied the year previous with carrots, potatoes, corn, rutabagas, beans, and other garden vegetables, and manured with long manure on the one half, and hog-manure on the other. Between the 1st and 5th of May (it having been previously deeply ploughed) I commenced work in the morning with six or seven men and boys, three horse-team ploughs and harrows; and at 12 o'clock, M., the same day, the planting was finished. I have no doubt that Judge Buel, had he been present, would have considered the planting of the seeds to be slightly done; but the crop was a good one, being one thousand bushels or over per acre. First we ploughed the ground very deep, and harrowed the furrows level; then took each man his hoe, reversing the edge of it, and expeditiously scraping or dragging the hoe along the surface of the ground twenty or twenty-four inches apart, bearing on the hoe sufficient to make a large mark or track, and to remove the stone and other encumbrances from the track or drill; and so on, back and forth, until the whole acre was marked out in drills: then each man or boy, taking a small dish with seed in one hand, and stooping down so as to bring the other hand as near the ground as might be to prevent the wind from blowing the seeds out of their place, walked quickstep, each one strewing the seeds according to their own judgment; having, however, previously received a good lecture

from the master not to strew them too thick. When this was done, each man took the hoe again, and half reversing it, with the edge up, went through again with an increased movement, gently puddling or stirring the soil in the centre of the drills. A piece of board or stick, four or five feet in length, will answer this last purpose about as well as a hoe. A great part of the seed sown by some farmers is lost by deep covering. A shower of rain will bring them up without any covering where the soil is loose and well fitted. The ground between the drills ought to be brushed over with the hoe immediately after they begin to come up, or before, if you can see where the drills are, so that you can avoid disturbing the carrots.

I think a man may cultivate three acres of carrots with the same amount of expense and labour, by keeping in advance of the weeds, that he can one acre in the common way, with the weeds in advance of him a number of days. When the carrots get up ten or twelve inches high, I plough between the rows with a horse again and again. When I harvest them, I run a strong team and plough as near the outside rows as possible, and very deep, turning the furrow from the rows; the hands follow after, and pull them out by the tops with ease, a number at once, and throw them in heaps; and so I proceed until the piece is finished. If there was any difference in the crop, it was in favour of that part where the long manure was spread the year before. I planted the same piece in 1837 without any additional manure. The crop was about one quarter less. I have no doubt that it would be a great benefit to our farmers who keep stock to cultivate the carrot, especially for milch cows. To those who are not experienced in the cultivation of the carrot, I would say, sow your seeds in drills, at least twenty or twenty-four inches apart; the earlier in the season the better, if your land is in good order; if they

stand thin in the drills, they will be large ; if very thick, it will spoil the crop.

THOMAS S. MEACHAM.

CHAPTER IV.

INDIAN CORN.

Varieties of Indian Corn.—To render Corn prolific.—Culture of Corn.—Experiments in producing improved varieties of Indian Corn.—Experiments in Harvesting Corn.—Selection of Seed, and Early Maturity.

VARIETIES OF INDIAN CORN.

DR. BROWN, in an essay lately published in the Farmers' Cabinet, enumerates thirty-five varieties of Indian corn which he has in his possession. He divides them into five classes, besides sub-classes. We give the names, as well for future reference as matter of curiosity.

A. YELLOW CORN.

A. a. No. 1, Genuine gourd-seed, of 24 rows ; 2, of 22 rows ; 3, of 20 rows ; 4, of 18 rows ; 5, of 16 rows ; 6, of 14 rows ; 7, of 12 rows.

A. b. No. 8, King Philip Indian corn, 8 rows.

A. c. No. 9, Sioux, or early flint, 12 rows ; 10, Sioux of Pennsylvania, 12 rows ; 11, Sioux and gourd-seed mixed, 16 rows.

B. WHITE INDIAN CORN.

B. a. White flint. No. 12, genuine white flint, 12 rows, Virginia ; 13, white flint, 10 rows ; 14, early white flint.

B. b. White flour. No. 15, from Peru, 8 rows ;

16, Pennsylvania, 8 rows, called Smith's early white;
17, New-Jersey, 8 rows; 18, New-York, 10 rows.

B. a. and *B. b.* No. 19, Mandan Indian corn, a mixture of 12 and 15.

B. c. No. 20, Early sugar or sweet corn, 12 rows, grains shrunken.

C. HÆMETITE, OR BLOOD-RED INDIAN CORN.

No. 21, Common-sized, 12 rows and red cob.

No. 22, Red cob with white grains.

No. 23, Red cob with yellow grains.

No. 24, Red cob with brown grains.

No. 25, Red cob with white gourd-seed.

No. 26, Red cob with gourd-seed and yellow flint.

No. 27, White cob with yellow grains.

No. 28, Speckled red and yellow grains on a white cob.

No. 29, The same on a red cob.

No. 30, Dwarf hæmetite, commonly called Guinea corn.

D. BLUE CORN.

No. 31, Blue corn, 10 rows.

E. No. 32, The corn of Texas; each grain is enclosed in a pod or husk, and the ear in a husk.

No. 33, Corn found in the envelope of a Mexican mummy.

No. 34, Cobbett corn, grown in England.

No. 35, The famous Dutton corn.

We take the liberty of adding to the above list five other varieties in our possession, seemingly not embraced therein, viz.:

1. Lake Superior corn, ears six inches, 12 rows, reddish brown colour, said to be very early; from S. Robinson.

2. Squaw corn, 8 rows, blue grain, also early.

3. Corn from Trieste, on the Adriatic; ears six inches, and semi-conical, 12 and 14 rows, orange yellow.

4. Rice corn, ears four inches, and grains like rice.

5. A yellow 12 rowed corn, from Vermont, ears considerably smaller than the Dutton.

Dr. Brown gives four criteria (the first three from Mr. Taylor) which should be regarded in selecting our seed-corn, viz. : 1. *The most stalk.* 2. *The largest cob.* 3. *Longest grain.* And, 4. *Early growth and quick culture.* The reason for the first is, that a man can gather more grain, stalk, blade, top, shuck, and cob, of large than he can of small stalks. This quality, however, would not be so highly esteemed in the North, for tall, large-growing corn would be here later in ripening; and besides, corn of this description will not bear planting so thick, and, consequently, will not yield so much per acre as varieties of more diminutive growth. 2. The large cob is preferred, because it gives the most corn. 3. The longest grain, because it decidedly settles the superiority of the farinaceous product.—We dissent from this conclusion, and think the superiority in farinaceous product depends more upon *weight* than the *length of the kernel.* The Dutton, it will be seen by the communication of J. Wright, has weighed 69 lbs. the bushel. This has a short kernel; and yet we doubt if any long-kernelled variety can be found to weigh so heavy, or to afford so much nutriment. The fourth requisite, early growth and quick culture, is a very important one to Northern farmers.

TO RENDER CORN PROLIFIC.

It seems to be a great desideratum with farmers to plant that variety of corn which will produce the most ears on a stock. This criterion of a good variety is deceptive, and passes for more than it is worth; and, withal, leads to a neglect of the main point which should engage the farmer's attention. It is not the *number of ears on a stock*, but the *number of bushels on an acre*, that should be the first aim of the grower; and this depends not so much on varie-

ty as upon richness of soil. Corn, like cattle, will produce according to the quantity and quality of the food which is consumed; and if this food be not in the soil, it matters little how many ears grow upon a stock; the product will be in the ratio of the food: if there are many ears, they will be comparatively small; if but few, comparatively large, in proportion to the richness of the soil. An acre of good pasture will carry, say five sheep, through the season, and fit them for the butcher; but if the acre is made to carry ten sheep, they cannot thrive, and will not be fit for the butcher. And again: if the acre of pasture is poor and light, the five sheep put upon it will be stinted in food, and will not thrive. The gain in the sheep will be in proportion to the quantity of herbage they convert into mutton and wool. So with corn. The roots of this grain, like the sheep, range over the whole pasture of a field, gather the nutriment which it contains, and this is transmuted into grain and forage; the aggregate of which is not very dissimilar, whether the ears be three, two, or one upon a stock, provided due regard is had in planting to the habits of the variety, so that the pasture be fed off clean without being overstocked. We have frequently observed that we have more ears upon a stock on the borders of our cornfield, and where the intervals are large between the hills, or some of the stalks deficient, than we have in the centre of the field, or where the planting is close; and that the size of the ears, or the aggregate of the product, is always in proportion to the richness of the soil and the excellence of its cultivation. The atmosphere undoubtedly contributes essentially to the food of the corn-crop, where the surface of the soil is kept clean, open, and permeable to it. The fermentation of long dung in the soil, and the frequent use of the cultivator, tend to keep it in this favourable condition. There is no danger of gorging or injuring the corn crop with

long manure if it be spread and buried with the plough; nor are its fertilizing properties so much impaired in using it for corn, potatoes, and ruta-baga in this way, as they are by the system of *summer-yarding* it, so generally adopted in some counties west of Albany.

The remarks which we have made upon Indian corn, tending to show that the product depends essentially upon the quantity of food which it finds in the soil for its subsistence, applies, with greater or less force, to all farm-crops. The economy of management depends upon the judgment of the farmer in adapting the food, both as regards quality and quantity, to the wants of the particular crop. But let us not be misapprehended on one point: unfermented dung should not be used for the small grain or other crops, which ripen at midsummer, until it has been first prepared and fitted for them by the autumn-ripening crops, as corn, potatoes, ruta-baga, &c. These latter subsist principally upon the gaseous and volatile portions of the manure, which are first disengaged from the mass in the process of fermentation, and which are rather deleterious to the former at the season when they are maturing their seeds.

Another criterion which some farmers consider as essential to a good variety, is smallness of cob. So far as this conduces to the early and perfect drying of the grain, it is entitled to weight, but no farther. The objection to a large cob was answered by a gentleman by asking the objector whether it required most cloth to make him or his son a vest, pointing to a boy standing by his side. The circumference of a cob two inches in diameter will contain double the quantity of grain that a cob of one inch in diameter will.

There is no doubt but the habits of corn change with change of climate; or, in other words, that the dwarf Northern varieties, when taken to the South,

in a few years become acclimated, and assume the tall growth of the South. It is hence advisable, that, where early maturity is desired, as it seems to be in our latitude, seed should be occasionally procured from the North. Another means of preserving the early ripening properties is to select for seed the ears which ripen first. We have raised the Dutton corn, obtained from the Green Mountains of Vermont, for sixteen years; and yet, taking care to save for seed the earliest matured ears, we are not sensible that it ripens much, if any, later now than it did when we first planted it.

CULTURE OF CORN.

In the fall of 1837, the ground which I intended for my corn was in timothy and clover, with a light sward, having been stocked about two months, then ploughed it late in the fall. In the spring following I covered it over with common coarse manure from the barnyard, which was composed of a large quantity of straw. My stock is principally sheep, and straw was thrown into the yard plentifully during the winter for bedding. In drawing it out, a load was usually dropped in a place, so that, after it was spread, it completely covered the ground to quite a thickness. About the middle of May the ground was ploughed very deep, and boys were sent ahead of the plough, who raked all the manure into the previous furrow, so that it was completely covered. Some of my neighbours then said that they would rather have that coarse manure off from the ground than on it for the good of the corn-crop, and that it would do no good till the next crop, or until it should be decomposed. I will here remark, that, from reason and experience, I must protest against leaving manure in the yard over summer, or even putting it into heaps to decay, as some do, to heat and drain off its strength. On the contrary, in most cases it is nearly as cheap to haul it into the field as to heap

it up in the yard. We get the use of it one year sooner, and have all the strength on the land, where it should be, instead of being washed into the streams of water. I think, for corn and potatoes, that the benefit the first year will more than pay the expense of carting an ordinary distance. To return to my subject: I next harrowed and furrowed my ground, or, rather, marked it very shallow, three feet apart. It was now the 17th of May, having been hindered in planting a number of days by a heavy rain. The hills were sixteen to eighteen inches apart, and I put three kernels in a hill. It being rather cold and wet, the corn did not sprout as quick as usual; and, on examination, I found that a small wire-worm, that had probably been in the manure, had eaten into the chit of much of it, so that only a part was coming up. Although now as late as the 4th of June, I commenced planting over, by putting in just as much seed as I did the first time, in a hill between every two hills, which made them nearly join. As I had only seed enough left of the kind to plant over 118 rods of the ground, the rest was planted in beans. I will here state, that the 118 rods was all the ground that had been manured, and a cast was made on the acre from that ratio. The rest was equally as good corn, but the ground was not well stocked. When I hoed the first time, I concluded, at the second hoeing, to pull out some where it was thickest; but it being left for some time, and forgetting to tell my man to do it, it all stood. I directed him to hoe it twice more; but he did it only once, having for excuse that the corn had got so large he could not do it; so that it had only two hoeings. The stalks were 8 or 10 feet high, and a complete swamp to appearance.

Now some of my neighbours said it would be all stalks and no corn. On the night of the 2d of September, I think, we had a severe frost, which killed the stalks; but the corn was all ripe, the last plant-

ed as well as the first; making for the last planted just 13 weeks. It needed no sorting to grind, and handsomer corn I never saw. As to its being all stalks and no corn, the result showed. I am strongly of the opinion that great improvements may be made in planting by distributing the seed more over the ground, and by putting in more of it. L. C.

I here offer my mode of treating corn, which I consider the most important among the grain crops. Whether manure has been spread before ploughing or placed in the hills afterward, I adopt the same practice. As soon as the corn is up, so that the rows or lines can be distinctly seen, I run the *plough* through, as near to the hills as may be without displacing the plants, to the depth of five inches, throwing the earth from the hills; if moles or mice are plenty in the field, both ways; if not, only one way. The rows are then gone over with the hand-hoe, the hard surface or crust immediately about the plants stirred and broken, and the contiguous weeds or grass destroyed: this is the first dressing. After about ten days, set in the plough in the same manner as before, if it has been ploughed through only one way; if both, reverse the furrows, and let the hoe be used to loosen the earth about the plants, and to draw a little fresh soil to the hill, at the same time eradicating all weeds and grass near the plants. Now we have ended the second process, and are ready, at the proper time, for the third and fourth, or more, as the soil or season may require, with the cultivator or harrow to break down small hillocks or ridges, and to keep a soft surface between the rows, that will absorb the showers or dews, when a hard surface would be but little benefited, taking care at each time to draw a little new mould to the hills, yet leaving them at the last dressing wide and square, and but slightly elevated. This little rise about the corn will help to support it at the autum-

nal gale, and will not turn the showers off to the injury of the crop. 'This management may seem not exactly orthodox; but I fancy I derive some advantages not to be obtained by the use of the harrow or even cultivator alone. Those mischievous miners, the moles and mice, are more effectually opposed in their operations, a deeper and softer bed is prepared for the roots to strike into, and greater extent of surface is exposed to be heated by the sun's rays; which is, in effect, protracting the summer a week or ten days; time enough, not unfrequently, to save a crop. A common saying with our farmers is, corn only wants hot weather; and the fact is notorious, that a fair crop of corn may be obtained by nice management in a season so dry that any other grain-crop would fail almost in toto. The harrow and cultivator scarify the ground, but do not lay it open with a bold incision, nor leave the corn-hill on a prominent ridge or hillock at the commencement of growth, when nothing but heat seems necessary to the vitality and health of the plants. If it be objected that by this use of the plough we assist the escape of vegetable food in the form of carbonic acid gas and volatile alkali, I reply, it may be so to the amount of six or eight per cent.—an inconsiderable matter compared with the accelerated maturity of the crop.

ARCH. JAYNE.

EXPERIMENTS IN PRODUCING IMPROVED VARIETIES OF INDIAN CORN.

Some ten or twelve years since, I instituted a series of experiments in crossing different varieties of corn, and was perfectly successful. The variety named in Dr. Brown's list (page 43 of the same number), "No. 16, Pennsylvania, 8 rows, called Smith's early white," was the result of one of the experiments. It was produced by what we call the *Tuscarora*, or "New-York cheat," with the *Sioux* (No. 9 of Dr. Brown's list). From the parentage of this

new variety, you would naturally expect a mulatto colour ; but I will explain why it is *pure white* as I go along. I had two objects in view, the one to get the large, white grains of the 'Tuscarora on the small cob of the Sioux ; and the other, to produce a variety earlier than either, if possible. To accomplish my object, I planted a piece of ground, say the eighth of an acre, with both varieties, one in each alternate hill ; but as the Tuscarora was known to me to be from 15 to 20 days later than the Sioux, I planted the latter 15 days after the former. Now the process of crossing is performed in the following manner. The variety that has the cob that I wish to retain is used as the female, and as the tassels (male flowers) appear, they are carefully cut off and suppressed ; the variety whose grain I wish to get is used as the male, and its tassels are allowed to grow. It is unnecessary to interfere with the female flowers (the silk). The ears of corn produced by the Sioux hills had the form and size of cob of the Sioux, but the grain was a beautiful sulphur colour, and of the form of the Tuscarora, though smaller. This corn I planted the next year, and the result was a beautiful variegation of the grains, of pure yellow and pure white, though all the grains were alike as to size and shape. The cream-colour had evidently returned to its original elements. I then carefully selected the white grains, and planted them the third year, and the result was the establishment of the variety called "Smith's early white." (I do not understand how or whence Dr. Brown obtained the name of *Pennsylvania*, 8 rows.)

My experiments established the fact satisfactorily to my mind, that you can place the grains of any variety of corn upon the cob of any other variety, by the process detailed above ; and that there is no object more worthy the attention of farmers than improvements of this kind. You have only to regulate the time of planting each variety, so that they flower

at the same time. I ought to observe, that if you do not destroy the tassels of the variety that has the objectionable *grain*, the crossing will not be so perfect, because the *impregnation* will be from two males instead of one, and, consequently, the grains produced will be various. The crossing is equally important in making the large late kinds small and early. You can get the tall Virginia corn (that is, the grain of it) upon the early dwarf stalks. Indeed, you may vary it almost at pleasure. As you will perceive above, it requires three years to accomplish the object perfectly. The first year effects the crossing; the second year certain characteristics return to their original elements, such as the colour, and somewhat of the flinty quality; the third year the new variety is produced perfect—and will remain so, so long as it shall be kept distinct from other varieties.

Another experiment was combined by me with the above, viz.: the first matured ears of good form and size were always selected for seed. By this process I was able, in five years, to make my new variety from 15 to 20 days earlier than the Sioux, or any other variety. I had green corn on my table for some years, two weeks earlier than the hotels which were supplied with early corn from Norfolk. I beg to observe, that the Smith's early white has but eight rows, and the Sioux (the female parent) twelve: now to account for this. After I had produced the variety, I was still desirous of putting it upon a smaller cob; hence I planted it with the sugar-corn, using the latter as the female. The result was the eight rows. I also once took a notion to give it a red cob, and had no difficulty in doing so, by using the red cob sugar-corn as the female; but I recrossed and got rid of the red cob again, because it stained the lips and fingers while eating it.

GIDEON B. SMITH

EXPERIMENTS IN HARVESTING CORN.

Andrew Nicol has given in the Farmers' Register a statement of some experiments he made last year with his corn crop, the substance of which we abstract.

1. He spread 32 loads of pine leaves on a piece of corn land, planted very close for the climate of Virginia, so as to give an average thickness of four inches. The crop received no after culture. The product was 75 bushels per acre, considered there a very large return. The pine leaves counteracted the effect of drought; and Mr. N. thinks that, had the covering been thicker, the product would have been greater.

2. The second experiment was made to ascertain the effect of topping, cutting up, and leaving the grain to ripen upon the standing stalk. Eighteen rows of 150 yards in length were stripped of the fodder; that is, all the leaves, except two above the ears, were taken off on the 11th September; the tops were cut from six of these rows on the 20th September; six other rows of the 18 were cut by the ground the same day; and the third six rows were left to stand, together with the first six, until the corn ripened; other six rows, from which neither fodder was pulled nor tops cut, were, on the same 20th September, cut off by the ground and set up in small shocks. The corn from each was gathered on the 2d December, and on the 7th February shelled and accurately weighed. The following are the results in measure and in weight:

1st 6 rows measured 8 bushels, weight per bushel 58 lbs.						
2d 6	"	"	7 $\frac{3}{4}$	"	"	57 "
3d 6	"	"	7 $\frac{5}{8}$	"	"	66 $\frac{1}{2}$ "
4th 6	"	"	8 $\frac{1}{2}$	"	"	59 $\frac{1}{2}$ "

These results go to show,

1. That leaves are essential, even after corn is cut off at the ground, in increasing the quantity and weight of the crop. And,

2. That the mode of cutting up the whole, grain, tops, and leaves, gives the *most* corn and *heaviest* corn, and certainly improves the quality and increases the quantity of cattle fodder. The difference between No. 2 and No. 4 will be seen to be nearly ten per cent. in quantity, and in weight about five per cent.

The third experiment was in removing the suckers from corn. Mr. N. considered the result decidedly in favour of the practice. Where the corn was not thus treated, the ears were diminutive, while the suckers produced little or no sound grain. There is no doubt that suckers abstract food from the plants, and, if taken off (we should prefer to *cut* them off) and well cured, they furnish excellent forage; yet we have hitherto doubted if the gain would repay the labour; still we may be wrong.

SELECTION OF SEED AND EARLY MATURITY.

We adopt the opinion of Joseph Cooper, so far at least as relates to maize, that a change of seed is *not necessary* when due regard is paid to its *selection*. We have cultivated the Dutton variety of corn for eighteen years, always personally selecting the earliest and fairest ears for seed, which were immediately braided and hung in an airy loft. It has ripened as early this as it did the first year we received the seed from the far North, while we are satisfied it has increased in productiveness; that it has larger ears, and more of them, and taller stalks. The seed is left to mature on the stalk till the crop is gathered from the field, the earliest ripened being then easily determined by the appearance of the husk and the rich colour of the corn. Hence the importance of every farmer taking care to secure, *in person*, his best seed.

There is one other fact that should not be lost sight of—the influence of soil and location upon vegetable growth. A moist, rich soil will give the

largest growth, both of foliage and fruit, and a light and dry one the earliest maturity, and the richest or most concentrated product. Professor Ives states, that plants from the seed of the *morus multicaulis* have the foliage of the parent in a rich humid soil, while they resemble those of the *morus alba* on a thin, light soil; and it is believed that a pound of the leaves of the latter are intrinsically more valuable to the silkworm than a pound of the former. It is not great size that indicates superiority either in animals or vegetables. A very large apple is seldom a very good one. The cider from a hilly, dry, calcareous soil, is always superior to that from a low and rich one. A very large beet contains much less sugar than the same weight of small beets. Indian corn, grown upon a light, dry soil, comes to earlier maturity, but is inferior in its growth and in the size of its ears to that which is grown upon a highly manured loam. Indeed, the difference is so great on our own grounds this season, that the growth and product in two locations would hardly be taken for the same variety.

We have another suggestion to make in regard to the influence of steeping. A communication from Senator Johnson, inserted in the first volume of the transactions of the old agricultural society, shows that the crop from seed-wheat, steeped in a solution of saltpetre, ripened two weeks earlier, and gave 25 per cent. more product than the crop from seed not thus steeped. We began to plant our main crop of corn on the 12th of May, and finished on the 16th. All the seed was steeped 12 hours in a solution of nitre, in quantities sufficient for one day's planting. A few quarts of seed which remained were set in the cellar, where it remained, partially covered with pickle, till the 19th, when it was planted in a vacant patch of thin soil, in which we also planted, the same day, six other varieties, all reputed to be remarkably early, and the seed of all which had been soaked in

saltpetre water. The last planted Dutton corn was decidedly the earliest of the seven sorts in coming to maturity, and was at least two weeks earlier than the main crop, planted from three to six days sooner. Its maturity may have been in some measure accelerated by the porosity of the soil, compared with that of the main field, which was highly manured with unfermented dung; yet we think it not improbable that it was principally owing to the seed having remained saturated for 96 hours in the nitrous solution.

Having referred to our specimen plat, we will add, that it consisted of the following varieties of corn:

1. Dutton; 2 and 3. Lake Superior and Squaw from Lake Michigan; 4. Early white, not recollected where from; 5. Early Canada, from Poughkeepsie; 6. Red Blaze, from Elmira; 7. Early yellow, from Vermont. These varieties were all planted the same day, two rows of each, with intervals between the different kinds of 20 or 30 feet. On examining them to-day, August 28, we find No. 1 mostly ripe, the husks dry and separating from the grain; No. 2, Lake Superior, an eight-rowed yellow, growing 4 1-2 feet high, but very prolific in suckers and ears, next to the Dutton in maturity. The early white is an eight-rowed corn, 5 1-2 feet high, and is third in ripeness. The Vermont is a yellow, eight-rowed corn, grows six feet high, and is next in ripeness to the early white. The Squaw, No. 3, is an eight-rowed coloured grain, grows six feet high, and is fifth in forwardness. The Red Blaze comes next, and the Early Canada is the latest. Both are eight-rowed, and, like the Dutton, they grow seven and eight feet high. As to *number* of ears on a stock, they are about alike, except the Lake Superior, which is far the most prolific in suckers and ears, though they are very small. As to *size* of ears, the Dutton has a manifest superiority; but in length, those of the early Canada and the Red Blaze eight-rowed

are equal, if not a little superior, to the Dutton. Several gentlemen who have visited the plat concur in the correctness of this statement.

CHAPTER V.

MANURES.

What quantity should be applied to an acre.—Winter Management of Manure.—Specific Manures.—Bone Manure.—Leached Ashes.—Peat Earth, Peat Ashes, &c.

[THE subject of manures is one of great importance to the farmer, and under this head we have arranged several papers from the pen of Judge Buel, illustrating the particular topics indicated. That there is a most lamentable deficiency in our general management and use of manures, cannot be questioned; and to introduce a more correct and farmer-like course was a favourite object with that successful cultivator. In addition to the remarks of Judge Buel, we have selected two papers of peculiar interest as part of this chapter; one being part of a communication from Mr. ANTHONY, of Rhode Island, illustrating the value of leached ashes as a manure; and the other a letter from the well-known farmer, W. A. SEELY, of Staten Island, on the use of peat-earth and peat-ashes as fertilizers of the soil. This letter is particularly important to farmers at the present time, as, in consequence of the geological survey of the state now going on, the presence of large

bodies of peat have been made known where its existence was scarcely suspected, and thus an easy and certain mode of fertilizing lands made poor by injurious cultivation, has been placed within the reach of thousands. It will be read with interest by all who possess, or can obtain, this invaluable substance.]

WHAT QUANTITY OF MANURE SHOULD BE APPLIED TO
THE ACRE ?

The answer to this question involves many considerations which preclude a definite reply ; such as the condition of the land, the quality of the manure, and the kind of crop. Too much, as well as too little manure, may be applied. What would be beneficial for an autumn-ripening or hoed crop, would be prejudicial to a small grain or summer-ripening crop (more particularly if the manure is applied in an unfermented state), and there would be, withal, a waste of fertilizing matter. Twenty tons to the acre would not be too much for corn, potatoes, ruta-baga, &c., if applied broadcast and ploughed in ; but if it be long manure, and applied in the drill or hill, and a dry season should ensue, it might prove an injury ; and were this quantity per acre of long, or even short manure, applied to small spring grain, it would probably cause a flush of straw, likely to be affected by rust, at the expense of the more valuable part, the grain. Dr. Coventry, late professor of agriculture in the University of Edinburgh, whose business and study it was to collect data, and make correct deductions in this and other agricultural matters, was of the opinion that from four to five tons of the kind usually denominated spit or tolerably rotted dung, are yearly requisite to keep up the fertility of the soil ; and this supply he thinks a well-managed farm may be made to produce. To show how this

quantity may be obtained, and how it should be applied, we quote from Mr. Youatt, the author of "British Husbandry."

"According to that calculation," says our author, "it must be observed, that the course of crops is supposed to consist—on light soils, of the alternate plan of corn and green crops [see New System of Husbandry]—on clays, which do not admit of that system, that the holding contain a proportionate quantity of grass-land, and that the quantity of manure should be supplied, not in small quantities annually, but in large ones, at intermediate distances of four, five, and six years. Light soils, in the common course of husbandry, rarely require the application of putrescent manure oftener than once in four years, and in all cases where the clover is allowed to stand two seasons, it may be deferred without disadvantage for another year. Heavy soils may run six years without it, provided that the land be laid one year in fallow, and that there be sufficient meadow to be reckoned at least one crop in the course. It being, however, clearly understood, that, whether on light or heavy land, nothing but grain, seeds, and livestock is to be sold off the farm, unless replaced with an equal portion of purchased dung; that the whole of the green crops, the haulm of pulse, and the straw of corn, is to be used in the most economical manner; and that some of the livestock are to be either soiled or fattened upon oil-cake: this plan, if carefully pursued on good soils, with capital sufficient to secure an abundant working and fattening stock of cattle, ought, under fair management, to furnish an adequate supply of dung for any of the usual courses of culture.

"Having thus submitted to our readers all that occurs to us of importance on the subject of farmyard manure, we shall here recapitulate a summary of the chief points which we deem particularly worthy of their consideration:

1. To bottom the farmyard with furze, fern [brake], dry haulm [stubble, &c.], or any other loose refuse that takes the longest time to dissolve; and over that to bed it deep with straw.

2. To occasionally remove the cribs of store-cattle to different parts of the straw-yard, in order that their dung may be dropped and their litter trodden equally.

3. To spread the dung of other animals, when thrown into the yards, in equal layers over every part.

4. To remove the dung from the yard at least once, or oftener, during the winter, to the mixen.*

5. To turn and mix all dunghills until the woody or fibrous texture of the matter contained in them, and the roots and seeds of weeds, be completely decomposed, and until they emit a foul, putrid smell; by which time they reach their greatest degree of strength, and arrive at the state of spit-dung.

6. To keep the dung in an equal state of moisture, so as to prevent any portion of the heap from becoming fire-fanged. If the fermentation be too rapid, heavy watering will abate the heat; but it will afterward revive with increased force, unless the heap be either trodden firmly down or covered with mould to exclude the air.

7. To ferment the dung, if to be laid upon arable land during the autumn, in a much less degree than that to be applied before a spring sowing.

8. To lay a larger quantity on cold and wet lands than on those of a lighter nature; because the former require to be corrected by the warmth of the dung, while on dry, sandy, and gravelly soils, the application of too much dung is apt to burn up the plants. Stiff land will also be loosened by the undecayed fibres of long dung, which, although its putre-

* The place of deposite where the manure is heaped up and mixed.

action will thus be retarded, and its fertilizing power delayed, will yet ultimately afford nourishment.

9. To form composts with dung, or other animal and vegetable substances, and earth, for application to light soils.

10. To spread the manure, when carried to the field, with the least possible delay; and, if laid upon arable land, to turn it immediately into the soil.

11. To preserve the drainage from stables and dunghills in every possible way; and, if not applied in a liquid state, to throw it again upon the mixen.

12. To try experiments, during a series of years, upon the same soils and crops, with equal quantities of dung, laid on fresh and afterward rotted, in order to ascertain the results of their application to the land. The whole quantity to be first weighed or measured, and then divided.

“The fermentation of farmyard manure is, in fact, a subject of far greater importance than is generally imagined; for on a due estimation of its value mainly depends the individual success, as well as the national prosperity of our agriculture. The experiments to which we point cannot, therefore, fail to come home to the interests of every man; they may be made without expense, and without any other trouble than the mere exercise of common observation and intelligence. Leaving, however, aside the discussion concerning the disputed worth of fresh or fermented, of long or short dung, let the farmer sedulously bend his attention to the accumulation of the utmost quantity that it may be in his power to procure. The manner and the time of using it, in either state, must, however, be governed by circumstances which may not always be within his control; and every judicious husbandman will rather accommodate himself to the exigency of the case, than adhere strictly to his own notions of what he conceives to be the best practice. In fine, whether favouring the one or the other side of the question, let him col-

lect all he can ; apply it carefully to his crops ; and then, trusting to events, '*let the land and the muck settle it.*' "

ON THE WINTER MANAGEMENT OF MANURE.

We make this preliminary remark, upon which what we have to offer is in a measure predicated, viz., that all the manure from the stables, yard, and hog-pen should be carried out in the spring for the corn and potato crops.

The objects to be obtained in the winter management of manure are,

1. To prevent waste by leaching and drainage ;
2. To prevent its becoming fire-fanged ; and,
3. To prevent more than moderate or incipient fermentation.

1. Where cattle-yards are upon a slope, or are convex, or nearly upon a level surface, the liquid portions of the manure, which may be termed, in a measure, the cooked food of plants, continually pass off and are lost. Heavy rains, and the drip from the barns and sheds, also passing through the manure in their escape from the yard, leach and deprive it of its finest and most fertilizing properties.

The remedies against this evil consist, *first*, in giving a concave or dish shape to the yard. The earth excavated from the centre being deposited upon the borders, which should be fifteen or twenty feet broad, with a slight inclination to the centre, a dry passage to the barn is secured, and a sufficient space of dry ground to feed the stock upon which run at large. *Secondly*, the yard should be bedded, after it is cleaned, with peat or swamp earth, if the farm affords it, six to twelve inches deep ; or, if this is not to be had, with any other porous waste earth ; and afterward should be kept well littered with straw, stalks, potato-tops, and the coarse grass and weeds of the farm. This shape of the yard prevents the escape of the liquids. and the earth and litter absorb and be-

come enriched by them. Even should the liquids of the yard be dried up, as they are in summer, the earth and litter will retain the fertilizing matters which they held in solution. By these operations alone the quantity of manure will be double what it is where they are neglected. *Thirdly*, to prevent an excess of water in the yard, what falls from the buildings should be conducted off by gutters. And, *fourthly*, a reservoir should be constructed under ground for the reception of the liquids that unavoidably flow from the yard, and particularly for the urine from the stables. By this latter means a great accession may be made to the fertilizing resources of a farm, and a material obtained fitted for the immediate wants of a growing crop.

2. When dung is accumulated in large masses, either when thrown from the stables or in the fields where it is to be applied, even though it be protected from the weather, a violent fermentation takes place, moisture is exhausted from the mass, and it becomes what is termed *fire-fanged*—dry, light, and mouldy, and seriously impaired in its value.

To avoid this in the yard, spread the manure occasionally over its surface. It thereby becomes blended with other matters less disposed to ferment, is trodden by the stock, and the air, one of the agents in causing it to ferment, is in a measure excluded. Under cover, it should not be suffered to accumulate in excess without the admixture of earthy matters, which will retard fermentation and preserve moisture. It is often convenient to draw manure to the field in the autumn or winter, where it is to be used. If such manure has not undergone fermentation, it should never be laid in heaps of more than three feet in depth, or more than six or eight loads together; the surface should be handsomely smoothed off, and then covered, when the frost will permit, with six or eight inches of sod or earth. This prevents violent fermentation, and the loss of the gaseous matters which fermentation always sends off.

With the foregoing precautions, there is little danger of fermentation proceeding to a wasteful or improper length before the manure is wanted for the corn or potato crop.

What farmer is there, who makes any pretensions to economy, who would not feel insulted to be told that he carelessly wasted one half of his family food or of his cattle food—one half of what his farm produced for animal subsistence? And where is the difference, whether he wastes the food of his family, his animals, or his crops? His crops feed both his family and his livestock; and, unless he feeds his crops, the others must ultimately suffer the penalty; for the earth, though a kind and prolific mother, cannot always give when we withhold from her the means of giving. Return to her *what is no longer of use to us*, and she will requite us with her richest blessings. Let us bear in mind, that every animal and vegetable substance which we give back to her bosom, she will faithfully elaborate into new organized matter for our pleasure and profit; but that if, like the prodigal, we exhaust the parental treasure, it can no longer supply us with bread or meat. Too many who occupy a rich virgin soil, may be compared to useless drones who waste their patrimonial wealth: they waste that which would benefit both themselves and their children.

SPECIFIC MANURES.

We have repeatedly said that wheat cannot be depended on as a profitable crop on primitive soils without the application of animal matters and lime. The hopes of making New-England a wheat-growing country always seem to us fallacious, from the absence, in all primitive formations, of these two essential elements, lime and animal matter. Lime is now generally admitted to be essential to a wheat soil; but as lime consists of 20 parts of the metal *calcium*, and about 7.5 of oxygen, it does not seem

to furnish nitrogen. Upon this subject we quote from the Edinburgh Quarterly Journal of Agriculture the following, in support of our own opinions.

“On analyzing the *grain* of wheat and the *bulb* of the turnip (the parts for which the crops are cultivated), it is at once found that both of them contain *elementary* principles not entering into the composition of ‘*common vegetable matter*,’ namely, *nitrogen* in the grain of the wheat, and *sulphur* in the turnip; besides which, the *saline* matter is also found to be peculiar; but this last will be considered more fully hereafter. Having once, therefore, discovered that these elements are essentially necessary to the growth of the above-mentioned plants, we are evidently led to ask ourselves the question, Whence are they to be obtained? Dear-bought experience has long since answered, in *animal manures*. Yes, all substances derived from the animal kingdom contain more or less of both nitrogen and sulphur, and hence the value, or, in fact, the absolute *necessity*, of such manures for the particular crops now under consideration. It may, indeed, be said by some, that, ‘however necessary animal manure may be for turnips, still there can be no absolute necessity for its application to the wheat-crop; for, as nitrogen is the substance here wanted, surely the atmosphere will present a ready and never-failing reservoir of that element.’ But it must here be remarked, in answer to such a statement, that it is exceedingly probable that the *higher* order of plants, at least, *never* obtain the nitrogen they possess from the air, but always from decomposing *animal* matter.”

And what, it may be asked, are *animal manures*? Not, we answer, mere vegetables, which have rotted in the yard or passed through the cattle of the farm—not farmyard and stable dung, in the ordinary mode of its management. The common vegetable matters consumed by the farm-stock do not contain nitrogen, this essential element of wheat. It,

however, abounds in the urine of animals and in all animal substances, as wool, hair, bone, horn, the dung of carnivorous animals, or such as feed upon flesh; it exists in fish, in soap-boilers' waste, impregnated with animal oil, and, to some extent, in shell-marls.

We shall be told, probably, in contradiction to our theory, that the primitive formation of New-England has produced good wheat, and that it promises to produce it again. When first subjected to culture, even soils of primitive formation have a quantity of animal matters upon their surface, which have been accumulating for centuries, and which may suffice for one or more crops of wheat; but these being exhausted, the crop necessarily fails. Art may in many cases supply the deficiency, by the application to the soil of one or more of the above-enumerated animal substances; and these elementary matters may have been accumulating from ordinary manuring, until the soil has become sufficiently charged with the specific food of a wheat-crop. We fear, however, that all attempts to raise good wheat—we mean the grain, not the straw—on soils of primitive formation, without the aid of animal manures, will be found to be rather an uphill business; and that, even with this aid, like Franklin's whistle, it will cost more than it is worth.

We will extract one other remark from the writer above quoted, which is, that "although *practice* has long ago shown the necessity of *animal* manures for the above-mentioned crops [wheat and turnips], still *chymical analysis* alone could ever have explained the *reason* for this necessity; thus placing the advantages to be derived from the science in a truly prominent and important light."

BONE MANURE.

Since bone manure has become accessible to a considerable portion of the farming community, by

the erection of bone-mills at Albany, Waterford, New-York, Boston, and other places, and is likely to come into more extensive use as its value is better appreciated, we propose to give some account of its fertilizing properties, of the soils and crops which it is calculated most to benefit, of its mode of application, the quantity that should be applied to the acre, &c. In doing this, we shall draw our facts principally from the report of the committee of the Doncaster Agricultural Association—a society which has rendered eminent service to the agricultural community, in different departments of husbandry, by its investigations and reports.

