

persistent care than careful grass-seeding. If there is no grass, then you have weeds. "Nature abhors a vacuum." Worse than useless trash will mar the fields, deteriorate the quality of the rest of the crop, and make future trouble by a new batch of weed seeds. To sum up, a single way to farm better, and at the same time make it pay, is to give greater care to the smaller details of the business.

To gather up the "small ends," and to "make by saving," is a safe and sure way for the average farmer to farm better and make it pay.

AGRICULTURE AND FARM MANAGEMENT.

By Dr. WM. S. ROLAND, *Member from York.*

[Read at the Conneautville meeting.]

Agriculture is the art of cultivating the soil in such a manner as to cause it to produce in greater abundance and perfection, the vegetables and fruits necessary to sustain animal life. Although, on all parts of the earth, where climatic extremes do not make it absolutely impossible, the soil possesses a certain degree of fertility, so as to produce, in more or less abundance, plants suitable for the subsistence of man and beast; yet, without care and cultivation, that natural product, in many sections of the world, is meager in quantity, and often almost destitute of the nutritious qualities which only can be imparted to it by careful and intelligent cultivation.

In ancient times, the nomadic habits of the people led them from one portion of the country, of which they were possessed, to another, in order that their flocks and herds might subsist on the natural products of the soil; and, although agriculture was one of the first occupations of man, but little attention was given to that industry, and that of the most primitive and unsatisfactory order. So it has been among the savages of our own day and country; millions of acres, which, when under their control, produced but little that was life-sustaining, but, when cultivated by industry and intelligence, return to the agriculturist most abundant crops of cereals, vegetables, and fruits.

Wherever the plow, guided by the hand of intelligent industry, has broken and cultivated the soil, it annually returns a rich reward for acquired scientific knowledge, practically applied by patient physical labor. Yet, here in our rich agricultural districts, and most productive portions of our country, we too frequently see men engaged in the cultivation of the soil they own, or which they farm for others, totally ignorant of the most simple rules, which should govern all who desire to thrive by this old and honorable occupation. They apparently know but little about the formation and nature of the soil of the farm on which they expect to spend years of toil, in order that they may thereby gain a living. They buy large tracts of worn-out and neglected land, from the acreage of which they blindly trust to be able to win enough by poor husbandry to not only make a comfortable living, but to amass a competency for their descendants. They have no clearly fixed ideas of the rules that should govern their system of cultivation, in order to more speedily and effectually assist nature in

rehabilitating their worn-out and unproductive fields, with a soil that would soon respond to the touch of intelligent husbandry by a return of most bountiful harvests. They often show most decided ignorance in the selection of their farms, as to the lay of the land, convenience of water, quantity of timber, and division of the farm into fields. They again display a most lamentable absence of any familiarity with the nature and quality of the soil they cultivate. They are equally as unable to understand how to treat wet and clayey soil, in order to render it sufficiently dry for cultivation, as they are to draw to the surface of dry and sandy soil that degree of moisture required by the crops growing on the surface. On the other hand, where intelligent, scientific knowledge of the nature and quality of the soil to be cultivated and recuperated go hand in hand with industry, the farmer will win from the improved soil the fruits of his labor with the first gathered crops. Hundreds of our young men who have been reared on farms, have reached the age of maturity through years of toil, and without having acquired that knowledge of the nature of the soil they cultivate, and the best means of improving it, which should be inseparably associated in the education of every man who selects farming as his future life-labor, and would prove a success in that occupation. One man, whose knowledge is thus limited, may toil on from year to year without making any appreciable improvement in the land he cultivates, or adding one bushel or pound to the crops raised by him the previous year; while his more scientific, although no more industrious neighbor, will add increased value to his land, and weight to his purse annually, by an intelligent cultivation of the same quality of soil. Nor is this all; for, when visiting the farms of the two men who have thus started side by side in the great life-battle set before them, you promptly recognize that farm cultivated and managed by the educated farmer from the one tilled by his neighbor, who blindly toils through the seasons, only to complain of short crops and hard times. The one shows unmistakable evidence of intelligent and thrifty management in the well laid out and clear fields, clean fence-rows, well filled barns, numerous stacks of grain and feed, cribs piled high with yellow corn, and sleek, well-bred horses and cattle; while on the other, the eye is outraged by the sight of barren and ill-shaped fields, almost run over with bushes and briars, dilapidated fences, empty barns and cribs, ill-fed stock, and a mass of broken and weather-beaten implements of husbandry, which have never been housed since the day they reached the farm. This comparison is not overdrawn, but is only a weak effort to point out the vast difference between intelligent husbandry and ignorant and careless farming.

