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The Handling of Upland
Soils.

Graduating Thesis,
by
Ernest L. Cottrell.

Outline.

Introduction.

Deterioration of soils due to:

Improper Cultivation.

Washing.

Winds.

Tramping.

Restoring Fertility by:

Adding Humus.

Deep Plowing.

Fill up Washouts with:

Brush.

Tyling.

Prevent Damage from Winds by:

Keeping Earth Moist.

Full of Humus.

Windbreaks.

Plant Leguminous crops.

Soy Beans.

Alfalfa.

Save and Apply Farm Manures.

Action of Frost.

Rotation.

The Handling of Upland Soils.

How to handle upland soils is a question which is forcing itself upon many farmers. It is a question of vital importance and one that many of us must answer immediately.

As population increases land rises in value so that the poorer land must be brought into use. While this is true, the prices of farm products are declining and the necessities of the farmer are on the increase. He must have more home comforts, dress better, and give his children a better education than he or his fore fathers had.

It can readily be seen that in order to supply these wants and meet the demands of civilization the farmer must increase his income; and the only way to do this, is to increase the production from the soil.

Before taking up this subject of

increasing the productivity of the soil, let us take a look at the fields and see in what condition they now are, and what has brought about these conditions.

Upon investigation we find that in nearly every case the soil has decreased greatly in fertility. In many cases the soil will not produce half the crop produced when it was first broken up. Some fields can hardly be cultivated at all, while others will not pay for the labor spent in cultivating them - that is, under the present system of cultivation.

There are several causes for this deplorable state of affairs.

Improper Methods of Cultivation is the cause for the greater part of the difficulty. The motto of the farmer has been quantity, not quality of work. Year after year, the same crop has been put in the same place and tended in the same way. The result is that the crop has taken up all the plant food available for it. As the crop decreases in yield year after year, the farmer begins to complain about there being no money in farming - that you could not raise a crop, and if you did you would get

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nothing for it. It is needless to say that the soil and crops are not the seat of the difficulty. It is the method of doing the work that is at fault.

The washing of soils has almost ruined some fields. Shallow plowing made it impossible for the soil to absorb the water that fell during heavy rains; so that instead of the soil absorbing the water, the water absorbed the soil carrying it away and forming deep gullies which soon became impassible.

Another factor which has reduced the fertility of the soil very much is winds. Dry south winds dry up the soil, and make it just like powder, and during heavy wind storms the available soil is blown into adjacent fields, or perhaps the adjacent State. The washing and blowing of soils has gone so far in some cases, that nothing but the pure subsoil is left.

These last two factors have been very hard to overcome; but there is still another factor which in some cases has damaged the land more than anything else and for which the farmer is wholly responsible, as it lies completely within his control. It is the practice

of letting the stock run all over the place in all sorts of weather, wet or dry, tramping the land until it is almost impossible to plow it. The reason farmers let their stock run loose this way is because they did not put up feed enough during the summer to keep the stock over winter, and so the cattle are left to shift for themselves. This not only ruins the soil, but it also knocks the profits out of stock raising.

The question now before us is, can the farmer bring this soil back to a state of productiveness which will richly reward him for his labors? Our answer to this question is that he not only can, but he must.

The chief deficiency in our upland soils is the lack of humus, decayed organic matter. It is to the lack of this substance that the packing, hardness and lack of fertility of our soils is due.

Humus supplies nitrogen to the soil. It promotes chemical action in the soil, liberating plant food from its compounds, thus making it available for plant use. It makes heavy clay soils mellow and easily cultivated. It increases the water storing capacity of the

soils and improves their texture.