With a view of collecting facts to form the basis of their report, the committee addressed seventeen queries to the most intelligent farmers of the country, embracing men of science, and asking answers to their interrogatories in regard to this manure. Forty-nine answers were returned. From these the committee made out their report; and it is the substance of this report we are about to give.

Bone manure had been used by those to whom the queries were addressed for an average period of twenty years. "Our correspondents," says the report, "with only two exceptions, all concur in stating it to be a highly valuable manure, and on light, dry soils, superior to farmyard dung and all other manures." In copying the language of one of them in relation to dry, sandy soils, we express the opinions repeated by the far greater number. "I consider bone for tillage one of the most useful manures which has ever been discovered for the farmer's benefit. The lightness of carriage, its suitability for the drill, and its general fertilizing properties, render it peculiarly valuable in those parts where distance from towns makes it impossible to procure manure of a heavier and more bulky description. The use of the bones diminishes labour at a season of the year, too, when time is of the first

importance; for one wagon-load of a hundred and twenty bushels of small drill-bones is equal to forty or fifty cart-loads of field manure."

"Upon very thin sand land," say the committee, "its value is not to be estimated; it is not only found to benefit the particular crop to which it is applied, but extends through the whole course of crops, and even in the succeeding course its effects are visible in the improved quality of the land, and the efficiency of a smaller quantity than would have first ensured a crop." Numerous facts are here cited in proof of this declaration of the committee. Where, for instance, in a district of many thousand acres, turnips would produce only tops, and those very small, the use of bones alone has increased the turnip-crop in some cases ten, and in few cases less than five fold; and all the succeeding crops of grain and grass were amazingly improved.

On light loams, provided they are dry, bones were found preferable to yard dung; but they do not seem to benefit wet soils at all.

On heavy loams and clays the experiments were unfavourable; and the committee infer that clay soils are, in general, too moist to receive any considerable benefit from bone manure.

Upon peat soils, thoroughly drained, the advantages of bone manure were very striking. Fifteen to twenty bushels per acre were found to surpass, very far, the ordinary dressing of farmyard dung, and even lime and pigeons' dung.

Upon gravels, the opinions of its efficacy are contradictory. Upon wet ones it does not succeed.

As to its durability—three acres were boned with one hundred and fifty bushels per acre by mistake. Fourteen years after, the land had not forgotten it, but was nearly half as good again as the other part, farmed precisely in the same way, with the exception of this single dressing of bones.

To the question, Do you continue to use bones?

not one in the forty-nine returned an answer in the negative. Their use was rapidly increasing.

Upon grass, either for meadow or pasture, their effect was favourable, the herbage being improved in quality and quantity. Six hundred bushels were spread upon twenty-four acres of a dairy-farm, of dry, sandy gravel, which had been laid down ten years. The effect was to produce double the butter from the cows depastured upon it to those which were fed upon like pasture not boned.

The general application of bone-dust in England is to the turnip-crop, one of the most important in British husbandry; and the opinions as to the best mode of applying it, whether in drills or broadcast, are various, though the former opinion rather prevails.

As to the size of the bones, the opinion is in favour of half-inch bones. Mr. Burk says, "If I were to till for early profit, I would use bones powdered as small as sawdust: if I wished to keep my land in good heart, I would use principally half-inch bones, and in breaking these I should prefer some considerably larger." "By using bones of a large size, with dust in them," says another correspondent, "I think I have sufficient of the small particles to set the crop forward, and sufficient of the large particles left to maintain the land in good condition for the last crop" in the course.

In regard to the quantity to be applied to an acre, although the committee admit that the average of the returns is thirty-nine bushels, they nevertheless recommend, as a sufficient dressing, twenty-five bushels of the small size and forty bushels of the half-inch, giving to the poorer lands a greater, and to the richer a smaller quantity.

Some of the correspondents prefer raw or fresh bones, and some those which have been boiled, and the glue and oil extracted.

Without going into farther detail, we shall close

our notice of the report by copying a summary of the deductions which the committee draw from the facts they collected. They are as follow :

“ On dry sands, limestone, chalk, light loams, and peat, bones are very valuable manure.

They may be laid on grass with good effect.

On arable lands, they may be laid on fallow for turnips, or used for any of the subsequent crops.

That the best method of using them, where broadcast, is previously to mix them up with earth, dung, or other manures, and let them lie to ferment.

That, if used alone, they may be either drilled with the seed or sown broadcast.

That bones which have undergone the process of fermentation are decidedly superior to those which have not.

That the quantity should be about twenty-five bushels of dust or forty bushels of large, increasing the quantity if the land be impoverished.

That upon clays and heavy loams it does not yet appear that bones will answer.”

From the foregoing data, the farmer will be able to judge how far bone manure is adapted to his soil; and, from estimating its cost and transportation, he can calculate the economy of purchasing and applying it. In the report before us, it is computed to be cheaper at 2s. (48 cents) per bushel for manuring, than yard dung at 10s. (\$2 40) the load, the price the latter is stated at in Britain. The price at the mills in this state is \$14 to \$16 per ton, which would bring it to more than 40 cents a bushel. So that to manure an acre with twenty-five bushels would cost about \$10 75, besides transportation and spreading. This dressing would be equal to that afforded by twenty common loads of manure, which ought to be estimated to be worth 50 cents a load, besides the expense of hauling it out and spreading it. It would therefore seem to be cheaper than stable-manure; and, at all events, it would afford a valuable auxilia-

ry where manure is scarce, or has to be brought from a distance.

As it is necessary, for the investigation of this subject, that the component parts of bones should be understood by every one interested in their use as a manure, I submit an extract from an analysis by that eminent chymist, Mr. Hatchett. He says:

"The component parts of bones are chiefly four, viz., the earthy salts, fat, gelatine, and cartilage.

"The earthy salts are three in number.

"1. Phosphate of lime.

"2. Carbonate of lime.

"3. Sulphate of lime.

"The proportion of fat seems to vary from one sixth to one fourth of the weight of the bone."

Annexed is also a table, calculated from experiments made from the bones of various animals (by the same chymist):

100 parts contain of the	Gelatine.	Phosphate of Lime.	Carbonate of Lime.	Loss.	Total.
Horse . . .	9	67.5	1.25	22.25	100
Ox	3	93	2	2	100
Sheep . . .	16	70	0.5	13.5	100
Swine . . .	17	52	1	30	100
Calf	25	54	...	21	100
Elk	1.5	90	1	7.5	100

Thus it appears that the bones of the calf afford the most gelatine, and those of the ox and horse the least, except the elk.

The gelatine, the most beneficial portion to the land, is also an important ingredient in making portable soups and in the manufacture of glue; and there can be little doubt that, in most cases, the gelatine is, with the fat, extracted from the bones, by boiling or otherwise, before they are sent to the mills to be crushed for manure.*

* Chaptal says that this renders the bones comparatively worthless, by depriving them of their most fertilizing properties. See Chaptal's *Chymistry applied to Agriculture*, Harpers' edition, p. 162.

LEACHED ASHES.

In 1833, a lot of land falling under my management which had then recently been purchased at \$30 per acre, seven acres of it (and perhaps the least valuable part, which, in my opinion, never possessed fertility, though it is usually called worn-out land, being a sandy plain with gravelly subsoil) were ploughed and rolled, in order to secure for the benefit of the crop what little valuable matter might be turned under; about 1600 bushels of leached ashes were spread upon the piece, and it was sowed with ten quarts of millet and sixteen pounds of Southern or small clover seed to the acre. The season proved dry and the seed took badly: the crop of millet was ten tons by estimation, and was sold for \$180. Nineteen tons of clover were supposed to have been obtained the two succeeding years at four cuttings; and this was sold for \$316. The clover having nearly all perished in the winter of 1835-6, it was pastured the season following, and last year, 1136 bushels of ashes having been applied to it, it was again sowed with millet, and stocked as before with Southern clover, twenty pounds to the acre. The product was thirteen tons of millet, for which I credited the owner \$221, retaining it for my own use. Like results have been obtained from similar treatment of the same description of soil in various instances; this not having been selected because the most striking, but because the amount for which the crops sold fixes their value, without knowing exactly the quantity produced, which in each case has been supposed. The labour bestowed on the lot was more or less blended with other business of the farm; it is therefore difficult, at this period of time, to ascertain the amount. I believe, however, it did not exceed the charge in the subjoined account.

Cost of land	\$210 00
“ ashes for both dressings	215 54
Seed for do.	41 25
Ploughing 10½ days	21 00
Rolling 3¼ do.	7 00
Harrowing 3¼ do.	7 00
Carting outside furrows	7 50
Sowing 3 days	3 00
Carting and spreading ashes	54 00
Cutting, curing, and housing 41 tons millet and clover	123 00
Five years taxes	2 10
Interest accruing on transaction	46 00
	<hr/>
	\$737 39
<i>Cr.</i>	
By produce sold, amounting to	\$717 00
Value of pasturage	15 00
Value of lot in its present condition	385 00
	<hr/>
	\$1,117 00
	737 39
	<hr/>
	\$379 61

There is reason to suppose, from present appearances, that the lot in question will cut two tons of clover this season per acre ; it will therefore be seen that my valuation is not a high one. A repetition of the treatment it has received would no doubt improve still more the texture of the soil, though I am inclined to think there might be a falling off instead of an increase in the amount of its products by subsequent ashings. Should this be the case, it would indicate a suitable condition for more permanent improvement by manuring.

PEAT EARTH, PEAT ASHES, &c.

In the number of the Cultivator for January, 1839, p. 191, a correspondent, in noticing “ a recently published account of the proceedings of the British Association for the advancement of Science,” as to the improvement of peat-bogs, and the use of peat-moss or turf as a manure, speaks of the preparation of the

latter in *barnyards*, and of *expelling from* the turf, through that mode of preparing it, the qualities with which it is imbued, when taken from the swamps, *deleterious to vegetation*. I began, some months ago, the use of it, in some degree, after the modes adverted to by the members of the association; and have, from information I have been able to obtain from emigrants, and from my own observation and reading, been led to a series of experiments with it. Though the results are not yet as complete as I hope eventually to make them, I apprehend that what I have thus far observed may be useful. I apply the turf in a variety of ways: First, after the mode of preparing it *in compost*, directed by Lord Meadowbanks, "which was printed and distributed gratis among the Scotch peasantry *many years ago*, and which has *ever since* been highly approved of, both by practical and scientific cultivators," in Scotland, Ireland, and generally in all the European countries in which peat is to be found. That method has been described in former numbers of the *Cultivator*, and will be found, in all its essential particulars, in Fessenden's *New-England Farmer and Rural Economist*, pages 209 to 212, and in Loudon's *Encyclopædia of Agriculture*. Composts have been made by me which, when prepared in strict conformity to those directions, have fully justified them. Through this means, there is no difficulty in *trebling or four-folding an ordinary farm supply of manure*, and which may (as the authors say) "be used *weight for weight* as farmyard manure, and will be found, *in a course of cropping*, fully to stand the comparison." Whenever I have deviated from the track laid down, I have found that a strict pursuit of the old practice was the better, and have returned to it. In particular, I find the necessity not only of avoiding the compression of the compost heap by the tread of the men or cattle employed, but the expediency of throwing into it every vegetable material which may contribute to

keep it light and as springy as possible. I also find it most prudent to avoid compression through raising the heap above the allotted height.

My supply of turf to this time has been taken from a swamp about five feet deep, of about two thirds of an acre, one half of which, down to the clay subsoil, I have used in composts or otherwise, and which I propose tilling the coming summer. I have also used the turf in *bottoming* my barn and cattle yard, stables and hog-sties, and in burning it for ashes. My first application of it to manuring began with the last spring.

The ashes were used as I have already stated in a previous number, and I can assure you my clover and grass crops fully justified all the anticipations I was authorized to make. Some of my neighbours, of excellent practical information in ordinary matters, attempted to dissuade me from the use of it. A few days before my harvest, I asked them to call and see a result I wished to exhibit to them. Leading them to a stand a short distance from a field to which the ashes had been applied, I pointed their attention to a very visible line which could be traced across a part of the field, and asked them if they could perceive a difference on its two sides. Admitting it, I asked them to accompany me to the line, and to follow it across the field, observing to them, that for the wheat-crop of the preceding fall, the manuring on both sides of the line, and the seeding for wheat, for timothy, and for clover had been precisely similar; but that, in the spring, an application had been made to the field to improve the grass, which was found, however, not to be sufficient for the whole field, and became exhausted on the land at which the line was visible. On examining the course of the whole line, the clover on the side to which the ashes

had been applied, even to the last cast of the shovel, was nearly double the height and luxuriance of the other, and far better loaded with blossoms; and here, I said, my friend, is the line up to which my turf-ashes, of which you disadvised the use, have been applied. Fortunately, in spreading, it run out on this land, and thus has afforded me an opportunity of again consulting with you as to its usefulness.

My mode of burning has also been heretofore described in the Cultivator, and my experience has convinced me of the policy of smothering the fire, and burning the turf as slowly, and confining as much of the smoke during the combustion as possible. My heaps are generally four to six weeks in burning. That the turf is *purely vegetable* will be perceived from the fact that *twenty* cart-loads of turf are necessary to produce *one* of ashes. Sand or clay are not destructible by combustion, and would, if present, have been found still the same in bulk and visible to the eye; none, however, can be discovered in the ashes; and this may be considered as a fair method of testing the question as to how much of mossy-earth the turf contains.

The correspondent in the Cultivator before alluded to queries as to the application of sulphuric acid for converting turf into manure, and for fertilizing a turf soil. This induces me to call attention to facts which have ever been witnessed by me: around almost every opening of the heap through which the smoke issues, an oily substance resembling sulphur will be perceived. Bottoming, before covering them with litter, the shelters under my barn and sheds, as I always do, to the height of about twelve inches, with turf, in order that it may absorb the stale and moisture of the place, I have observed that though, when taken there dry from the swamp, the turf is perfectly devoid of all smell, after having been thus used it becomes as *sensibly acid* to the smell as the most sour lemon. In turning it over, the acid exhalation cannot but be perceptible to every by-stander.

All writers upon turf, in speaking of its antiseptic properties, say it is imbued with a phosphoric acid, having some affinity to gallic acid or tannin, and which renders it, in that state, anti-putrescent, and, consequently, deleterious to vegetation. It will dry-rot and pulverize when exposed to the air, and is in that state pernicious, because it has not gone through the fermentation necessary to render it soluble, and fitting food for plants. . The *fermentative* decay and solution of vegetable and animal substances afford to vegetation its proper nutriment. The turf, it will be perceived, when used in compost, and in contact with fermentative manures, *attracts to itself and absorbs* so much of the putrescent exhalations as is necessary to expel the acid which checks its decay, in common with the manure placed in juxtaposition with it. If this, then, be a tendency of the turf in the compost, *why should it not operate similarly*, though in a less degree, *in the earth* to which it is applied, and, so far from affording nutriment to surrounding vegetation, attract it to itself, and absorb the putrescent or fermentative substances already in the soil? In the first instance, it has always been said, and it is no doubt true, that the turf, while saturated with the acid, is remotely deleterious to vegetable growth and to the soil; and after having, within the soil, taken to itself what will promote its decay, it probably gives it back, and does become in some degree beneficial as a manure. It may well be that sulphuric acid will, by its action on the turf, accelerate the souring to which I have adverted, and thus promote the decay of the turf. Turf was, for a long while, the source of disappointment as a manure, until the principles applied to it by Lord Meadowbanks were scientifically explained and brought into practice.

In the spring and in the fall, immediately after carrying out the supply of manure from my cattle-yards and hogsties, I bottom them anew with turf to the depth of at least a foot, covering it with six

inches of seaweed or drift. To the accumulation of the place during the winter, when little is to be lost, in fermentative manures, by solar heat or evaporation, I cart around the yard and spread *on its upper edges*, some eight, ten, or more feet wide, the emptyings of my stables and yard-sheds, with the littered surface occasionally of my hogpens (which are placed in the centre of my barnyard). The feeding-racks and moveable pens are from time to time shifted, that the turf and seaweed may, by the tread and droppings of the cattle, and the occasional moisture of the yard, be worked together, and the turf saturated with them as much as practicable. The main part of the manure, being placed on the upper sides of the yard, in settling down to the centre and towards the barnyard drain, passes necessarily among the bottoms of the turf and seaweed, which thus become imbued with the substances necessary to prepare them for the fermentative decay, which the acid of the one and the saline impregnation of the other require for them. In the spring, as soon as solar heat may induce a tendency to fermentation, and consequent evaporation and loss, the yards are turned over with a plough or the shovel, that the whole may be so commingled that the turf may attract and absorb the waste which would otherwise ensue. At the lowest part of the barnyard, and that to which everything from the farmhouse, kitchens, farming-yards, and stables tends, I have a cemented cistern *or tank* capable of containing 250 hogsheads. The windmill and horse power of the yard is connected with this tank by pulleys, straps, and chain buckets, so that if, during the winter, spring, or summer, I think best to wet my compost heaps, hogsties, or any of the yards with those drainings, the power is conveniently applied, and by leaders the draining is thrown back to settle again through the mass and return to the tank. The compost-yard adjoins the barnyard; and is so graded, that if the drainings from

the tank be thrown on to the heaps, after settling through, they return by box under-drains into the yards and tank. If a surplus is still on hand, a cart with a hogshead and sprinkler is used, with which, in a four to one diluted state, I irrigate such grasslands as I think may be benefited by it, or my grain crops in such parts of a field as I apprehend may want it: an excellent method of readily adding to the manure, and of forcing those parts of a field which in the spring are perceived to want manuring; or my garden is fertilized and forced by it to any state of productiveness which can be effected by such an application of the most stringent and prompt in its influence, of all manures. The last spring, in spots where my wheat did not thrive comparatively, applying it with a watering-pot, the grain advanced and outstripped the surrounding parts of the crop, which before had afforded better promise of thrift. Pouring a pint of it into a hill of corn, of potatoes, or of vines of any kind, will be found to give an astonishing impulse to them.

The filling and driving of the cart, of sprinkling it on the field, or applying it to the hill or garden, is the work of the barnyard power, a boy, horse, cart, sprinkler, and watering-pot. The cart and its sprinkler, in its form and use, is in all respects like those employed in cities for sprinkling the streets. To irrigate and manure drilled crops, the sprinkler should be taken from the rear of the cart, and two of them should be hung parallel with the shafts and over the drills.

During the heavy rains of the fall and spring, should the drainings of the yard accumulate and fill the tank, and not be otherwise wanted, the surplus is let off into a *muck-road*, embanked on the sides, and filled to the depth of ten to fifteen inches with seaweed, turf, turf ashes, and a small supply of manure, and made gradually to percolate and settle downward through a distance of from four to six hundred feet in length and twenty in breadth, and through which *muck-road* cattle, carts, and vehicles of every

kind, when *it is not too wet*, are forced to find their way, to break up and mix its contents with the drainings of the barnyard. Until the drainings of the yards have reached the farthest extent of this road, they should not be applied to agricultural uses. Before driving my cattle from my yards, if it becomes necessary to do so, and always two or three times a day when its surface is moist, a boy, as a standing rule, drives them for exercise several times round the yards, the better to bring the manure in contact with the bottomings. I have other modes, not here explained, by which I readily avoid the access to my yards and tank of the excess of drenching rains, when the storms are heavy and of long duration. This I may explain, if desirable, on another occasion. Within *the last year* I have lost none—*absolutely none!*—of the leaching of my yards and stables.*

* “The modern agriculturist, he thought, did not pay sufficient attention to the manures made in the foldyard. Sometimes he had been asked how his fattening animals paid him for the trouble of producing them. This, however, could not be answered by a mere reference to the sum he obtained for them by sale, but there was a variety of circumstances to be considered before he could answer it properly. For instance, the quantity of manure obtained from them was one—not wet straw, but good manure. There was another thing which required attention: when the manure was carried from the foldyard into the fields, it was suffered to lie in a large heap for a long time; so long, indeed, that, before it was spread upon the land, its qualities had perished. He was aware that it required a certain time for fermentation to take place, but it was frequently left till such fermentation had passed off. It was his practice, as soon as the heaps were raised on the field, to throw a quantity of mould upon them, and thus prevent evaporation taking place too rapidly. Proper attention ought also to be paid to draining the foldyard. The produce saved was now, in ten out of twelve instances, lost. It would be advisable, when the yard had a fall, to establish conveniences for catching it, and then convey it to the lands. In France and the Netherlands they were extremely careful in preserving this liquid manure, and the peasants might be seen conveying it out to the fields, and giving each plant a proper proportion.”—Shillito in Quarterly Journal of Agriculture.

To this it will be said by some, it is *laborious and expensive*. Not so much so as may be apprehended, or as would be the case with others not assisted with mechanical powers and under-drains as I am ; but what I have thus done at some expense, others may do, in a great degree, for a mere trifle, and in a way that I may hereafter suggest.

I assume, as a standard, the fact that farmers with us pay one dollar per load for manure, and that this is a criterion by which to form an estimate of the labour or capital which may *profitably* be bestowed in obtaining it as I do. If this be the true criterion for judging, every day's labour I expend in producing it is worth *twenty-fold* the sum I pay my hands to effect it.

Turf affords an *invaluable medium for saving the waste of manure*, and for increasing its amount and usefulness ; and it is better than rich mould, earths, or the pearings and bottoms of ditches, inasmuch as it is *all* vegetable, and in itself, strictly speaking, a manure, when properly prepared.

The contents of stables, barnyards, and cattle and hog pens should never be exposed to the solar heat or to fermentative evaporations, or their drainings lost, when turf, or any inert vegetable substance, or surplus farm materials of a vegetable or animal nature abound ; nor should animal substances, fish or any other, be suffered to waste their effluvia in the air when such materials can be had. For all useful purposes, enough of the agricultural influence or effect of manure is produced *as soon as vegetable or animal decay is sure to progress*. From that moment a compost should be resorted to, and the heat and action of the manure (which is sure and irresistibly powerful) be thus brought to operate on substances to which this propensity has not been sufficiently imparted. In this state, all that is ordinarily wasted tends to a useful result in augmenting the mass.

It is a common practice to bury fish, preparatory

to their use as a manure, in common, raw earth. The most soluble of ordinary manures, it is soon dissipated by atmospheric action, and leaves on the soil to which it has been applied a raw earth, in its then condition injurious to it. I find it far more beneficial to bury the fish in turf and in turf ashes, seven loads to one of fish (in Loudon, it is said, of turf alone, even 20 to 1), which the decay of the fish will make an excellent and very powerful manure, and one which will endure long after the fish will have done their office in the soil and disappeared.*

W. A. SEELY.

Wheat-Sheaf Farm, Staten Island, Jan. 18, 1839.

CHAPTER VI.

IMPROVEMENT OF GRASS-LANDS.

Of Pasture.—Of Meadow.—On converting Arable or Plough Land into Permanent Meadow or Pasture.—Report on Grasses and Grass-Lands.

ALTHOUGH the alternation of grass and grain crops is deemed most profitable, on soils and in situations which will admit of this kind of husbandry, yet there are many situations in which this alternate change cannot be carried into effect without manifest prejudice to the interests of the cultivator. There are some soils so natural to grass as to yield an undiminished product for many years, almost without care or expense. There are others, upon the banks of streams which frequently overflow, which it is

* For much valuable information on the use of lime as a manure, see the very full and able article by M. Puvis, in *Chymistry applied to Agriculture*, p. 203, *et seq.*, published by Harper & Brothers.

prudent to keep in grass, lest the soil should be worn away by the rapid flood of the waters. Others, again, are too precipitous or too stony to admit of arable culture. Nor should we conceal the fact, that it is still a controverted point whether rich, stiff clays are not most profitable when permanently appropriated to grass. Whatever causes prevail, the fact is indisputable, that a considerable portion of our lands are, and will continue to remain, in meadow and pasture. It is with the view to aid the farmer in correcting any defects that may exist in such grass-grounds, and in improving and keeping them in condition, that we offer the following suggestions. And, first,

OF PASTURE.

The evils that are experienced in pasture-grounds are, the gradual disappearance of the best grasses; the growth of mosses and weeds in their stead; and the prevalence of coarse herbage in situations where there exists a superabundance of moisture. Wherever there are stagnant waters, as upon flat surfaces, the pasture is rendered peculiarly unhealthy for sheep; but it is remarked, that if the water is in continued motion, as is generally the case upon the declivities of hills and mountains, no ill consequences follow.

To remedy the evils we have enumerated, and to improve the condition of pasture-grounds, one or more of the following expedients may be advantageously resorted to, viz., sowing and harrowing in grass-seeds, scarifying, bushing, draining, manuring, and top-dressing with marl or lime.

Grass-seeds may be sown either in the autumn or spring, followed by the harrow, and, if practicable, by the roller. The harrow partially extirpates the mosses, breaks and pulverizes the surface, and buries the seeds; and the roller presses the earth to the seeds and smoothes the surface. The bush-harrow

is to be preferred. This may be constructed by interweaving some strong but pliant branches of trees through the open squares of a heavy harrow, which thus forms an efficient brush, and, when drawn over the ground, performs its duty perfectly during a short distance; but the branches being pressed close, and worn by the motion, soon become so flat as not to have the effect of spreading the earth thrown upon the surface by earth-worms, or ground-mice, or ants. It is therefore recommended in British Husbandry, as a better mode, to fix the branches upright in a frame, placed in the front part of the carriage of the roller; by which means they can be so placed as to sweep the ground effectually, and, when worn, can be moved a little lower down, so as to continue the work with regularity. This operation also completely breaks and scatters the manure dropped on the field by the stock, and partially incorporates it with the surface-mould.

Scarifying is cutting the sod and loosening the surface. Concklin's Press-harrow is a suitable implement for this purpose. We also subjoin the drawing of an implement constructed for this purpose, which we take from British Husbandry, calculated to be drawn by a one or two horse team.

This implement is intended to cut the sod perpendicularly, so far down as to sever the roots of the grass, which occasions it to throw out fresh ones. It slices the sod without tearing it, and should be constructed with a number of very sharp coulters, fixed into a crossbeam at such distances as may be

thought advisable, say from six inches to a foot, and of a width according to the strength intended to be employed in drawing it. The blades should be occasionally whetted to preserve their edge, and the implement should be used when the ground is in a moderate state of moisture, and the grass short. If the land is poor or moss-bound, it may be passed crosswise. It is best adapted to moist clays which do not contain stones or gravel. It is advantageously used to precede the sowing of grass-seeds. The foot-wheel is to regulate the depth of the work.

Draining improves the quality of the herbage, and marling or liming increases the quantity. It is remarked, that animal dung, when dropped on coarse pastures, produces little or no benefit; but when calcareous matters have been laid upon the surface, the finer grasses soon take possession of it.

Manures alone are seldom applied to pasture, especially with us; but applied in the form of compost, as a top-dressing, they are serviceable. Gypsum and spent ashes may be used with undoubted benefit in most cases.

It need hardly be added, that bushes, thistles, and other perennial weeds obstruct the growth of grass, and that they should be carefully extirpated.

Our pasture-grounds are generally left to take care of themselves; but there is no doubt that some expense bestowed upon their improvement, in some of the modes above suggested, would be profitably laid out.

OF MEADOW.

The crop being here annually carried off, it becomes a matter of necessity, if the field is to be kept permanently in grass, to apply manure occasionally, if we would prevent a diminution of product. It is affirmed that a perfectly thick bottom cannot be maintained on permanent meadows in England, unless it is manured every second year. Gypsum will

effect much here upon dry soils, though there its effects are equivocal; but gypsum alone will not suffice even here. The average product upon our old grass-lands will hardly average over a ton and a half to the acre. With a biennial or triennial top-dressing of dung or compost, where the sod is in good condition, it is believed the average would be double.

Meadows are subject to all the evils that are experienced in pastures from mosses, wetness, and the diminution of the finer grasses, besides the greater exhaustion of fertility consequent upon carrying off the annual growth; and the same measures are best adapted to renovate them. Meadows are generally depastured after the hay has been taken off and the rowen partially grown. "After the cattle have been removed," says an English writer, "the land is *bush-harrowed and rolled*." It has been stated, though some question the fairness of the experiment, that the operation of heavy rolling has been found to add six or seven hundred weight of hay per acre to the produce of the crop.*

The effect of pasturing meadows in the spring upon the coming grass-crop has been a matter upon which farmers have differed, though all agree that heavy cattle should not be kept on so late in autumn, or put on so early in spring, as to injure the sole of the sod by poaching it when in a wet state. Mr. Sinclair has stated, that a given space of the same quality of grass having been cut towards the end of March, and another space of equal size left uncut till the last week in April, the produce of each having afterward been taken at three different cuttings, that of the space last cut exceeded the former in the proportion of three to two; and in one instance during a dry summer, the last cropped space exceeded the other as nearly two to one.† It is

* Derbyshire Report, vol. ii., p. 83.

† Treatise on Agriculture, p. 113, 114, Harpers' edition.

generally conceded that it is better to feed off rowen than to cut it as a second crop.

ON CONVERTING ARABLE OR PLOUGH-LAND INTO PERMANENT MEADOW OR PASTURE.

The first obstacle to encounter is the practice, yet too prevalent, of throwing plough-land into old field or pasture, without stocking it with grass-seeds. We lay it down as an unerring rule in good husbandry, that ploughed fields intended to be converted in pasture or meadow should be well stocked with grass-seeds; and, as next in importance, that as many species of grass-seeds be sown as can be procured or are adapted to the soil; and that, if possible, there be included the seeds of those grasses which are either indigenous to, or which are found to thrive well in, the immediate neighbourhood, and in similar soils. The reasons for recommending several species are these: Each kind has its particular season of growth, and exhausts a particular food in the soil; and by multiplying the number, we are more apt to obtain a constant growth of herbage, and a far more abundant supply of feed. Thus, for instance, say a square foot of surface will support but six stocks of timothy; this grass, growing neither very early nor very late, the herbage would neither be abundant nor permanent. But the same square foot, which would support but six plants of timothy, would support, at the same time (because every kind requires its specific food), six plants of five other species, say meadow fox-tail, red clover, white clover, orchard, and tall oat-grass, or species of the agrostis or fescue families. Of these six kinds, some one would be in luxuriant growth at all seasons, and the herbage would be increased from three to four fold, if the soil be good, by the admixture of the different seeds.

We cannot too often repeat, that pastures and meadows are almost as much benefited by a rich

soil, and a soil moist, not wet, as arable husbandry. The food of the grass, as well as of the grain crop, must come mainly from the soil; and if this food is scanty, the crop will in like manner be scanty. And, again, the more nutritious grasses will not grow on soils habitually wet.

"The products of natural meadows," says Armstrong, "have been carefully and skilfully analyzed in Germany, in Italy, in England, and in France; and the result shows that wet meadows contain the smaller number of the different species of plants, but the greater number of those which are either useless or injurious; and, on the other hand, that *moist* meadows contain the greater number of the former, and the smaller number of the latter. The following simple table exhibits at a glance the present state of knowledge on this important part of our subject:

	No. of Plants.	Useful.	Useless or bad.
In wet meadows	30	4	26
In dry "	38	8	30
In moist "	42	17	25

"The agricultural labours suggested by these facts are of two kinds: the eradicating of useless, pernicious plants, and the continuance and multiplication of those which are good. The first of these objects is promoted by mowing the meadows before the seeds of noxious plants ripen, by pasturing them, once in three years, with sheep, horses, and cattle in succession; by harrowing them in the spring and fall; by destroying by hand perennial weeds; and, lastly, by sufficiently draining those that are wet.

"Many pernicious plants are annuals, and are killed by the first of these operations. A similar effect is produced by the second; the harrow or scarifier will destroy mosses or other weeds whose roots are fibrous and superficial; the hand-hoe will extirpate such tap-rooted plants as resist the harrow and are refused by cattle; and draining will expel all worthless aquatics."

In order to obtain seeds of indigenous kinds which are not to be had in the shops, it is common in Europe to have the seeds carefully gathered by children, which, being sown on a well-prepared piece of ground, and taken care of, will soon yield seeds for farm-culture. It is easier to accommodate the plant to the soil than to adapt the soil to the plant.

In laying down lands to permanent meadow or pasture, it is all-important to have the soil perfectly broken and pulverized; as the future value of the crop will depend upon the perfect germination of the seeds, and this cannot be expected without a thorough pulverization and preparation of the soil. It is also important to sow plenty of seed. The ground, to be sure, will sustain and nourish only a certain number of plants; yet it is better to go to an extra expense for seed than to have a deficiency of plants. It is usual, in Britain, to sow from ten to sixteen pecks of grass-seed to the acre on lands intended for permanent grass, and from six to a dozen species. Another practice there, entitled to our notice, in laying down lands permanently to grass, is to sow grass-seeds exclusively, that is, unaccompanied with any sort of grain. A good turf is the main object; and if grain is sown with the grass-seeds, it robs the soil of much of the food which is necessary to nurture the young grass, and permanent value is thereby sacrificed to temporary and comparatively trifling profit.

The best time for sowing, for permanent grass-lands, is said to be the early part of autumn, say in August or the first of September, in order that the plants may become well established before winter. Or, the more hardy kinds may be sown then, and the tenderer kinds sown upon the same field in the spring, as we sow clover upon the winter-grain. As the seeds of grasses are generally small, the use of the roller, to pulverize and press the earth upon them, and to smooth the surface, is almost indispensable

in good husbandry. It is considered of great advantage to give a light dressing of compost or of rotted dung to young grass; and to avoid feeding it with heavy animals the first year, before the turf has thickened and become firm.

If the grounds laid down in grass are intended for permanent meadow, reference should be had to the grasses which are fit for the scythe at nearly the same time. For information on this point, we refer to p. 30, vol. iv., and to pages 11, 33, 47, and 63, vol. iii., of the Cultivator.

Should pasture and meadow be made to alternate, or should fields be kept exclusively for each? The American practice is not to alternate; and yet there seems to be substantial reasons for a contrary course. The object in both cases is to obtain the greatest quantity and the best quality of food for farm-stock; and this object is promoted in both cases by scarifying, draining, and top-dressing. Labour is as profitably laid out in improving our pasture as our meadow grounds. But feeding and mowing have different effects upon the soil. In one case the crop is annually carried off, and in the other consumed upon the ground. Meadows, therefore, diminish in fertility, while pasturing increases the productive powers of the soil. Is it not proper, for this reason alone, to alternate, in order to keep up fertility? But there is another argument: pastures soon abound with biennial and perennial plants, as thistles, mulleins, &c., which, as cattle do not consume them, mature and shed their seed, and multiply rapidly; whereas, if they are occasionally converted to meadows, these plants would be cut down before the seed matured, and at least the biennials would be soon extirpated. These weeds are as prejudicial in pastures, in diminishing the quantity of herbage as they are in meadows, and the same good management requires their extirpation in both.

Something depends *on the size of enclosures*. Small

enclosures, say ten acres, are believed to be better than large ones. Grass grows better when there is no stock upon it than when it is subjected to the constant tread of heavy animals; hence it is deemed economical to shift cattle occasionally from one enclosure to another. Another advantage of small enclosures is, it enables the farmer to keep different classes of stock separate, and thereby prevent injuries, which often occur to weaker animals from running with stronger ones.

“Respecting the *stocking of enclosures* (we quote from *British Husbandry*), it is the opinion of the most intelligent graziers, that the cattle fed upon them should be divided in the following manner. Supposing four fields, each containing a nearly equal quantity of land, one of them should be kept entirely free from stock until the grass has got up to its full growth, when the prime or fattening cattle [or the cows, where the dairy is the prominent business] should be put into it, that they may get the best of the food; the second best should then follow; and, after them, either the working or store stock, with lean sheep to eat the pastures close down: thus making the whole of the stock eat over the four enclosures in this succession:

No. 1. Clear of stock, and reserved for the fattening beasts or cows.

No. 2. For the fatting beasts till sent to No. 1.

No. 3. For the second-best cattle, until forwarded successively to Nos. 2 and 1.

No. 4. For stores and sheep to follow other cattle, then to be shut up until the grass is again ready at No. 1 for the fattening beasts,”
p. 482.

“*Land that is constantly mown must also be frequently manured, or it will be thrown out of heart.*” There is no doubt on this point. If the crop is frequently carried off, and nothing in the shape of vegetable matter returned to the soil, the land must and

will deteriorate, till the crop will not pay the labour of gathering it. Those, therefore, who will have *good*, permanent meadows, must, once at least in four years, give it a bountiful top-dressing of dung.

[We add here the following concise but valuable report made to the Agricultural Society of this state, on grasses and grass-lands, by L. E. ALLEN, Esq., of Buffalo, merely remarking that we fully concur in the opinion expressed, that the quantity of grass-seeds sown is in most cases far too limited.]

REPORT ON GRASSES AND GRASS-LANDS.

The committee on laying down grass-lands, &c., report :

In the consideration of this subject, but two distinct propositions submit themselves to the reflection of the committee; and, first: our soils in the Northern states may be ranged, for the purpose of this report, into two classes: the tenacious, whether clayey, loamy, or vegetable; and the silicious or sandy. These are sufficiently well known to every farmer without analyzation. The first division of these soils may be termed "natural grass-lands;" the second requires the grasses to be frequently cultivated by rotation with other crops, and, for the present purpose, may be termed "artificial" soils for grasses.

In the management of the first, the committee feel warranted in the assertion (and for the truth of this they appeal to the innumerable instances in all parts of the Northern states, where large and productive tracts of meadow and pastures have been in uninterrupted grass-culture for more than half a century), that, so far as has yet been tried, lands may be kept in grass for such a length of time as "the memory of man runneth not to the contrary." It is true that these soils will not, more than others, bear con-

tinual cropping without occasional, nourishment, with impunity; but when once well seeded, by the application of various manures, among which that of the barnyard is the best, and in the absence of close after-seeding, they will yield grass, as the common saying is, "almost for ever."

In many sections of our country, where vegetable loam preponderates upon a clayey or a hardpan subsoil, the ploughing up of meadows and pasture-lands for many years is almost destructive to their future production of grass; and it is only by long and regular applications of mixed and rich manures that they can be brought back to their primitive luxuriance. In proof of this remark, your committee need only refer to some of the most celebrated and productive grazing districts of the state, where the staple grasses of our country have been *always* successfully cultivated. In frequent instances, perhaps in a large majority of cases, lands of this description, which have been cleared within the last fifty years, and are now occupied as pasture and meadow, have *never* been ploughed, but remain in the same uneven condition of surface as they were left when the harrow followed the first grain and grass-seed which were deposited in them after clearing. Great reluctance is usually manifested in disturbing these fields, although somewhat inconvenient to the mower, their proprietors being so well satisfied with their annual crops as to prefer the old adage, and "let well enough alone." Your committee have witnessed instances of this description of soil, which have been for thirty years in grass, and but slightly manured, and, under very ordinary cultivation, producing in a common season two or three tons of the finest hay per acre. Such, however, are extraordinary cases in favourable positions. An ordinary crop may be one to two tons per acre, according to the care and attention of the farmer.

It is true that these lands may become exhausted,

and the grass "run out," as the term goes, through bad husbandry and neglect; but the application of yard-manures, of new grass-seeds and the harrow, will, in nearly all instances, restore them to their wonted luxuriance. It need hardly here be stated, that irrigation, draining, and other artificial stimulants may be important to the productiveness of the meadow and the pasture; but, as these always suggest themselves to the judgment and good sense of the cultivator, they do not necessarily come within the province of this discussion. The quantity of seed sown to the acre, for either pasture or meadow, should not be less than half a bushel; the kind or variety to depend somewhat upon the soil and its situation. For mowing, the red clover, timothy, and red-top are the best and most desirable. For pasture, the same, with the addition of white clover and blue or June grass, which are almost everywhere indigenous to the soil, and are among the richest and most nutritious of all our grasses. In fine, the simplest methods compatible with the established rules of good husbandry, your committee believe, with such soils, are the best for their profitable and perpetual cultivation.