Therefore, in order to make farming a success, the farmer must necessarily combine industry, care, and judgment, with an intelligent knowledge of the nature of the soil he cultivates, and the best system for improving the same, whether it be selected by his own choice or by the accident of circumstances. The reading farmer is taught by scientists that the surface of the earth is composed almost entirely of four substances; these, they say, are the decomposed rocks of a former period, called by them primitive earths, and are clay, sand, lime, and magnesia, a combination of which form the fertility of the soil. Clay, the first-named component part of this combination, is composed of a substance which is readily recognized by all. It absorbs water slowly, and hence can always be found acting as a reservoir for the water

which gives the farmer so much trouble in the low lands of his farm, and practically destroys what would otherwise be most excellent meadow land, not only because it holds the water, but for the additional reason, that its tough or tenacious nature prevents the roots of cultivated crops from penetrating it, and this hindrance must be corrected by chemical process, or the land given over to bushes and sour-grass. But how to most successfully produce this change in the soil, is a question which has frequently troubled the minds of our most successful agriculturists. Most of writers on the subject agree that the change necessary to the improvement of clay soil can be best effected by applying to, and mingling with it, all kinds of calcareous (lime,) manures, ashes, street-sweepings, and barn-yard manures after which it should be plowed up in the fall, so as to expose it to winter frosts, which destroy and mellow its tenacious qualities. Sand, the next of the four primitive earths, is a soil of an entirely different nature from clay. It is not cohesive, and is, therefore, incapable of retaining moisture, and hence crops grown on a sandy soil often suffer from drought, as the moisture so readily escapes. Writers on this character of soil also differ as to the proper mode of treatment; most of them, however, agree that deep plowing, with a dressing of the heavy wet deposit from the barn-yard, with the black deposits found in swamps and along streams, are attended with good results. A further benefit to sandy soil results from allowing the small stones often found on the surface to remain, as they assist in retaining moisture, and are not in the way of crops or machinery. Lime, also one of the primitive earths, as a general and valuable fertilizer is too well known, even among the uneducated, to require any extended notice. Most farmers know lime to be a valuable and lasting fertilizer when properly applied to the soil; but, many desiring a more active agent for the production of crops, resort to the use of often expensive, and sometimes worthless, artificial fertilizers. The fertilizers in which dissolved bone is found in large quantities are considered the best. Bone, like lime, however, is not a very active agent, but is a lasting one; yet the difference in cost between lime and bone, and their relative effect, must be left to the judgment of the farmer. Magnesia, the fourth primitive earth, is not recognized as possessing any valuable fertilizing qualities.

A manuscript touching on this branch of my subject came into my possession many years ago, and which seems to have been written in 1835, in which the writer says: "The agricultural value of a soil depends less on the nature of the materials composing it than upon their relative fineness."

Plants draw a large portion of their nutriment from the atmosphere. The soil upon which they grow should be of such a texture as to retain a suitable quantity of moisture, and not be so clayey as to bake and crack in the heat of the sun, or so sandy as to become parched and mere dust at the depth to which the roots penetrate.

Argillaceous earths have a strong affinity for water, and retain a small portion when heated. There should be enough of this in the soil to enable it to retain three or four per cent. of water when dry, and to make the other materials into a loam. The substratum should always be taken into consideration, as well as the soil, and if it be sand or loose gravel, the soil, unless it contains a rather large portion of clay, is apt to be too dry; but if the sub-soil be clay, the soil will almost always be what is termed cold and wet. Where clay occurs,

gravel and sand are often observed in alternating strata; advantage is often taken to drain wet soils, from a knowledge of this fact, by boring through the clay, so that the water above the clay bed can drain through into the sand or gravel below, whence it finds an outlet in springs at a lower level.