Another great aid in producing fertility is plowing. Thoro and deep plowing brings more soil into use for the plants, and will allow the roots to penetrate the soil more deeply and make a more extensive growth. It will form a larger reservoir for water, and so do much to prevent the washing of soils. Roberts says, "In order to emphasize the need of deep plowing to form a reservoir for the storage of moisture, let us suppose that the soil is in a fine, arable condition as to moisture, and contains fifteen per cent of water. If one inch of rain should fall, upon the deeply tilled land, the soil would contain twenty one percent of water; but if it should fall upon the shallow plowed land it would contain over twenty six per cent. The case would be still worse if two inches of rain should fall. Then in the former case, the land would contain twenty eight and nine tenths percent water, and in the latter, thirty five and seven tenths per cent; an amount which would probably carry the soil off bodily."

Sometimes in the spring when late

heavy rains have set in, planting time is delayed by the land being too damp and cold for the young plants. It may then become necessary to dry and warm the land to hasten the time of planting. This may be done by means of the disc harrow which brings the cold soil to the surface where it may be acted on by the sun.

Plowing brings fertility to the surface. When a heavy, hard rain comes, the water percolates through the soil into the subsoil, taking with it the elements needed in crop production. If the surface of the land is in a moist condition, this water will be drawn back by capillary attraction, bringing with it these elements required for plant food. When this water evaporates, it leaves on the surface these elements that it has brought from the subsoil.

While plowing is one of the most beneficial processes in cultivation. There are times when it does positive injury. This is when the soil is too wet or too dry. If the soil is too dry it is turned up in great lumps which cannot readily be broken up, this allows too free a circulation of air, and the soil is dried out.

If plowed when too wet, the soil will become puddled and get so hard that crops cannot grow in it.

By thoro continued shallow cultivation, the soil may be kept in a mellow, moist condition thru out the season. The depth of cultivation depends upon the kind of crop grown. Some deep rooted crops require deep cultivation to keep the moisture and plant food down deep enough in the ground; while shallow rooted plants require the food material and moisture nearer the surface; therefore; shallow cultivation is preferable in the latter case. If a soil mulch of two or three inches is kept during the growing season, evaporation is greatly lessened, and the same is true of the devastating effect of hot winds.

The damage from washouts may be cured in several ways. If the land is plowed deeply, there will be less likelihood of washouts. If the washouts are small they may be filled up by back furrowing into them. If they are large, dams may be built across them at frequent intervals with brush or waste, as old hay, straw etc. The brush may hinder in

cultivation for some time, but it will soon rot and leave the ditch filled up. In no case should these ditches be filled up with stone as stone will always bother subsequent cultivation.

In case the ditches are too large to be filled up in the manner described, it may be profitable to use tiling varying in size with the size of the ditch and the amount of water carried off by it. The tiling should be placed not less than three feet below the surface. Stone drains at this depth, when properly made, will last thirty years. In these ways, fields that have been practically ruined by washing may be brought back into a smooth condition.

The damage by winds may be prevented in a large measure by thoro cultivation. Sand that has been thoroly cultivated is generally moist, and soil that is damp does not blow off. Soil containing a relatively high percentage of humus will not blow. In one instance, two fields were side by side separated only by a wire fence, on a windy day, dust was rising from one, so thick that you could not see twenty feet away. While there was practically no dust from the second field. The first field had never been

manured or carefully cultivated, while the second field had been carefully cultivated and well manured. This shows what can be done in preventing damage from wind storms. The subsurface packer is a great aid against wind.

Much can be done in the way of preventing the blowing of soils, by running furrows across the field in the opposite direction from which the wind blows.

The subject of wind breaks is being agitated a good deal at the present time, and the future of windbreaks appears to be a satisfactory method of partially solving the wind problem.

The advantages of windbreaks are many. They have proved a boon to fruit growers, and why should they not prove equally valuable to those engaged in raising field crops.

In the first place, belts of trees prevent, to a limited extent, the evaporation of moisture from the soil. Large belts of trees make a cooler atmosphere by respiration from the leaves. It has been argued by many that belts of trees cause a larger percentage of rainfall. But the chief use of windbreaks is to protect the crop from hot winds. That it will do this

is shown from the fact that fields shielded by trees will stand more hot winds than fields not so protected.