In treating the second proposition, viz., the cultivation of grasses on the lighter soils, your committee will remark, that much must necessarily be left to the judgment of the cultivator as to the time that his lands are to be kept in grass, depending upon his own necessities, or what he requires from his land. As a general rule, if the raising of grass be an object, so long as the lands produce well, either from their natural fertility or by the application of artificial stimulants, they should not be disturbed; but when the object is a regular rotation, with a strict regard to the greatest profit, two to four years is sufficient for the benefit of the land, and as long as such soils will usually yield a grass-crop that will pay. It is better that the soils be properly prepared, by pre-

vious grain or root crops and abundant manuring, and by harrowing and rolling, for the reception of grass-seeds, and that the manures of the farm, save, perhaps, lime, ashes, and plaster, be withheld for the use of the current ploughed crops, rather than to expend them upon the grasses; yet much must depend upon the local position of the ground, the climate, and the dry or moist condition of the soil.

The descriptions of grasses best fitted for these soils are, so far as our experience has yet tested, the red clover and timothy. They are strong, hardy, and rich in their properties, universally known and cultivated, and have, in competition with all rival experiments, maintained their reputation and superiority. The proportions of seed distributed on the soil may vary with the views of the cultivator, as he intends it for hay or for pasture, and may range from one to two thirds of either variety; but in no case, for *thorough* seeding, should the combined quantity be less than from half a bushel to three pecks per acre. The great fault with our farmers is, that they do not half seed their grass-lands, the usual allowance being less than half the quantity recommended. As to the time and manner of seeding, your committee unhesitatingly recommend the earliest spring, on a light loam; or, if that be wanting, while the ground is yet unsettled, on a crop of winter-grain. If this be not practicable, the other best plan would be either sowing with spring-grain, or seeding in the summer with buckwheat or turnips, as the occasion may demand.

Ploughing into the soil an occasional grass-crop for its renovation, in the absence of stimulating manures, cannot be too highly recommended in the lighter soils; and for succeeding crops of almost any description, this process is also highly advantageous, and may, without hesitation, be always recommended.

As the discussion of this subject at greater length

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would lead your committee into minute details not required by their duties on this occasion, they beg leave to close their communication with the following suggestion to all who would cultivate grasses :

Read attentively, and follow the practical rules laid down in the best agricultural papers of the day, and no intelligent farmer need be at a loss to understand how he may most successfully cultivate his lands with grasses.

CHAPTER VII.

PLANTS.

The Germination of Seeds.—Roots and Leaves.—Extent of the Roots of Plants.

THE GERMINATION OF SEEDS.

SEEDS often fail to grow ; and the seedsman is often found fault with for vending bad seeds, when they are really good, and when the cause of their not growing is owing to the gardener or planter. To induce germination, moisture, atmospheric air, and a certain temperature are indispensable ; and it is also requisite that light be excluded from the seed until the nutriment in it is exhausted, or until the root can draw nourishment from the soil. The first effect of the air, heat, and moisture upon the seed is to change its properties ; to convert its starch into sugar—into a sort of milky pulp, the proper food of the embryo plant. If at this stage the seed becomes dry, its vitality is believed to be destroyed ; but if the agents referred to are permitted to exert their influence, the contents of the seed swell by degrees, and the point of the future root being formed, breaks through the shell in a downward direction, while,

about the same time, the point of the future stem comes forth in an upward direction. The presence of air, heat, and moisture are afterward as indispensable to the growth of the plant as they were to the germination of the seed.

Now it often happens, that when seeds are planted in fresh-stirred ground, or when the soil is moist, they undergo the incipient process of fermentation, and the earth not being pressed upon them, and dry weather ensuing, the moisture is abstracted, and the seeds perish. Too much moisture is also often destructive to the vital principle of seeds; while others, again, are buried too deep to be vivified by solar and atmospheric influence. The first object in planting, therefore, should be, to place the seed just so far under the surface, and to cover it with so much earth; as shall barely secure to it a constant supply of moisture. There are many seeds, as of the carrot, parsnip, orchard-grass, &c., which, if not previously steeped, or the soil well pulverized and pressed upon them, fail to grow for want of moisture. Hence, in sowing orchard-grass, it is found prudent to spread the seed upon a floor and sprinkle it with water, and to pass a roller over the ground after it is sown. And hence, in loose garden mould, it is advisable to press the earth with the hoe or the spade upon all light seeds after they are sown.

But we would draw the attention of the farmer, as well as of the gardener, to another mode of preventing failure and disappointment in the growth of certain seeds; and that is, by *sprouting* them before they are planted. This may be conveniently done with Indian corn, pumpkins, mangold-wurzel, beets, &c., on the farm, and with melons, cucumbers, beans, peppers, and a great number of other seeds which are assigned to the garden. The mode of doing it with the field-seeds we have named is this: steep them from twelve to twenty hours in tepid water; then pour off the water, and leave them in a warm

place, covered, to exclude the light and prevent their drying, or in a dark cellar or room, and the radicles or roots will shoot in a few days, and may then be planted without injury. Having been obliged to suspend our planting for four days on account of rain, we found our seed, which had been previously steeped and set by in a dark room, with radicles two or three inches long. It was planted, however, with but little inconvenience, and did remarkably well. Mr. J. Nott sprouted a part of his corn last year, and a part of it was not sprouted; and, what is worthy the particular notice of farmers, he assures us that *the sprouted corn was not hurt by the wire-worm, while the unsprouted seed was seriously injured*, although planted by the side of each other. Mr. Nott accounts for the difference in this way: the wire-worm attacks the chit, and feeds upon and destroys the germe: but the radicles having already protruded, and not being to the taste of the worm, the insect attacked the solid part of the kernel, where its progress was too slow and too remote from the germe to retard its growth. Mr. Nott also sprouted his mangold-wurzel-seed, and planted it as late as the 27th of June. Almost every seed grew, and the crop might be called a good one early in September.

To sprout garden-seeds, procure two sods of equal size, say eighteen inches square; place one in the corner of the kitchen chimney, with the grass down; lay your seeds upon it, and if they are small, wrap them in a piece of brown paper; then place the other sod upon them, with the grass up; water well with warm water, and the seeds will sprout in from twenty-four to forty-eight hours.

There is one manifest advantage in sprouting seeds: it tests their goodness, and shows whether they will or will not grow. A small quantity of seed-corn submitted to this test before planting, would in many instances prevent great loss to the farmer.

ROOTS AND LEAVES.

Plants may be said to consist of two great parts, the root and the stem, with their various appendages. But since we are in this place merely to consider one function of vegetable life, namely, the function of *absorption*, or the manner in which plants bring matter, external to themselves, within the range of their vital actions, we may confine our researches almost entirely to the *roots* and *leaves*; these being, beyond doubt, the parts by which extraneous matter is first received into the plant; and, in the first place, let us examine the functions of the root.

The term *root* is generally considered to include all that part of the plant which is beneath the surface of the soil. This, however, is not strictly correct; for many plants possess what botanists call a *rhizoma*, or underground stem. The true root is that part of the plant which, from the instant of its bursting the coverings of the seed, begins to direct its course downward (or towards the earth's axis), "with a tendency so powerful that no known force is sufficient to overcome it." Moreover, it differs from the stem in many of its characters; thus, it does not divide itself into smaller fibres in the regular manner in which stems generally give off their branches. Again, it never produces leaves or scales; and another important distinction is, "that it never becomes green (at least in tissue) when exposed to the action of air and light, while all the other parts of vegetables, when thus exposed, assume that colour." The root is divided into the body and fibres, the latter of which will alone claim our attention. These fibres are furnished at their extremities with a remarkable structure, which, from its resemblance to a sponge, has been termed *spongiolæ*. It consists of an extremely loose texture, and is most probably merely "the newly-formed" internal "tissue" of the

root itself, deprived of its more dense covering or *cuticle*, as it is termed. This opinion is very much strengthened by the well-established fact, that roots grow by their extremities only. In this manner the spongiole is always being renewed; and, what is of still more consequence, is never *long in one place*. On this account it is that plants which live many years (if not growing too near others of the same kind) are not liable to die from having exhausted the soil; or, in other words, are not liable to be starved to death; for it is evident that, by the constant *change of position* of the spongiole, which is the only part of the root by which nourishment is received into the plant, there must be a constant supply of food, so long as the soil around it contains any organic matter in a fit state for absorption. It has been shown, by innumerable experiments, that the spongioles, or absorbent extremities of the roots, cannot take up anything but fluids; or, at all events, if they can absorb solids, they must be in such a minute state of division that they would remain suspended in water even for a considerable time, which is a fineness of particles far greater than will probably ever be attained by any *mechanical* means.

It has likewise been proved that plants are capable of choosing, to a *certain* degree, their food; or, in other words, of selecting those substances which are best adapted for their peculiar nature, and rejecting what would be injurious. This power, however, appears to be limited, as it is perfectly possible to destroy a plant by giving it poison by the roots. The root, moreover, has the power of *excretion*, or returning to the earth such matters as are either useless or injurious. From this last property of roots, we may draw two valuable conclusions: *first*, that, in order to poison a plant, the substance used must be capable of acting rapidly, or it will most probably be rejected before it has had time to produce its effect; and, *secondly*, that, since plants reject

substances *useless* and *injurious* to them, the soil where they grow may in time become so impregnated with such substances as to render it incapable of supporting the *same species* of plant any longer; or, at least, until such time as the rejected matter shall have been decomposed. The next purpose which the roots of all land, and of the majority of aquatic plants, serve, is obviously to fix them firmly in their places. On this account, we find, in *many cases*, that a certain proportion exists between the size of the stem and the root. This, however, is subject to exceptions. But, on the other hand, in all cases, an obvious relation may be perceived between the *form* of the root and the kind of soil in which the plant grows. Thus, if two specimens of the same plant—some of the grasses, for example—be found growing, the one in clayey, the other in a sandy soil, it will be seen, on examination, that the root of the one growing in the sand is much more minutely subdivided, and contains many more small fibres, than the one which grows in clay; and the reason of this is obvious. We have already seen that the spongioles are the only absorbent parts of the root; that they exist only at the extremities of the smallest fibres; and, moreover, that they can take up nothing but what is presented to them in the form of solution. Now, in the clayey soil, from its retentive nature, the soluble parts are not allowed to drain away; and hence the plant is supplied with food near at hand, and, consequently, a few short fibres are sufficient. On the other hand, plants growing in sand are frequently deprived of all fluid near them by the sinking of the soluble matters through the loosely aggregated soil; in which case the plant would inevitably perish from starvation, were it not for the wise law of nature, which provides against such calamities by endowing the roots of plants placed under such circumstances with the power of shooting forth innumerable minute fibres in all direc-

tions, in order that advantage may be taken of every drop of moisture which falls in their neighbourhood. Nor is it merely in the number of minute fibres that the roots of plants growing in sand differ from those which inhabit the stiffer soils. The form of the *body* of the root is distinct: thus, nearly all bulbous and other large succulent roots—as the turnip, for example—require sandy soil; and, moreover, some plants, as that species of grass named *Phleum pratense* (meadow cat's-tail, or timothy grass), change the form of the root according to the soil they inhabit. In stiff clays, the plant just mentioned has a fibrous root, whereas in sand it becomes bulbous, and assumes all the characters of *Phleum nodosum*. The explanation here is as evident as in the former case. The bulbs of the roots act as reservoirs of food for the plant: thus, in very dry seasons, these bulbs shrivel up, their fluids being all needed by the rest of the plant, and hence withdrawn. So beautifully do we perceive in this, as in all other cases, that design and adaptation of means to specific purposes, which must impress even the most skeptical with the absolute existence of a *Great First Cause*.—Madden.

EXTENT OF THE ROOTS OF PLANTS.

Roots perform a double office to plants: they serve as braces to keep them in an upright position, and they are purveyors to supply them with food suitable to their growth and maturity. To enable them to perform these offices well, three requisites in the soil are essential. *First*, it is important that the soil be mellow, that the roots may penetrate it freely, not only to strengthen their bracing power, but to extend their range for food, this being absorbed or taken up by the spongioles or extreme points; and the greater their range the more abundant the food which they supply. *Secondly*, it is important that this food be in the soil, in a soluble state; that is, in a condition to be dissolved by, and incorporated

with, the fluids in the soil. This food consists of vegetable and animal matters, or of whatever has been such. *Thirdly*, it is important that a quantity of moisture be always present in the soil, to dissolve the food of plants, or to serve as the medium for conveying it first to the spongioles, and from thence into and through the plant. Air, heat, and moisture are all essential agents in preparing the food of plants in the soil, and in giving vigour to vegetable growth.

It should be the object of the farmer and gardener to aid these natural operations in cultivated crops; and to repay the soil, by labour and skill, for the annual tribute which they draw from it. These labours consist in returning to it vegetable food (manure) equivalent to that which they annually take from it; in rendering it mellow and penetrable to the roots of the growing crop; in regulating the supply of water, too much being as hurtful as too little; and in keeping the surface loose and porous, for the free admission of air, heat, and moisture. Hence the advantage of deep tillage, perfect pulverization, draining, manuring, and the frequent use of the cultivator among drilled or hoed crops; and these considerations also suggest one objection against using the plough in the culture of these crops, and earthing or hilling them to any considerable extent; as both of these modes of culture, ploughing and hilling, tend to curtail the natural range of the roots, and, consequently, to diminish the pasture and food of the crop.

The depth and horizontal spread of roots are greater than is generally apprehended, as they often branch into minute filaments imperceptible to the naked eye; still these minute imperceptible filaments collect food for the parent plant. Jethro Tull, the father of drill-husbandry, has given us a good and satisfactory illustration of the great extension of the roots of the common turnip, which we here insert, not only to convince our readers of the fact, but

to illustrate the importance of good ploughing and thorough pulverization in tillage husbandry. We invite attention to the cut, and then to the explanation in the words of Tull.

“*A method to find the distance to which roots extend horizontally.*—A piece or plat, dug and made fine, in whole, hard ground (Fig. 1), the end A two feet, the end B 12 feet, the length of the piece 20 yards: the figures in the middle of it are 20 turnips, sown early and well hoed. The manner of this hoeing must be at first near the plants, with a spade, and each time afterward a foot distance, till the earth be once well dug; and, if weeds appear where it has been so dug, hoe them out shallow with the hand-hoe. But dig all the piece next the outlines deep every time, that it may be the finer for the roots to enter when they are permitted to come thither. If the turnips be all bigger as they stand nearer to the end B, it is a proof that they all extend to the outside of the piece, and the turnip 20 will appear to draw nourishment from six feet distance from its centre. But if the turnips 16, 17, 18, 19, and 20 acquire no greater bulk than the turnip 15, it will be clear that their *roots* extend no farther than those of the turnip 15 does, which is but about 4 feet. By this method the extent of the *roots* of any plant may be discovered. There is another way to find the length of *roots*, by making a long narrow trench at the distance you expect they will extend to, and fill it with salt; if the plant be killed by the salt, it is certain that some of its roots enter it.

“What put me upon trying this method was an observation of two lands or ridges (Fig. No. 2), drilled with turnips in rows, a foot asunder, and very even in them; the ground at both ends and on one side was hard and unploughed. The turnips, not being hoed, were very poor, small, and yellow, except the three outside rows, *b, c, d*, which stood next to the land (or ridge) *E*, which land, being ploughed and

harrowed at the time the land A ought to have been hoed, gave a dark, flourishing colour to these three rows; and the turnips in the row *d*, which stood farthest off from the new-ploughed land E, received so much benefit from it as to grow twice as big as any of the more distant rows. The row *c*, being a foot nearer to the new-ploughed land, became twice as large as those in *d*; but the row *b*, which was next to the land E, grew much larger yet. F is a piece of hard, whole ground, of about two perches in length, and about two or three feet broad, lying between those two lands which had not been ploughed that year. It was remarkable, that, during the length of this interjacent hard ground, the rows *d*, *c*, *b* were as small and yellow as any in the land. The turnips in the row *d*, about three feet from the land E, receiving a double increase, proves that they had as much nourishment from the land E as from the land A, wherein they stood, which nourishment was brought by less than half the number of *roots* of these turnips. In their own land they must have extended a yard all round, else they could not have reached the land E, wherein it is probable that these few roots went more than another yard, to give each turnip as much increase as all the roots had done in their own land. Except that it will hereafter appear that the new nourishment taken at the extremities of the roots in the land E might enable the plants to send out more roots in their own land, and receive something more from thence. The row *c* being twice as big as the row *d*, must be supposed to extract twice as far; and the row *b* four times as far, in proportion as it was of a bulk quadruple to the row *d*."

"When roots are in a tilled state," says Tull, "a great pressure is made against them by the earth, which constantly subsides, and presses their food closer and closer, even into their mouths, until itself becomes so hard and close that the weak sorts of

roots can penetrate no farther into it unless reopened by new tillage."

Tull's work was published a hundred years ago. It has been quoted and commented upon by most of the subsequent writers upon agriculture; and the facts above stated have never been controverted nor doubted, either by these writers, nor, so far as we have learned, by practical farmers. They are, therefore, undisputed. Why is it that cultivated crops upon the margins of fields, and about stumps and fast stones, give more dwarfish plants and less product than the well-tilled portions of the field? It is not owing to the poverty of the soil; for these portions abound most in the elements of fertility, by reason of the plough, on being raised from the furrow, depositing there the finest and richest mould. Why do meadows deteriorate? Is it not because the roots of plants have not a sufficient range in mellow earth to supply the requisite food; and because the unbroken soil "becomes so hard and close, that the weak sort of roots can penetrate no farther into it?"

There are some practical improvements which we would draw from the preceding facts. And,

First: In regard to the use of the plough in Indian corn and other hoed crops. The roots of Indian corn are known, from repeated observation, to extend in the soil at least six, eight, and ten feet; and, if planted in squares four feet apart, each hill has virtually a pasture of four feet square to feed upon. Now if the plough is run both ways through the crop, this pasture is reduced to at least two square feet, for the roots which furnish sustenance are within reach of the plough, and must be cut by it. Hence the plough, where it is employed, reduces the pasture of each hill from sixteen to four square feet, or three fourths.

Secondly: In regard to the application of manure, whether it should be applied in hills and drills, or

spread broadcast. The roots extend simultaneously with the stems, and draw sustenance for the plant through their extreme points. Hence, by the time the crop is first dressed, the roots have extended beyond the manure deposited in the hill, and, consequently, the plant derives but a partial benefit from this central deposite of food. If, on the other hand, the manure is spread broadcast, the roots, as they extend, are constantly reaching new supplies, and the plant is sustained in undiminished vigour.

Thirdly: In regard to fallow crops instead of naked fallows. Where sward ground receives but one ploughing (but that should be a thorough one), the vegetable matter of the surface is turned completely under, safe from the wasting influences of the weather. This vegetable matter readily decomposes, furnishing a permeable stratum for the roots, the food which these roots seek for, and moisture to convey it to the plants. As the roots of the sod decay, the upper stratum becomes permeable to heat and air, and crumbles into a fine tilth. In the case of naked fallows, a good portion of the vegetable matter is lost by being turned to the surface at the second ploughing, and the ground consequently becomes more compact, and is not so readily penetrated by the roots of the crop, nor by heat, air, and moisture, the essential agents of vegetable growth. And,

Fourthly: The facts which we have detailed afford a strong argument in favour of the alternating system of husbandry wherever it can be introduced; of periodically breaking and pulverizing the soil with the plough, harrow, and roller, and with root-crops, thereby rendering it more congenial to the growth of grasses and small grain.

CHAPTER VIII.

SWINE. .

[THE following report, made by C. N. BEMENT, Esq., at the annual meeting of the New-York State Agricultural Society, will be found to embrace much valuable information on the several breeds, as well as the treatment of this animal. In scarcely any instance has improvement been more manifest than in the case of swine; and it must be admitted, that in no case was such improvement more needed. For farther information on this subject we refer to the Cultivator, vol. vii., No. 1.]

Until recently, very little attention has been paid to the breeds of our farm-stock; and pigs, being considered an inferior species of domestic animals, have been the last to engage the attention of the farmer: even at the present day, in many districts of our country, the old, unprofitable kinds of this animal continue to prevail. Indeed, systematic breeding, with a view to improve the form and value of the animal, may be said to have hardly commenced among us, the improvements which are perceptible being rather the fruits of European than American skill.

A common error in this country has been to regard more the size of the animal than its symmetry or good points; to estimate a breed according to the great weight which it could be made to attain rather than the profit with which it could be fitted to the hands of the butcher—the most material point to the

farmer. But experience is teaching us a new lesson on this head. Butchers now judge of an animal, not according to its gross weight, but according to its good points, or the value of the meat which it carries. Breeders have learned to prefer those which, with a given quantity of food, will lay on the most meat. And the consumer has learned, too, that meat that shows the most solid fat is neither the most healthy, the most savoury, nor the most economical. It is the due admixture of fat and lean, or the prevalence of what is termed *fat-lean* (such as is seen in the Devonshire ox and the South Down sheep) that gives the greatest value to butcher's meat.

It was lately remarked by an eminent breeder in England, Mr. Gray, at an agricultural dinner, that he could feed, on an acre of land, a greater number of pounds of mutton, in carcasses from 18 to 20 lbs. per quarter, than in carcasses from 28 to 30 lbs. per quarter; and that a quarter of mutton from a sheep of 18 to 20 lbs. weight per quarter is worth more in proportion than from a sheep of 30 lbs. per quarter; and, consequently, that the advantage is on the side of the smaller carcasses. And he assigned this among other reasons, that, in case of drought or scarcity, a small animal can collect as much food as a larger one, and, having a smaller carcass, it derives more advantage from it; that, while the larger is losing in condition, the smaller one, if not improving, is remaining stationary; and when the period arrives at which an abundance of food can be obtained, it almost immediately recovers itself, and is fit to go to market sooner than the larger animal.

These remarks are found to hold good in regard to swine as well as sheep. The same quantum of food that will give 600 lbs. to hogs of a very large breed, will fatten two hogs of 300 lbs. each; and the meat of the latter, though not so fat, will be of the better quality. This and other considerations have given to what is termed the Berkshires a decided

superiority, both in England and America, over most other breeds.

The history of the introduction of this breed among us was stated in the report upon swine made at the last meeting of this society. Since that time, the demand for this breed of pigs, from almost every state in the Union, has greatly increased, and prices, in some cases, have almost exceeded credulity. Two hundred and fifty, three hundred, and even five hundred dollars a pair, have been paid for them. Nor have they been found deficient in weight when they have had time to mature their growth. They have been fattened to weigh five, six, and seven hundred pounds; and one, eighteen months old, purchased of Judge Buel, was brought to this market last week from Fulton county, which weighed, when dressed, 633 lbs., the carcass of which sold in the market at about \$56.

But it is not the weight which this breed of hogs may be brought to that gives them their great intrinsic value. They are docile, quiet, come to early maturity, have but little offal, give a large and excellent ham, one of the most valuable parts, sweet, sound, and high-flavoured pork, and make, it is believed, as great, if not greater returns for the food consumed, than any other breed among us.

It is a matter of congratulation to the admirer of this breed of hogs, that Mr. Lossing, of this city, has recently imported three animals of this breed, carefully selected by Mr. Hawes in England. This, it is hoped, will prevent the necessity of breeding in-and-in, and thus preserve to us the breed in its purity.

In corroboration of the high opinion entertained of this breed of hogs, I will state that Col. Williams, a spirited and wealthy gentleman residing on Long Island, desirous of procuring a superior breed of hogs, wrote to his friend and agent at Liverpool to procure for him, *without regard to price, six pigs of the*

best breed in England, and to take time and satisfy himself before purchasing. After diligent inquiry, his friend finally settled on the Berkshire, as being considered, taking all things into view, the best and most approved breed, and purchased seven, four males and three females, being the entire litter (the owner refusing to sell a part), and forwarded them to New-York, where they arrived in October last. One of the male pigs will be sent to the chairman of this committee in the spring, which will go still farther to keep the breed from degenerating.

There are other good breeds of hogs in some sections of the country, each of which has its advocates and admirers, such as the Bedford or Woburn, Mackey, Leicesters, Mocho, China, Byfield, and Grass-breed, as they are termed.

Much loss has been sustained by our farmers in not keeping up the purity of blood when possessed, the importance of which has been too little regarded; and, before they were aware of it, the good qualities were lost, either by breeding in-and-in, or by crossing with inferior animals.

As it regards the choice of hogs for breeding, it is recommended that the male should be small-headed, deep and broad in the chest, the chine rather arched, the ribs and barrel well rounded, and the hams falling full down nearly to the hock. He should also be more compact in his form, and rather smaller than the female; for if she be coarse, her progeny will be improved in form and flesh by the cross; and the more roomy she is, the better chance will she afford of producing a large and healthy litter. Respecting her make, no other observation need be made than to choose her of a deep and capacious body, with a good appearance, and belonging to as perfect a race as can be found.

The boar should be well fed, and, when young, used sparingly. The sow should also be kept in good condition, so as to support her offspring, but

should not be made too fat: for, if in very high order, she will probably bring but a weak and indifferent litter of pigs. She should not be allowed to farrow in the winter, as the young are then extremely tender, of all animals the least able to endure cold, and thrive with great difficulty. March and the first of April for the spring, and August and September for the fall litters, are therefore to be preferred as the best seasons for farrowing.

When breeders possess a good kind of stock, they are too apt to follow it up by breeding what is termed "in-and-in" with the same family; a practice which, it is well known, cannot be successfully persevered in; for the animals will become bad feeders, grow delicate, fall off in size, and almost entirely give up breeding; and, should they casually have a litter, the pigs will be small and weak, and die almost as soon as they are born.

It not unfrequently happens that a young sow will devour her young: she should, therefore, be carefully watched, and well fed when about to farrow, which may be known by her carrying straw in her mouth to form her bed. It is a good precaution to sponge the backs of the pigs immediately after they are born with a strong infusion of aloes in lukewarm water, as its bitter taste will prevent her from destroying them: care should also be taken, before farrowing, to separate her from other hogs. She should have a dry and warm place, and be provided with a good supply of straw cut short, to prevent the pigs from getting entangled, in which case she is apt to lay upon and kill them. To protect the pigs, an open frame or strong rail on each side of her, elevated a few inches from the ground, under which the pigs may run, has been recommended. Eight or ten days after farrowing, the sow may be allowed to leave her sty for a short time every day, and when the pigs acquire a little strength they may accompany her. A grass-field is the best place,

for the herbage improves the sow's milk; the pigs also grow faster as well as more healthy, and the sty is rendered more cleanly by their absence. If the brood be numerous, they should be lessened, in order to relieve the sow, to eight, or, at most, nine; though from ten to thirteen have been brought up in perfect order, without any apparent injury to the mother. In such cases, however, she should be a strong and healthy animal, as well as supplied with an abundance of the most nutritious food. During the whole period of her nursing, the offals of the kitchen or dairy-wash, with shipstuffs, ground oats, barley, buckwheat, or corn, mixed and given lukewarm morning and evening, and in the middle of the day, boiled potatoes, beets, or carrots, with a little Indian meal, or pease and barley ground and mixed, or something equally nutritious, may be fed to her.

The young pigs, even while sucklers, should not be left wholly to the nourishment offered by the sow, but should be furnished, two or three times a day, with skim-milk, or buttermilk-whey, or pot liquor, made lukewarm, and having a little meal, shorts, and boiled roots mixed up with it; or, if this be thought too troublesome, skim-milk, with a small quantity of meal, may be left constantly for them in a part of the sty to which the sow cannot have access. In six or seven weeks they will generally weigh from thirty to thirty-five pounds, and be strong enough to wean. After weaning, they should not only be kept dry and clean, but regularly fed.

The importance of swine, to consume the refuse or coarse grain of the farm, and for the production of manure, is too well known to the farmer to require farther notice.

Pigs that come in March and are intended to be killed in December, should be well fed with the wash of the kitchen and dairy from the time of weaning, should have a run in good clover where there is plenty of water, and, as soon as pease will answer, a

small quantity of these should be added to their food daily, to be increased as they increase in size: feeding and fattening hogs exclusively on corn, at the present high prices, it is evident, would be a losing and ruinous concern. It is therefore recommended, that, as soon as the harvesting of potatoes commences, the hogs should be confined and fed with boiled or steamed potatoes, with a few pumpkins, beets, or carrots: pease also, and oats and buckwheat ground together, should be well mixed when hot, and fed lukewarm regularly three times per day. Great care should be taken not to cloy their appetites by giving them more than they will eat at each time; and, as they advance, it is recommended to feed them a little at a time several times in the day. To keep them easy and quiet, much depends on regularity; for they are much better observers of time than many are aware of.

To harden and give solidity to their flesh, about two or three weeks previous to their being killed they should be plentifully fed with corn and pure water; but it would be more economical to have the corn reduced to meal, and, if convenient, made into mush or pudding, adding a little salt by way of relish. A little fine charcoal thrown into their pens occasionally, and a small quantity of sulphur mixed with the food, will add much to their health.

It has been ascertained that one bushel of grain, ground and cooked, will go nearly as far as two in its whole state; and these remarks will apply equally well to grown hogs.

March pigs, well fattened, weighing from 200 to 250 pounds, and killed in December, will command in this market the highest price; but for consumption on the farm, an older and larger hog is recommended, say from 300 to 400 pounds.

Hogs treated as above, if of a good breed, will require from six to eight weeks to fatten them sufficiently for slaughtering.

CHAPTER IX.

SHEEP AND THEIR MANAGEMENT.

Native Sheep.—Spanish Merino.—Saxon Merino.—New Leicester or Bakewell Breed.—South Down.—The Influence or Effect of Feed on the Quantity and Quality of the Wool and Carcass.

[THE first part of this chapter consists of a report, made by Col. H. S. RANDALL, of Cortland county, to the State Agricultural Society, and presents the best history of the several breeds of sheep, and their introduction into this country, that has yet been presented to the American public. The raising of sheep and the growing of wool have become one of our greatest agricultural interests, and deserves a proportionate share of public attention. To those engaged in these pursuits, this paper will be most acceptable. The second part of this chapter is a similar report, made to the same society, on the management of sheep, by FRANCIS ROTCH, Esq., of Otsego county, the present able and respected president of the State Agricultural Society, whose experience in the management of cattle and sheep, and judgment of their respective qualities, is probably not exceeded by that of any other individual in this country. The course pointed out in the report is plain, and the advantages resulting from following it are great and certain.]

NATIVE SHEEP.

Although this name is popularly applied to the common coarse-wooled sheep of the country, which existed here previously to the importation of the improved breeds, there is, properly speaking, no race of sheep "native" to North America. Mr. Livingston, in speaking of a race as "indigenous," only quoted the language of another,* and his informant was either mistaken as to the fact, or misapprehended the term. The only animal of the genus *Ovis* originally inhabiting this country is the argali,† known to our enterprising travellers and traders who have penetrated to the Rocky Mountains, where the animal is found, as the Big Horn. Though the pelage of the argali approximates but little to the wool of the domestic sheep, they are, as is well known, considered by naturalists to have belonged originally to the same species; and the changes which have taken place in the form, covering, and habits of the latter, are attributed to their domestication, and the care and skill of man during a long succession of years.

The common sheep of the United States were of foreign, and mostly of English origin. The writer of the volume on sheep in the "Farmer's Series" [Mr. Youatt] speaks of them as, "although somewhat differing in various districts, consisting chiefly of a coarse kind of Leicester, originally of British breed."‡ Others have seen, or fancied they saw, in some of them, a strong resemblance to the South Downs. Mr. Livingston was of this number.§ But it is far more probable that they can claim a common descent from no one stock. Our ancestors emigrated from different sections of the British dominions, and some portion of them from other parts of Europe.

* Livingston's Essay on Sheep, p. 56, 60.

† Godman's American Natural History.

‡ Vol. on Sheep, p. 134.

§ Essay on Sheep, p. 53.

They brought their implements of husbandry, and their domestic animals to fertilize the wilderness. Each, it would be natural to suppose, made choice of the favourite breed of his own immediate district, to transport to the New World, and the admixture of these various races formed the mongrel family now under consideration. Amid the perils of war and the incursions of beasts of prey, they were preserved with sedulous care. As early as 1676, Mr. Edward Randolph, in a "Narrative of the Lords of the Privy Seal," speaks of New-England as "abounding with sheep."*

The common sheep yielded a wool only suited to the coarsest fabrics, averaging in the hands of good farmers from three to three and a half pounds of wool to the fleece. They were slow in arriving at maturity compared with the improved English breeds, and yielded, when fully grown, from 10 to 12 pounds of a middling quality of mutton to the quarter. They were usually long legged, light in the fore-quarter, and narrow on the breast and back, although some rare instances might be found of flocks with short legs, and some approximation to the general form of the improved breeds. The common sheep were excellent breeders, often rearing, almost entirely destitute of care, and without shelter, one hundred per cent. of lambs, and in small flocks a still larger proportion. These, too, were usually dropped in March or the earlier part of April. Restless in their disposition, their impatience of restraint almost equalled that of the untamed argali; and in many sections of our country it was common to see from 20 to 50 of them roving, with little regard to enclosures, over the possessions of their owner and his neighbours, leaving a large portion of their wool adhering to bushes and thorns, and the remainder placed nearly beyond the possi-

* Colonial Papers of Massachusetts.

bility of carding by the "*Tory bur*," so common on new lands.

The old common stock of sheep, as a distinct family, have nearly disappeared, having been universally crossed, to a greater or less extent, with the foreign breeds of later introduction. The first and second cross with the Merino resulted in a decided improvement, and produced a variety exceedingly valuable for the farmer, who rears wool only for domestic purposes. The fleeces are of uneven fineness, being hairy on the thighs, dewlap, &c.; but the general quality is much improved; the quantity is considerably augmented; the body is more compact and nearer the ground; and they have lost their unquiet and roving propensities. The cross with the Saxon, for reasons which we shall hereafter allude to, has not been generally so successful. With the Leicester and Downs, the improvement, so far as form, size, and a propensity to take on fat are concerned, is manifest.

SPANISH MERINO.

The history of this celebrated race of sheep, so far as it is known, has so often been brought before the public, that it is deemed unnecessary here to recapitulate it. The first importation of them into the United States took place in 1801. Four rams were shipped by Mr. Delessert, a banker of Paris, three of which perished on the passage.* The fourth arrived in safety at Rosendale, a farm owned by that gentleman near Kingston, in this state. In 1802, two pairs were sent from France by Mr. Livingston, the American minister, to his estate on the Hudson; and later the same year, Mr. Humphreys, our minister to Spain, on his departure from that country, shipped one hundred for the United States. But they attracted little notice until our difficulties with

* "Archives of Useful Knowledge."—Cultivator, vol. i., p. 183.
I.—P.

England led to a cessation of commercial intercourse with that power in 1808 and 1809. The attention of the country being now directed towards manufacturing and wool growing, the Merino rose into importance. So great, indeed, was the interest excited, that from a thousand to fourteen hundred dollars a head was paid for them. Other and numerous importations soon followed; and, unfortunately, some of the cargoes arrived in the worst condition, bringing with them those scourges of the ovine race, the scab and foot-rot. These evils and the increased supply soon brought them down to less than a twentieth part of their former price, so that they could be bought for \$20 a head. When, however, it was established, by actual experiment, that their wool did not deteriorate in this country, as had been feared by many, and that they became readily acclimated, they again rose into favour. But the prostration of our manufactories, which soon after ensued, rendered the Merino again comparatively of little value, and brought ruin on numbers who had purchased them at their previous high prices. The rise which has since taken place in the value of fine wool, as well as the causes which led to it, are too recent and well understood to require particular notice. With the rise of wool, the valuation of the sheep which bear it has of course kept pace.

The Merino has been variously described. This arises from the fact that it is the general appellation of a species, comprising several varieties, presenting essential points of difference in size, form, and in quality and quantity of wool. The Escorial flocks stand first in point of fineness. Attached to the convent *El Escorial*, within a short distance of the capital, and being the private property of the kings of Spain, no pains or care have been spared upon these beautiful flocks. They are of a good size and fine form, "combining excellence," as is

remarked by an intelligent writer,* “scarcely admitting of improvement.” It is supposed that most of the Escorial sheep which found their way into this country are but indifferent specimens of this celebrated variety of the Merino. Their fleeces are somewhat lighter than those of the Paulars, Negrettis, &c., and altogether they bear a close resemblance to the *genuine* Saxons, of which they are the parent stock.

According to Mr. Lasteyrie,† the Negretti “are the largest and strongest of all the Spanish travelling sheep.” The Guadaloupe “have the most perfect form, and are likewise celebrated for the quantity and quality of their wool.” The Paulars “bear much wool of a fine quality; but they have a more evident enlargement behind the ears, and a greater degree of throatiness.”

As the last named was one of the principal varieties introduced into the United States, a more particular description of it may not be unacceptable. The sheep of the Paular Convent are large, with heavy, but, compared with the Escorial or Saxons, coarse fleeces. The wool of the pure bloods contains a considerable quantity of jarr or hair, and it abounds in yolk to such a degree, that it catches and retains at its extremities much floating dust, the pollen of hay, &c. This gives it a peculiarly stiff and hard feeling externally. It however forms an excellent protection against storms and cold. The form of the Paular is generally good; but an unusually large dewlap, so plaited and doubled as to go by the popular appellation of “the ruffle,” extends from the lower jaw to the brisket, presenting a great obstacle to the shearer, and an unseemly and ungraceful appendage in the eye of the refined breeder. On the sides of the neck, and not unfrequently the

* Cultivator, vol. ii., p. 150.

† “Farmer’s Series,” vol. on Sheep, p. 156. We quote Mr. Youatt.

face, the skin also lies in loose wrinkles. The head is coarse, and, in the male, usually surmounted by large horns. The skill of the American breeder has obviated some of these defects, and there are a few (very few) flocks claiming purity of blood, which have little or no jarr, and an almost entire absence of the throatiness peculiar to this variety. Probably, however, in most of such instances, they owe it to a cross with the Saxons.

There are some other varieties of the Merino which we shall not pause to describe. Taken collectively, the Spanish rams, according to Chancellor Livingston, yield about eight and a half pounds of wool, and the ewes five, which loses half in washing; making four pounds and a quarter the average weight of fleece of the rams, and two and a half the average of the ewes.* Some varieties considerably exceed this estimate, and probably it would fall short if applied to the prime sheep of any variety. In the celebrated flock of French Merinos at Rambouillet, the average weight, exclusive of tag and belly wool, is six pounds to the fleece. It should be stated, however, that both Mr. Livingston and Mr. Humphreys assert, that the Rambouillet sheep carry more wool than any of the Spanish flocks.† Col. Humphreys, in a letter to the Agricultural Society of Massachusetts, even goes so far as to say "that the improved stock of France yield twice as much wool as those of Spain." Some carefully selected small flocks in this country, which were "salved"‡ after the preceding shearing, have averaged, including the ordinary number of rams, four and a half pounds of wool to the head. The gummy, thick wool of the Merino can be but imperfectly cleansed on the back of the animal, where it is the universal custom in the Uni-

* Essay on Sheep, p. 39.

† Livingston's Essay, p. 71, and note.

‡ Rubbed over with a salve consisting of oil, wax, &c., which adds to the weight of fleece.

ted States to wash it; and probably four pounds of *clean* wool would be as high as the maximum average in the choicest flocks. Few overgo three and a half.