Sandy or gravelly soils are much improved by mixing clay or loam with them, and, on the contrary, clayey soils are benefited by a dressing of sand or gravel. Soils containing too much argillaceous earth heave by frost and draw the roots of plants and winter grain out of the earth, thus causing what is called winter-killing. The soil should be of such a texture as to allow the water in it to freeze, without making the earth heave or rise above its ordinary level. Who has not observed in such soils, on the approach of winter, when the ground began to freeze, that the stones of moderate size imbedded in them, which are ordinarily on a level with the surface, were then lower—in other words, the stone remaining fixed; the earth by freezing had risen above it.” But getting back to my subject, in addition to the four primitive earths, which have been named as constituting the soil and sub-soil, the upper, or what is known as the mold, contains the decayed remains of vegetable and other fertilizing matter, which have grown and decayed thereon—as is the case on our great fertile prairies of the West, or have been fed to the soil from time to time in the process of cultivation. The decomposition of this matter is the cause of the fertility of the soil, and wherever that deep mold is found, the farmer will not plow and sow in rain. Then, if this be true, is it not the wise farmer who will carefully gather all vegetable matter into his barnyard, and there let the process of decomposition go on, until his soil is prepared for the crop, and then judiciously apply it to the land, in order to give life and vigor to the plants. The more manure of that kind, the larger will be the return to the farmer. At the meeting of the Indiana State Board of Agriculture in 1875, Mr. Thomas Olcott read an essay on grass and grain growing, in which, among other wise sayings, he said: “The main point is to make every rod of land on the farm available in raising something useful; good crops and increased fertility are the objects; manuring is the life of farming; the true idea of farming is to raise such variety of grains and grasses; of rich luscious fruit; variegated with the finest selection of stock and domestic animals, as will throw a charm around that spot called home.” But how can this best be done? is the question that presents itself to the mind of every man selecting a farm for his future home. It is a question of easy solution, if every one engaging in husbandry will select for himself a farm of an acreage commensurate with his ability to cultivate it well, so as to improve the soil to the very highest state of fertility, he will be taking the first important step on the highway to prosperity. The man of abundant means may conveniently purchase a large tract of land, and by the proper use of money, judiciously expended on it, will bring it into a high state of cultivation. But with us a large number of our young farmers enter their chosen field of labor on the threshold of manhood with limited means, and often in doing so commit the grave blunder of selecting more land than they can profitably cultivate, and hence, more than they can pay for. One man selects a large tract of improved land, but, owing to his inability to hire the requisite amount of labor, purchase sufficient stock and implements to cultivate the whole in a workmanlike manner, that portion which must necessarily lie idle is

nonproductive, and hence becomes a dangerous and continued stumbling-block in the way to success. On the other hand, the man who selects poor and cheaper land is in no better position, for he is compelled to meet an additional outlay in the purchase of fertilizing matter before he can harvest a single respectable crop. Nor is this all; for the man who owns and indifferently cultivates a large tract of land is compelled to meet many expenses which he would not encounter on a smaller tract, and from which he would reap the same returns. Why, for instance, should a wise farmer pay taxes and other heavy expenses on twice as much land as he can cultivate with profit? It is the small, rich, closely cultivated tracts that pay the farmer best. The productiveness of well-tilled land is almost unlimited, and if the careful farmer can grow thirty bushels of wheat, or one hundred bushels of corn, or forty bushels of oats, or two hundred bushels of potatoes, or three tons of hay, on one acre, when intelligently cultivated, would it not be the height of blind folly to go over three or four acres to gather the same amount of crops which can be raised on one acre? Suppose the farmer owns but fifty acres, six acres of which is timber land; on this small farm he could have eight acres in wheat, nine in corn, five in oats, two in rye, one in buckwheat, one in potatoes, seven in grass, seven in pasture, three in orchard, and one acre for house, barn and out-buildings, and garden. Here is all the variety of crops provided for, and, if highly cultivated, would feed the family and give a surplus for market, from which sufficient could be saved to apply to any necessary or useful purpose. In cultivating this small tract, the farmer would require the assistance of a stout industrious youth; he should keep two or three good horses or mules, mares would be most profitable, as they, if well cared for, would raise colts annually. He should keep four or five good milch cows, and raise all the likely heifer calves; he should also keep a few sheep and swine, and poultry, all of which should be good stock. Then, as the annual products of this small farm enable him to do so, he can produce additional land, and with the same care and industry, make farming on a larger scale as profitable as when he owned but fifty acres. But, in order to be successful in the way that has been here indicated, the man who takes to farming as an occupation must have brain, push, and untiring industry, or he must prove an unfortunate failure—a drone in the hive of busy workers.

Statistician Dodge, of the United States Agricultural Department, under the heading of A. burden upon Agriculture, says: "A mortgage is a blessing when it enables a poor industrious young man to secure a home and a profitable business, and to pay for it in sure and easy installments; it is a withering curse when it makes production dear and difficult, consumes a crop before it is made, and renders indebtedness hopeless."

FARMERS' BOYS.

By Mrs. F. M. LEIGHTON, *Glenburn, Pa.*

[Read at the Scranton meeting.]

I am happy in being permitted to address you on another subject than the one assigned me in your programme; one more congenial, and suggested by a mother's partial fondness for a class in which you