The three elements in plant food which concern the farmer the most are, Nitrogen, potash and phosphoric acid. Of these three, Nitrogen is the most important, as it is the element in which most soils are lacking. In most of our Kansas soils, there is a sufficient quantity of potash and phosphoric acid, but in many portions of the country, the soil has been robbed of its Nitrogen by careless cultivation and poor planning.

The quickest, cheapest and best way of getting Nitrogen in the soil is by raising leguminous crops, such as alfalfa, clover and soy beans.

For the Western Kansas farmer, alfalfa is the crop of all crops to raise. No farmer who raises stock of any kind can afford to be without it. A late experiment at the Kansas experiment station proved that alfalfa was worth twenty eight dollars per ton when fed to hogs. It is also very valuable when fed to dairy cows or fattening steers. Many farmers

have proven to their own satisfaction that alfalfa will not grow on uplands. This is a mistake. Alfalfa will grow on poor uplands, it will produce a crop of about two tons per acre as an average on land so poor that it will not produce corn. From this it will be seen that alfalfa is a valuable crop for feeding; but it is doubly valuable when we consider its worth as a restorer of fertility. The soil swarms with millions of different species of micro-organisms, and several of these species attach themselves to the roots of leguminous plants, living on them, and in turn furnishing the plant with nitrogen, which it obtains from the soil air. This is stored up on the roots in nodules or tubercles, and when the plant is removed, most of these nodules are left in the soil; not only this but the roots penetrate deeply into the soil, breaking it up, making it mellow, and available to future crops.

The soy bean is a nitrogen producing crop, also furnishing nitrogen to the soil in a manner similar to alfalfa. At the experiment station, it was proved that soy beans were worth one dollar and six cents per

bushel when fed to hogs. From six to ten bushels per acre can be raised as an average on upland soils.

Another method of improving our soils is by the careful saving and judicious application of farm manures. There is probably nothing so thoughtlessly wasted on the farm as manures. Many farmers have found that applying manure to the land does it great damage in drying it out and reducing the crop yield. This may have been caused by putting the manure on too thickly. In such a case the above results would follow; as the manure would open the soil, and allow free circulation of air, which would dry it out, and so starve the crop. Manure, when rightly applied, will help to conserve moisture, keep the land from blowing, add humus and improve the texture of the soil.

Manure should be spread on the fields as soon after it is made as is convenient. It pays better to apply a thin covering of manure often than it does to apply a heavy coat once in a long time. Quicker and greater returns will be received, if the manure is

applied in the fall or early spring, to alfalfa than if applied to any other farm crop. But in this case, the manure must be well rotted or it will bother when the alfalfa is cut.

All manures are not of the same value; for instance, the manure made by young growing animals will be worth less pound for pound than that made by mature or old animals, if fed on the same feed.

Manure which is made by animals fed on highly nitrogenous food is much more valuable than manure from animals fed carbonaceous food. Manure from fattening animals is worth more than that made by half starved animals.

Most of our uplands contain plenty of plant food but it is not available to plants. It is bound up in its compounds. One way to overcome this difficulty is to plow the land early in the fall or as soon as the crop is off the land; then, just before the ground freezes up, throw the soil up into steep narrow ridges. This will allow the frost to work on it, the compounds will be broken down and

the elements made available for plant use. But care must be taken to smooth the land down early in the spring to prevent evaporation. This method can be used only on land where there is no danger of washing; otherwise the washing would more than balance the good obtained.

Rotation of crops must not be forgotten in this connection. Some plants require their food to be abundant and easily available while other plants can rough it, or in other words, make a good growth on poor soils. On uplands, a long rotation is preferable. The following may be used as a ten year rotation.

Alfalfa five years.

Corn two years.

Soy Beans One year.

Kaffir Corn two years.