The Merino, though the native of a warm climate, becomes readily inured to the greatest extremes of cold, flourishing as far north as Sweden, without degenerating in fleece or form.* It is a patient, docile animal, bearing much confinement without injury to health, and we never have been enabled to discover in it that peculiar "voraciousness of appetite" ascribed to it by English writers.† Accurately conducted experiments have shown that it consumes two pounds of hay per diem in winter; the Leicester consumes from three and a half to four; and the common woolled American sheep would not probably fall short of three. The mutton of the Merino, in spite of the prejudice which exists on the subject, is short-grained and of good flavour when killed at a proper age, and weighs from eight to ten pounds to the quarter. It is remarkable for its longevity, retaining its teeth and continuing to breed two or three years longer than the common sheep or the improved English breeds; but it should be remarked in connexion with this fact, that it is correspondingly slow in arriving at maturity. It does not attain its full growth before three years, and the ewes in the best-managed flocks are rarely permitted to breed before they reach that age. The Merino is not a good breeder, the bearing ewes giving little milk, and sometimes neglecting their lambs. Eighty per cent. would probably be as high as the average number of lambs usually reared.

We have already adverted to the cross between the Merino and the native sheep. On the introduction of the Saxon family of the Merinos, they were universally ingrafted on the parent stock, and the

* Lasteyrie.

† "Farmer's Series," Sheep, p. 149.

cross was continued until the Spanish blood was nearly bred out. When the admixture took place with pure-blooded and prime Saxons, it resulted most favourably. A variety was produced superior to the Merino in form, carrying less wool, but this more than compensated by its fineness. The excessive throatiness of the Paulars disappeared or was greatly diminished. But, unfortunately, these instances of judicious crossing were rare. Our country was flooded by eager speculators with the grade sheep and refuse Merinos of Germany. Fineness of wool during the period of this strange excitement was made the only test of excellence, no matter how scanty its quantity, no matter how diminutive or miserable the carcass. Governed by such views, the holders of most of our Merino flocks purchased these pseudo-Saxons, and the consequence was, as might have been foreseen—their flocks were ruined.

SAXON MERINO.

In the year 1765, Augustus Frederic, elector of Saxony, obtained permission from the Spanish court to import 200 Merinos, selected from the choicest flocks of Spain. They were chosen principally from the Escorial flock, and on their arrival in Saxony were placed on a private estate belonging to the elector, under the care of Spanish shepherds. So much importance was attached to the experiment, as it was then considered, that a commission was appointed to superintend the affairs of the establishment; and it was made its duty to diffuse information in relation to the management of the new breed; to dispose of the surplus rams at prices which would place them within the reach of all holders of sheep; and, finally, by explaining the superior value of the Merinos, to induce the Saxon farmers to cross them with their native breeds. Popular prejudice, however, was strong against them, and this was height-

ened by the ravages of the scab, which had been introduced with them from Spain, and which proved very destructive before it was finally eradicated. But when it became apparent that the Merino, so far from degenerating, had improved in Saxony, and that the Saxon wool exceeded the Spanish in fineness and value, the wise and patriotic efforts of the elector began to reap their merited success, and a revolution took place in popular sentiment. The call for rams became so great, that the government resolved on a new importation, to enable them more effectually to meet it, and to improve still farther the stock already obtained. For this purpose an individual, considered one of the best judges of sheep in Saxony, was despatched to Spain in 1777, with orders to select 300. For some reason, probably because he experienced difficulty in obtaining a greater number presenting all the qualifications he sought, he returned with but 110. They were from nearly all the different flocks of Spain, but principally the Escorial, and were considered decidedly superior to the first importation. In addition to the establishment at Stolpen already founded, others were now commenced at Rennersdorf, Lohmen, &c.; schools were established for the education of shepherds; publications were distributed by the commissioners to throw information on the subject before the people; and the crown tenants, it is said, were each required to purchase a certain number of the sheep. When we take into consideration the unwearied pains bestowed on this favourite object by the Saxon government; the fact that the Saxon variety are descended only from the choicest sheep of Spain, and that a degree of care and attention are bestowed on their breeding in the former country entirely unknown in the latter, it is not a subject of surprise that the emigrant Merino in Saxony excels the parent stock in the quality of his fleece and that roundness of form and fineness of bone which

indicate better feeding properties. The Spanish shepherd is little changed from what he was in the days of Cardinal Ximenes or Pedro IV. : with much practical knowledge of his business, but never dreaming of improvement ; and his knowledge strangely blended with prejudices as ancient as the pedigrees of his sheep, running back to a period when Spain was a Roman province. He is *not the owner of the sheep under his care*, but the ill-paid servant of a titled family or a religious order, who, in nine cases out of ten, are no more disposed or more competent to carry out a system for the improvement of their flocks than himself. And, finally, the Spanish custom of pasturing their sheep during the entire season in large flocks, without enclosures,* to render the necessary divisions practicable, entirely prevents that nice adaptation to each other of the male and female selected for breeding ; that counterbalancing of the defects of one parent by the marked excellence of the other in the same points, which exhibits the skill of the modern breeder. In Saxony, and the other states of Germany, the case is far otherwise. The electoral flocks, the parent stem, are under the direction of commissioners appointed for their intelligence and their knowledge of the subject ; and the noted private flocks employ the first agricultural skill of the Saxon landholders. The low price of labour, too, admits of a degree of attention and constant care over their flocks unknown in other countries. The attention bestowed upon breeding may be inferred from the fact, that in many of the largest flocks, every individual sheep is numbered and registered, its pedigree known, and its offspring recorded. The number and age of the sheep

* Neither are there enclosures in Saxony ; but the division is effected by the bucks being placed in pens, and the ewes classified and marked. The ewes are from time to time driven in the yard around the pens, and when the teaser has selected one, it is placed in the pen of the buck for which it is marked.

is expressed by an ingenious method of marking on the ear, invented by Mr. Thaer, which causes little mutilation, and effectually distinguishes any number of sheep. "When lambs are weaned," says Mr. Charles Howard, in a letter to the author of the volume on sheep in the "Farmer's Series," "each is placed upon a table, that his wool and form may be minutely observed. The finest are selected for breeding, and receive a *first* mark. When they are one year old, and prior to shearing them, another close examination of those previously marked takes place: those in which no defect can be found receive a *second* mark, and the rest are condemned. A few months afterward, a third and last scrutiny is made; the prime rams and ewes receive a *third* and final mark; but the slightest blemish is sufficient to cause the rejection of the animal."

Considerable attention has also been bestowed in Germany on the breeding of grade sheep—a cross between the Merino and the native sheep of the country. These native sheep were of two varieties, and they bore a strong resemblance to the old common stock of the United States; those which were fed on the uplands being smaller and of finer fleece, and the lowland sheep carrying more flesh and coarser wool. The sheepholders who were unable to purchase pure bloods resorted to this cross. The wool of some of these flocks, after a few generations, has rivalled even the electoral in fineness; but it loses in quantity, as the native German carried much lighter fleeces than the Spanish sheep. The sheep themselves are also much less perfect in form, the means of the common breeder not permitting him (and, indeed, there being no prospect for an adequate return) to bestow the same labour that the breeder of pure bloods does, to sacrifice for the least defect, and, in short, incur the same expenses, when, at best, his sheep will not sell for more than one eighth or one tenth of the price of pure bloods.

In 1834, the best Spanish wool sold in the English markets at from 2*s.* 6*d.* (60 cts.) to 4*s.* (96 cts.); the Saxon at the same time commanded from 4*s.* 6*d.* (\$1 08) to 5*s.* 3*d.* (\$1 26) per pound.* In the United States, where less difference, and very unjustly, is usually made, the full-blooded Saxon sells for about one third more per pound than the Merino. The fleece in good flocks averages about two and a half pounds, and often, if only grown sheep were included, would rise as high as three. But this is far from the standard of many flocks in the United States, called, and doubtless believed by their owners to be, genuine Saxons. This brings us to a most painful part of our subject, and one which we would willingly pass over in silence, were not our obligations to the public paramount to any considerations for the feelings of individuals. In disclosing the frauds practised on the American public, we are compelled, for the purpose of doing justice to the innocent and the guilty, and also for the information of those who have been the purchasers of the imported sheep, to go into a minuteness of detail which would be otherwise uninteresting, and perhaps be deemed censurable.

The following statement was submitted to the committee by Mr. Grove :

“The first importation of Saxony sheep into the United States was made by a merchant of Boston, at the instance of Col. James Shepherd, of Northampton. They were but six or seven in number. In 1824, Messrs. G. & T. Searle, of Boston, imported 77 Saxon sheep. They were selected and purchased by a Mr. Kretchman, a correspondent of the above firm residing in Leipzig, and shipped at Bremen on board the American schooner *Velocity*. I was engaged to take charge of the sheep on the passage, and I also shipped six on my own account. I

am sorry to say, that as many as one third of the sheep purchased by Kretchman (who shared profit and loss in the undertaking) were not pure-blooded sheep. The cargo were sold at auction at Brooklyn as 'pure-blooded electoral Saxons,' and thus, unfortunately, in the very outset, the pure and impure became irrevocably mixed. But I feel the greatest certainty that the Messrs. Searle intended to import none but the pure stock; the fault lay with Kretchman. In the fall of 1824, I entered into an arrangement with the Messrs. Searle to return to Saxony, and purchase, in connexion with Kretchman, from 160 to 200 electoral sheep. I was detained at sea seven weeks, which gave rise to the belief that I was shipwrecked and lost. When I finally arrived, the sheep had been already bought by Kretchman. On being informed of what the purchase consisted, I protested against taking them to America, and insisted on a better selection, but to no purpose. A quarrel ensued between us, and Kretchman even went so far as to engage another to take charge of the sheep on their passage. My friends interposing, I was finally induced to take charge of them. The number shipped was 167, 15 of which perished on the passage. They were sold at Brighton, some of them going as high as from \$400 to \$450. A portion of this importation consisted of grade sheep, which sold as high as the pure bloods, for the American purchaser could not know the difference. It may be readily imagined what an inducement the Brighton sale held out to speculation, both in this country and Saxony. The German newspapers teemed with advertisements of sheep for sale, headed 'Good for the American market;' and these sheep, in many instances, were actually bought up for the American market at five, eight, or ten dollars a head, when the pure bloods could not be purchased at from less than \$30 to \$40. In 1836, Messrs. Searle imported three cargoes, amounting in the aggregate to 513 sheep.

They were of about the same character with their prior importations, in the main good, but mixed with some grade sheep. In the same year a cargo of 221 arrived, on German account, Emil Bach, of Leipzig, supercargo. A few were good sheep and of pure blood; but, taken as a lot, they were miserable. The owners sunk about \$3000. Next came a cargo of 210 on German account, Wassmus and Multer owners. The whole cost of these was about \$1125, in Germany. With the exception of a small number, procured to make a flourish in their advertisements of sale, they were sheep having no pretensions to purity of blood. In 1827, the same individuals brought out another cargo. These were selected exclusively from grade flocks of low character. In the same year, the Messrs. Searle made their last importation, consisting of 182 sheep. Of these I know little. My friends in Germany wrote me that they were like their other importations, a mixture of pure and impure blooded sheep. It is due, however, to the Messrs. Searle to say, that, as a whole, their importations were much better than any other made into Boston.

“I will now turn your attention to the importations made into other ports. In 1825, 13 Saxons arrived at Portsmouth. They were miserable creatures. In 1826, 191 sheep arrived at New-York, per brig William, on German account. A portion of these were well-descended and valuable animals, the rest were grade sheep. In June, the same year, the brig Louisa brought out 173 on German account. Not more than one third of them had the least pretensions to purity of blood. Next we find 158 shipped at Bremen on German account. Some were diseased before they left Bremen, and I am happy to state that twenty-two died before their arrival in New-York. All I intend to say of them is, that they were a most curious and motley mess of wretched animals. The next cargo imported arrived in the

brig Maria Elizabeth, under my own care. They were 165 in number, belonging to myself and F. Gebhard, of New-York. These sheep cost me \$65 a head when landed in New-York. They sold at an average of \$50 a head, thus sinking about \$2400! I need not say that they were exclusively of pure blood. A cargo of 81 arrived soon after, but I know nothing of their quality. The next importation consisted of 184, on German account, per brig Warren. With a few exceptions, they were pure-blooded and good sheep. We next have an importation of 200 by the Bremen ship Louisa. They were commonly called the "stop-sale sheep." They were of the most miserable character, some of them being hardly half-grade sheep. The ship Phœbe Ann brought 120 sheep, of which I know little, and 60 were landed at Philadelphia, with the character of which I am unacquainted. Having determined to settle in America, I returned to Saxony, and spent the winter of 1826-7 in visiting and examining many flocks. I selected 115 from the celebrated flock of Machern, embarked on board the ship Albion, and landed in New-York June 27, 1827. In 1828 I received 80 more from the same flock, selected by a friend of mine, an excellent judge of sheep. I first drove them to Shaftesbury, adjoining the town of Hoosic, where I now reside. On their arrival they stood me in \$70 a head, and the lambs half that sum."

It should be remarked, that the above statements were made by Mr. Grove with the greatest reluctance, and only at the earnest solicitation, or, rather, requisition of the committee, who conceived it their duty to place the whole circumstances before the public.

It will be inferred, from the facts above stated, that there are few Saxon flocks in the United States that have not been reduced to the quality of grade sheep by the promiscuous admixture of the pure and the impure which were imported together, and *all* sold

to our breeders as pure stock. This accounts in a satisfactory manner for the different estimation in which this breed of sheep are held in Germany and in this country, and for the degeneracy of the pseudo-Saxon of the United States.

In its general habits and characteristics—its docility and patience under confinement, as well as its deficiency as a breeder and its slowness in arriving at maturity—the Saxon bears a close resemblance to the Merino. It consumes about the same amount of food, and is equally remarkable for its longevity. Its mutton, however, is considered of better quality, and rather superior in quality.

THE NEW LEICESTER OR BAKEWELL SHEEP.

The unimproved Leicester was a “large, heavy, coarse-wooled breed” of sheep, inhabiting the midland counties of England. It is described also as having been “a slow feeder, and its flesh coarse-grained and with little flavour.” The breeders of that period regarded only size and weight of fleece. The celebrated Mr. Bakewell, of Dishley, was the first who adopted a system more in accordance with the true principles of breeding. He selected from the flocks about him those sheep “whose shape possessed the peculiarities which he considered would produce the largest proportion of valuable meat and offal;” and having observed that animals of medium size possess a greater aptitude to take on flesh and consume less food than those which are larger, and that prime fattening qualities are rarely found in sheep carrying a great weight of wool, he gave the preference to those of smaller size, and was satisfied with lighter fleeces. To reach the wonderful results obtained by Mr. Bakewell, it was supposed that he resorted to a cross with some other varieties; but it seems now to be well established that he owed his success only to a judicious principle of selection, and a steady adherence to certain principles of breeding.

The improved Leicester is of large size, but somewhat smaller than the original stock, and in this respect falls considerably below the coarser varieties of Cotswold, Lincoln, &c. Where there is a sufficiency of feed, the New Leicester is unrivalled for its fattening properties, but it will not bear hard stocking, nor must it be compelled to travel far in search of its food. It is, in fact, properly and exclusively a lowland sheep. In its appropriate situation on the luxuriant herbage of our highly-cultivated lands, it possesses unrivalled earliness of maturity; and its mutton, when not too fat, is of a good quality, though usually coarse, and comparatively deficient in flavour, owing to that unnatural state of fatness which it so readily assumes, and which the breeder, to gain weight, so generally feeds for. The wethers, having reached their second year, are turned off in the succeeding February or March, and weigh at that age from thirty to thirty-five pounds to the quarter. The wool of the New Leicester is long, averaging, after the first shearing, about six inches, and the fleece weighs six pounds. It is of coarse quality, and little used in the manufacture of cloths on account of its length, and that deficiency of felting properties common, in a greater or less extent, to all the English breeds. As a combing wool, however, it stands first, and is used in the manufacture of the finest bombasins, &c.

The high-bred Leicesters of Mr. Bakewell's stock became shy breeders and poor nurses; but crosses subsequently adopted have obviated these defects. In England, where mutton is generally eaten by the labouring classes, the meat of this variety is in very great demand, and the consequent return which a sheep possessing such fine feeding qualities is enabled to make, renders it a general favourite with the breeder. Instances are recorded of the most extraordinary prices having been paid for these animals; and Mr. Bakewell's celebrated buck "Two

Pounder" was let for the enormous price of four hundred guineas (\$2000) for a single season! The New Leicester has spread into all parts of the British dominions, and been imported into the other countries of Europe and the United States. They were first introduced into our own country by the late Christopher Dunn, Esq., of Albany, about twenty-five years since. Subsequent importations have been made by Mr. Powel, of Philadelphia, and various other gentlemen.

We conclude this notice of the Leicester with the following description of what should constitute a perfect animal of this breed, from the "Farmers' Series:"

"The head should be hornless, long, small, tapering towards the muzzle, and projecting horizontally forward. The eyes prominent, but with a quiet expression. The ears thin, rather long, and directed backward. The neck full and broad at its base, where it proceeds from the chest, so that there is, with the slightest possible deviation, one continued horizontal line from the rump to the poll. The breast broad and full; the shoulders also broad and round, and no uneven or angular formation where the shoulders join either the neck or the back, particularly no rising of the withers, or hollow behind the situation of these bones. The arm fleshy through its whole extent, and even down to the knee. The bones of the leg small, standing wide apart; no looseness of skin about them, and comparatively bare of wool. The chest and barrel at once deep and round; the ribs forming a considerable arch from the spine, so as in some cases, and especially when the animal is in good condition, to make the apparent width of the chest even greater than the depth. The barrel ribbed well home; no irregularity of line on the back or belly; but, on the sides, the carcass very gradually diminishing in width towards the rump. The quarters long and

full, and, as with the fore legs, the muscles extending down to the hock; the thighs also wide and full. The legs of a moderate length; the pelt also moderately thin, but soft and elastic, and covered with a good quantity of white wool, not so long as in some breeds, but considerably finer.”*

THE SOUTH DOWN.

This breed of sheep has existed for several centuries in England, on a range of chalky hills called the South Downs. They were, as recently as 1776, small in size, and of a form not superior to the common woolled sheep of the United States. Since that period, a course of judicious breeding, pursued by one man (Mr. Ellman, of Glynde), has mainly contributed to raise this variety to its present high degree of perfection, and that, too, without the admixture of the slightest degree of foreign blood. In our remarks on this breed of sheep, it will be understood that we speak of the pure, improved family as the original stock, presenting, with trifling modifications, the same characteristics which they exhibited sixty years since, are yet to be found in England, and, as the middle space is occupied by a variety of grades, rising or falling in value as they approximate to or recede from the improved blood.

The South Down is an upland sheep of medium size, and its wool, which, in point of length, belongs to the middle class, is estimated to rank with half-grade Merino. The average weight of fleece in the hill-fed sheep is three pounds, and in the lowland four pounds. But the Down is raised more particularly for its mutton, which for quality takes precedence of all other in the English markets. Its early maturity, and extreme aptitude to lay on flesh, render it peculiarly valuable for this purpose. The Down

* Sheep Husbandry, p. 110.

is turned off at two* years old, and its weight at that age is from 80 to 100 lbs. High-fed wethers in England have reached from 32 to even 40 lbs. a quarter! Notwithstanding its great weight, the Down has, in the language of Mr. Youatt, a patience of occasional short keeping and an endurance of hard stocking equal to any other sheep. This gives it a decided advantage over the bulkier Leicester, Lincolns, &c., as a mutton sheep in hilly districts, and those producing short and scanty herbage. It is hardy and healthy, though, in common with the other English varieties, much subject to the catarrh or "snuffles," and no sheep better withstands our American winters. The ewes are prolific breeders and good nurses. The Down is quiet and docile in its habits, and, though an industrious feeder, exhibiting little disposition to rove

A sheep possessing such qualities must, of course, be exceedingly valuable in upland districts in the vicinity of markets. Accordingly, they have been introduced into every part of the British dominions, and imported into various other countries. The Emperor of Russia paid Mr. Ellman three hundred guineas for two rams; and in 1800, "a ram belonging to the Duke of Bedford was let for one season at eighty guineas, two others at forty guineas each, and four more at twenty-eight guineas each."† These valuable sheep were introduced into the United States a few years since by Col. J. H. Powell, of Philadelphia, and a small number was imported by one of the members of this committee in 1834. The last were from the flock of Mr. Ellman, at a cost of \$60 a head. Several other importations have since taken place.

The following is the description of the perfect

* Among breeders, the sheep is termed a two-year old, or a two-shear sheep, until three years old. In this case the sheep is between two and a half and three years old.

† "Farmers' Series."

South Down by Mr. Ellman, the founder of the improved breed :

“The head small and hornless ; the face speckled or gray, and neither too long or too short. The lips thin, and the space between the nose and the eyes narrow. The under jaw or chap fine and thin ; the ears tolerably wide, and well covered with wool, and the forehead also, and the whole space between the ears well protected by it, as a defence against the fly.

“The eye full and bright, but not prominent. The orbits of the eye, the eye-cap or bone, not too projecting, that it may not form a fatal obstacle in lambing.

“The neck of a medium length, thin towards the head, but enlarging towards the shoulders, where it should be broad and high, and straight in its whole course above and below. The breast should be wide, deep, and projecting forward between the fore legs, indicating a good constitution and a disposition to thrive. Corresponding with this, the shoulders should be on a level with the back, and not too wide above ; they should bow outward from the top to the breast, indicating a springing rib beneath, and leaving room for it.

“The ribs coming out horizontally from the spine, and extending far backward, and the last rib projecting more than others ; the back flat from the shoulders to the setting on of the tail ; the loin broad and flat ; the rump broad, and the tail set on high, and nearly on a level with the spine. The hips wide, the space between them and the last rib on either side as narrow as possible, and the ribs generally presenting a circular form like a barrel.

“The belly as straight as the back.

“The legs neither too long nor too short. The fore legs straight from the breast to the foot ; not bending inward at the knee, and standing far apart both before and behind ; the hock having a direction

rather outward, and the twist, or the meeting of the thighs behind, being particularly full, the bones fine, yet having no appearance of weakness, and of a speckled or dark colour.

"The belly well defended with wool, and the wool coming down before and behind to the knee and to the hock; the wool short, close, curled, and fine, and free from spiry projecting fibres."

ON THE MANAGEMENT OF SHEEP.

The committee on "the feeding and management of sheep in winter," while they are fully aware of the importance of the subject thus brought under their notice, feel that they can suggest but little that is new and instructive to the intelligent farmer or flock-master in the home management of sheep as now practised; yet they are inclined to believe that there is much, both highly interesting and useful, to be gathered from a knowledge of sheep husbandry in other countries, where its vast importance (forming, as it does in some cases, the chief wealth of the nation) has called to its aid all that education, science, and close observation could suggest for its improvement: nor are instances wanting where this valuable knowledge has been practically applied in this state, with a success that warrants the committee in offering some suggestions from the German practice that may materially improve the winter management of sheep with us.

Most of the sheep in the Northern and Middle States produce wool of an improved quality, being more or less mixed with the Merino, or the improved Merino of the Saxony family, and are principally kept for their fleece, the carcass being a secondary consideration: within a few years, however, this latter has become more valuable, from causes which it is not necessary to examine, as they are evident to every observing mind. The committee would therefore have it understood, that their attention has

been almost exclusively directed to the management of the Spanish sheep, in all their various grades, as found in this country

Many plans have been recommended, rules have been prescribed, maxims laid down, and the requisite quantities of food stated, for maintaining sheep in a thriving and good condition. But all these can only be understood relatively, for we must take the size of the animal into consideration; and it should be borne in mind, that a large sheep requires more food than a small one, and that a sheep which gives five or six pounds of wool must consume more than one which gives but three pounds.

These facts lead to a consideration which has received little or no attention from the great mass of our farmers who keep sheep, namely :

The influence or effect of feed on the quantity and quality of the wool and carcass :

It may be laid down as a rule, that two pounds of good hay, or its equivalent in grain, roots, and straw per day, fed regularly at three different times, are sufficient for a grown sheep of the Merino family, producing three pounds of fine wool, provided it enters upon its winter keep healthy and in *good condition*. For breeding ewes, or a larger race of sheep, this quantity would not be sufficient; while for a race by nature small and weak, it would be more than they require, and, if fed to them, would greatly diminish the quality of the wool, though it should increase its quantity.

Farmers in Germany generally allow their sheep an average of from one and three fourths to two pounds of hay daily (including the whole flock), and their sheep are vigorous, healthy, and in good condition, with the best of wool. Others allow them one and a half pounds daily, and they do not suffer with this quantity, but are healthy and rather thriving; still they do not yield so much wool, nor is the carcass so heavy; while others again, through ill-ad-

vised economy, have limited their sheep to one and a quarter pounds of hay per day ; but it was found that they sheared from ten to sixteen ounces less wool per head ; that the constitution of the animal could not be matured, and that he ultimately became a diminutive and feeble animal. The wool from such sheep is termed "*hunger-fine*," appearing to possess a high degree of fineness upon the sheep's back, and being extremely soft to the touch. "But," says Mr. Elsner, a writer on sheep husbandry, "this kind of softness is as exceptionable as its fineness, both arising from the poverty of the animal ; for, after shearing and washing, it lessens to an unusual degree in volume." It is deficient in strength, elasticity, and the felting properties, and it does not make as perfect and durable a fabric as it would had the sheep been kept in a thriving condition. Its intrinsic value, therefore, to the manufacturer is not so great as its apparent fineness would indicate ; and the grower, who anticipated a "good clip" of wool from his flock, is very unpleasantly awakened from his dream when he finds that they shear much less than he expected ; and this, we fear, is too often the case with many of our *economists* who undertake to keep flocks of fine-wooled sheep.

It is, however, certainly a most erroneous conclusion, that sheep produce an increased or extra quantity of wool in proportion to their increased or extra quantity of food. "Farmers who were deceived by this theory," says Mr. Elsner, the author above quoted, "have been disappointed ; for the increased quantity of wool was scarcely half in proportion to the extra quantity of feed, and the quality was considerably deteriorated." Such is the opinion of one of the most intelligent breeders and close observers of the economy of sheep in Germany. The experience of one of the members of this committee fully goes to confirm the above position ; and his experiments, made with great attention and exactness for

a series of years, both here and in Germany, enable him confidently to offer the following results: that sheep of good size, superior fineness, and thick fleece, when rightly fed and managed, produce, on an average, two and three fourths to three pounds of clean wool, washed on the sheep's back. But a flock is only rightly fed and managed when they are not allowed quite as much as they would eat, thus ensuring thriftiness and bodily health. To effect this desirable object, as has been already stated, two pounds of good hay, or its equivalent in grain, roots, and straw per day, are required; whereas the same sheep, were they allowed as much hay as they could eat, would consume over three pounds, or its equivalent in grain, roots, and straw. Now, in order that the increased or extra quantity of wool be equal to the increased or extra quantity of hay or other fodder, they ought to shear from four and an eighth to four and a half pounds of wool per head. But this is not the case; the increase seldom amounting to more than 25, instead of 50 per cent. In other words, six pounds of hay, fed to three sheep, produced from eight and a quarter to nine pounds of wool; while the same quantity, and of the same quality, fed to two sheep daily, produced from six and seven eighths to seven and a half pounds only, leaving a balance in favour of the former of from one and three eighths to one and a half pounds: an item in the profits of a sheep establishment of some importance, especially where large flocks are kept. But this is not the only disadvantage of high feeding; for, while it ruins the constitution of the animal, it injures the quality of the wool.

Some German writers on sheep-husbandry estimate this reduction in quality at ten per cent., and maintain that the greater waste in cleansing it increases the loss to twenty per cent.; such wool containing a larger quantity of oily or greasy substances, which go far to make up the increased

weight of the fleece. Assuming this to be a correct estimate (and it is believed to be so), it will be found that, for an outlay of 50 per cent. in extra feed, only five, or, at the most, ten per cent. of wool is obtained in return. It would, however, doubtless increase the carcass and the quantity of manure; but this would be done at too great a price; though, if the sheep were intended for the shambles, it would alter the case.

Having considered the influence or effect of feed upon the quality and quantity of the wool, and shown that either extreme, *too little* or *too much*, is unprofitable to the wool-grower, the committee will, in the next place, proceed to that part of their subject relating to the care and management of sheep during winter.

It may be classed under three heads: *Feeding*, *Watering*, and *Shelter*.

Food.—This should be such as to agree with the habits and economy of the sheep, and should contain nourishment and bulk equivalent to two pounds of hay.

The varieties of winter provender to be considered are hay of all the cultivated grasses, such as clover, lucerne, &c., &c., and hay from natural but dry meadows; sound oat, barley, rye, and wheat straw, and well-cured vetches and pea-vines; all kinds of grain (with the exception of the less healthy rye), roots, such as potatoes, carrots, ruta-baga, mangold-wurzel, turnips, and the different kinds of beets; all of which are suited to the health, thrift, and the internal economy of sheep.

Of the different kinds of hay, white and red clover, sainfoin and timothy, stand first, and seem to be best adapted to the nature of sheep; they eat it with great avidity, and with but little abatement in appetite, through the whole of a long winter. Of red clover there are two kinds, the Northern and the Southern; the latter of which makes much the best

hay. Sheep should be made to eat up their hay clean when it is cut at the right time and well cured, and that time is when clover, lucerne, and sainfoin are in full bloom, and when timothy has about one quarter to one half of the blossom off. But when the growth is large and the hay decayed at the bottom, then they should not be forced to eat it clean; but an allowance must be made, as the decayed parts, were they compelled to eat them, would prove hurtful. Also, where hay has been somewhat injured by rains during the process of curing, allowance should be made. Mow-burned or mouldy hay should never be used in the sheep-cot, for it causes a general debility of the system, and, if continued, will ultimately produce the *rot*.

Hay from lowland meadows is not as good as that from the uplands; though, if the former be renovated by occasional ploughing and reseeded, it improves the quality: but, in portioning out the quantity of hay to sheep, a suitable allowance should be made; and the more of the wild and sour grasses that are mixed with it, the greater should the allowance be.

Hay from wet meadows is not wholesome for sheep, and should never be given them unless from necessity; then double the usual quantity must be allowed. Were they confined to such hay, and compelled to eat it nearly or quite clean, it would prove ruinous to the flock.

Hay from meadows that have been very highly enriched by top-dressings, afford a luxuriance and rankness of growth possessing a laxative property, and should be dealt out to sheep very cautiously, especially to lambs; and if it is pretty freely salted with a view of preserving it, still greater caution is necessary. Sheep will then eat it greedily, especially if salt has been withheld from them for some length of time; but it is then the more dangerous, as foddering from it a few days in succession, or

even a few times, creates excessive thirst. Sheep drink an unusual quantity of water, and scouring is thus produced, which often proves very fatal.

But, before entering upon any course of feeding, it is advisable to divide your sheep into different flocks. The breeding ewes into one, the wethers into another, and the lambs into a third. From these main divisions, subdivisions may be made as circumstances require, taking care that the individuals composing the different flocks are as nearly as possible of equal size and strength; if not, the weaker portion are not apt to get a due share of fodder. And if there be any individuals that are old, feeble, &c., an invalid department should be added, and extra care and attention bestowed upon it.

Having all these arrangements completed, a careful supervision must be extended over the whole, and the course of treatment regulated by circumstances.

Supposing the breeding ewes to be in good condition, they should receive one and a half pounds of hay, and one and a quarter pounds of grain per day, until the rutting season is over: the grain must be then withheld, and the flock go through the winter on hay, increasing it to two and a quarter pounds, and giving an occasional foddering of straw, until within five or six weeks of lambing, when this allowance should be decreased a little and roots substituted, commencing by degrees with one bushel of potatoes, or one bushel and five eighths of ruta-baga to one hundred ewes, and increasing the quantity gradually, of potatoes to three bushels, and of ruta-baga to four and three quarter bushels per day. With this kind of treatment there will be very little difficulty in raising lambs.

But when a flock of ewes are not in such condition, and require, therefore, more feed and better treatment, two pounds of hay and one quarter of a pound of grain ought to be fed daily until the rutting season is over, when the grain should be withdrawn

and roots immediately given, of potatoes two, or ruta-baga three bushels to a hundred per day, until about lambing-time, when that quantity is to be increased to three bushels of the former and four and three quarter bushels of the latter. Both flocks should receive a foddering of straw or good corn-fodder three times a week, generally at night, of which they will eat a considerable portion, while the orts serve for litter.

The three-year old wethers will go through the winter on hay, with an occasional foddering of straw, the orts of which serve them for litter. But the younger wethers require better feed, and, being hard to winter, the best hay should be given them, with some small additions of grain or roots, say one fifth of a pound of grain, or three quarters of a pound of potatoes, or one and a quarter pounds of ruta-baga.

It being very desirable that the lambs should go through the winter in the best possible condition, much care is required; and having given them a few sheaves of oats every evening before they were taken out of the pasture, it remains now to be determined as to the kind and quantity of feed they are to receive. This ought to be the best hay, and as much of it as they will eat without cloying. If it is well mixed with white and red clover, and has been cut in good season and well cured, it should be eaten up clean. In addition to this, from a quarter to half a bushel of oats per hundred head may be their daily allowance, as circumstances require.

The flock of invalids, having been placed in the warmest situation, claim every care and attention; and no pains or trouble must be spared to carry them through the winter, so that the old ewes shall be enabled to raise a lamb each, which will pay for all the extra expense and trouble the whole have cost.

In connexion with the foregoing remarks, it becomes necessary to ascertain the feeding properties of grain, roots, and straw, as compared with hay, to

enable the farmer to make his estimate of the quantity he will require, and to calculate the probable profit or loss of raising certain crops, and feeding them to sheep.

The experiments of Mr. De Raumer, of Kaltwasser, in Silesia, go far to establish certain facts on this subject. They are interesting to the inquiring mind, and may be considered as settled. Mr. De Raumer is a thorough, practical, and scientific farmer, and is considered high authority on agricultural subjects: his farm-establishment is very extensive, and his experiments may be relied upon.

"REMARKS.

"*Potatoes*, raw and cut into slices, sheep eat greedily, and with continued good appetite; they ate seven pounds per head daily, with an allowance of straw. The animals remained healthy and lively, and drank three pints of water per head daily.

"*Mangold-wurzel*, sheep eat with less greediness: they consumed regularly eight pounds per head daily, with straw as with the potatoes, and drank scarcely one quart of water. The animals remained likewise healthy.

KINDS OF FEED.	Increase of weight in the live animal.	Produced	
		wool.	tallow.
		lbs. oz.	lbs. oz.
1000 pounds raw potatoes, with salt .	40½	6 8½	12 5½
1000 do. do. without salt	44	6 8	10 14½
1000 do. raw mangold-wurzel .	38	5 3½	6 5½
1000 do. pease	134	14 11	41 6
1000 do. wheat	155	13 13½	59 9
1000 do. rye, with salt	90	13 14½	35 11½
1000 do. do. without salt . .	83	12 10½	33 8½
1000 do. oats	146	9 12	40 8
1000 do. barley	136	11 6½	60 1
1000 do. buckwheat	120	10 4½	33 8
1000 do. good hay	58	7 10½	12 14
1000 do. hay, with straw, without other fodder	31	15 8	6 11
1000 lbs. whiskey still-grains or wash .	35	6 1	4 0

"*Pease*, sheep eat very eagerly; they consumed two pounds per head per day, drank two to three quarts of water in twenty-four hours, and the animals remained perfectly healthy. In an unsoaked condition, they are hard for sheep to eat, and affect their teeth.

"*Wheat*, sheep eat greedily, and it disposes them to be very lively; they consumed two pounds per head daily, drank from two to three quarts of water, and remained perfectly healthy.

"*Rye*, sheep do not eat readily, and it does not suit them well, as the above results in the increase of weight show: they drank from two to three quarts of water daily.

"*Barley*: of this the sheep ate two and a half pounds per head daily, and thrived upon it, drinking three quarts of water in twenty-four hours.

"*Oats* the same as barley.

"*Buckwheat* the sheep ate with great avidity, and with the best results as to health and liveliness. A sheep can eat from three to four pounds, and will drink from two and a half to three quarts of water in twenty-four hours.

"*Of good hay* a sheep can consume four and a half pounds, and will drink from two and a half to three quarts of water in twenty-four hours."

Mr. W. A. Kreisig, a celebrated farmer in East Prussia, considers that one pound of oil-cake meal is as nutritious as two pounds of good hay.

80 lbs. of clover hay* are equal to 100 lbs. meadow hay.

80 lbs. lucerne and sainfoin, to 100 lbs. do.

200 lbs. sound and well-cured vetches and peavines, to 100 lbs. do.

300 lbs. sound barley and oat straw, to 100 lbs. do.

* *Note by the Translator.*—The clover in Germany grows finer than the clover in this section of country: it resembles more the Pennsylvania clover, and yields two crops a season. It is cut when in full blow, and well cured in cocks.

400 lbs. sound wheat and rye straw, to 100 lbs. do.
 100 lbs. water-turnips, equal to 40 lbs. of potatoes,
 or 50 lbs. of mangold-wurzel.

Mr. John Philip Wagner says, in his work entitled "Contributions to the Science and Treatment of Wool and Sheep," that "200 pounds of potatoes, 266 pounds of carrots, 350 pounds of ruta-baga, and 90 pounds of clover-hay, lucerne, and sainfoin, are each of them equal to 100 pounds of good hay."

Your committee beg leave farther to cite the practice of a few of the most celebrated breeders of sheep in Germany; and, first, that of Mr. Albricht Thaer, of Moeglin, in Prussia. Potatoes and straw constitute the main feed for his large flock of 1500 during winter. He cuts the potatoes into small slices, feeding them alternately with straw. When his pastures, in the fall of the year, begin to fail, he commences feeding potatoes, by scattering them in the field in such quantities as he deems sufficient, with the best effect upon the health and condition of the animals; his flock fully attesting that sheep may be kept principally on roots and straw. One of the committee, who has been familiar with sheep-husbandry both in this country and in Germany, confidently believes, from his knowledge on the subject, that the same practice can be profitably applied in our sheep-husbandry.

Mr. Bloeck, of Schieraw, in Silesia, one of the most intelligent and experienced breeders of sheep, keeps a flock of 500 in the following manner. He fodders six times a day.

1st fodder—	208 lbs. rye straw, of which they eat .	52 lbs.
2d fodder—	130 lbs. oat do. do. do. .	97 lbs.
3d fodder—the dry sheep receive	160 lbs. of pea-	
	vines, of which they eat . . .	120 lbs.
	the ewes receive hay . . .	120 lbs.
4th fodder—	potatoes mixed with cut straw	750 lbs.
	rye bran	31 lbs.
	oil-cake meal, . . .	8 lbs.
	barley meal, . . .	33 lbs.
	—————	822 lbs.

5th fodder—the ewes receive hay	. . .	120 lbs.
the wethers 160 lbs. pea-vines, of which they eat	. . .	120 lbs.
6th and last fodder—208 lbs. of rye and wheat straw, of which they eat	. . .	52 lbs.
Total amount consumed per day		1503 lbs.

The flock was of superior quality, the animals large, and always in excellent condition.

Count Magnis, of Eckhardsdorf, gave to 100 breeding ewes the following per day :

1st fodder—straw and clover hacker	. . .	69 lbs.
2d fodder—the same	. . .	69 lbs.
3d fodder—clover hay	. . .	100 lbs.
4th fodder—potatoes and straw hacker	. . .	72 lbs.
5th fodder—straw	. . .	75 lbs.
Total		395 lbs.

The daily portion of the electoral flock of Rennsdorf, the private property of the King of Saxony, consisting of 400 breeding ewes and rams, was 1000 pounds of hay in two meals, and at night a foddering of straw.

Many other valuable practices of the German shepherds might be cited ; but your committee, fearing that they have already exhausted your patience, forbear to enlarge upon them ; they therefore proceed to the consideration of the second proposition, namely, water.

All domestic animals require water in proportion to the quantity of dry provender they consume ; and sheep demand particular attention in this respect, as well as some care in regulating the quantity, according to circumstances. Warm springs are always to be preferred ; though sheep are frequently to be seen eating snow, which may be attributed in most cases to fever.

It is desirable that the flock should be able to drink without wetting their feet or wading into the mud, both of which are not only very injurious by pro-

ducing disease in the foot, but deter the animals from drinking as often as inclination prompts.

Protection against the inclemencies of the season is the third consideration in the "feeding and management of sheep in winter." It is almost as necessary to their health and prosperity as food itself, and for this reason, comfortable shelters should be built for them: they not only do much better, but it is a great saving of time, fodder, and manure. It will be found that ten tons of hay, fed to sheep that have warm shelter, will go farther than twelve tons fed out to them from a stack, and when they have no other protection from the inclemencies of the weather than the side of the stack or a fence. Such stables, if properly constructed, will pay at least from 15 to 25 per cent. interest annually. This alone should prompt the owner of a flock to provide comfortable lodging places for them. "*A merciful man is merciful to his beast.*"

Each full-grown sheep requires six square feet of room, including racks. The stable should be eight feet high, with windows in the upper part, that may be closed as circumstances require. The floor overhead ought to be made tight, that nothing may fall through. The animals must be well littered, as it will add much to their health and comfort. Where this is neglected, the dung accumulates and creates an offensive smell, and the sheep are then very loath to enter their stables. It is but too often the case, that when farmers *do* shelter their sheep, the stables contain a mass of dung so offensive that the flock will not enter them, and, if forced in and confined there, it proves highly injurious: hence the prejudice "that housing sheep is injurious to their health."

CHAPTER X.

MISCELLANEOUS.

OUR COUNTRY—OUR WHOLE COUNTRY.—Clover : its value for Cattle, for Seed, and for the Soil.—Use of Clover.—Clover and Clover-seed.—Prevention of Smut.—Why is it best to bury Manure ?—Butter-making.—Drill Husbandry.—Effect of Steeps.—Modes and Profits of Strawberry Culture.—Statistics of American Wool and Woollen Manufactures.—Experiment in Harvesting Corn.—Cultivation of Cucumbers.—The circumscribed Farmer &c., &c.

THERE is no one business of life which so highly conduces to national prosperity and independence, and to general and individual happiness, as the cultivation of the soil. Agriculture may be regarded, says the great Sully, as the breasts from which the state derives its support and nourishment. Agriculture is truly our nursing mother, which nurtures, and gives growth, and wealth, and moral health, and character to our country. It may be considered as the great wheel which moves all the machinery of society ; and that whatever gives to this a new impulse or energy, communicates a corresponding impetus to the thousand minor wheels of interest which it propels and regulates. Providence seems wisely to have ordained, that because this is the most necessary employment towards the subsistence and comfort of the human family, its labours shall receive the highest and most substantial reward. While the other classes of society are directly dependant upon agriculture for a regular and sufficient provision of the means of subsistence, the agriculturist is enabled to supply all the absolute wants of life from his own labours, though he derives most of his pleasures and profits from an in-

terchange of the products of his industry with the other classes of society. Agriculture has been called the parent of arts, not only because it was the first art practised by man, but because the other arts are its legitimate offspring, and cannot continue long to exist without it. It is the great business of civilized life, and gives employment to a vast majority of almost every people.

The substantial prosperity of a country is always in the ratio of its agricultural industry and wealth. Commerce and manufactures may give temporary consequence to a state; but these are always a precarious dependance. Venice, Genoa, Portugal, Spain, &c., each in turn rose to wealth and power from commercial enterprise; but they all now exhibit melancholy evidences of fallen greatness. Their population degenerated under the corrupting influence of commercial wealth, and, having no suitable agricultural basis to rest upon, they have fallen in succession from their high standing, victims to the enervating influence of domestic cabals, or before the more robust energies of rival powers. They exhibit nothing now, in their political or social institutions, in their agriculture or the condition of their population, that can be admired or coveted by the freemen of America. Great Britain has now become ascendant in commerce and manufactures; yet her greatness in these sources of power and opulence is primarily and principally owing to the excellent state of her agriculture; without which she could not maintain her manufactures or commerce in their present flourishing state, or long retain her immense foreign possessions, or anything like her present population. Only one third of her people are said to be employed in agriculture; yet their labours, such is the high condition of her husbandry, suffice to feed themselves and the other two thirds. An agricultural population of five millions, of all ages, produces annually, from her limited soil, seven

hundred millions of dollars' worth of agricultural produce, averaging about one hundred and forty dollars to each man, woman, and child. The recently-published letters of Dr. Humphreys are so conclusive and instructive upon this subject, not only in regard to the importance of agriculture to a nation, but as showing the susceptibility of this art of high improvement and great productiveness, that we subjoin below an extract from one of them.

"It is the opinion of competent judges, that the advances made in the agriculture of Great Britain during the last seventy or eighty years, are scarcely exceeded by the improvement and extension of her manufactures within the same period, and that to these advances no other old-settled country furnishes any parallel. That they have been very rapid, indeed, the following figures and comparisons abundantly show. In 1760, the total growth of all kinds of grain in England and Wales was about 120,000,000 bushels. To this should be added, perhaps, 50,000,000 for Scotland; making a great total of 170,000,000. In 1835, the quantity in both kingdoms could not have been less than 340,000,000 bushels. In 1755, the population of the whole island did not much, if any, exceed 7,500,000. In 1831 it had risen to 16,525,180, being an increase of 9,000,000, or 120 per cent.! Now the improvements in agriculture have more than kept pace with this prodigious increase of demand for its various productions; for it is agreed on all hands, that the 16,500,000, or, rather, the 17,500,000 (for more than a million has been added since 1831), are much fuller fed, and on provisions of a far better quality, than the 7,500,000 were in 1755. Nor is Great Britain indebted at all, at present, to foreign markets for her supplies. Since 1832, she has imported no grain worth mentioning; and till within the last six months, prices have been so exceedingly depressed as to call forth loud complaints from the whole agricultural interest of the

country. England is at this moment so far from wanting any of our breadstuffs, if we had them to export, that she has been supplying us liberally all winter from her own granaries; and, according to the latest advices, she had still bread enough and to spare. Again: it is estimated by British writers of high authority, that the subsistence of 9,000,000 people costs, in raw produce, no less than £72,000,000, or £8 for each individual, per annum. According to this estimate, the annual product of this great branch of national industry is \$350,000,000 more at present than it was in 1755; which is more than twice the value of the whole cotton manufacture of the country in 1831. Now if it costs \$350,000,000 to feed the increased population of 9,000,000, then to feed the whole population of 17,500,000 must cost nearly \$700,000,000! What an amazing agricultural product for so small a territory! And yet it is the opinion of practical men of the highest respectability in England, that the raw produce of the island might be wellnigh doubled, without any greater proportional expense being incurred in its production; that is to say, 35,000,000 people might draw their subsistence from one little speck in the ocean! Now *we* have a territory more than fifteen times as large as the island of Great Britain; and what should hinder it, when it comes to be brought under no higher cultivation than some parts of England and Scotland, from sustaining a population of 500 or 600 millions of people? This would give to Virginia something like thirty millions; to Illinois and Missouri about the same number each; to New-York near twenty-five millions, and so on in proportion to the other states. I am quite aware that this estimate will be regarded as extremely visionary and incredible by many readers; but not more so than it would have been thought, in the middle of the last century, that England, Scotland, and Wales could ever be made to sustain thirty-five, or even thirty millions."

A *city* may flourish by foreign commerce, by becoming the carrier of other nations, till foreign aggression, or foreign rivalry, or the opening of new channels of trade—contingences of no unfrequent occurrence—shall blast its prospects, and consign it, like Persepolis, Pétra, Tyre, and other ancient cities of the East, to ruin and oblivion.

A *town* or *district* may flourish by manufacturing industry, as many have done in ancient and in modern times, so long as it can exchange its merchandise for the means of subsistence and of acquiring wealth; but if its dependance for these is upon foreign lands, its prosperity is unstable; the interchange is liable to be interrupted by wars, rivalships, and other contingences.

A *country* can be long prosperous and truly independent only when it is sustained by agricultural intelligence and agricultural industry. Its foreign commerce may be swept from the ocean; its manufactures may perish; yet still, if its soil be tilled, and well tilled, it can be made to yield all the absolute necessities of life; it can, when misfortunes abate, like the roots of the trunkless tree, send forth a new stem, new branches, new foliage, and new fruit; it can rear again the edifice of the manufacturer, and spread again the sails of commerce; and it will yet retain the germe and the spirit of independence.

The preceding facts will serve to show the importance of agriculture to a nation in sustaining its prosperity and its independence, and in supplying the wants and multiplying the comforts of its population. The same reasoning that applies to nations, applies to states, to counties, to towns, and to neighbourhoods. Agriculture constitutes the basis of their prosperity, directly or remotely; and the blessings which it confers are always in the ratio of the intelligence, skill, and industry which direct and control its operations. Take a town, for example, which

has a mixed population of the various classes of society. If the average produce of each acre of land is but ten dollars, it is barely sufficient to cover expenses and to feed the farmer's family. Having nothing to sell, the farmer, of course, cannot buy; or, if he buys, he cannot pay the merchant, the manufacturer, or the mechanic; nor can he support the lawyer, the physician, the schoolmaster, or the clergyman. But if every acre be made to yield thirty dollars' worth of produce annually, which most lands, properly managed, are capable of doing, the twenty dollars, or two thirds of the whole product of the soil, become virtually a circulating medium. It is so much surplus wealth created by the agricultural labour of the town. Now let us suppose, farther, that the lands in the town amount to twenty thousand acres. Under the reckless system of management which too generally prevails, and which, upon the average, does not produce over ten dollars an acre on old improved lands, the product would be barely sufficient to maintain the agricultural population, without adding to their wealth, or enabling them to buy of the merchant or others the necessaries and comforts which they stand in need of. I am aware that this does not hold good in practice; for even the most shiftless farmers buy; but if they pay, it is at the expense of many of the substantial comforts of life, or perhaps, ultimately, of their farms, which they might continue to enjoy, and to increase in value, under a more enlightened system of management. But under the improved system, which we have not graduated high at thirty dollars per acre, and which is under the average product of well-cultivated lands both in Europe and America, the aggregate agricultural labour of the town would give an annual increase to its wealth of *four hundred thousand dollars*. Is there, then, an intelligent, reflecting man, who cannot see and appreciate the advantages to society, to the state, and to

the nation, of a highly-improved state of agriculture? Is there one who does not see that his personal interests are promoted by this certain and constant influx of wealth, drawn from the soil, prolific in the bounties and blessings of a wise and beneficent Creator? HE has spread everywhere the means of making man wise and happy. HE has given him the capacity to apply these means to his own good. HE has commanded him to bring his capacities into constant and active exercise; and HE has *promised* to reward, and HE *will* reward, all who prove faithful to the command.

I do not aim to disparage the other great branches of national industry, which are bountiful sources of wealth and happiness, by praising agriculture; but I think the importance of this great business to the state has not been duly appreciated, nor its interests sufficiently regarded and promoted by those who have had the management of our state affairs. My object is merely to make agriculture the base, as it ought to be, of the social edifice. We are so prone to look *up* for blessings to what are termed the higher walks of life, and to expect them to fall upon us without an effort, that it becomes necessary, at times, to point to their legitimate sources *below*, in the soil. Agriculture, manufactures, and commerce are all important, in a public point of view, in the order in which we have named them; and, like the human body and its members, are reciprocal aids to each other. The agriculturist gathers from the soil the elements of usefulness; the manufacturer fits them to our wants; and the merchant becomes the factor of both, and the medium of interchange.

It is but just, in the mean time, to suggest some of the important bearings which our manufactures have upon the prosperity and independence of our country. These consume the surplus products of the soil; they convert into useful fabrics the wool, the hemp, the flax, and much of the cotton, of the

farmer and the planter; and they supply to the great agricultural mass of population articles of necessity and convenience, at a cheaper rate and of better quality than the farmer could fabricate them for himself. *The manufacturers of our country consume more of the surplus provisions of our soil than all Europe, Asia, and Africa put together.* I know it is said that we can get our wearing apparel from Europe, had we no protecting duties, cheaper than we can manufacture it ourselves. And this is undoubtedly true as regards many articles that we use. But what would be the consequence? What was the consequence in 1836, when we were flooded with foreign goods without the means of paying for them? Our manufacturers became embarrassed; many of the mills were stopped; and a general stagnation of all business ensued. Had the causes which produced that state of things continued to operate, a complete prostration of our manufacturing energies must have ensued, and the manufacturer been obliged to seek his employment and his bread among the agricultural class: the home market for the surplus products of our soil would have been thus cut off, and the stimuli to industry and enterprise everywhere paralyzed. Europe does not want, and will not buy, our agricultural products. She sells to us even breadstuffs. Ours must find a home market, or no market at all.

But there is another consideration which claims from us an interest in our manufactures. Why are manufactured goods cheaper in Europe than they are in America? Not because our workmen are less expert or our machinery less perfect. The difference lies in the social condition of the workmen of the two countries—in the price of labour. So depressed is the condition of the operatives in Europe, that they are compelled to labour for a bare subsistence. They enjoy but few political rights. There the many toil to support the few in luxury

and extravagance. Here the case is widely different. Our citizens enjoy equal rights, and the spirit of our institutions demands that they should be so rewarded for their labour as to be able to assert and maintain their rights. Depress them by poverty and want to the condition of the operatives in European workshops, and you degrade them as men, and render them dangerous as freemen.

The interests of the different classes of society in our country are so intimately interwoven, that it may be assumed as a truth, that each class and each individual best subserve their own good, when they endeavour to promote the welfare of all, of every other class and individual. It comes, then, to this, if our views of the matter are correct, that agriculture, being the great conservative principle of national prosperity, independence, and character, should be primarily supported—should be encouraged, enlightened, and honoured; that our manufactures, being necessary, like the elaborating organs of the plant, to convert to convenient and useful purposes the products of agriculture, should hold the second rank in our regards—as a branch of national industry which cannot be dispensed with without manifest injury to the other classes of society, and without perilling our independence as a nation; and that agriculture and manufactures being duly cherished, commerce, as a necessary medium of interchange between the two great branches of national industry, and between them and foreign nations, will as certainly prosper and flourish as the tree in a rich soil, which is braced and supported by a good system of roots below, and has a healthy top and foliage above. Let us, then, improve our agriculture, and foster and protect our manufactures, that our commerce may enlarge its boundaries and multiply its gains. Then may we, in the spirit of our motto, exclaim, OUR COUNTRY—OUR WHOLE COUNTRY.

I.—S

CLOVER : ITS VALUE FOR CATTLE, FOR SEED, AND FOR
THE SOIL.

We have received a communication from Mr Henry Brewer, of Enfield, Tompkins county, illustrating the value of clover as a means of keeping up the fertility of his soil, and of rendering its culture profitable. Mr. Brewer was from old Dutchess, the land of clover. He purchased his farm in Enfield in 1830, at \$8 50 per acre. It now gives a product of from fifteen to forty dollars per acre per annum ; and the improvement and the profit he ascribes principally to the cultivation of clover. As the communication is very lengthy, having the writer's permission to do so, we give the purport of it in a condensed form.

Mr. Brewer remarks, that New-York farmers pay to those of New-Jersey and Pennsylvania annually many thousand dollars for clover-seed, which they might raise for themselves with profit. He would as soon think of buying his seed-oats and seed-wheat as his clover-seed. He prefers the Southern or dwarf clover, because it is fit to cut five or ten days earlier than the tall-growing or Northern kind, and is more certain of ripening the seed of the second crop. He sows with his small grain at the rate of fifteen lbs. the acre, and sometimes sows his corn-fields after the last hoeing.

Mr. Brewer appropriates his clover to three very valuable purposes : to feed his stock, to fertilize his land, and to fill his purse ; and he has succeeded admirably in them all, so far as we can judge. His cattle thrive upon it, both as a green and a dry crop, in summer and winter ; his wheat and corn feed and thrive upon it, when buried and decomposing in the soil ; and his purse increases with the increase of his cattle and his crops. And, finally, besides feeding his cattle and fertilizing his soil, the seed of his second crop gives him an acreable profit, annually,

of from fifteen to fifty dollars. Now there is no secret in the business, no patent right. He gives you his whole process, that you may profit by his example if you will. We shall endeavour to present it in concise and plain terms.

Clover is used either for hay or pasture the first crop, and uniformly for seed and forage the second crop. If for pasture, he turns his stock upon it about the first of May, or when the soil has become so firm that the feet of the cattle will not poach the sod. At this time, the growth is such as to enable the cattle to thrive. He pastures till about the 20th of June, and the closer it is cropped at this time, the better, he thinks. The cattle are then withdrawn, and the second crop is permitted to grow and mature its seed. If the first crop is designed for hay, it is cut from the 20th to the 25th of June, although it may not have passed the bloom, or arrived at that state when most farmers deem it in a proper condition to be cut. It is important to cut it as early as the 25th, Mr. B. thinks, in order to give the second crop time to grow and mature its seed before it is injured by the frosts of autumn; five days often making a material difference in the seed-crop. We do not like Mr. B.'s mode of curing this early-cut clover: he takes it, when partially cured, to his barn, and spreads it about upon scaffolds and poles till made, and then puts it into his bay. This causes unnecessary labour. Cured in grass-cocks, according to our repeated directions,* it will be as good as

* We have this year varied our practice somewhat, and, we think, with advantage. The grass cut in the forenoon has been turned in swath directly after dinner, and put into grass-cocks the same day. If rain has threatened, the cocks have been opened the second day, and the hay finished; but we prefer to leave them to the third day, when a slight opening, to evaporate the external moisture, suffices. The grass mown in the afternoon is turned the same day in swath, or, if not wilted enough, in the forenoon of the second day, and in the afternoon put into cocks. We deem it important, 1st. That clover should stand

when spread over a barn, and more than half the labour will be saved. Mr. B. thinks clover hay made in the shade is much better than that made in the sun. "The next way of curing this green clover," says the writer, "is with wheat-straw that has been kept in the barn for that purpose, by laying a course of hay and then of straw, and so on until you have it all secured." The importance of mowing the first crop early is illustrated by the fact that one of Mr. B.'s neighbours, who had been persuaded to cut his first crop some days earlier than usual, acknowledged that he should obtain thirty bushels more clover-seed than usual in consequence of it.

The seed-crop is gathered with care and brought to the barn as soon as it is fit, that rain upon it, or unnecessary exposure to the weather, may be avoided, both of which materially impair the value of the butts or straw for fodder. The heads are separated with a flail, and the seed extracted by Robert Rittenhouse & Co's. patent clover machine. The average product in seed is from four to five bushels the acre; which, at present prices, is worth sixty to seventy dollars: a tolerable acreable profit for a second crop. In regard to his clover machine, Mr. B. has cleaned four hundred bushels of seed with it, without a dollar of expense in repairs. It is portable; and, "when there is once a machine in a neighbourhood," says Mr. B., "I think the farmers will then raise

in cocks some time, in order to equalize the moisture, to sweat; that is, that the moisture contained in the thick stems may have time to disseminate itself upon the surface, and into the thin leaves and blossoms. If a slight fermentation takes place in the cocks, so much the better; as the hay, in that case, is not likely to undergo a second fermentation in the barn. Dilly. That the curing process should be carried on, as much as possible, without the aid of the direct rays of the sun, which certainly impair the nutritive properties of the hay. Expose a lock of clover two days to the direct influence of the sun's rays, and it becomes blanched and valueless, and cattle will reject it.

—*Cond. Cult.*

their own seed, as is the case in my neighbourhood. And if they raise it themselves, they think it costs nothing ; they then sow liberally, and get a bountiful return." The machine cost sixty dollars ; and it would verily seem to be worth more than that amount annually to the farmers of the neighbourhood.

In regard to the value of clover in keeping up the fertility of the farm, Mr. Brewer considers it of the first consequence ; for, says he, " I think I can manure my farm with clover cheaper than I can cart manure from my own barnyard ; although I have it all carried out in the spring of the year for my hoed crops, while unfermented, because I think it of more value to have it rot in the soil than in the farmyard. I do not wish to have it understood that I am an advocate of the miserable practice of leaving the manure in the barnyard, as many of my neighbouring farmers do, to waste one half of its best qualities, for I have my barnyard thoroughly cleaned every year."

One word as to the condition of the farm when it came under Mr. B.'s management. The soil is described as being a sandy loam, mixed with slate gravel, and most of it very stony. When he went on to it, remarks he, in 1830, " there were about fifty acres of cleared land, and it was considered one of the poorest farms in the town by my neighbours, who assured me I could not get grass enough from the farm to keep one cow. There was but two acres of meadow upon it, and that was too wet to plough. But this did not discourage me. I purchased two and a half bushels of clover-seed the first spring, which some of my neighbours thought was enough to seed my whole farm, weeds and all ; but I sowed it on sixteen acres." Such was Mr. Brewer's beginning ; and the reader is already advised, that this spirited start has been followed up for eight years with increasing advantage. The

wheat-crop has averaged from eighteen to twenty-four bushels per acre.

USE OF CLOVER.

Almost uniformly, clover (with plaster) is used as an ameliorating or enriching crop; yet the *land* is but little benefited thereby. For, as soon as the clover has attained to such a height that cattle can "get a good bite," while the herbage is tender, and before the stalk becomes in the least indurated, the cattle are turned upon it, and are continued there as long as they can get a living. Then comes the turn for colts or sheep, which continue the spoliation till the field is a complete waste, and almost as barren of herbage as the Libyan desert. And now, perhaps, it is time to put in the plough for a winter crop; so the soil is turned over, and if ten bushels of rye, or fifteen or twenty bushels of oats per acre are obtained, the proprietor is entirely satisfied.

Now it strikes me that this is a very mistaken policy. It is true, the stock that takes the first clip fares most daintily, and the land is somewhat benefited by the manure left upon the surface; but, in the case of a dairy farm, where the cows are often driven a considerable distance from the pasture to the yard, there is a great waste; though many never think of that. But the root of the clover thus sheared of its lungs can never attain to much size; and, as hardly a leaf or a stalk is turned under, the soil can be but little benefited by the green crop; and if it does not degenerate, it certainly does not improve.

About three years since, in July, I called on a gentleman in the north part of the town where I reside, who makes use of clover, "according to my notion," in the right way. He went with me over a considerable portion of his farm, and through fields which he intended to sow with wheat or rye. The soil was a gravel, and by nature not the most fertile.

In these were horses, swine, and cows, up to their eyes in clover in full bloom, and of most luxuriant growth ; and it gave me pleasure of no ordinary degree to witness such a feast : a feast for the eye, for the brute, and for the soil. I remarked, " Indeed, Mr. T., your stock fare sumptuously." " Yes," was his reply, " and that is the way I manure my fields. When the clover is pretty well rolled down (I don't allow the cattle to *eat it all up*) I go in with my harrow, and complete the levelling process by drawing it in the same direction that I plough, that in the latter operation the herbage may be more completely buried." He likewise told me that it was by far the cheapest manure he could use ; and that, as long as he could produce clover in such abundance, he would not draw manure if it were *given* him. This is carrying the principle to its fullest extent, farther than I should approve ; but it might have been only his extravagant manner of showing his entire confidence in the system of cultivation, independent of other means of fertility. Still I very much doubt his willingness to *give away* his yard manure, or to part with it for the market price ; and I did not observe that he "*summered*" any. He need not have told me that he obtained large crops ; they were splendid ; for his oats in adjoining fields proved it. By-the-way, oats are the crop he most cultivates. The land in this region is often ploughed in the fall, and only harrowed (but that *thoroughly*) in the spring.

CLOVER AND CLOVER-SEED.

Clover is becoming of more and more importance, and the quantity sown is annually increasing, in proportion as the new system of husbandry extends among us. Its tap roots penetrate and loosen the soil ; its stems and foliage produce abundance of nutritious food for the neat stock of the farm ; and both roots and stems, when turned under by the

plough, are highly enriching to the soil. It is indispensable in alternate husbandry; and we feel justified in saying that its liberal and judicious use, together with gypsum, upon many light soils, has added fifty, one hundred, and even two hundred per cent. to the profits of their culture. Yet there are a great many districts of our country in which its value is seemingly but little appreciated, and in which its cultivation has been yet hardly begun. There is scarcely a plant grown upon the farm that returns to the soil more of the elements of fertility; affording almost a certainty that its cultivation will continue to increase for some years in a progressive ratio.

From this view of the subject, it is apparent that clover-seed will continue to increase in demand as it has continued to advance in price; and that the raising of it for market promises to be a lucrative business. The dwarf Southern clover will afford a crop of hay to be cut the last of June, and a crop of seed to be gathered towards autumn. The price of seed is now from twelve to fifteen dollars a bushel; and if we suppose the acre to yield but five bushels, the profit will be enormous. Machines for cleaning the seed are already abundant, and others have been introduced for gathering the heads in the field. We give below the drawing and dimensions of one described by Mr. L'Hommedieu, in the transactions of the old Agricultural Society

Dimensions.

1, 2. The shafts, 4 feet 4 inches long, and 3 feet asunder.

3, 4. The handles, 3 feet long, and 20 inches apart.

5. The fingers or teeth, 13 inches long.

The wheels are 16 inches in diameter.

The machine is drawn by one horse, and guided by a man or boy. It simply consists of an open box, about 4 feet square at the bottom and about 3 in height on three sides. To the forepart, which is open, fingers are fixed similar to those of a cradle, about 13 inches in length, and so close together as to hold fast and break off the heads of the clover stocks which catch between them, and which are thrown back into the box as the horse advances. The box is fixed on an axletree supported by the wheels. The driver raises or lowers the fingers of the machine, so as to take off all the heads of the grass; and, as often as the box is filled with them, they are thrown out, and the horse goes on as before.

PREVENTION OF SMUT.

We extract the subjoined table from the Quarterly Journal for June, as particularly applicable and useful at this season. It gives the results of trials with various liquids as steepers for seed-wheat, made by Mr. Bevan, on a sandy soil in Bedfordshire. The columns in the table marked A. contain the results from the steeped grain sown, and those marked B. are the results from smutted samples.

LIQUIDS EMPLOYED.	No. of smutted ears in three sheaves.		Bushels of good wheat per acre.		Cwt. of straw per acre.	
	A.	B.	A.	B.	A.	B.
Solution of potash	1	81	21.6	13.6	36.6	29.1
" muriate of potash	3	218	20.2	10.1	36.0	21.1
" muriate of potash (salt petre)	7	115	23.8	14.3	36.9	31.9
" soda	9	159	20.2	11.7	35.6	26.7
" muriate of soda (common salt)	0	290	24.0	14.5	41.5	33.3
" sulphate of soda (glauber salt)	12	241	21.6	12.3	38.5	27.8
" muriate of ammonia (sal ammo.)	1	150	19.8	17.6	35.4	30.2
" soot	0	123	20.8	11.4	34.8	25.3
" lime, saturated	0	2	21.9	12.4	38.7	25.9
" nitric acid (aqua fortis)	Seed did not vegetate.					
" muriatic acid (spirit of salt)	0	126	20.7	16.1	35.7	34.1
" sulphuric acid (oil of vitriol)	0	0	20.4	17.8	35.4	37.1
Dry, in its natural state	0	323	20.3	14.7	35.7	31.1
Washed in common water	.	107	...	18.3	...	35.8

It will be seen that the seed steeped in a pickle of common salt was free from smut, gave the greatest product in good grain, and the greatest weight in straw. This steep may be used by every farmer.

The article from which the above table is extracted was written by George W. Johnson. The writer examines the erroneous theories and opinions which have prevailed as to the origin or cause of smut in grain, and, we think, satisfactorily shows their fallacy. Mr. Johnson then proceeds to detail what he considers correct knowledge upon the subject, and

quotes some of the most eminent naturalists in support of the opinion, that what passes by the different names of *smut*, *dust-brand*, and *burned corn* is a parasitical fungus, which preys not only upon the sap, but destroys the very organic structure of the grain and chaff upon which it fixes. Botanists generally distinguish this fungus by the name of *urido segetum*. Chymical analysis has shown it to consist, 1st, of about one third of its own weight of a green, butyrous, fetid, and acrid oil: 2d, nearly one fourth of a vegeto-animal substance, perfectly similar to that which comes from *putrid gluten*: 3d, of a *black coal*, one fifth of its weight, similar to that which is found in all remnants of putrid organic compounds: 4th, of free *phosphoric acid*, amounting to scarcely more than .004 of the smut: 5th, of phosphates of ammonia, magnesia, and lime, in the proportion of a few thousandths. "The contagion attacks especially the gluten, and precedes, indeed prevents, the formation of starch." It has also been shown by Duhamel, Kirby, and others, that the disease exists in the affected plant before the development of the head; that it is propagated by minute seeds, which attach to the kernel, and which are so light as to float buoyantly in a damp atmosphere; that the vitality of these seeds is not destroyed by frost; but that they will contaminate seed-grain with which they come in contact after being long in the soil. In early spring, when the plants were but a few inches high, upon carefully opening the hose or blade which covers the ear, M. Duhamel found this embryo already black and distempered. After quoting the results of many experiments, besides those in the above table, made by Mr. Bevan, Mr. Johnson adds:

"The conclusion from these and many other accordant experiments is, that washing the seed is effective in preventing the communication of the disease to the crop. If the washing were frequently repeated, or the cleansing made complete, by pass-

ing a continued stream through the wheat for some hours, it is probable that simple water might be employed for this purpose as effectually as any saline solution. But, as this would require more labour than is desirable, and as the salts, &c., employed are beneficial in other ways, by protecting the seed from vermin, and ministering to the future vigour of the plants, steeps are generally and very properly adopted."

If lime be employed, it is recommended to prepare it by mixing "one pound of fresh lime with three gallons of boiling water, allowing these to stand for two hours, and the clear liquid then to be poured off and immediately used. In this liquor the wheat should be soaked for twelve hours, stirred twice or thrice during the time, and then mixed upon a floor, with the powder made by pouring three gallons [pints!] of boiling water upon five pounds of lime."

Mr. Johnson has had no experience with lime himself; but he has witnessed many experiments with stale urine and a solution of common salt. He thinks the latter the most agreeable; and, although both were completely effective, he has used the salt, as being most cleanly as well as convenient. His mode is to wash the seed with pure water, skim off the floating light grains, and then soak it twelve hours in a pickle made with common salt, strong enough to float a hen's egg. Mr. Johnson is satisfied, from experiments he made, and which he details, that the soil is one source of infection, and that salt is an antidote to this infection; and he thinks the truth of his opinions is confirmed by the fact "that fields in the vicinity of the sea are rarely injured, and never extensively, by the ravages of the smut."

WHY IS IT BEST TO BURY MANURE?

Animal matters decompose with facility when acted upon by moisture and air, the greater proportion of their elementary parts making their escape

in various forms of combination, and leaving the earths, alkalis, and carbonaceous matters remaining.

When this decomposition takes place beneath the surface of the ground, these gaseous compounds, as well as the carbon (which there is reason to believe assumes also the gaseous state by combining with oxygen), may be supposed to be partially or wholly retained in the earth, to afford the matter of nutrition to plants.

Purely animal substances, therefore, which thus readily decompose, do not absolutely require fermentation before they are mixed with the soil.

Vegetable fibre is, under certain circumstances, a slowly decomposing substance. When vegetables are green and full of juice, as all green crops and grass leys, they readily ferment [hence the impropriety of wasting these fertilizing properties by cross-ploughing]; but when the stems are dried, as in the case of straw and litter, they decompose with slowness, and the mixing them with animal matter hastens the putrefactive fermentation.

The principal animal matters which are mixed with the ligneous fibre of the litter, and which cause it to undergo decomposition, are the dung and the urine of the animals.—*Prof. Low.*

The practical lessons to be drawn from the above theory are, 1st, to make your cattle-yards concave, or hollow in the middle, to retain the urine of the animals, nearly a moiety of the manure: 2dly, to strew or feed your straw, stalks, and other litter in the yard, to absorb the urine and other liquids there accumulating: 3dly, to apply this manure before it has undergone much fermentation, that the soil may absorb its gaseous portions; and we would add, 4thly, to apply it to a hoed crop, that the weeds and grasses, the seeds of which are blended with the dung, may be extirpated in the process of after culture.

BUTTER-MAKING.

A nice process of butter-making, as practised by Mr. J. M. Weeks, of Salisbury, Vt., is given in the *Yankee Farmer*. Mr. W. makes three qualities of butter : one, he says, worth 38 cents, being the pure butyrous matter, of exquisite flavour ; the second, worth 19 cents ; and the last, 9 or 10 cents, a glutinous substance, and insipid in taste. Mr. Weeks heats his milk after the animal heat has passed from it, but to what temperature he does not say, and then sets his pans in cool, running water ; and, when cold, they are raised out of the water, and the milk skimmed in 6 to 18 hours. We conjecture, for Mr. Weeks has not told us, that the first skimming is made before the milk is placed in the running water, or perhaps before it is heated, and the last at the end of the 18 hours. The butter is salted and worked when it comes from the churn, worked again the next day, without cold water in any of the processes, and then packed tight in tubs, lined with bags previously saturated with beeswax, and covered on the top with fresh pickle. The great requisites in making and preserving good butter are :

1. That everything should be cleanly throughout the process.

2. That the milk should be kept at a proper temperature, say from 45° to 55°, while the cream is separating.

3. That the cream should be taken off and churned before its quality is impaired.

4. That its temperature should be from 55° to 65° when put into the churn, and the churning should be moderate and uniform.

5. That salt of the best quality, in sufficient quantity to suit the palate, should be blended with it at the first working, and the buttermilk completely separated from it by the butter-ladle.

6. That the working of the butter should be re-

peated at the end of 24 hours, after the salt has become completely dissolved, when all the liquid should be pressed out.

7. That it should be packed (without any addition of salt to make it weigh) in stone jars, or in wooden firkins or tubs, such as will not impart to it any taint or bad flavour, and in such manner as will totally exclude the air.

Butter made in this way will be of fine flavour; and, if put down and kept in the manner here recommended, its flavour will be preserved for an almost indefinite period, provided it is not exposed to a temperature of over 70°. Water, mixed either with the milk, the cream, or the butter, and especially soft water, adds nothing to, but materially injures the flavour. We have no doubt that the position assumed by Mr. Weeks is correct, that milk skimmed at three several times will give three qualities of butter—the cream taken off first being the richest and most valuable.

The common remark of our good dairy-women is, "my butter is good enough;" and many think so who have no very sufficient reason for such an opinion. But as the principal object in making butter is gain, and as it will sell according to its intrinsic value, every one should seek to improve its quality, if not to please themselves, to please their customers, that they may realize a larger profit.

DRILL HUSBANDRY,

We have no doubt, will ultimately come into vogue among us—we mean, in the culture of wheat and other grains—though for a long time its progress will be slow. At the late Preston agricultural meeting in England, the question proposed for discussion was, "the comparative advantages of the drill and broadcast systems of husbandry." Mr. Binns ably advocated the drill system, and set forth its advantages under the following heads.

1. The seed is delivered with regularity.
 2. It is deposited at a proper depth.
 3. The weeds, during the growth of the plants, are destroyed with great facility.
 4. The plants cultivated receive the undivided benefit of the soil and manure, and have not to maintain a constant struggle with weeds.
 5. The land, by the process of hoeing, is undergoing preparation for another crop.
 6. The necessity of summer fallowing is avoided.
 7. By admission of the sun and air between the rows, a stronger and healthier plant is produced, and, of course, a heavier crop.
 8. By stirring the soil, it is rendered more susceptible of benefit from the atmosphere, imbibing more oxygen, and being both warmed and enriched by the sun.
 9. The roots shoot freely in a pulverized soil.
 10. By drilling, the farmer is enabled to have heavier crops of beans and wheat on light land.
 11. Clover and grass seeds answer incomparably better with the pulverization^s produced by hoeing, independent of clearness from weeds.
 12. The drills give facility for depositing smaller portions of manure with greater effect.
- These advantages are all self-evident to a good farmer; and it might have been added, as a thirteenth advantage, that drilling economizes seed, though Mr. Binns rejects it on the ground that if the plants are thin, they throw out side-shoots, which produce imperfect grain, and ripen unequally. Mr. B. affirms that fifty-six bushels of wheat have been raised on the light soils of Norfolk by drill husbandry.

The drills employed in sowing wheat, &c., are drawn by a horse, and sow six or eight rows at a time at the required distance, dropping and covering the seed. The machine for clearing between the rows is also drawn by one horse, and consists of a

frame with six hoes attached to it, which occupies the same space as the drill. The rate of drilling is an acre per hour. Wheat is drilled at nine inches between the rows, and barley at seven. The horse-hoe is used once, and the hand-hoe twice. The expense of weeding in England is stated at two shillings (forty-eight cents) per acre.

EFFECT OF STEEPS ON WHEAT.

Mr. Hathaway's letter, published in the June number of the Cultivator, 1838, giving his opinion that steeping Italian spring wheat in strong brine for a length of time is injurious to its vegetating principle, has induced me to make some experiments for my own satisfaction. The results have not been what I anticipated, and they certainly go to prove that gentleman to be correct.

The wheat on which I experimented was the Italian—the berry fair and plump. The pickle was impregnated with as much salt as the water would dissolve. Parcels containing twenty-five kernels each were steeped at different periods of time, placed in moist earth, and marked in such manner that they might be easily distinguished, and were suffered to remain undisturbed until the greater part of the stems made their appearance above ground.

Result of First Experiment.

No. 1, 25 kernels, steeped 5 minutes, 2 did not vegetate						
" 2,	do.,	do.	30	do.,	2	do.
" 3,	do.,	do.	1 hour,	4		do.
" 4,	do.,	do.	18 hours,	12		do.

[2 kernels missing.]

The result of the parcel steeped 18 hours being unexpected, I made another trial, which was as follows:

No. 1, 25 kernels, well washed in brine, every kernel vegetated.						
" 2,	do.,	steeped 4 hours,	2 kernels	did not vegetate.		
" 3,	do.,	do.	8	do.,	6	do.
" 4,	do.,	do.	12	do.,	11	do.
" 5,	do.,	do.	18	do.,	13	do.

I.—T

It seems from the above, that the injury sustained is proportioned to the length of time the grain has been steeped, and that when it has been in the brine 18, or even 12 hours, almost one half loses its vegetative power.

I am fully satisfied that pickling and liming the seed is an infallible preventive of smut in the wheat crop; but I do not think that steeping for 10, 12, or 18 hours is necessary. This opinion is founded on my own experience and observation, as well as the long practice and experience of others. My method has been to make the brine as strong as I could, permitting the wheat to be no longer in it than is necessary for washing it, and skimming off whatever floats on the surface; when taken out it is mixed with fresh slaked lime, and sown soon after. With this preparation, even when the seed is impregnated with smut (as was the case last year with part of the Italian wheat that I obtained), the crop has been perfectly clean. Liquoring, as it is called, has been practised in the wheat-growing districts of Scotland for these forty years past, and how much longer I do not know: but as long ago as at that period, good farmers would almost as soon have thought of throwing their seed into the sea as of sowing it without that preparation. Brine made from salt or seawater, or otherwise, and stale chamber-ley, were used, the latter most generally. When chamber-ley was applied, the usual method was to sprinkle it on the heap of grain until it was well wetted, adding fresh slaked lime, and sowing immediately. In the application of brine, some steeped the seed for a longer or shorter time, and others sprinkled it. Without liquoring, in nine cases out of ten, the crop was smutty; with it, *never*. I will conclude with a quotation corroborative of what I have just stated. "There is some danger from the first; for if the seed steeped in urine is not immediately sown, it will infallibly lose its vegetative pow-

er. The second, viz., sprinkling the urine on the seed, seems to be the safest, if performed by an attentive hand; the last, brining, may do equally well, if such a quantity of salt be incorporated with the water as to render it of sufficient strength. But it may be remarked, that this last mode is often accompanied with smut, owing, no doubt, to a deficiency of strength in the pickle; whereas a single head with smut is rarely discovered where urine has been used."—*Treatise on British Husbandry*.

JAS. SMEALEE.

MODES AND PROFITS OF STRAWBERRY CULTURE.

Having noticed an article in the August number of the *Cultivator*, 1838, on the culture of strawberries, to which my attention has been directed for a number of years, and wishing the public to possess all the light on the subject which can be obtained, I am induced to communicate what little knowledge I have of it. The kind generally cultivated on Long Island (where I reside) for the supply of the New-York market, I believe to be the early scarlet; and of these I have at present about three acres under cultivation. We generally transplant, and form our new beds in the beginning of May. Formerly the universal practice was to plant in rows from two to two and a half feet apart, the plants single being left single, and at a distance of from 12 to 18 inches from each other. My present practice, and that of many others, is to plant them in hills about three and a half or four feet asunder each way, placing four plants in a hill, two and two together, about three inches apart. By planting in hills there is a great saving of labour, for it takes less time, the plants are more easily kept clean by running the cultivator through them both ways, and there is less labour in hoeing; whereas, by the old method, when planted close, the cultivator could not be used among them at all, or, at most, only one way. The cultivator is

run through the plants as late as it can be done without serious injury to the runners, hoeing them each time; and it is seldôm, when judiciously performed, that they require this operation over three times. I have always, in my practice, found the plants when properly managed, sufficiently to cover the ground to produce a good crop of fruit the next season. A piece, covering less than half an acre, of last year's planting, produced this season over 3000 baskets, containing nearly a pint each, which were sold in the New-York markets for \$200. This, however, is an uncommon yield, and is seldom excelled, or even equalled. New beds almost invariably yield better than old ones, and produce larger fruit, though the berries are apt to be sandy after showers. It took nearly two acres of my old beds to yield the same quantity that the half acre of new did. The soil I prefer for strawberries is light, sandy land newly cleared, on which no animal or vegetable manure has been used. On land of this kind, which has been prepared by previous crops, and on which weeds have not been suffered to go to seed, the plants will last four or five years, while on old land they are seldom profitable over two, and often not more than one.

The greatest enemy to the beds is white clover, which, in old lands, after the first year's bearing, generally gets possession, and eradicates the plants. Land lately cleared is not often troubled with this grass: the great danger here is from sorrel, but this is less destructive. Our beds cover the whole ground: there are no alleys, no clipping of runners, no digging the paths, no burning with straw, as recommended by some gardeners; for it is doubtful whether these operations would be profitable, and pay cost. At all events, our experience leads us to adopt the plan I have described. The only operation which I have found necessary and advantageous after the first year, is to pull up and destroy the

weeds and grass, and to run a light harrow over old beds early in the spring, when matted too thick with plants. As for manure, it is not customary with us to put any on. I once read an account of plaster being highly beneficial, which I tried, but it failed of improving the plants. Lime might aid in destroying sorrel, but I have not tried it.

Much has been written about male and female plants, and of the necessity of mixing them in the beds to make them fruitful. Now all this may be necessary with some varieties; but with the one we cultivate I can assure you it is not: no cultivator in my neighbourhood (*Narrows, L. I.*), from which the New-York markets are principally supplied, as far as I have ever heard, does it. I once tried an experiment which appears to me conclusive. I planted a small bed in my garden at the time when the fruit commenced ripening, taking only such plants as had good and fair fruit on them, and no others. This bed produced the next year abundantly: they were all female plants, and there were no males in their vicinity to impregnate them. The male and female blossoms of this variety must be on the same plant, although, to the eye, no difference is presented in their appearance.

T. G. BERGEN.

STATISTICS OF AMERICAN WOOL AND WOOLLEN MANUFACTURES.

The following is a statement of the number of sheep and of the woollen manufactories in the different states, the number of pounds of wool produced in each, and its value at 50 1-2 cents per lb., which seems to have been the average price for the last ten years.

	Sheep.	Sets machinery.	Quantity. lbs.	Amount. dollars.
Maine . . .	622,619	24	2,023,512	1,021,873
New-Hampshire . .	465,179	43	1,511,832	763,475
Vermont . . .	1,099,011	100	3,571,786	1,803,751
Massachusetts . .	373,322	519	1,213,297	612,715
Rhode Island . .	81,619	80	265,262	133,957
Connecticut . .	265,169	184	829,299	410,313
New York . . .	4,299,879	234	13,974,606	7,057,176
New-Jersey . . .	250,000	20	812,500	410,313
Pennsylvania . .	1,714,640	123	5,572,580	2,814,158
Delaware . . .	150,000	20	487,500	246,187
Maryland . . .	275,000	15	893,750	451,343
Virginia . . .	1,000,000		3,250,000	1,641,250
Ohio . . .	1,711,200	30	5,561,400	2,808,500
Kentucky . . .	600,000		1,950,000	934,750
Total . . .	12,907,638	1392	41,917,324	21,159,761

There were imported in 1836, over and above our exports, 12,296,249 pounds of foreign wool, mostly of coarse quality, costing abroad less than eight cents per pound, and not subject, therefore, to duty.

Of this gross amount of wool, it is estimated that thirty-one million pounds were worked up in the manufactories, leaving twelve million for family manufacture, three million and a half of which are supposed to be used in New-York, three in Pennsylvania, and two in Ohio.

The woollen-manufacturing establishments in the United States are employed on the following fabrics, viz.: on broadcloths, 344; cassimeres, 178; satinets, 574; flannels, 158; jeans, linseys, &c., 210 blankets, yarns, and hats, 24; carpets, 61.

Hoosic has 37,807 sheep, the greatest number of any town in this state; and Dutchess county 234,294 the greatest number of any county in the state.

EXPERIMENT IN HARVESTING CORN.

In the November number of the Cultivator, 1838, we gave the result of an experiment in harvesting corn, going to show that it is better to cut it up than to top it. We now give the result of another experiment of the same kind.

In the first week of September we went with two neighbours into our cornfield, where our men were cutting up corn, and caused 36 hills to be cut up, of the fair average quality of the field, and stooked separately: adjoining which, 36 hills were topped in the usual way, and other 36 hills, immediately adjoining the last, were left to ripen upon the entire stock. On the 23d of September we proceeded to pick, husk, and weigh the corn on the several parcels. The result was as follows:

No. 1, cut up,	had 126 ears,	which weighed	56½ lbs.	
" 2, topped,	" 127 "	" "	52 lbs.	2 oz.
" 3, standing,	" 125 "	" "	52 lbs.	10 oz.

We found on trial the same evening, that it required 78 lbs. of ears to give a bushel of shelled corn. The field was planted at exactly three feet between the rows, and at about two feet four inches in the rows; but, assuming that the distance was three by two and a half feet, it would give to the acre 5808 hills; and there probably were not 20 hills deficient in five acres. With these data, the product on an acre, under the different modes of harvesting, would be as follows, omitting fractions:

No. 1 would give	9274 lbs.,	or 119 bushels.
" 2	" 8409½ "	" 108 "
" 3	" 8490 "	" 109 "

Although the parcels selected were supposed to be similar, it was perceived, after the corn was gathered, that an apple-tree, casting a shade from six to seven feet broad, stood in No. 3—the whole field being a young orchard—which undoubtedly had an influence in lessening the product of that parcel.

In regard to the condition of the grain in the different parcels, that of No. 1, which had been cut up and stooked, was unquestionably the best: it was dry, sound, and bright; while much of Nos. 2 and 3, which had been topped or left standing entire, had fallen upon the ground, was wet or mouldy, and

some of it had actually grown. The difference in the fodder was still more palpably in favour of No. 1; it evidently exceeding in value either of the other parcels more than one half.

In an experiment made by us last year, the loss in topping over cutting up was found to be about six bushels to the acre; in this last experiment it appears to be eleven bushels to the acre. The number of ears and the product are less this year than the last, owing to the drought. None of the suckers produced ears this year, though many produced them last.

This experiment confirms us in the opinion we have long entertained, that there is a prodigious waste, both of corn and forage, and, we insist, of labour also, in the still common practice of topping corn. And we again beg those who remain incredulous in this matter to make the experiment, as we have repeatedly done, and satisfy themselves. Say there are 300,000 acres of corn cultivated in this state, and that the loss by topping is only five bushels to the acre, the aggregate loss would amount to 1,500,000 bushels, equal in value to one million of dollars annually, to say nothing of the loss in labour and forage.

The reason why topped corn produces less than that which is cut up, although often stated, is here repeated: the topped corn is deprived of its elaborating organs—its lungs—the leaves above the grain; and, of course, receives no farther accession of growth, or but very little, while the corn that is cut up retains these organs, which continue to send down nourishment to the grain for some days through the green, succulent stocks. Any farmer may readily satisfy himself that leaves are indispensable to growth, by a simple and easy experiment: let him pluck all the leaves from a fruit-bearing branch of an apple, plum, or other fruit-tree, at any stage of growth of the fruit, and he will find that the

fruit on such limb will neither grow nor acquire its proper flavour, though it may change its colour.

CULTIVATION OF CUCUMBERS.

My object in this article is to describe the manner in which cucumbers are cultivated on Long Island for the supply of the New-York markets. I would premise, that the kind of cucumber grown is suited to field-culture, and that the great object is to have good fruit, and as early as possible, for two or three days make a great difference in its value in market.

Cucumbers will grow on any good soil; but, to have them early, we require one that is rich and sandy, and of a dark colour—yellow and light-coloured soils being later. The field should, if possible, be protected from the south and northwest winds, and be situated near the bay or river, where there is always less danger from late frosts. The south winds with us, in May and June, retard vegetation more than any other, in consequence of their being chilly and cool, from blowing over the ocean.

Ground intended for cucumbers we prefer ploughing in August or the beginning of September of the preceding year, and sowing it with rye: the pasture which this produces pays for the labour; and its other advantages are, the prevention of weeds going to seed to trouble us in the spring; the soil not blowing about in the winter, especially on the knolls, nor being so liable to blow when ploughed in the spring, on account of the roots of the plants, and the sustenance afforded to the crop by the decay of the rye. Previous to ploughing for the crop, there should be spread seven two-horse loads of street or horse manure to the acre; but if the soil is poor, more will be necessary, and the ploughing should take place immediately after the spreading. The ground is then harrowed over two or three times until it is quite mellow, furrowed shallow with a plough into hills four and a half feet apart, half a

shovel of manure dropped in each hill, which is then flattened down with a hoe, and covered about an inch thick with fine soil. Short hog-manure, carted out of the pen the preceding fall, and cut over once or twice early in the spring, and made fine, is preferred for the hills; but this not being in general sufficiently abundant, we procure from New-York in the fall the manure of cows fed on distillers' slops, mixed with that of horses, so as to make it sufficiently firm to handle with a fork, and mix it with the hog-manure. The manure should be cool, for fermentation in the hills is injurious to the plants.

The sooner the seed is planted after ploughing, the better: the time of planting depends upon the forwardness of the season, and it is generally commenced when single apricot blossoms are open, but some seasons earlier. About a week is occupied in putting in the first seed, and nearly the same period in planting over the second and third times. The casualties to which the seed and plants are subject, induces us to continue putting in seed almost every day for this space of time, so as to make sure work. It sometimes happens, when the weather has been unfavourable, that every hill in some fields is planted over the third, and even single hills the fourth time. I prefer spreading the first seed in the south half of the hills, the second planting in the northwest, and the third in the northeast sides: if it becomes necessary to plant the fourth time, I put the seed in the south half, where the first seed is by that time rotten. If this plan is properly followed, the different plantings will not interfere with each other. We generally put in from thirty to forty seeds each time, and cover them with fine soil from three quarters to an inch deep. Sprouting the seed previous to planting does not succeed well early in the season, though it sometimes answers well, when the weather is favourable, in the latter part. Cucumber-seed is the most tender of the vine kind,

for if, after planting at the usual depth, wet weather should follow, it is almost sure to rot; if the weather is dry, the seed dries out; if, when favourable to their vegetation, and the plants have advanced so as to be breaking ground, a storm should occur, they generally perish: a northeaster of three or four days' continuance destroys the plants when young, and, in some instances, when more than a week old; if they are up too early, a late frost is apt to sweep them clean. Seed, to vegetate, requires to be near the surface of the wet soil, not buried deep in it: our ignorance of the weather which will follow after planting causes most of our errors; when planted in a heavy soil, the seed is less liable to rot and dry out than in a sandy one, but the fruit is later. If it happens that there are more plants in a hill than we require, we find it an easy matter to eradicate them with the hoe and fingers; but it is not so easy to place them in the hills when deficient.

When the first rough leaves of the plants are about the size of a twenty-five cent piece, a cultivator is run through the rows both ways, and they receive the first hoeing: the plants are also thinned out, so as not to crowd each other. In hoeing, the soil between the plants should not be disturbed; large weeds (if there are such) should be pulled out, fine soil drawn around the plants up to the seed-leaves, so as to cover the small weeds, and the hill made flat, and not concave. We are careful not to hoe while the plants are very young; for, if a storm should occur shortly after the operation has been performed, the hills soak in too much water, which is injurious. Ten or twelve days after the first hoeing, the plants, if good, are thinned to six or eight in a hill, leaving the largest ones, and, if possible, three or four inches apart. About eighteen days after the first hoeing, or about the time when single blossoms open, we run a one-horse plough twice through a row each way (if the ground is hard, three times),

throwing the furrow from the hills, and then commence the second hoeing, which is performed in the same manner as the first, care being taken not to earth up higher than the seed-leaves, and to scrape out the crust between the plants if the ground is hard or covered with weeds : if the plants are fair, they are thinned down to five in a hill.

When the vines extend so that single ones meet each other between the hills, to prevent injuring them, they are carefully laid aside by hand, or with a short stick, and the cultivator is for the last time run once through the rows each way. They then receive the third and last hoeing, the ground being loosened and drawn up around the hills with the hoe, and broken between the plants with the fingers. It is customary to leave five plants in a hill, standing from four to five inches apart, but some reduce them to four : I have made no experiments to test which is the best.

Cucumber-vines will yield fruit about eight weeks, and the fields are picked over at least every second, and sometimes every day. In picking, a light stick, with a crosspiece framed to it, so as to resemble the letter T, is made use of to push the leaves aside, the more readily to discover the fruit.

The insects which trouble and destroy the plants are the black worm and striped bugs : the first are apt to be numerous in ground which was occupied the preceding year with red clover ; they cut off the plants at or just above the surface in the night, and are generally hunted out and destroyed early in the morning, when their burrowing is fresh, and they lay near the surface : the striped bug or yellow fly eats the plants in the daytime, and is sometimes very destructive on land where a crust is formed on the surface, which, being raised up by the young plants, affords them a harbour. The best remedy is to catch and destroy them with the fingers in the morning, when the dew is on them and they are

chilled, which prevents their flying and escaping as freely as when the sun has warmed them. Sandy land, having no crust to shelter these pests, is generally exempt from their depredations.

We are acquainted with the system of rotation of crops, and it has been practised among our farmers for years; but cucumbers, as well as some other vegetables, do not seem to require it. I have a piece of about half an acre, on which I have cultivated them for the last ten successive years, ploughing in the usual quantity of street-manure every second year, and they have flourished as well as on the adjoining ground, which has been similarly manured, and on which the crops have been changed.

The following is the number of hills planted, their produce, and the amount of sales for the last four years, viz. :

Year.	Hills planted.	Cucumbers sold.	Amount received.
1835 . .	6000 . .	104,965 . .	\$823 84
1836 . .	6600 . .	99,670 . .	820 96
1837 . .	7370 . .	130,735 . .	532 00
1838 . .	7110 . .	118,600 . .	734 87½

During each of these years large quantities of cullings, and, when unsaleable, good cucumbers, were fed to the hogs and cattle, of which no account was kept.

TUNIS G. BERGEN.

Narrows, L. I, October, 1838.

THE CIRCUMSCRIBED FARMER.

By this we mean such as possess a limited capital, and a *limited desire for improvement*, except in their own way; such as decline taking an agricultural paper, because it teaches nothing, they say, that is adapted to their practice or that is graduated to their scale; because, in fact, it is not oral, or delivered by word of mouth, but has been subjected to the operation of the printing-press.

Let us ask these gentlemen, if they were disposed to have their son become a first-rate farmer, wheth-

er they would select a teacher of circumscribed knowledge, who followed the practices of the last century, and knew only how to *kill land*, or one who was familiar with all the improvements of the age, and whose thrift in business was a guarantee that he *worked* it right? Now the agricultural journal is to the circumscribed farmer what the good teacher would be to the boy, an instructor in the improvements and best practices in his business, written by those who have made and adopted them, and have profited by them; and for the particular benefit of those who have limited means, or cannot go abroad for the information they need. The modern improvements in farming go to economize labour, or, rather, to render labour more productive and profitable, and to keep up the fertility of the soil; two objects of as much or more importance to the circumscribed farmer than to one of more extended means. The man who takes an agricultural journal profits by the experience of hundreds; while he who takes none can profit only from his own, and that, perhaps, of a few neighbours. The adage teaches that two heads are better than one, the world over.

These remarks are preliminary to some extracts we are about to make from John Lorain, a philosopher and a first-rate farmer, written for the special instruction of circumscribed farmers, to whose notice they are respectfully recommended.

"In this country land is very cheap: an excellent ready-cash market for the produce of the soil generally prevails. This offers every rational encouragement to the poor but industrious farmer, who depends principally on his own labour and that of his family for cultivating the soil occupied by him. He is but little affected by the high price of labour, or the idleness and insolence of workmen, which take place in every country where labour is scarce, unless the laws be oppressively severe.

“The principal reason why this class of farmers so seldom become wealthy, and but too frequently continue poor, is the desire of immediate returns from cropping, and the mistaken idea that the profits to be derived from rearing live-stock progress too slowly to answer their purposes. This induces them to crop the soil yearly, with but little attention to grass or an increase of cattle, until their grounds become so much exhausted that rest is absolutely necessary to procure crops worth gathering. The soil being greatly impoverished, and the seeds of the grasses destroyed, as far as perpetual ploughing and cropping can effect this ruinous purpose, the grounds rest with no other covering but that of some scattering and debilitated grass and weeds. This exposes the soil to the very injurious action of the sun, wind, washing rains, and melting snows. When such grounds are ploughed for crops, instead of being richly stored with grass-roots, and well covered by their tops, scarcely any vegetation is found to replenish them, or to nourish the crops grown on them.

“These ruinous practices naturally introduce poverty of soil, and its inseparable companion, poverty of purse. This, however, is not all: it entails on posterity the wretchedness introduced by their inconsiderate forefathers, or an Herculean task to counteract the curse of poverty which their negligence has produced. Whether Satan is also the instigator of this evil I do not presume to determine; but certain I am that it is much greater (so far as farming is concerned) than the curse entailed on the soil by the fall of Adam. That seems to consist simply in brambles and thorns, including with these such other vegetation as would compel man to earn his bread by the sweat of his brow. This curse, we may all see, is irrevocable; but we may also, at the same time, observe, that if man complies with Heaven’s mild decree, and removes those obstacles to the

growth of plants which better suit his purpose, agriculture flourishes, and his rational wants are abundantly supplied.

“But when the hand of folly inflicts the additional curse of poverty on the soil, this insatiable monster, like Aaron’s serpent, swallows up all the rest. Even brambles, thorns, &c. (the mild chastisement of Heaven), cannot prosper where poverty has obtained dominion over the soil, as may be readily seen; for these, and all other vegetation on such grounds, look sallow, starved, and debilitated.

“That man is inexcusable, and ought to be punished for this sin against common sense, himself, his posterity, and the community in which he resides, is evident.

“Before this inconsiderate being enters the forest, glade, or prairie, nature has been for ages enriching the soil for his use. This fertility might be preserved and increased, even by the circumscribed farmer, if a system of agriculture calculated to keep the ground fully replenished with decaying animal and vegetable matter were practised, and due attention paid to the augmentation of livestock in proportion to increased ability, instead of the ruinous practice of perpetual ploughing and cropping.

“Reason alone demonstrates this interesting fact. It has also been clearly shown by actual practice in almost every neighbourhood—by the successful enterprise of farmers who commenced their business on lands bought on credit, and covered with timber, without any buildings on them, and with not more than a pair of working cattle, and cows barely sufficient to supply the family with butter and milk. Nay, more: some who were not half as well off as this have paid for their land, acquired an extensive stock of cattle, and become wealthy, though their mode of management was very inferior to that which has been proposed. They, however, increased their livestock in full proportion to the

means furnished by the system of management employed by them.

"From first to last, they have been enabled to live better, and far more independently, than those who relied principally on the plough. The cause of this is evident: milk, butter, cheese, wool, meat, hides, and manure, are continually increasing. It is true that but little manure could be obtained in the beginning: that little, however, was spread, the product was greatly increased, as was also the fertility of the soil for a succeeding crop, and the grasses following it. Where is plenty of good grasses and hay, young cattle will grow as much or more in one year than they do in two when kept on pasture fed bare during summer, and on straw through the principal part of the winter.

"It is proper to remark, that, although many circumscribed farmers make considerable progress in increasing their livestock, their laudable enterprise is too often suddenly checked before they obtain half the number of domesticated animals necessary to the proper cultivation of their grounds.

"This evil originates in the prevailing error, that huge piles of stone and mortar, or of boards and scantling, are the best means that can be pursued by the cultivator to improve his farm. Hence it is that we see, almost in every part of Pennsylvania where it is possible to effect this mistaken improvement, extensive barns and dwelling-houses standing on farms where we do not observe half the quantity of grass or number of cattle necessary for the proper cultivation of the surrounding soil."

ON THE APPLICATION OF MANURES.

Whether by the term *manure* be understood all things commonly so called, or only putrescent substances, I have had but one opinion for a long time in regard to their application, and this has been confirmed by all my subsequent experience, each year

adding something to the great mass of consentaneous facts. When my attention was first turned to this subject (some thirty-five or forty years ago), I had adopted, but without examination, the notion at that time most common among us, that it was best to let all putrescent manures be well rotted first, and then bury them deep, either by the plough, spade, or hoe. This notion, like the common law, was so old, that "the memory of man extended not to the contrary;" but, happily for us all, the revolution had broken the entail of opinions as well as of landed estates, and left us at liberty to think and act for ourselves. The natural consequence of this increased freedom was the introduction of many new practices in the arts as well as in government; and agriculture came in for some small share of these benefits. Among them was the application of putrescent manures to the surface, and in a much less fermented state than had ever been tried before. But so dreadfully afraid were the first experimenters of the formidable laugh of that once numerous family, "The Goodenoughs," that they made their trials, as it were, by stealth; and, consequently, the results remained for a long time unknown, except to a few. I happened to be among this small number, and could not long resist the evidence of my senses, although I must confess that at first it seemed to me a sort of sacrilege even to doubt, and still more to act, in direct opposition to an opinion which, for aught I know, had descended from Triptolemus himself. By degrees, however, my courage waxed stronger and stronger every year, until I felt myself brave enough to commence the following experiment, which several old farmers, in whose veracity I perfectly confided, had assured me they had often tried, and always with the result which I am about to report in my own case.

I began penning my cattle late in the spring, and continued it until frost in pens of the same size,

moved at regular intervals of time, and containing the same number of cattle during the whole period. These pens were alternately ploughed and left unploughed until the following spring, when all were planted in corn, immediately followed by wheat. The superiority of both crops on all the pens which had remained unploughed for so many months after the cattle had manured them, was just as distinctly marked as if the dividing fences had continued standing: it was too plain to admit even of the slightest doubt. A near neighbour, a young farmer, had made the same experiment on a somewhat different soil the year before, but with results precisely the same. Similar trials I myself have made, and seen made by others, with dry straw, alternately ploughed in as soon as spread, and left on the surface until the next spring. In every case the last method appeared to be the best, as far as the following crop could prove it. The same experiment has been made by myself and others with manure from the horse-stables and winter-farm pens, consisting of much unrotted corn offal, and, without a solitary exception seen or heard of by me, the surface application, after the corn was planted, produced most manifestly the best crop. Upon these numerous concurrent and undeniable facts my opinion has been founded, that *it is best to apply manures on the surface of land*; nor is it likely to change until I see a still greater number, equally well authenticated, on the opposite side: up to the present time I have not heard of a solitary one. True it is that I have read many ingenious, fine-spun arguments in opposition to the opinion which I hold in common with numerous other agriculturists, but no proofs whatever have accompanied them, and therefore I must remain incredulous until they are sustained and corroborated by such facts as should always be deemed indispensable to establish any practice whatever in any of the various branches of husbandry.

To collect these facts is a slow and tedious process, not very flattering to that pride of opinion which delights in speculative theories, and which sickens at the thought of the labour necessary to make and record accurate experiments in agriculture. In no other way, I think, can we account for those differences of opinion as to matters of practice which are often found among our brethren where all the facts are on one side. But unwillingness to believe in that which we cannot explain in some way to gratify our vanity, gave rise to the sect of skeptic philosophers, and, it is to be feared, will keep up the race as long as the world stands. Let me not be here misunderstood. Far be it from me to object to theory and speculation, provided the sole object be to arrive at truth. As this should be the aim of all, I am in favour of the utmost latitude of discussion in the honest pursuit of it. But I do, and must ever protest against that practice, which is far too common among us, of regarding plausible and apparently scientific conjectures more than the actual results of experiments fairly and accurately made; so that not unfrequently we indulge our fancies with the former, even in direct opposition to the latter. Take, for example, the two conflicting theories as to the best mode of applying manures, and test them by the uniformly-concurring results of the several experiments which I have stated. All these results undeniably prove that the surface-application was the best, although the kinds of manure differed considerably. And what *facts* have we in opposition to this? Not one: nothing but the conjecture that the evaporation from surface-spread manure must carry off the greater and the best portion of the food of plants therein contained. But that such evaporation cannot so act seems to me to be unquestionably proved by every fact I have mentioned: for, *if it did*, then the land of summer cattle-pens, ploughed up as soon as the cattle were removed, would in

every case have produced better crops than that of the *unploughed*, instead of doing it in none. Similar results, too, must have followed in the other cases which I have stated, whereas I have never seen nor heard of their doing it in any one.

My belief, founded on the facts already stated, is, that all the fertilizing substances of manures are soluble in water, and will remain uninjured themselves, and useless to plants until the solution begins, whether they be deposited *on* or *under* the earth's surface. I also believe that this solution is caused by every fall of rain, and is immediately absorbed by the subjacent soil, which absorption results from two causes: first, the principle of gravity; and, secondly, the stronger attraction of the earth than of the atmosphere for every substance in solution which constitutes the food of plants—moreover, that the earth never parts with this food, when thus absorbed, to anything but the plants themselves; for it is *their* peculiar aliment, and not that of the atmosphere, whose existence, for aught we know to the contrary, is entirely independent of it, although its agency seems essential to the health and vigour of all plants. If this were not the fact; if, for example, the earth did give the best and greatest portion of this food to the atmosphere, or if it escaped from surface-spread manure before gravity and attraction could impart it to the earth, then the evaporation which is supposed to be the medium of conveyance, and which is known to be constantly going on from the soil, would, in process of time, certainly render it barren, even without any cultivation whatever. Yet neither total nor partial barrenness is ever known to be produced by any other cause than incessant culture without manure. That evaporation does take off something from manure while in a moist state, is proved by the offensive smell which constantly exhales from it until it is entirely dry. This smell arises from a gas which is said by some

to contain the most valuable portion of the food of plants. But admit the fact, where is the proof of this portion being lost? I say there is none. On the contrary, we have what I consider a conclusive reason for believing that this food is immediately given by the atmosphere to the tops of plants, as more suitable to them than to their roots. My reason for this belief is the result of the following experiment, which I have known to be repeated several times. All the bark was taken off from around the body of certain young trees, in a ring about three inches wide, for the purpose, in the first case which I saw, of ascertaining whether this process would kill the tree. But, to the surprise of us all, not more than a year or two elapsed before that part of the body above the ring became obviously larger than the part below; and this difference in size increased every year afterward, as I had frequent opportunities of noticing.

Another reason why I believe that manures act better spread on the surface of land than buried under it in the customary manner, is, that, in the first case, the rain-water carries the dissolved substances no deeper than the roots of most of our cultivated plants; and that these substances are there held fast by the earth's chymical affinity until the stronger attraction of the spongioles of the roots begins to act upon them. But, in the second case, that is, where manure is ploughed under as soon as spread, all the food of plants contained therein being placed at once quite as deep as their spongioles naturally extend, and this, too, before the rains begin to dissolve it, the subsequent solutions necessarily sink still deeper, and generally beyond the reach of the plants for whose nourishment they are designed. In no other way can I account for the long-noticed and invariable superiority of crops produced by surface-spread manure to those produced by that which has been ploughed in. To me there appears to be

but this alternative: either to deny the facts already stated, which I myself have often witnessed, or to explain them (if we must theorize on the subject) in some such way as I have attempted to do. Permit me farther to add, that on this subject nature herself seems to offer us a useful lesson, if we were not too wise in our own conceits to be taught by such an instructress; for I know not a single exception to *her* practice of depositing on the earth's surface all the putrescent substances, of every nature and kind, which appear designed to preserve her fecundity.

In close connexion with this subject, there is one other matter on which I will take the liberty to express an opinion: this is in regard to the best state in which manure can be applied. So far as my own experience enables me to judge (an experience confirmed by that of many others, in whose practical knowledge of the subject I have great confidence), I believe that the fresher it is the better; for in this state so much less will suffice than in a more advanced stage of putrefaction, that time, labour, and value are all saved in the application: while none of the alleged "*burning*," ascribed to manure's being "*too hot*," ever occurs if the quantity used be lessened in proportion to its freshness. This injury to plants, if I mistake not, is always caused by *excess* in the quantity, and not by the *quality* of the manure we apply to them, although the two things are often confounded, and thereby contribute to the perpetuation of error in regard to the nature and operation of all fertilizing substances. There is not, I believe, an agriculturist of any experience in our country who has not had frequent opportunities of witnessing numerous facts to prove the correctness of these opinions. But, as I before remarked, we are all vastly fonder of our own fancies than of facts in opposition to them, and, consequently, pass by all such without notice; or, when too strong and ob-

trusive to be entirely disregarded, we spare no labour nor pains to force them, as far as we possibly can, to support some previously-conceived notion which our silly pride forbids us to abandon. This obstacle to the progress of all improvement, but especially in husbandry, is one of the most pernicious of our besetting sins; and, *but for this*, it seems to me impossible that any controversy should still exist in regard to the best manner and state in which to apply manures to land. Two or three years, at farthest, would have been amply sufficient to establish the most beneficial practice, if all those whose special interest it is to ascertain it would have diligently and impartially resorted to comparative experiments, accurately and assiduously made for the purpose, rather than to speculating and theorizing about it. But it can never be too late to make such experiments. Let me, therefore, most earnestly recommend to all who have doubts on the subject, forthwith to commence making trials of the different methods of applying manures, and also of the different states in which it is best to apply it. The opinions of experienced men are certainly well worth consulting in regard to all matters connected with their respective trades, professions, or callings; but we should never implicitly take them as guides for our own practice any longer than until we can have leisure to test their correctness by actual experiments. When a number of these concur in producing the same uniform result, it is matter of very little comparative importance how others may endeavour to account for the fact, as the fact itself is the all-important thing, especially in every practical art. But this war between speculation and practice, between nature's doings and our fanciful ways of accounting for them, is destined, I fear, never to cease so long as such a thing remains in the world as pride of opinion. Let a man once commit himself so far (either in speaking or writing) as publicly

to deliver what he considers an argument in support of his *ipse dixit*, and there are a hundred chances to one that he persists in it to the day of his death.

JAMES M. GARNETT.

Fredericksburgh, Va., June, 1839.

EFFICACY OF LIME IN PREVENTING INSECT DEPREDATIONS—MILDEW OF THE GOOSEBERRY.

In the Cultivator for May, 1839, page 57, I noticed a communication which stated, among other things, that a piece of corn, on ground where fragments of wall, &c., had been strewn for manure, was exempt from the ravages of worms. This recalled to my recollection some facts which were communicated to me in conversation some time ago by an intelligent old gentleman, who was for many years a farmer in Columbia county, in this state, and which were in substance as follows: He once applied what he supposed at the time was plaster or gypsum, but which was afterward ascertained to be lime, to a number of hills of corn, potatoes, cucumbers, melons, &c. It was used at the time of planting, about a handful being thrown directly over the seeds in each hill previous to their being covered with earth. He remarked that the corn to which this application had been made was entirely exempt from worms, while other pieces in the vicinity suffered severely from their depredations. The cucumber and melon vines, &c., thus treated, were also exempt from their attacks, neither were they troubled by the striped bugs or flies with which they are generally attacked. My informant farther assured me that he had afterward repeated this experiment a number of times, and always with a like satisfactory result. It would seem from this that lime is to a great extent a preventive of the ravages of the grub and other insects, when applied at or previous to the time of planting. The mode practised by my informant may not answer for all soils and situations, but the same result

might probably be attained by throwing the lime mixed with earth over the surface, and ploughing or harrowing it under previous to planting.*

There are in my garden some young gooseberry-bushes which have been well manured and pruned, but the fruit, since they commenced bearing (about three years ago), has been uniformly *rusty*, as it is commonly termed. To prevent this, I have tried several remedies without success. Last year, seeing salt dissolved in water somewhere recommended, I had it sprinkled over the bushes several times, commencing when they were in blossom, but without any effect. I have also tried lime (recommended, I believe, in the Cultivator). Last fall it was applied freely about the roots, and the branches whitewashed as thoroughly as practicable, and a small quantity mixed with water was sprinkled over the bushes two or three times this spring. E.

THE PHILOSOPHY OF PRUNING.

We apprehend that the common practices in this branch of rural labour are not altogether based upon a sound philosophy. The animal structure, we all know, is admirably adapted to its wants, its habits, and its uses. There is no surplusage; no useless encumbrance; all is necessary to fulfil the designs of nature. From analogy, then, and from the sys-

* *Remark.*—We have cultivated the gooseberry eighteen years, during sixteen of which we lost most or all of the crop by mildew or rust; but the last two years the fruit has been fine, clean, and healthy. We impute the recent exemption from these diseases to the application of brine (salt and water) to the ground about the bushes in the month of February the two preceding years. We consider the mildew a vegetable parasite, which abides permanently upon the collar and root of the bush, and from which seeds are disseminated, under a suitable state of the atmosphere in summer, to the fruit; and that the application of salt, when vegetation is dormant, destroys the parasite without hurting the bush. Pickle may be used in the growing season at the rate of one ounce of salt to one gallon of water. In winter it may be made much stronger.—*Cond.*

tem and order which everywhere pervade the visible creation, is it not reasonable to infer that every part of the vegetable structure is alike essential to its well-being? Are not the branches and leaves as indispensable to the tree as the limbs and lungs are to the animal? Who will say otherwise? Nature produces nothing in vain. Although we may *assist* in carrying out her designs, we cannot cross her purposes without suffering the penalty imposed for a violation of her laws.

No one part of a plant can be affected without at the same time affecting the other parts. Roots and branches reciprocally produce and nourish each other. If a tree has part of its roots destroyed, the branches which these support will decay; and when, on the other hand, some of the branches are destroyed, a portion of the roots will perish also. The extent and form of the one will, in a measure, ever correspond with the extent and form of the other. If a young tree be kept close pruned—divested of its limbs and foliage—it will soon be stunted in its growth, the wood will become carious and diseased, and the plant will be short-lived. If, therefore, we destroy the equilibrium which nature has established between roots and branches, by greatly diminishing the one or the other, we thwart her designs and mistake our own interest. Every branch has its roots—its mouths—in the soil, to supply it with the elements of its nourishment; and every root has its branch and its leaves—its lungs—in the air, to convert those elements into food for the joint benefit of them both and of the stem. One cannot attain growth without the co-operation of the other. Without the roots the plant cannot receive the elements of its food, and without the leaves, those elements, when taken into the system, are of no benefit; but, on the contrary, like undigested food in the animal stomach, generate disease instead of promoting health and vigour. Every leaf performs its office

in the process of nutrition and growth ; and, other circumstances being alike, the increase in the growth of the plant will be in proportion to the number of its healthy leaves : if one half of these be destroyed, the growth will be only one half as great as if the whole had remained ; and, if complete defoliation takes place, the growth will entirely cease. Hence pruning decreases growth in proportion to the extent or severity with which it is practised.

“ Whenever a tree has a live spray cut from it, an injury is inflicted on that tree that can never entirely be repaired. Every wound received is stored up ; and if wounds be constantly added, they will accumulate to a degree too great to be borne, and the tree will sink under its infirmities. It is useless to attempt to transfer the timber of the boughs to the stem, or to confine the growth entirely to it. However desirable it may be to the pruner to have all the growth diverted to the increase of the stem, he never will be able to effect it. He may, like the dog, snap at the shadow and lose the substance ; but never will he be able, by pruning off the boughs, to increase the growth of the stem one jot. No : the size of the stem will be in proportion to the head it has to support. The stem is not, as he may imagine, a production formed merely for the use of man ; it is the canal or passage in which the juices pass between the roots and branches ; and the size of this passage is always in proportion to the offices it has to perform. If the number of branches [meaning to include leaves] be increased, the quantity of sap passing between them and the roots will be increased ; a greater space becomes necessary for the increased quantity of sap, and, consequently, the stem is increased. Let the head of the tree increase, and, depend upon it, there will be a corresponding increase of the stem.

“ It is said to be right to cut away a small proportion of the weaker branches, and thus turn the cur-

rent of the descending sap more abundantly into the stem. It is hard to understand what is meant by this explanation of the effects of pruning. Does the sap descend down the stem till it arrives at the weaker branches, and then ascend up them and increase their size instead of that of the stem? If so, the weaker branches would soon become the stronger; or, rather, if trees have the property of sending the sap from the strong branches to the weaker, all the branches would be equally strong. The descending sap, on reaching the weaker branches, would become ascending sap. And if the small branches be considered obstructions, preventing the descent of the sap, the large branches must be greater obstructions. But where does the sap descend from? Pruners forget that they cannot cut a live spray from a tree without lessening the quantity of its leaves. Their theory is founded in error, and all their reasoning is false."—*Ballard, in Farm. Mag.*

This explains what often seems enigmatical to superficial observers in vegetable economy, viz., that moderate-sized trees from a nursery have ordinarily a much thriftier and healthier growth, and arrive sooner to a good bearing state, when transplanted, than trees that are very large. In the former, the natural proportion between the roots and the branches is preserved, the roots being taken up nearly entire; the sap-vessels, therefore, are filled, and the growth is but partially retarded. While, in taking up very large trees, whose roots have greatly extended, the mouths of the plant are seriously diminished, the sap-vessels contract and become indurated in consequence of the diminished supply of sap, and the tree must acquire new roots and new sapwood by a slow process of growth ere it can flourish with its accustomed vigour. The same evil results from cutting off the entire top of a tree. It is deprived of its elaborating organs; and, although

the root may send up the elements of food, they cannot benefit the plant for want of leaves to convert them into vegetable blood. It is no argument against this position, that deciduous trees spontaneously develop foliage and flowers in the spring. There is a store of elaborated sap laid up in autumn to effect this. Strip a tree entirely of its leaves in June, when this store is exhausted, and the tree will not grow, and probably will die. The stem, at least, will sustain serious injury. The nurseryman knows that, after an apple, pear, or plum stock has been cut down and grafted upon, the heart-wood becomes unsound if the graft fails to grow, and the whole stock dozy, and, in a manner, worthless for a future scion, and that it will not grow a particle above where it sends off suckers.

The tendency of pruning to generate disease and to shorten the life of trees is illustrated in the appearance of old orchards which have been injudiciously pruned. Wherever a limb is split off by winds or accident, it will be seen to expose a diseased heart-wood; and this disease at the heart spreads to the roots and branches, and induces premature death. The natural duration of the apple-tree is believed to be more than one hundred years; and yet how few are found in a healthy state at fifty years! Mark the contrast, in soundness of wood, in vigour of growth, and in duration of life, between the apple and other frequently-pruned trees, and those trees, whether fruit or forest, which are left to luxuriate naturally, without the artificial aid of the pruning-knife.

If pruning be prejudicial to growth and longevity, why, then, we may be asked, prune at all? We answer, for utility, to give beauty to the tree, and to improve and increase the fruit.

In natural forest-growth, trees attain height, and a straight, clear timber form, from their crowded situation; and as the lower branches become useless,

they die and fall off. But in cultivated grounds, or where there is ample room for roots and branches to spread, this does not take place; and hence the propriety of pruning here to obtain a good stem for timber, or a handsome top for shade and ornament. Often there are two or more leading shoots striving for the mastery, and, unless they are shortened or taken off, there will be two or more stems of diminutive size, instead of one of larger size. We may therefore prune shade-trees to improve their form or to please the fancy, and timber-trees to improve the bole; but in neither case do we either increase the growth or prolong the life of the tree.

"As the twig is bent, so will the tree incline," is literally true in regard to pruning. We can give almost any form to trees which fancy may conceive, by beginning early, and persevering with the pruning-knife or shears, as is often witnessed in clipped hedges and in ornamental garden-grounds. We may make them dwarfs or standards, or give them a thin or dense foliage at our pleasure. They may be trained or cut into the shape of animals, into geometrical forms, or architectural or sculptural compositions.

We prune fruit-trees to improve the fruit and to induce a bearing habit. The roots of trees take up from the soil a certain quantity of vegetable food, call it geine, or humus, or organic remains, or what you please; it has previously constituted parts of vegetable structure, and is convertible by natural processes into wood or fruit, or both. If the tendency of the plant is to wood, as is generally the case with all healthy young trees, the fruit will be scanty and inferior, at least till the tree has attained to mature size. But if the tendency to growth is checked by poverty of soil, disease, or judicious pruning, the tree will be brought into a precocious state of bearing, and, in the case of judicious pruning, produce more and better fruit.

In pruning or training to induce a fruit-bearing habit, the object is to check the uninterrupted, and, we may say, natural descent of the elaborated sap to the root, by encouraging a horizontal instead of an upright growth of the branches when the tree approaches the bearing age. This causes a stricture in the descending sap-vessels at the bifurcation or junction of the branches with the stem, and a consequent accumulation of elaborated sap in the branches, to generate fruit-buds and to swell the fruit. The same object is sometimes, though injudiciously, effected by cutting out a narrow circle of bark, or by ligatures, to prevent the descent of the elaborated sap. Hence the upright shoot is often cut out, particularly in the apple-tree, and the branches are trained horizontally, diagonally, or in a half-inverted position, as on walls, espaliers, and in the *en queneille*, or distaff form of training. These operations have also a tendency to improve the quality of the fruit, by giving it a better exposure to the kind influences of the sun, air, and light, all essential to its due maturity and high flavour. Nature provides for the propagation of the species by producing perfect seed, leaving to art the labour and contrivance of enlarging and enriching the pulp or fruit. All fruits may be improved from their natural state by artificial culture, though nothing can be added thereby to the intrinsic value of the seed or the natural duration of the tree. The seeds of the wild crab or wild pear are as good to sow for stocks to graft or bud upon, as the seeds of the cultivated varieties of these fruits; and, indeed, according to Dr. Van Mons's theory, which his practice seems to have confirmed, they are the best from which to start new varieties.

Prune, therefore, when necessary to improve timber; prune for ornament; prune to improve the fruit; but do not-prune in the hope of accelerating growth or of prolonging life. And, in all your pru-

nings, cut while the wood is small, and spare to the tree all the foliage you can consistent with the object you have in view. By pruning when the tree is young, and pruning often, we may secure a handsome stem and a well-formed head, and we cause no wounds that do not speedily heal.

The common practice is to prune in autumn or spring, when the tree is divested of foliage. To this practice we make two objections. In the first place, the wounds are exposed (unless covered with a suitable composition) to the searching and corroding influence of the sun, wind, and rain, there being no leaves to shield nor circulating pulp to heal them. In the second place, it causes the multiplication of suckers, and often increases the evil which it is designed to cure. The sap is arrested in the spring, when its flow is greatest, in its natural course to the amputated branches, oozes out and corrodes the bark and wood, or exhausts itself in the production of a prolific growth of suckers, more detrimental to the tree than the parts that have been lopped off. If pruning is performed the last of June, when the exuberant flow of sap has abated, the wounds are in a measure protected by the foliage from the weather; much unelaborated has then become elaborated sap, transformed into cambium or pulp, whose healing qualities soon cover the edges of the wound; few or no suckers are generated, and the heart of the tree is preserved from canker and decay. These opinions as to the propriety of summer-pruning have been confirmed in our mind by three years' practice and observation.

Another common error in pruning is the practice of cutting all the lateral shoots from a young tree except a few at the top; and to cut young, vigorous wood from the tops of old trees, leaving long, extended, naked branches, which are often broken by the winds. In the first case, we obtain long, spindling stems, incapable of supporting, when trans-

planted to an open situation, a good top. The same evil occurs in the nursery or the forest, when the young trees stand in a crowded position. In the second case, we produce unsightly and comparatively unproductive tops. Since the offices and the importance of leaves in the vegetable economy have been better understood, a manifest improvement in pruning has taken place. It is now contended, and, we think, upon correct principles, that none, or but very few of the lateral branches should be cut entirely from young trees until the tree is tall enough to form a head; and that the pruner should be content with *shortening* those which interfere with the main stem, and such as are of unreasonable length. By this means we get a tapering and straight stem, and retain the aid of a large portion of the leaves towards its enlargement. Every leaf contributes to the growth of the stem below the point of connexion. When the tree has attained a proper height to form the top, it is advisable, particularly with the apple, to cut out the upright shoot, leaving three, or, at most, four lateral branches upon different sides. If a little attention is afterward annually given to cutting out the small limbs which are likely to cross or interfere with each other, the necessity of cutting off large branches will be for a long time prevented. In old trees, the older branches frequently become cankered and diseased, and young, thrifty wood is thrown out at or near their base. In this case, it is always preferable to cut away the diseased wood, leaving the healthy shoots to take their place. In transplanting trees the knife should be used sparingly. If the roots are greatly diminished in digging up the tree, the top may be lightened by thinning its branches; or, if none of these can be spared without marring the form, the longer branches may be shortened, or cut in at a bud; but we do not advise, in any case, the cutting off the entire top.

THE MIND AND THE SOIL.

In cultivating the soil, we have our seed-time and our harvest-time; and we all very well know, that if good seed is not deposited in good time, the harvest will either be scanty or altogether fail. We can reap only what we sow, unless it be the weeds and noxious plants which spring up spontaneously from our neglect. So it is with the mind. It has its seed-time and its harvest-time; its vernal season of youth, and its summer season of manhood. And the good seed we sow in the young mind will as assuredly grow and give its increase as that which we deposite in the soil. Our crops tend to increase our wealth and add to our animal enjoyments. The improvement of the mind not only tends to these desirable ends by aiding the labour of the hands, but it tends also to knowledge, to virtue, to happiness.

Do we estimate these things rightly, and assign to each its relative value? Do we not graduate the wages of the labourer who cultivates our soil by the measure of good he can render us? And do we not graduate the wages of the teacher, who cultivates the minds of our children on a very different principle, by the small amount which his wants or his limited capacity induces him to take? While we make merit the criterion of our choice in the cultivation of the soil, do we not too often make the want of it the criterion in choosing the cultivator of the mind? And yet all must acknowledge that qualification and excellence are as much more important in the latter than in the former, as mind is superior to matter, as a good man is superior to a good crop. Who would not feel a higher pride in rearing a family of intelligent, virtuous, and useful children, than in rearing a fine beast, or in raising a great crop of corn? Let us try to mend in this matter; to get good labourers in the mental and moral no less than in the vegetable field of culture. Then shall our children "rise up and bless us."

CHAPTER XI.

MISCELLANEOUS ARTICLES—CONTINUED.

Caleb Kirk on Hedging.—Animal Nutrition.—On the Use of Gypsum.—Choked Cattle.—Specific Food in Soils for Plants.

HAVING preferred plashing to any other mode that I had seen made use of in training a hedge, I began the process when the stalks were about an inch in diameter near the root, and from that to an inch and a half: if well attended to in their previous growth, they will attain that size in six or seven years after they are planted; but, if neglected, they may require double that period. It may be observed, that no advantage is gained by plashing before a good *root* is formed, for that is the future support and basis of the superstructure. By having a good strong root, the cutting or wounding the top or body of the stalk will soon recover from any injury received in the necessary work of plashing, which is done by cutting the body of each stalk with a hedge-knife or pruning-hook, bending the stalk with one hand in the direction it is to be laid, at the same time, by a stroke of the knife with the other, about four inches from the surface of the ground. If one stroke should not prove sufficient, a second or third may be applied, being careful to leave as much of the wood uncut as to afford the sap to flow into the top, and yet to bend easy into an inclined position of about forty-five degrees' elevation from the base or bank on which it stands: one third or one fourth of uncut wood is sufficient to supply sap to the plashing, which must bend easy, otherwise it would incline to rise out of the proper degree of inclination. Much depends on this circumstance in forming a good and

uniform hedge ; the plashings should not press one upon another so much as to prevent a free and unobstructed circulation of air, and the sun's rays also, as the health and vigour of the plashing is much promoted thereby. If there should be too much wood in the hedge, by planting too close or any other cause, it must be cut away, leaving no more than what is really necessary to form the basis of a good and lasting live fence. One of my errors was suffering too much brushwood to be crowded into my first live hedges, both living and dead ; brushwood, such as was cut away in some places where too thick, and filled in where too thin. In order to make a *present* fence, I was induced to suffer it to be done in this way, from the recommendation of my hedger, who was from the west of England, and had been in that practice ; for the immediate making a fence of such materials as he had to do with, I readily gave *his* judgment the preference, he having had experience in the business.

But my observations in two or three years more convinced me of the impropriety of introducing dead wood to fill every vacancy, as well as crowding too much of that which was living. I had much of it to remove in places where a want of health demonstrated the present evil. After this was done the remaining part became more healthy, but it remains thin, and never will overcome the injury. There seems to be no inclination to put out shoots from the old wood in those vacancies, which would have put forth shoots when newly laid if no obstruction had been present.

I find it is best to trim off the branches, especially the large ones, though not very close to the body of the stalk. It shoots young sprouts more abundantly from the plashing, which rise in an upright form, as well as those from the stumps shooting up through the plashing ; interlocks the whole together, holding the plashing in their place as crossbars, and forms

a kind of lattice-work. On the contrary, if the plashing is too crowded, the shoots rising from the stump will evade the thicket and push out in a lateral direction, endeavouring to gain the benefit of sun and air, and rise on the outside, where they are injurious instead of beneficial; by secluding the plashing from the benefit of sun and air, the sap no longer inclines to the plashing, but flows freely into the suckers on the outside.

I have been more particular on this point, having seen errors in others, as well as my own, on that head.

Previous to laying a hedge, a quantity of stakes are to be provided about four feet and a half long if it stands on a bank, or a little longer if the ground is not elevated, and split as small as they will bear to drive about one foot in the ground; they are to be driven through the plashing occasionally, as the work progresses, in a straight line two feet and a half or three feet distant from each other. These stakes are driven through the plashing, so as to keep

the part laid directly over the stumps, for reasons before given, the shoots rising immediately through the plash: the stakes are bound in their place by wattles or poles, prepared of alder or willow, or anything that will not in future make useful timber, as their use is only temporary, until the hedge becomes set by growth.

This binding has the appearance of a twisted rope.

If rightly done, it steadies the head of the stakes, and keeps them in a direct line, and serves the purpose of holding straggling shoots that may be directed under its confinement, and confines the top of the hedge, holding it steady for trimming until its own growth gives it stability.

The next year after being laid it should be examined, and any shoot that inclines to leave the right direction should be cut away, unless there is a vacant spot to receive it; then it ought to be introduced into such vacuum. By frequently trimming the superfluous branches off, the body becomes more dense and impenetrable.

About five years past I adopted the summer trimming about the middle of June, and found it much easier to accomplish while the shoot was in a tender state; and I have regularly done the trimming in that and the following month ever since, finding the labour much easier performed, and no bad effect on the hedges, though warned by some to the contrary, apprehending bad consequences to arise from cutting at that season.

The present season having been excessively dry and warm, I have not discovered the least injury: they have held their foliage as well as usual.

My conclusion has been, that by cutting when the sap is in full flow, and taking away the small shoots that were carrying off a considerable portion for their support, that portion must diffuse and spread through the whole body of the hedge, and add strength to every remaining part.

The foregoing remarks will apply to either kind of thorn as it regards the treatment of them; but the Virginia kind has advantages, though not so rugged in appearance as the Delaware: they are more uniform in their growth, and give regularity and uniformity to the hedge. But what is very important is their inclination to send out an abundance of shoots or suckers when cut, not only from the

stump, but from the plash also : the latter is not the case in the Delaware thorn ; they seldom afford shoots out of the plash ; except where the top end is cut off, the suckers will rise.

To attain a regular distribution of shoots from the plashing, we must be mindful to give every stalk laid a proper degree of slope or inclined plane, as before observed : by that means they are likely to rise on the body of the plash. If too much elevated, the sap flows to the head, and produces a cluster at that point ; and if laid too much in a horizontal position, the sap is not encouraged to follow that direction, and will produce suckers from the stump only, leaving the plash without sufficient nourishment to become useful, and which must consequently decline.

It will be readily understood, that the more generally we can direct the flow of sap through the whole body of the hedge, strength and uniformity is thereby promoted, it becoming healthy in all its parts. After that object is attained, all that is necessary is the keeping it within proper limits by trimming.

The figure represented on page 278 is a view of a section of newly-plashed hedge divested of foliage, after having formed the first shoots from the old stalks, making the first effort to fill the vacancies, and seven years old before it was cut. This figure

represents a section of one that has been laid seven years and annually trimmed, being in full foliage at

the time the drawing was taken. The first, showing the skeleton of a hedge, may be useful to demonstrate the subject in that stage of its progress to maturity. This figure presents an end view of the section represented on page 280, showing a correct view of the shape which I preferred for forming a hedge the most impenetrable at the bottom; these views are elevated on a bank from a foot to eighteen inches high, which was formed from repeated dressings, as they required fresh earth to cover the grass about the roots, which retards their growth in a young state remarkably if not kept down. This elevation gives the hedge a much more forbidding appearance to ungovernable animals.

The trimming may be done with a hedge-knife about eighteen inches long, with a hooked point, used with one hand, or with any other sharp, light tool that may best suit the operator, making the stroke upward rather than downward: the root being secure in the ground, it will not give way before the stroke as it would in making the stroke downward. The last trimmings of these specimens were made with a common grass-scythe, as the mowers were cutting the grass in the field. I found, by applying the scythe to the hedge, it was an expeditious mode, though rather unhandy to strike upward; but a little practice overcame the difficulty.

After viewing these specimens of hedges produced by the foregoing mode of management in a given time, it will be information. I have no doubt, to some, sufficient to determine their choice whether a dead or living fence is to be preferred.

I made the choice upon an imaginary view, without having the advantage of ocular demonstration, and without any idea of the comparative expense, or even attempting to make any calculation on the sub-

ject, as I had made up my determination in favour of a live fence.

There are now some data to form an estimate upon; and the subject is of such a nature as to require a series of years to gain the desired object; yet I have confidence in believing it can be ascertained with much correctness.

The last number on this subject was more fully demonstrated by a drawing, not only to assist the young husbandman in the best mode of forming his live fences, but to give a view of what may be considered a specimen of a *finished hedge*, or one that has attained maturity—being thirteen years old from the time of planting, and needing no farther care but that of *annual* trimmings, shearing or clipping the extra shoots that incline to enlarge it beyond proper limits. The mode has been already treated of.

The next inquiry is, *What is the cost* of obtaining such a desirable enclosure, to protect and secure the labours of the farmer, and, at the same time, ornament his farm! The following is a correct estimate; as near as the nature of the case will admit, calculated for the latitude or neighbourhood of the writer of these notes, being done from actual experiments made by himself, and some of his neighbouring farmers pursuing the same plan of hedging. Taking a given distance, say one hundred panels of post and rail fence, measuring ten feet to the panel, which is the usual length, makes *sixty perches* and ten feet over.

One thousand quicks will plant that distance : their cost from nursery is	\$5 00
Planting them by a man and boy, each two days ;	
man's wages and board at 75 cts.	1 50
boy's do. do. 50 "	1 00
One dressing the first year by running a furrow or two with the plough	25
And then a light dressing with the hoe (same hand)	75
Expense of first year	<hr/> \$9 50

2d year, dressing as above		\$1 00	
3d " do. do.		1 00	
4th " do. do.		1 00	
5th " do. do.		1 00	
6th " do. do.		1 00	
5 years' dressing		—	\$5 00
7th year, trenching to prepare for plashing, plough, and horse		\$0 50	
Three days' work, at 75 cts., throwing up a ditch		2 25	
500 stakes, counting labour as above, including timber		3 50	
Wattles, and cutting them		2 00	
One hand three days at plashing, at \$1		3 00	
Expense of 7th year		—	\$11 25
8th year, 1 day's work, trimming and cleaning		\$0 75	
9th " do. do. do.		75	
10th " do. do. do.		75	
11th " do. do. do.		75	
12th " do. do. do.		75	
13th " do. do. do.		75	
Expense of six years		—	\$4 50
			<u>\$29 25</u>

The foregoing process has produced such a hedge as is exhibited in the drawing, taken from a section of one thirteen years old, now in good condition and improving, becoming more dense every year; and, so far as I am able to form a judgment, I am of the opinion that seventy-five cents annually applied to the trimming will keep it in that form perpetually.

The calculation on this section of sixty perches will afford data to apply to any quantity of greater extent; and the annual expense on this, after the seventh year, is uniform, and may be considered to continue so for as long a time as it is regularly attended to, and will apply to any extent, at one cent and a quarter per rod or perch of sixteen and a half feet.

If the writer of these observations had commenced hedging with the knowledge now obtained by experience, one half his labour would have been saved.

The expense of a fence made of timber, say post and rail, which is the most common in the vicinity of this place, is seventy-five cents for each panel of a four-rail fence to those who have their fencing to purchase and the labour to pay; that is, seventy-five dollars for one hundred panels, which, compared with the same length of hedging, places the case, for a perishable material, with thirteen years of the time gone \$75 00

And for a hedge growing better every year 29 50

Leaving \$45 50

as a balance in favour of sixty perches and ten feet distance: what this will amount to on a large farm I shall leave to the owner's calculation.

I may farther remark, the labour of making live fence can be done by weak hands if rightly directed: my plashing was done by a man seventy-four years of age. The making of rails and handling them require a person in the prime of life; and every stage of the process of erecting wooden fences is laborious, besides the destruction of much valuable timber, which in some neighbourhoods is a heavy tax on the owner.

Each neighbourhood may make their calculations of fences made of timber. According to circumstances attending the hedge, calculations may be relied on, if the foregoing rules and remarks are strictly attended to, which will apply to either kind of thorn; but it was the "Virginia parsley-leaved thorn" of Marshall's catalogue of forest-trees that was preferred, and which grows spontaneously from this place to the South as far as the Mississippi; and I have no doubt of its thriving in a northern latitude, seeing no bad effect from the winters of our Delaware climate, although I had a section plashed in the midst of winter to prove the consequence.

The hedge may be considered as made in seven years from the time of planting, as it is only trim-

ming that is required afterward, which amounts to one cent and a quarter for each perch of distance: the quarter may be thrown off if the clipping is never *omitted in due time*, as this lessens the labour—a rule that will apply through every operation in husbandry, and should *never* be forgotten while twenty-five per cent. is saved, and often fifty.

ANIMAL NUTRITION.

Until within a very few years, little attention seems to have been paid to the subject of animal nutrition: the quantity or kind of food most suitable for this purpose was mostly overlooked; and if life were supported, no questions were asked as to the why and the wherefore. So long as the population of the world remained few in number compared with the acres from which subsistence was to be drawn, there was, indeed, little use in inquiries of the kind; then, as now in the United States, or on this Continent generally, a supply of food of some kind was usually certain. Now and then, years of famine in particular sections might occur; for in those times, when the means of intercourse were so limited, the inhabitants of one country might be starving, while those at a distance of a few hundred miles were rioting in abundance; but these calamities were soon forgotten in the succeeding plenty, and led to no valuable investigation as to the nature of food or nutrition. The population fared more nearly alike in former times than at present, so far as food was concerned; it was bulky and hearty, and, if it produced disease, it was of a different kind from that which now assails the modern omniverous eater and drinker, and in all cases was decidedly the same. In these days, the differences in mankind made by rank or wealth are scarcely more deeply marked than those observable between the diseases of the rich and the poor: differences, in the main, to be attributed to the nature of their diet and its effects on the animal system.

Among the inquirers into the effects of different kinds of food or animal nutrition, Dr. Stark, of Vienna, appears to have taken the lead; indeed, he seems to have fallen a martyr to his zeal in the cause of science, perishing, as he undoubtedly did, from the results of his long-continued experiments on *himself*. By confining himself to food of a particular kind for a considerable space of time, he was able to ascertain its actual effect on the organs of digestion, and its value as a source of nourishment. Bread, meat, and milk, each in its turn, for a considerable period was his sole nutriment; and the result showed that these things, certainly among the most nutritive of substances, could not maintain the vigour of the body, or even life itself, for but a limited time. In this respect man differs from the majority of animals; his organization is such as to admit and even require a variety of food; while many animals are, by a law of their natures, confined to a particular kind, as flesh or vegetables.

The French physiologists, Magendie and his coadjutors, followed up the experiments of Stark, not on themselves, but on animals; and found they could not long survive on food, however nutritious in itself, unless they received a large portion of that on which they naturally subsist. Thus a dog fed on white sugar and water alone soon became emaciated, lost his appetite and sight, and perished. Few substances can be more nutritive than sugar, but it lacked the power of properly distending the stomach and exciting its digestive energies. Dogs fed on pure wheat bread and water lived but little longer; and rabbits, which eat a variety of vegetables, such as clover, cabbage, barley, corn, and carrots, were unable to live for any time when confined to one of these. It was found that animals, when much emaciated and reduced by one kind of food, were not often restored by another, though they frequently partook of it with greediness—the tone of the stomach could not be regained.

To facilitate proper digestion of food by the animal or man, it is necessary that, with the nutritive part, substances more bulky, or containing little nutritive power, should at the same time be taken into the stomach. An experiment has been made in England on the feeding of horses, which demonstrates this fact most conclusively. Some cavalry horses were selected; and while one part of them received sugar and water alone, the other part had a few pounds of cut straw added to their portion of sugar and drink. Those which received the sugar alone fell away rapidly, while those fed with the sugar and straw thrived perceptibly; and a repetition of the experiment on another set of animals showed the same result. In man, the rich and high-seasoned food, the fine flour and the fat meat, are to the stomach what pure wheat or sugar would be to the stomach of the horse. There is much nutriment, but little that can facilitate digestion. A man swallows nourishment enough for half a dozen; but, instead of its producing a good effect, his stomach becomes disordered, its functions debilitated, and in the midst of plenty he becomes dyspeptic, and incapable of enjoying anything. The man who lives on common food, sound and sufficiently nutritious, is rarely troubled with the evils that press so heavily on him who, regardless of the law of nature, takes more nutriment and less substance than is consistent with a healthy tone of the digestive powers.

Perhaps the best estimate of the time required for the digestion of the various substances used as food by man, and their general effect on the animal organization, is given in the book of Dr. Beaumont, from experiments made on the living subject, and under circumstances more favourable to correctness than are known to have ever before existed. We give below a table of the results obtained by him, not as a mere matter of curiosity, but as furnishing information of the most valuable kind in connexion

with animal nutrition. The first column indicates the substance taken into the stomach; the last the time required for its digestion.

	h. m.		h. m.
Boiled rice	1 00	Mutton, fresh	3 15
Sago, tapioca, barley, and boiled milk	2 15	Veal	4 00
Tripe and pigs' feet . .	1 00	Wheat bread, fresh baked	3 30
Fowls, beef's liver . .	2 30	Corn bread	3 15
Hard eggs	3 30	Sponge cake	2 30
Soft do.	3 00	Succotash	3 45
Custard	2 45	Apple-dumpling	3 00
Trout, boiled or fried .	1 30	Apples, sour and mellow	2 00
Other fresh fish	3 00	Do. sweet and mellow	1 30
Beef, rare-roasted . . .	3 00	Parsnips, boiled	2 30
Do. dry-roasted	3 30	Potatoes, do.	3 30
Salt beef, with mustard .	2 30	Do., roasted	2 30
Pickled pork	4 30	Raw cabbage	2 30
Raw do.	3 00	Raw, with vinegar . . .	2 00
		Cabbage, boiled	4 30

Dr. Beaumont found that the envelope of the seeds of the apple and the skins of potatoes were scarcely acted upon by the gastric juice, and that they were consequently indigestible. As a whole, it would seem that animal aliments are digested easier than vegetable ones; but his experiments show conclusively, that, whatever the kind of food, the ultimate principle of nutrition, or the chyle, is the same in all cases.

Digestion is much facilitated by the particles of food being made fine when taken into the stomach, and the quantity of nutritive matter furnished is greater. Individuals, therefore, in whom the digestive powers are weakened, find a benefit in thoroughly masticating or chewing their food. This principle is of great importance in the feeding or fattening of animals, and shows the necessity of grinding or cooking the materials given them if we would have them derive the full benefit of the nutritive matter contained.

The experiments of Dr. Beaumont farther prove, that when food of great nutritive powers is taken

into the stomach in large quantities, the functions of that organ become evidently clogged, and that usually, in eating, a larger quantity of nutritive matter is received than is beneficial. A certain quantity of solid food, or food of a bulky nature, he found to be essential to easy digestion and a proper separation of the nutritive principle. This agrees with the fact that horses or cattle require cut straw or hay mixed with their grain, both to ensure mastication, and to furnish the necessary bulk of solid matter in the stomach. It is a common saying with farmers, that an ox, when feeding on meal, must be furnished with a lock of hay to make him a cud. They require more than this; and the reason, from what has been said above, is perfectly obvious.

ON THE USE OF GYPSUM.

There is no longer any doubt in our mind of the advantage of applying gypsum in the spring to all our meadow-lands which are beyond the influence of the sea atmosphere, and which are habitually dry. There are instances recorded, to be sure, of its not producing perceptible benefit the first year; and some instances where it did not seem to operate even the second year, and yet ultimately developed its fertilizing properties.

We do not design now to discuss the question *how* gypsum does operate, but to inquire and state, from the facts within our reach, to what crops its application is particularly beneficial; on what soils its effects appear to be greatest; how much should be applied to the acre, and at what season it is best applied. We are satisfied, that if the value of gypsum were better known, it would be much more extensively used than it is; and that, the more it is used, the greater will be our agricultural surplus.

Gypsum, according to Chaptal, consists of

I.—Z

Pure calcareous earth or lime	. . .	30 parts, or 33	
Sulphuric acid		32	" 43
Crystallized water		38	" 24
		<hr/> 100	<hr/> 100

-It requires from 450 to 500 times its weight of water to dissolve it. When pure, it does not effervesce with acids; it is insipid in taste, and free from smell. A simple mode of trying its quality consists in putting a quantity of it pulverized into a dry pot over the fire, and when heated it gives out a sulphurous smell. If the ebullition or bubbling which then takes place be considerable, the plaster is good; but if not, it is considered indifferent; and if it remain motionless, like sand, it is not thought to be worth anything. Its colour is white, gray, or blue. Its effects in benefiting agriculture have been greatest in Germany and in the United States. Its benefits in Great Britain and France have been less obvious.

The soils upon which gypsum operates most beneficially are the light, dry, sandy, and gravelly. Upon soils containing little or no vegetable matter, its effect is trifling; but when these lands are dressed with dung, the gypsum then produces a great effect; and, the dung being present, the poorer the land, the greater its benefits. It seldom produces any sensible effect upon wet grounds, and frequently none upon stiff clays.

The crops which are most benefited by gypsum are the clovers, lucerne, Indian corn, and pease. There are some few cases noticed of its being found beneficial to wheat and other small grains; but it is the generally received opinion that it does not operate directly on these. Gypsum, however, may be made indirectly beneficial to all crops which are grown upon a clover lay, by causing a greater growth of clover, which becomes food for the crop which follows, and which is abundant in proportion to the

rankness of the previous clover. Its effect upon turnips is doubtful; and some will not allow that it is beneficial to potatoes. Davy lays it down as a fact, that it is most beneficial to those plants which always afford it on analysis; and the small grains are not found to contain it at all. Many instances are given where its application has doubled and tripled the clover-crop.

The quantity which should be applied to the acre is a point quite unsettled; and it should probably be varied according to soil and circumstances. John Taylor, of Virginia, and Judge Peters, of Pennsylvania, concurred in opinion, that on lands where it was applied annually, one bushel to an acre was an ample dressing. In Europe it is recommended to dress with five or six bushels to the acre. We have generally sown but a bushel; but last spring, by way of experiment, we doubled the dressing on a portion of a meadow, and found the grass there much the heaviest. It is advisable to try it in different quantities, and to note the result of each, as a guide to future practice.

The time of applying gypsum is generally in the spring, sometimes as late as May or June. The writer of British Husbandry recommends, with much plausibility, that gypsum be applied to clovers semi-annually, viz., soon after the crop is mown in summer, and in the spring just after the plants have begun to shoot. We shall be thankful for memoranda of any experiments that may have been made in this practice in our own country, and also *whether it produces a better effect when laid on in dry than in wet weather*. The work from which we have just quoted dwells with emphasis on the importance of having the gypsum attach to and remain upon the leaves of the young plants, and repeats the charge to sow it when the leaves are wet with dew or with a recent light rain, and never just preceding or during a rain. Professor Low says that mineral substances,

as powdered lime and gypsum, are absorbed through the pores of leaves when scattered upon them. A watery temperature, it is alleged, at least arrests its effects, and seems to suppress them altogether if the gypsum has been calcined, a process which it is sometimes subjected to, to facilitate its reduction to powder. Burning, however, merely expels the crystallized water, without otherwise altering the gypsum, the strongest heat not being sufficient to expel the sulphuric acid. When applied to tillage-crops, it should be either sown broadcast in spring, or scattered upon the hills or drills of the growing crop. Upon the principle quoted above, the latter would seem to be the better practice in regard to hoed crops; though our mode of applying it to corn has been to sow it broadcast before the ground is harrowed for seeding. When applied at the rate of five or six bushels to the acre, the effects of a dressing have sometimes continued some four or five years. The most common practice is to sow it annually upon the crops and grounds likely to be benefited by it, and to sow it in quantities from one bushel to two bushels on the acre.

To determine the capacity of gypsum for absorbing moisture, an ounce and a half, in fine powder, was exposed to the air during three foggy nights, and afterward carefully weighed, when it was found to have gained not quite half a grain in weight. This fact overthrows the theory that plaster is beneficial on account of its capacity and tendency to imbibe moisture from the atmosphere.

The benefits of gypsum are so palpable in our country upon clover and some other crops, and indirectly upon nearly all, that we cannot but hope these remarks will serve to extend its use upon our farms, and to induce many to try it who are experimentally ignorant of its fertilizing powers.

CHOKED CATTLE.

The facts that more attention is now paid to the rearing of cattle and the introduction of improved breeds than formerly, and that many valuable animals are yearly lost from obstructions in the throat or by choking, which might be saved were proper measures adopted, have induced us to present to our readers drawings of a cattle-probang or throat-tube, from the work on cattle by the Useful Knowledge Society, and a condensed account of the best methods of removing obstructions known at the present day. We give these engravings the more willingly, as the tube is found one of the most efficient and immediate agents of giving relief in hoven or bloat that has yet been devised, and, where it can be had, far preferable to the knife. to which farmers in this disease are frequently compelled to resort.

These cuts will give a sufficient idea of the construction of the most useful probang or œsophagus-tube, and which should be in the possession of every farmer who breeds cattle extensively; or, where this is not the case, one might answer for several neighbouring farmers. No man, however, who pretends to the character of farrier or veterinarian, should be without these or similar instruments.

Fig. 1. *a.* The tube made of simple leather, or of leather covering a canal of spiral wire. It is about four feet and a half in length, so as to reach from the mouth to the rumen or stomach, leaving a sufficient portion outside the mouth to be firmly grasped.

b. The stilett or rod, represented as introduced into the tube, and running the whole length of it. It gives greater firmness and strength to the tube when it is either passed into the stomach in cases of hoove, or used to force obstructions down the gullet.

c. The handle of the stilett.

d. A hollow piece of wood running freely upon the stilett, and placed between the handle of the stilett and the round extremity of the tube. The stilett is longer than the tube by the extent of this piece of wood, but is prevented from protruding by the interposition of this slider on the handle. The stilett may be introduced at either end of the tube. It is usually inserted at *e* when the instrument is used to force anything down the throat, because the bulb at the other end has a flat, or, rather, concave surface, and can therefore act with more certainty and power on the obstruction in the throat.

e. The end of the tube which is introduced into the paunch in cases of hoove. It is rounded to permit it to be more easily forced through the pillars or roof of the paunch, and is perforated with holes for the escape of the gas with which the stomach may be distended.

Fig. 2 represents the whalebone stilett (any tough elastic wood will do for the rod when whalebone cannot be had), with the hollow piece of wood running upon it, and shows how easily that may be withdrawn when the stilett is taken from the tube. This piece of wood taken off, the stilett will project a little at the end of the tube; and by moving the stilett up and down in the tube, this may be made to act on the obstructing body in the manner, and with somewhat the force of a small hammer.

Fig. 3 will be presently described.

Fig. 4 is a piece of strong, thick wood, widest in the centre, and perforated for the passage of the tube. Its use is to keep the mouth open during the use of the probang; and it is secured by leather straps nailed to the extremities, and buckled round the horns. The farmer should have another mouth-piece, with a central hole that will admit the passage of a small hand. He will thus be enabled to grasp and remove any obstruction that has not descended beyond the commencement of the gullet.

Let it be supposed that a cow has swallowed a potato or turnip too large to descend the gullet, and thus arrested in its progress, and evidently seen at a certain distance down the throat. The farmer should have immediate recourse to the tube, introducing the flatter end, and using moderate force. If the body yields to this, he is justified in pushing it into the chest; but if it is with difficulty pushed on, the operator should instantly cease attempting to drive it down, for the fibres of the gullet soon become irritated by distention, and grasp the foreign substance, as it were, spasmodically. The gullet also itself becomes smaller as soon as it enters the thorax, and a substance that moves easily in the upper part can scarcely be moved at all in the lower portion.

But if it cannot be driven down, it may perhaps be solicited or drawn upward. The fibres of the gullet have allowed the substance to pass them, and are somewhat weakened by the unnatural distention; and, not having recovered their tone, they may yield again. The internal coat of the gullet is smooth and yielding: it may, however, be made more so, and some effect may also be produced on the surface of the obstructing body. Half a pint of olive oil should be poured down, a persevering attempt being made by the fingers externally to give the body a retrograde motion. When moved sufficiently upward, it

may be drawn out by the hand, introduced through the large mouth-piece.

If the obstructing body cannot be moved in this way, recourse may be had to the corkscrew tube, Fig. 3, in the cut.

a. The leather tube as before, but somewhat larger, longer, and stronger, with the upper part, for the purpose of additional strength, sometimes of brass.

b. The handle of the stilet, that runs through it as through the other tube.

c. The piece of wood sliding on the stilet. In consequence of the corkscrew termination, this must be in two parts, easily removed. They are here removed, and one of them hangs down, suspended by a string. When removed, they allow the point of the stilet to project two or three inches.

d. The bulb which is introduced through the mouth-piece. It is larger than those on the other tube, but not so large as the distended gullet.

e. A corkscrew fixed at the end of the stilet; and which, coming out at the centre of the knob, cannot possibly wound the gullet.

When this instrument is used, the screw is retracted within the knob, and secured by placing the pieces of wood *c* on the handle of the stilet. The instrument is then introduced through the mouth-piece, and forced down the throat until it reaches the obstruction. The pieces of wood are then taken off, and the screw, by turning the handle, is worked into the obstructing body as the common corkscrew into a cork. If the potato or turnip is fresh and sound, a great purchase is thus obtained, and in most instances the root may be thus drawn out and got rid of; but if only a portion is brought away, some good has been done, and the screw should be returned as long as it will take hold. The substance will now probably yield to the pressure of the first probang, and in a crushed state pass into the stomach.

Sometimes, too, the stilet of the first tube, the slide being taken off, can be advantageously used as the rod of a gun, forcing the obstruction down by repeated percussions.

Should these contrivances fail, and the obstruction still remain, bleeding, sometimes carried to absolute fainting, may be resorted to, in preference to crushing the root by external violence, though even this is sometimes admissible. There is not a more powerful relaxant of the muscles than bleeding; and during this momentary relaxation the operator may frequently move the body—upward, if possible and in preference, but downward if it will not come up. If the obstruction can neither be forced down nor removed by crushing, the animal must be lost unless the operation of *œsophagotomy* be resorted to, or the obstruction cut down upon, and then removed through the opening. The veterinary surgeon will here find no difficulty, and may proceed with confidence.

The animal should be cast, thrown on the right side, the head stretched out, and lying as flat as the horns will permit. The point of obstruction will be seen at once. An opening is now made through the skin, the cellular substance a little dissected away, the gullet opened, and the obstruction removed. The edges of the gullet should then be brought together and confined with two stitches, and the skin secured in the same way. The beast should have nothing but gruel for two or three days, then gruel and mashes may be allowed, and in a fortnight or three weeks the wound will generally be healed.

If the root has passed into the thorax before it is observed, or the operator has been called, the chances of saving the animal are much diminished. The obstruction must be either drawn up or pushed down without delay; and great force is here allowable; for, if it be not overcome, the animal will surely die. Cattle that have once been choked are found more liable

than others to suffer again; and it will therefore be generally advisable to fit them for the butcher as early as possible.

The tube may be made of thin, firm sole-leather; or, if of upper-leather, it may be sowed over a spiral tube of small flexible wire. It may be three fourths of an inch in diameter, with a suitable bore, and the bulb may be one and a quarter or one and a half inches in diameter. The stiffness of the tube is greatly aided, when necessary, by the introduction of the rod or stilet.

Every one has lost some animals which in all probability might have been saved by the cheap and simple apparatus we have here described, while many have perished by quackery or the ill-judged efforts made to save them. It is but a few days since a gentleman of our acquaintance lost a cow that was choked with a potato. Some little effort had been made to remove it, when he was told that a quantity of soap put down would have the desired effect, and the informant undertook to see it administered. The required quantity was prepared and poured down, when the animal died almost instantly. The probability is, that more was given than the gullet could contain, and that the first breath, by drawing the fluid soap into the lungs, produced instant suffocation. Soap, too, is a dangerous remedy for another reason: it is very rare that the alkali is so thoroughly neutralized as not to retain some causticity; and, when put down the gullet, if it remains a considerable time in one place, it excoriates the inner membrane, or in some cases eats through the gullet, and thus destroys the animal. Oil, as above directed, is better in all cases than soap; and no farmer should intrust another with the care of a diseased animal, unless he has reason to believe that he possesses some knowledge of the structure, formation, and capacity of the part diseased. We have known animals killed by thrusting a stick so far into

the stomach as to perforate its walls ; and this was owing to ignorance of the distance between the mouth and the stomach. If regard to the sufferings of the animal does not influence them, the fact that such cruel treatment must be a source of loss should induce farmers to adopt a better and more scientific mode of treatment.

SPECIFIC FOOD IN SOILS FOR PLANTS.

That soils the most favourable for the growth of plants of any particular kind may, unless attention is paid to furnishing a supply of the food in which such plants delight, become exhausted and unfit for their production, is a fact which a multitude of experiments fully proves, and which seems to be generally admitted. The earths themselves, silex, lime, and clay, can hardly be said to be the food of plants, though minute portions of them are taken up by the vessels and appropriated to the structure of the firmer parts. The earths seem only to serve as a reservoir for the nutritive matter ; or perhaps they constitute rather the fountain of that electro-magnetic agency which has been proved so efficient, if not, indeed, the sole cause of vegetation.

We may reduce plants to their elements by calcination, and we may examine the products given by their decomposition, but we only discover the parts that are left : the power that collected their particles has ceased to operate ; and we should be almost as well qualified to judge of what the human body can perform, and of the nature of its nutrition and growth, from a post mortem examination, as to decide on these same functions in a living plant from an examination of the remains of a dead one. Chymistry has performed wonders, and from its invaluable aid much more may be expected ; but the causes that change the qualities of a soil, and, of course, the whole character of its vegetation, are of such a nature, and, perhaps, so slight or evanescent,

as to escape or be overlooked in the scrutiny of the most competent observer.

The fact that, by continued cultivation or cropping, the soil becomes exhausted of the food of plants or incapable of producing them, is too evident to be denied; and that in some cases a good growth of a particular kind of plant may be had, when the one previously cultivated has run out, seems equally certain. The trees of our forests, no less than the plants cultivated for food, seem subject to this law, and the instances that prove such tendency to change abound in every part of our country. In some places, where the timber on large tracts of land has been felled and allowed to spring up again without intervening cultivation, it is not uncommon to find the young growth consisting of entirely different varieties from those that first occupied the soil; and in some places, where the soil has been cultivated for years and then left to itself, the same result of a total change of timber has ensued. In many places in Western New-York, where the original growth was beech or even hemlock, we have seen, when this has been removed and the soil left to itself, the whole surface covered with cherry, laurel, and other trees, not one of which was known previously to exist near the place.

In Virginia and the states adjoining, it is well known, and the fact has frequently been noticed, that where the original growth is pine, as it is on a very large part of the low country, when this is cleared off, the succeeding growth of timber is never pine, but a mixture of the hard woods, principally oak, chestnut, and their congeners. On the contrary, where these latter formed the original growth, the succeeding one is most usually pine, growing up in dense and almost impenetrable thickets. In some of the oldest-settled parts of that region, this process has been repeated several times on the same lands; the former, but most unskilful practice in farming

having been to crop a piece of land until completely exhausted, and then leave it to the recuperative efforts of nature, while new lands were cleared and put under cultivation.

In the valuable papers of Dr. Hildreth on the coal region of the West, and in the notes of a Naturalist, both to be found in Silliman's Journal, are notices of large tracts on which nothing but a heavy growth of white oak and its kindred trees are found, and the soil of which is full of pitch-pine knots, scattered in the greatest profusion over large districts, on which a pine-tree has not been seen since the discovery of the country. The inference is irresistible, that, owing to some unexplained cause, these immense forests have perished, and their place has been occupied by the magnificent oak woods that now form so conspicuous a feature of these districts. So plentiful are these pine remains in some places, that the collecting and burning them for tar has been a profitable business.

That there is the same tendency in cultivated plants to change, or to run out and be succeeded by others, is well known to every one. Continued care is required to keep meadows that lie long in grass from becoming filled with other and worthless varieties; and reseeding and frequent manurings are necessary to prevent the kinds desired in the soil from running out. So soils on which the same crop is too frequently raised will show a tendency to throw it off in the inferior value of the crop produced. New-England and Eastern New-York were once the best of wheat-growing districts, but have long since ceased to be such; and the most momentous question that can be asked by the Western farmer is, will that region, now so productive, exhibit a similar decline? There can be no reason to doubt that it will, unless an improved and more rational mode of farming be adopted to prevent it. As illustrating the changes that take place in soils

from cultivation, rendering them unfit for plants of a particular kind, we make the following extracts from a communication in the *Cultivator* of April, 1838. It is from the pen of a gentleman of Suffolk county, Long Island :

“ With us, wheat was raised from the first settling of the county until 1780 or 1790 ; it then failed. About that time we began to get fish (for manuring), which were used for rye, and did well. It was no uncommon thing to have 40 bushels to the acre. For wheat they did not answer, neither did any other manure. Farmers, as a general thing, gave up trying to raise it. At the present time, wheat is a far more certain crop than rye, and has been for years past. Rye has been failing for some time, and latterly many pieces have been cut merely for the straw. There is a complete revolution in the two grains. * * * * Corn has not fluctuated ; it has been a steady crop, and governed by the seasons. Oats the same. Flax has run nearly the same round as wheat and barley.”

Two causes have, by vegetable physiologists, been assigned for this action of plants on the soil, both of which have been advocated with great skill, and in favour of both of which a formidable array of facts and experiments may be adduced. One of these theories supposes that a specific food for each kind of plant exists in greater or less quantities in the soil, and that, when this food is exhausted by a succession of crops of the same kind, the plant must of necessity fail for want of its proper nourishment. In this way the changes of forest timber noted above may be explained, since rendering the soil unfit for the production of one kind of plant by no means disqualifies it for growing another. By this theory, also, the cause of the changes of the grain-crops in our country is made plain ; as the specific food of each plant being in a great degree different, that required by the rye had been untouched by the

wheat, and vice versa. The second theory by which these facts are accounted for is that of the justly celebrated De Candolle, which supposes that plants, in growing, secrete substances injurious to, and not required by them; which substances, strictly excrementitious, are thrown off by the roots into the soil, and, by repetitions of the process, finally render it unfit for the growth of the plant. This excrementitious matter is, however, supposed to affect no plants except those of the same kind with that from which it has been ejected: thus that from the pine would not prevent the growth of the oak, nor would that which rendered the soil unfit for wheat injure in the least a crop of rye.

It is clear that most of the phenomena alluded to above as attending a succession of crops on the same soil, or the changes which the forests of a country undergo, may be explained by either of these theories; and it is not improbable that both may be more or less influential at the same time. To us the weight of testimony has appeared to be in favour of the theory which attributes these changes to an exhaustion of the specific food of the plant rather than to the excretion of poisonous matter from the preceding vegetation. It must be admitted, however, that the experiments of De Candolle and Macaire go far to prove such an exudation or secretion from plants; and, this fact once established, it cannot be unreasonable to suppose that the matter thus rejected must be unsuitable for the succeeding plant, should it be one requiring the same kind of nutriment.

Thus, admitting the truth of either of these theories, or of both, we arrive at the conclusion that change of plants is a law of nature; and the manner in which we can imitate her, and thus avoid the inevitable consequences of continued successions of the same kind of plant, is distinctly pointed out. Nature restores the original constituents of the soil

by a slow and gradual process : science has enabled us greatly to abridge this period, by producing ourselves, in rapid succession, the same changes that nature, unassisted, would require half a century to effect. We do this in two ways : either by restoring to the soil, in the form of manures, what we have taken from it in the shape of grain or grass, or by such a rotation of crops as shall prevent the exhaustion of the specific food of the plant in the one case, or the injurious accumulation of excrementitious matter in the other. The successful combination of both these methods, manuring and rotation, constitutes the great secret of successful agriculture ; and the establishment of the principles on which the system is based may be considered the greatest improvement of its age. In those parts of our own country and in Europe where the system of manuring and rotation has been fully adopted, a steady improvement in the soil and in the crops is clearly apparent, and not the least symptom of exhaustion or of deterioration can be seen. It is time that the unphilosophical system of taking crop after crop of the same kind from land should be abandoned for the more rational one pointed out by nature herself, and which has been proved to be so far superior to the former methods. Corn, wheat, clover, and manure (the last applied to the first crop) have trebled the produce of the lands in Dutchess and on Long Island within thirty years ; and lands that had been exhausted and abandoned have been reclaimed, and restored to a state of fertility rivalling the best districts of the West. There is great reason to fear that this subject is not yet properly appreciated by our farmers. We, in the comparatively new parts of our country, go on as though exhaustion were impossible, and reducing the fertility of our lands a mere fiction. Do we not already begin to perceive proofs (and particularly where the skinning process in cropping is adopted) that these

causes have already begun to operate? Do we get as much wheat per acre on such lands as we did twenty years ago? If not, to what cause shall we attribute the falling off? One of the most important questions a farmer can ask himself is, How shall this reduction of crops be arrested where it has already commenced, and prevented where it does not yet exist!

CHAPTER XII.

Address of the Hon. Judge Buel, delivered before the Agricultural and Horticultural Societies of New-Haven County, September 25, 1839.

I APPEAR here, gentlemen, by invitation, to address you on the cultivation of the soil, which it is the object of the associations here convened to promote improvement in. I have been prompted in the undertaking rather by a *desire* to render a service, than from any confidence in my *ability* to perform one; and, in the few remarks I have to offer, shall need much of your indulgence for imperfections in style and deficiency in matter.

Agriculture and Horticulture are intimately related to each other. They both depend upon the soil, and the animals and plants which it nurtures, for support, for profit, and for pleasure. They both administer and are indispensable to our wants and comforts. They are governed in their operations by the same natural laws. Agriculture has cognizance of the farm, which supplies our principal wants; Horticulture of the garden, which administers to our more refined appetites, to our health, and to the rational pleasures of the mind. The one gives us bread and meat, and the materials for our clothing;

the other, choice delicacies for the table, and multiplies around us the charms of floral beauty and rural scenery. Both tend to beget habits of useful industry and sober reflection, and to improve us in all the social relations of life. It is befitting, therefore, that institutions designed to foster and promote improvements in these primary and associate branches of labour should unite in their anniversary celebration, and in returning thanks to the Supreme Being for the bounties of a fruitful season.

Of the utility of these celebrations, and the exhibition of the products of the farm and garden which are made at them, I have no kind of doubt. They bring to public notice whatever is new and most valuable in a business which highly interests us. They perform the work of years in diffusing useful knowledge in all the departments of rural labour. They awaken in the bosoms of hundreds the dormant powers of the mind, which otherwise might have slumbered in apathy. They excite to industry, to emulation, and to the study of those laws which everywhere control the visible creation, and which enlighten and reward all who humbly seek and follow their counsels. Nor is it the cultivator of the farm and garden alone that are to be benefited by these exhibitions. Whatever tends to increase and improve the products of the soil, serves to augment the common stock, and enables the grower to supply the market with more and better products, and to buy more liberally of the other classes in return. The merchant, the manufacturer, the mechanic, and the professional man, have all, therefore, as deep an interest in promoting the improvement of agriculture and horticulture as the farmer and gardener have. Society is in some measure a joint concern, at least so far as relates to what are termed the producing classes; the more these earn by their labour, the greater is the accession of substantial wealth to the community. The

amount of honey in a hive depends not upon the number of bees which it contains, but upon the labour and skill of the *working bees*. The farmer virtually provides for the other classes, and is, at the same time, their principal patron and customer; and, although his labours are too often held to be low and menial by those who cannot or will not appreciate their value, his condition affords the best criterion by which to judge of the welfare of those around him. No country can long flourish, or preserve its moral and physical health, whose agriculture is neglected and degraded. The amount of a farmer's sales and of his purchases will depend upon the profits of his labour. Double these by an improved system of husbandry, which I feel assured can be done, and which has been far more than realized in many old districts of our country, and you will double the substantial wealth of the neighbourhood, and impart corresponding life and activity to every other department of business. If we look to Spain, to Portugal, to a great portion of Italy, to South America, or any other country where agriculture is neglected, or holds but a subordinate rank, we shall find a degraded population, characterized by superstitious ignorance, poverty, and crime. Every class of the community, therefore, has a deep interest in promoting the improvement of the soil; and all should willingly contribute their aid towards enlightening, honouring, and rewarding those who are honestly employed in its cultivation.

With regard to the utility of agricultural and horticultural societies, much will depend upon the objects which bring their members together. If they associate for selfish purposes, merely to monopolize the spoils, and withdraw whenever they are disappointed in their sinister hopes, jealousies and apathy will ensue, and the association will fall, as many under like circumstances have fallen, without public loss or public regret. But if the association be

formed for mutual improvement, and in the benevolent and patriotic desire to do a public good ; to stimulate and reward industry and enterprise, however humble their condition ; and if it strive, by concentrated and persevering efforts, to improve the condition of a district, of a county, or a state, then will it inspire public confidence, obtain public support, and become a public blessing. To illustrate this last proposition, I beg to refer to some associations which have been tried, and whose labours have been crowned with palpable and brilliant success.

The counties of Berkshire, Essex, and Worcester in Massachusetts, have each, for many years, maintained an agricultural society ; and they each distribute ten or twelve hundred dollars a year, one half of which is paid out of the state treasury, in prizes to successful competitors in the various departments of agricultural and household labour. It is said, and I believe with truth, that every dollar thus expended has made a return of twenty dollars in the increase of agricultural products which it has caused ; and so satisfied are the inhabitants of the benefits of the expenditure, that an increased spirit is annually manifested by all classes to maintain and perpetuate these nurseries of industry and improvement.

The Highland Society of Scotland affords another illustrious example of the utility of agricultural associations, when conducted with a view to public improvement. This society was organized in 1784 ; but so few were its members and so limited its means, that it attracted but little public notice, nor effected any great improvement in husbandry till the commencement of the nineteenth century. Yet it had sown the good seed, which never fails, under proper management, to yield to the husbandman a bountiful harvest. Nor did it fail in this case. The society now numbers twenty-two hundred members, embracing most of the opulent and influential men

of the country, of all professions, and distributes annually in prizes about seventeen thousand dollars. In no country or district has agriculture made more rapid strides in improvement than it has in Scotland since the organization of this society; which, although it may not have been the only, has most assuredly been a principal, cause of this wonderful and salutary change. Up to 1792, the agriculture of Scotland, to adopt the language of the Edinburgh Quarterly Journal of Agriculture, was "wretched; execrably bad in all its localities! Hardly any wheat was attempted to be grown; oats full of thistles was the standard crop, and this was repeated on the greater part of the arable land, while it would produce twice the seed thrown into it; turnips, as part of the rotation of crops, was unknown; few potatoes were raised, and no grass-seeds or clover were sown. A great part of the summer was employed, in the now fertile shire of Fife, in pulling thistles out of the oats and bringing them home for the horses, or mowing the rushes or other aquatic plants that grew on the bogs around the homestead." But a change soon came over the land. The seed which had been sown by the Highland Society had germinated, and its luxuriant foliage already covered the soil. In 1815, according to the authority I am quoting, "beautiful fields of wheat were to be seen; drilled green crops everywhere abounded; the bogs had disappeared; the thistles no longer existed;" naked fallows were abolished; draining was extensively introduced; wet lands were made dry; poor, weeping clays were converted into turnip soils; and "whole parishes were completely transformed from unsightly marshes into beautiful and rich wheat-fields; and where the plough could scarcely be driven for slush and water, were heavy crops per acre and heavy weight per bushel."* The improvements in Scottish husbandry

* Quarterly Journal of Agriculture for June, 1839, p. 70.

have continued to advance until, according to the estimate of Sir John Sinclair and Professor Lowe, both high authority, until the acreable products of her soil more than double those of our Atlantic states.

The means adopted by the Highland Society to effect these radical improvements in Scottish husbandry are such as may be employed by us with almost a certainty of corresponding success. "In the days of its youth and feebleness," says the Quarterly Journal which I have just quoted, "the Highland Society sent the leaven of the turnip husbandry into all the glens and straths of the North, by offers of small prizes to certain Highland parishes, and the same may be said as to the growth of clover and the finer grasses. As it advanced in strength as to numbers and to cash, attention was turned to premiums for stock; then came offers of reward to men of science to discover better implements and machines, to diminish friction, and consequently draught, such as in the threshing-mill, and other parts of agricultural machinery. Still advancing in the scale of intellect and of science, premiums were offered for essays to bring to light the facts connected with chymistry and natural philosophy; and under the auspices of the society was set up the Quarterly Journal of Agriculture, a work which has been the vehicle of conveying so much useful information to the agriculturist, that we humbly venture to say it ought to appear on the bookshelf and table of every farmer's parlour. After this, the great stock shows were resolved upon." At the Glasgow show in 1838 there were exhibited for prizes 461 neat cattle, 121 horses, 274 sheep, and 47 swine; total, 903 domestic animals, in 634 lots. Of the other competitors the numbers were as follows:

For Butter	.	.	.	.	.	18
" Full Milk Cheese	.	.	.	.	.	15
" Skim Milk Cheese	.	.	.	.	.	6
" Wool	.	.	.	.	.	8
" Roots and Seeds	.	.	.	.	.	13
" Implements	.	.	.	.	.	28

In 88 lots.

The number of persons present was estimated at over 17,000, besides workmen and official people; not one in a thousand of whom probably left the exhibition without carrying home with him some newly-acquired knowledge in his business, or some new stimulants to improvement and industry. Not only has Scotland profited by the labours of her agricultural society, but Great Britain generally, and even the United States have been highly benefited by them. The information which that society has promulgated has been widely disseminated among us by our agricultural journals, and has contributed not a little to the improvement of the agriculture of our country. And in England, which had been thrown into the background by the superior improvements in Scottish husbandry, it has within the last year induced the formation of the English Agricultural Society, on a broad and liberal scale, which promises important advantages to English husbandry, and to agriculture generally.

As evidence of the utility of horticultural societies in multiplying and improving the products of our gardens and in promoting rural embellishments, I would refer to the neighbourhoods of Boston and Philadelphia, where societies of this kind have long existed, and to the Horticultural Society of London. In the first-named cities and their environs, the progress of horticultural improvement has been manifestly great. Many new and choice fruits, culinary vegetables, and ornamental plants have been introduced, culture has been much improved, the markets better supplied, and prices cheapened.

The London Society, although its garden has been established but about twenty years, has concentrated in it, from both continents and from the islands of the sea, embracing every clime, more than five thousand varieties of edible fruits, including fourteen hundred varieties of the apple, and seven hundred of the pear, and an almost endless number of ornamental plants, many of them before unknown in our catalogues. Its collection of pears, which embrace hundreds of recent origin from Flanders and from France, have been already broadly spread over these states, and supply our dessert with a succession of this delicious fruit. As a corresponding member of this society, I have participated, and have enabled others to participate, in the good which it has been generously diffusing abroad. In 1825, and at subsequent periods, I have been supplied liberally with grafts of the choicest fruits which it had collected.

The great obstacles to horticultural improvement are ignorance of the relative merits of different kinds of fruits and culinary vegetables, and of the proper modes of cultivating and preparing them for the table. The generality of country gardens exhibit but a scanty assortment of vegetable productions, and these but badly cultivated, and often of inferior quality. The tendency of horticultural exhibitions is to show the good and bad in contrast, or rather to promulgate a knowledge of the better sorts, of their culture and use, to excite useful competition, and to demonstrate the utility of garden culture as a source of health, pleasure, and profit. I have had many fruits presented to me which the donors considered of the first quality, but which I found, on comparison, to be of secondary or inferior grade. The man who has seen or tasted only inferior fruits, may well mistake them for good ones. It is as easy to cultivate good fruits as bad ones; and no one eats so good fruits as he who cultivates them himself. It is as easy to cultivate the vergaleu as it is the choke-

pear; the green-gage as the horse-plum; and yet the difference between them, in all the qualities which we most esteem, is incomparably great. But, till we can show our neighbour better fruits, he will continue to cultivate and rest content with his choke-pear and horse-plum.

With regard to what is termed ornamental gardening, or the cultivation of flowering shrubs and plants, there is an objection, real or affected, often made by very many people, on the ground that it yields no profit. If the great object of life were to accumulate money, without enjoying any of the comforts, save the gratification of animal appetite, the objection would be conclusive. But we are endowed with other and higher appetites than the mere brute; and Providence has everywhere surrounded us with suitable objects for their development and innocent gratification. Shall we, then, reject the proffered benefactions so kindly tendered because they add nothing to our pelf? And what is there in the natural creation better calculated to soften down the rough asperities of our nature, to awaken kind feelings towards each other, and to excite reverence and love for the Most High, than a familiar acquaintance with the wonders and beauties of His vegetable kingdom. Did you ever know a misanthrope or a miser who was an admirer of flowers? I would not recommend the neglect of more important duties for the culture of a flower-garden; yet, when there is ability or leisure (and these may be found to a greater or less extent in almost every family), a taste for floral beauties should be inculcated in the young, not only as a source of rational pleasure, but as a salutary precaution against bad companions and bad habits. The mind must be employed and must have recreation. It is better to direct it to the works of the Creator than to the works of man. Lord Bacon has said of the garden, "It affords the purest of human pleasures: the greatest refreshment to the spiri-

of man : without which, buildings and palaces are but gross handiworks."

But I am forgetting myself. In my ardour to commend horticulture for its useful, elevating, and purifying influence upon the habits and manners of society, I did not recollect that I am addressing the highly-polished inhabitants of a classic city, who have long since demonstrated in practice the truth of the lessons I would inculcate. I will therefore dismiss this branch of my subject, and turn to the less attractive, though more important topic of agriculture ; barely adding,

That in all endeavours to improve the condition of society, whether religious, moral, or industrial, individual efforts and example can affect but little ; and hence, that in every great work of reform or improvement, the concentrated strength of many has been resorted to and brought to a focus by means of associations ; and that the great objects of society are not likely to be promoted in a more eminent degree by any, than by associations formed for like purposes with those which I have now the honour to address.

Being a native of this state, and having spent my early days within its borders, I can well remember the farming practices that were wont to prevail. The farm was, to use the commendatory language of that day, " suitably divided into meadow, pasture, and plough land ;" and each division was exclusively devoted to its object, until most of the nutritious grasses had "*run out*" in the meadow, and the ploughland had become too much impoverished to bear a remunerating crop. Many an acre was turned into "*old field*" or commons, destitute alike of natural or artificial herbage, affording scanty gleanings to half-famished cattle. I beg not to be misunderstood. I am describing what *was* a bad feature in Yankee husbandry. Farming has no doubt recently undergone great improvements in Connecticut, as it has

elsewhere. Yet, on a fair comparison with highly-cultivated agricultural districts, I believe it will be found that the husbandry of this state, in the main, is susceptible of great improvement. The lands of Connecticut were originally rich and productive. The seasons are about as propitious as they were wont to be; the earthly elements remain in a great measure unchanged; and the lessons in improvement that have been taught elsewhere, leave little reason to doubt that, under proper management, these elements may again be restored to their original fertility.

In a late tour which I made through parts of New-York and New-Jersey, I found many evidences of recent improvement, and I doubt not that similar ones abound in my native state. In a part of Dutchess county which I visited, the best farms have been sold within my recollection, with improvements and buildings, at from seven to seventeen dollars an acre. They cannot now be bought for one hundred dollars an acre; and one was sold last year at auction, without buildings, at one hundred and thirty dollars an acre. Fifteen years ago, a farm in Western New-York of 400 acres, exhausted by bad husbandry, was bought by a Scotch farmer for \$4000. This farm has been so improved by good husbandry, that the owner was last year offered for it \$40,000. He refused the offer upon the ground that it actually netted him the interest of \$60,000, or \$1050 the acre. A farm was pointed out to me in New-Jersey which was recently sold for \$7 the acre, and that was all it was said to have been worth in its then condition. By a liberal outlay in draining, it being level and wet ground, and in liming, manuring, &c., it is now considered worth \$125 an acre. I went over another farm which a few years ago was bought at the same price, and which now, on account of the improvements which have been made upon it, is considered worth \$100 per acre. I am informed, on the best

authority, that similar cases of the rapid increase in the products and value of farms, consequent upon an improved system of management, are to be found in Pennsylvania, Delaware, and Maryland. Although these cases are isolated ones, they nevertheless serve to show the practicability of vastly increasing the value and products of our exhausted lands.

Among the causes which have essentially contributed to the deterioration of our lands and the consequent depression of our agriculture, I consider the following as prominent :

Ignorance of the *principles* of agriculture ;

The want of a sufficient outlay in the management of our farms ; and

The low estimation in which the employment has been held by all classes, including farmers themselves.

Agriculture has too generally been considered a business requiring mere physical power, with which the principles of natural science had little or nothing to do. To plough, sow, and gather the crop has been the general routine of farming operations, regardless of the poverty which our practice was inflicting upon the soil and upon our children. Like the reckless heir of wealth, we found ourselves in possession of a treasure ; and without inquiring for what purpose it came into our hands, or realizing our obligations to husband and preserve it for others, we have squandered it lavishly, through our ignorance or our folly. True, we have been occasionally admonished of our error by the schoolmen, who, wrapped in abstract science, and knowing little practically of its application to husbandry, have as often tended to confuse and mystify as to enlighten and instruct. Hence the prejudice which has arisen against book-farming. But science and art are now uniting their labours, and are deriving mutual aid from each other on the farm, as they have for some time been doing in the manufactory and in the shop

of the artisan. A new era is dawning upon the vision of the farmer ; new light is illuming his path, and a new interest and new pleasures are urging him on to improvement. He begins to study the laws which Providence has ordained for the government of improved culture, and he finds, in their application to his labours, the means of increasing profits and of high intellectual enjoyment. And the more he studies and is guided by these laws, the more does he become satisfied of former errors and his comparatively limited sphere of usefulness. Science is probably capable of rendering more important services to husbandry than to any other branch of labour, and presents a wider field of useful study to the cultivator of the soil than to any other class of society.

The deficiency of farming capital, or, rather, the stinginess with which capital is employed in improving and maintaining the condition of our lands, is another cause of declension in the profits and character of our agriculture. The farmer is too prone to invest his surplus means in some new business, or in adding to his acres instead of applying them to increase the profit of his labour and the products of his farm. He either works more land than he can work well and profitably, or he diverts to other objects the means which would yield a better return if applied to the improvement of the soil. He is apt to consider twenty or thirty dollars an enormous and wasteful outlay upon an acre of land or upon a choice animal ; and yet the interest of this outlay will be ten times paid by the increase of crop or the increase of the animal ; and, in most cases, the principal also will be returned to him in the course of two or three years. Many of the most thriving farmers in Southern New-York, New-Jersey, and Pennsylvania make a quadrennial expenditure of twenty dollars or more to manure an acre ; and it has become a maxim with them, that the more the

outlay for manure, the greater the nett profit of their lands. But it is not the outlay for manure alone that demands a liberal expenditure of capital. Good seed, good farm-stock, and good implements are all essential to the economy of labour, and to neat and profitable farming. And I think it will appear, from the cases I have quoted, that in many locations capital may be very advantageously employed in reclaiming wet and marshy grounds, generally rich and the most productive when laid dry.

When our cattle grow lean and threaten to disappoint our hopes of profit, we do not hesitate to impute the evil to the want of food or to inattention in the herdsman. And, if we are prudent managers, we at once graduate our stock to our food, knowing that one well-fed animal is of more value in the market than two animals that carry but skin and bones, and we take care that the food is properly fed out. When our crops become lean, we need not hesitate to ascribe the decrease in product to like causes—want of food, or want of attention in the farmer; and prudence and profit, in like manner, require that our crops, like our animals, should be limited to the food and labour which we have to bestow upon them. In other words, an acre well manured and well worked will be found to be more profitable than four poor acres badly worked.

I may here be asked, from whence are to be obtained the vast supplies of manure requisite to manure our old lands? I answer, from a multiplicity of sources around us, from every animal and vegetable substance within our reach. Nothing that has once been part of an animal or a vegetable but can be converted into corn, grass, and roots. I think I may assume as facts, that, upon an average, not half the manure is saved upon our farms that might be, and that this moiety is half lost before it is applied to the soil. Every horse, ox, or cow wintered upon the farm, if well fed, and littered with the straw,

stalks, &c., of the crop, should make from six to ten cords of good manure. Dr. Coventry, late professor of agriculture at Edinburgh, estimated that the straw of an ordinary acre of grain, computed at 21 cwt., may be converted by the urine and liquids of the stables and cattle-yards into three and a half tons of manure; that meadows that cut one and a half tons of hay will give four tons of manure; clover, the first year six tons, and the second year five and a half tons per acre; and that, with the extraneous substances which may, with due care, be collected without expense from the roads, the ditches, the ponds, and from refuse of every kind about the house and premises, the acreable amount should be amply sufficient for a full supply of manure once during every course of the four-year system of husbandry. Arthur Young, with six horses, four cows, and nine hogs, which consumed 16 loads of hay and 29 loads of straw, obtained 118 loads of manure, 36 bushels to each; and from 45 fatting oxen, well fed and littered, 600 tons of rotten manure. But an American lawyer,* and an excellent practical farmer withal, has gone beyond these estimates. I visited his farm a few weeks ago, which lies upon the seashore. It consists of about 200 acres, most of which was in a course of crops. The crops of the season had all received an ample supply of manure, as their appearance indicated; and yet I was shown masses of well-prepared compost in reserve, consisting of yard manure, peat ashes, peat earth, seaweed, and fish, estimated at twenty-five hundred dollars—all produced upon his farm.

The third impediment to agricultural improvement which I propose to notice is the subordinate rank which has been assigned to this employment, and to which the farmers themselves have contributed, by a want of respect for themselves and for their vocation. The wholesome habits of society have been

* W. A. Seely, Esq., of Staten Island.

broken up by the civil and political convulsions of the age, and the inordinate thirst for acquiring wealth and fashionable consequence through mercantile and other speculations, so that honest, productive labour has been thrown entirely into the background, and considered not only ungenteeled, but menial and servile. Yet I venture to lay down this proposition, that he who provides for the wants and comforts of himself and family, and renders some service to society at large by his mental and physical industry, performs one of the high duties of life, and will ultimately be rewarded, in the conscious rectitude of his life, by a greater measure of substantial happiness than he who makes millions by fraud and speculation, to be squandered in extravagance, or wasted in folly by his children or grandchildren. The revolutions that are constantly taking place in families sufficiently admonish us that it is not the wealth we leave to our children, but the industrious and moral habits in which we educate them, that will secure to them worldly prosperity and the treasure of an approving conscience.

The farmers, I have remarked, share in the errors of the day. Not content with the gains which are ever the reward of prudent industry, and which might be greatly increased by the culture of the mind—not content with one of the most independent conditions in society, hundreds and thousands of them seek other and new employments, and some those of a truly menial character, to get rid of labour (the greatest blessing to man), and to raise themselves in the scale of fashionable society. And if they cannot participate themselves in this imaginary greatness (and it is seldom anything more than imaginary), they are anxious to reflect the evil upon their posterity; to rear their sons to the law—the railroad to office, to political power and turmoil; to make them merchants, a useful but greatly overstocked business, or to place them in some other genteel employment, which shall exempt them from the toils

of labour, the salt that best preserves from moral corruption.

Mistaken men! What class of men in society have within their reach so many of the elements of human happiness—so many facilities for dispensing benefits to others, one of the first duties and richest pleasures of life—as the independent tillers of the soil? “The farmer,” says Franklin, “has no need of popular favour; the success of his crops depends only on the blessing of God on his honest industry.” If discreetly conducted on the improved principles of husbandry, agriculture offers the certain means of acquiring wealth, and as rapidly as is consistent with the pure enjoyments of life, or with the good order and prosperous condition of society. Agriculture is the golden mean, secure alike from the temptations of mushroom opulence, and the craven sycophancy and dependance of poverty. “Give me neither poverty nor riches” was the prayer of the wise man of Scripture; “lest,” he added, “lest I be full and deny thee, and say, who is the Lord? or lest I be poor and steal, and take the name of my God in vain.”

When we consider that agriculture is the great business of the nation—of mankind; that its successful prosecution depends upon a knowledge in the cultivators of the soil of the principles of natural science; and that our agriculture stands in need of this auxiliary aid, we cannot withhold our surprise and regret that we have not long since established professional schools, in which our youth, or such of them as are designed to manage this branch of national labour, might be taught simultaneously the principles and practice of their future business: a business on which, more than on any other employment in society, the fortunes of our country, moral, political, and national, depend. We require an initiatory study of years in the principles of law and medicine before we permit the pupil to practice in these professions. We require a like preliminary

study in our military and naval schools, in the science of war and navigation, ere the student is deemed qualified to command. And yet, in agriculture, by which, under the blessing of Providence, we virtually "live, and move, and have our being," and which truly embraces a wider range of useful science than either law, medicine, war, or navigation, we have no schools, we give no instruction, we bestow no government patronage. Scientific knowledge is deemed indispensable in many minor employments of life; but in this great business, in which its influence would be most potent and useful, we consider it, judging from our practice, of less consequence than the fictions of the novelist. We regard mind as the most efficient power in most other pursuits; while we forget that in agriculture it is the Archimedean lever which, though it does not *move*, tends to *fill* a world with plenty, with moral health, and human happiness. Can it excite surprise, that, under these circumstances of gross neglect, agriculture should have become among us, in popular estimation, a clownish and ignoble employment?

In the absence of agricultural professional schools, could we not do much to enlighten and raise the character of American husbandry, by making its principles a branch of study in our district schools? This knowledge would seldom come amiss, and it would often prove a ready help under misfortune to those who had failed in other business. What man is there who may not expect, at some time of life, to profit directly by a knowledge of these principles? Who does not hope to become the owner or cultivator of a garden or a farm? And what man enjoying the blessing of health would be at a loss for the means of an honest livelihood, whose mind had been early imbued with the philosophy of rural culture, and who would rather work than beg?

An early acquaintance with natural science is calculated to beget a taste for rural life and rural labours, as a source of pleasure, profit, and honour.

It will stimulate to the improvement of the mind ; to elevate and purify it ; it will lead to self-respect, to virtuous moral deportment. And it will tend to deter from the formation of bad habits, which steal upon the ignorant and the idle unawares, and which consign thousands of young men to poverty and disgrace, if not to premature graves. A knowledge of these principles, to a very useful extent, can be acquired with as much facility in the school or upon the farm as other branches of learning. Why, then, shall they not be taught ? Why shall we withhold from our agricultural population that knowledge which is so indispensable to their profit, to their independence, and to their correct bearing as free-men ? Why, while we boast of our superior privileges, keep in comparative ignorance of their business that class of our citizens who are truly the conservators of our freedom ? I know of but one objection : the want of teachers. A few years ago, civil engineers were not to be found among us. The demand for them created a supply. We have demonstrated that we have the materials for civil engineers, and that we can work them up. We have materials for teachers of agricultural science, which we can also work up. Demand will always ensure a supply.

The enumeration of the foregoing obstacles to agricultural improvement sufficiently indicates the means which will be efficient in removing them. These means consist, so far as I now propose to notice them,

1. In giving a *professional* education to the young farmer, which shall embrace the *principles* and *practice* of the business which he is designed to follow in life ; and,

2. In diffusing more extensively among those who have completed their juvenile studies, and are better fitted to profit by the lessons of wisdom and experience, a knowledge of the same principles, and of the

best modes of practice which these principles inculcate, and which experience has proved to be sound.

We have professional schools in almost every business of life, except in the cultivation of the soil, one of the most important and essential of them all, and one embracing a larger scope of useful study in natural science, and in usefulness to the temporal wants of the human family, than any other. The policy of monarchs and of privileged orders has been to repress intelligence in the agricultural mass, in order to keep them in a subordinate station. But neither the policy nor the practice should be countenanced by us. Our agriculturists are our privileged class, if we have such. They are our sovereigns, because, from their superior numbers, they must ever control our political destinies for good or for evil. And the more intelligent and independent we can render them, the more safe we make our country from the convulsions of internal feuds and the dangers of foreign war.

I put the question to fathers: Would you esteem that son less, or think him less likely to fulfil the great duties of life, who had been educated in a professional school of agriculture, with all the high qualifications which it would confer for public and domestic usefulness, than him who had been educated for the counter, the bar, or other high professional callings? On which could you best rely for support and comfort in the decline of life? Nay, I will venture to carry the appeal farther; to the discriminating judgment of the unmarried lady: Would you reject, as a partner for life, the student of such a college, coming forth with a sound mind, deeply imbued with useful knowledge, and a hale constitution invigorated by manly exercise, whose cares and affections were likely to be concentrated upon home and country, and whose precepts and examples would tend to diffuse industry, prosperity, and rural happiness around him? The father's response would, I think, be an unhesitating no to the first question;

and the lady's, after due deliberation, I verily suspect, would be a half-articulate amen. I pretend not to the spirit of prophecy, yet I venture to predict that many who now hear me will live to see professional schools of agriculture established in our land, to see their utility extolled, and to be induced to consider them the best nurseries for republican virtues, and the surest guarantee for the perpetuity of our liberties. They should be established; they will be established; and, the sooner they are established, the better for our country.

To those who have passed to manhood, and who have made up their minds, from necessity or from choice, to till the ground, the means of improvement, of studying the principles of their business, and of becoming acquainted with the most approved modern practices in husbandry, the opportunities of acquiring useful knowledge are abundant and cheap. One of these means, and a valuable one, is proffered him through the exhibitions and publications of these societies. Another is the perusal of books upon agriculture and rural economy, which should form a part of social and rural libraries. And another facility of acquiring this useful knowledge is afforded by the agricultural periodicals of our country, which, besides containing a great deal that is instructive in the philosophy of farming, are a record of the best modes of practice, and of much that is new and important in the various departments of rural and household labour. A volume of the *Cultivator*, of which I can speak with accuracy, contains about as much matter as five or six volumes of the popular novels of the day, and twice as much as four numbers of our literary quarterly journals. The price of the *Cultivator* is one dollar per annum. I verily think, that if the farmer would divide his patronage between political and agricultural journals, he would be a manifest gainer in his fortune and in his family; would be more happy in his business, and more

domestic in his habits ; a better manager, and a more useful citizen.

Time will not permit me to go into the details of modern improvements in husbandry. These improvements are great, and afford the brightest hopes to the philanthropist and the patriot. No one who can carry back his memory forty years can withhold his wonder at the astonishing advances which have in that time been made in the manufacturing and mechanic arts by reason of the aids of science ; and those who can scan the future will have no less reason to rejoice in the anticipated advantages which are in prospect, from an improved culture of the mind and the soil, consequent upon a better system of education among the agricultural population, and the general diffusion of useful knowledge which is likely to result from it.

I will merely farther remark to the farmer, that, if he would prosper in his business, he should study, practice, and adopt the better system of husbandry which is abroad in the land, and which has already greatly profited thousands, so far as his soil and circumstances will permit ; that he should drain his wet lands, economize his manures, and apply them with judgment ; that he should cultivate well what he does cultivate ; alternate his crops ; extend his root-culture ; increase and improve his stock as the products of his farm will permit ; and substitute fallow crops for naked fallows.

In conclusion, gentlemen, permit me to express my hearty wish that success and honour may crown your efforts to improve the condition of your country, industrial and moral—associate benefits almost as intimately connected as cause and effect—and that you may long live to enjoy the blessings which are promised to him who truly loves his neighbour, and reveres and worships his God.

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