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CROP ROTATION

by

A. H. SANDERSON.

DEFINITION: By crop rotation is meant the systematic changing of crops in contrast with a haphazard method of changing them, or the continuous growing of one crop on the same land in other words a method is pursued whereby there is a regular succession of definite crops, one following another for a certain number of years, then through the same round again. Of course for any given year the different fields on the farm would be in various periods of rotation, or there might be a separate rotation for each field according to its special adaption.

ORDINARY PRACTICE: The importance of occasionally changing crops has been recognized for a long time, and it has been practiced to a greater or a less degree, but in the vast majority of cases it was simply a change without any regard to the probable effect it would have on the soil or the results in the yields which could almost certainly be expected. The farmer will tell you that he has to change his crops in order to keep the soil from wearing out. In most cases he does not understand his own explanation, and further he only recognizes the one benefit to be derived, while if the plans are properly laid there should be a great number of benefits, as I shall presently show.

NECESSITY: The necessity of rotation should no longer be doubted. The fact that a field will produce three or four crops of one grain when grown successively does not prove that policy a good one to pursue. It is too short sighted. Look at the land in any of the older cultivated regions where a great deal of "one crop" production has been carried on and what are the facts? The land is worn out, and to keep up the yield in production either a radical change in methods must be inaugurated, or a large amount of commercial fertilizer must be applied. This fact is also being demonstrated in the rich prairie lands, where for instance, only wheat is grown without intermission.

The average yields are not as large as they were fifteen or twenty years ago. In places where several crops are grown, and rotation is practiced to a high degree the decrease in yields are not seen, or at least to a very slight extent. The results from practical experience cannot be doubted, therefore the evidence proves conclusively that crop rotation is a necessity, and sooner or later must be observed by every intelligent farmer.

ADVANTAGES OF ROTATION: Let us now consider a few of the real benefits to be obtained from a systematic rotation.

(a) Plant Roots Different Lengths: One of the most important points to be observed is the fact that different crops have different lengths of roots, and that by changing from a shallow-rooted crop to a deep-rooted one, we virtually change the soil from year to year on which the crop feeds. Although corn roots may go three or four feet deep into the soil, yet they also spread out and by extensive branching feed heaviest on the surface soil. Wheat feeds deeper in the soil than corn, while the roots of clover and alfalfa extend to even greater depths than the roots of wheat. Consequently the deep-rooting plants will draw a large amount of their plant food from the subsoil. Also, some crops mature early in the year as oats and wheat; others mature late as corn and cane. One crop will thus obtain food materials which was not available to the other.

(b) Plant Food: Different crops also take up the food materials in different forms and amounts. They differ in their feeding just as animals do. One crop will use especially large amounts of one element while another crop will use more of some other element. For instance the potato and fruits require a great deal of potash, the grains take up more phosphates, while wheat soon exhausts the nitrates avail-

able. Thus the changing of crops from year to year does not so readily exhaust the soil of the important food elements, and the life of the soil is lengthened for many years.

(c) Physical Condition of the Soil: In raising a crop one kind of cultivation is employed and if this is carried on for many years the soil becomes hard to work and a change is needed. For instance if it is corn land it becomes packed down and needs plowing to pulverize and loosen it up. If wheat land ^{there is} ~~it~~ apt to be a hard pan formed by the pressure of the plow and the tramping of the horses. The rotation therefore furnishes the opportunity to change the treatment of the soil and a better texture is obtained. The roots and stubble or stalks left in the field by the previous crops also improves the physical condition of the soil.

(d) Soil Moisture: Closely related to the physical condition of the soil and depending on it, is the soil moisture. A soil in good condition will take in more rain than one in poor condition, it will be better drained and the moisture will be better conserved in the soil for the crop during the dry season. Cultivation puts the soil in this good condition. One year we plow shallow, another year deep, and another we cultivate or use some other method. Hence when the rain falls it is taken in rapidly and under the force of gravity is drawn down to a considerable depth. In other words cultivation deepens the water reservoir. Another point receiving considerable attention the last few years is the fact that when the the soil particles are fine and there is plenty of humus in the soil, a given amount of soil will hold more moisture than one in poor condition. Of course this is of great practical importance to the farmer for there is usually a far greater amount of rainfall in any year than is needed for one

crop, but so much of it is wasted because it cannot get into the soil that there is usually a deficiency of moisture some time during each year. Now ~~if~~ the moisture is in the soil when the dry season arrives all that is necessary to do is to put on a soil mulch to prevent the wasteful surface evaporation and make the water pass up through the plants.

(e) Effect on Weeds: A rotation also has great influence in determining what plants obtain the moisture from the soil. Weeds are great feeders and of course leave that much less water for the crop. It is also noticed that when one crop is grown continuously certain weeds are likely to become numerous. By changing crops and with them the cultivation we often kill the weeds and thus destroy the crop's enemy.

(f) Insects and Diseases: Certain insects and fungus diseases are associated with each crop therefore when a rotation is practiced the insect or disease is left without its natural host to feed upon and must either adapt itself to the new environments or be exterminated. If we remove the food of the insects, bury them or their eggs deep in the soil, or turn them up to the frost, we are helping to destroy them.

(g) Increased Yield: If then a rotation makes a much better environment for the crops the yields should be increased, and this has proved true in practice. The large crops without decreasing the fertility of the land is of course the great question which decides whether a rotation is practical or not. If the large crops could be grown without paying any attention to the lasting quality of the soil, its texture, moisture content, or the enemies present, then it would be an easy matter to decide which crops to grow. But as each of these fac-

tors have such a great influence on the crop they must be taken into account. Also no generation of farmers should impoverish the soil of its wealth of fertility. A farm should be left in as good or better condition than it was when taken, and this can only be done where a systematic rotation is practiced in which some leguminous crop is used. Any increase of a yield of a crop generally means a decreased cost of production per ton, and this in turn means an increased profit from the field. It takes as much work to plant and cultivate a half crop of corn as it does a full crop, hence the desirability of getting as large a crop as possible.

(h) Crop Failures: When only one crop is grown on the farm there is considerable danger of losing it. If all is in wheat you may get an immense crop, but again any one of a dozen influences may blight your whole prospects of a crop. A hard winter may kill it; the Hessian fly or chinch bugs may take it; hail or storm may beat it down. With corn it may get washed out, or a few days of hot winds when it is in the tassel may kill all the pollen and so no grain be formed. Similar misfortunes may strike other crops, but the point is that where there are several crops there is little danger of any of them getting destroyed. Some of the crops are almost sure to survive and produce a fair yield. With one crop, and it a failure there would be no income for the whole year.

(i) Work Extended: Again, when a single crop is grown the whole rush of work comes at one or two periods of the year, and the remainder of the year there is nothing to do. During the rush the men and horses are worked to the limit of endurance, and often laborers cannot be obtained to take care of the harvesting of the crop. Good hired hands cannot be secured because they know the work will only last for a short

time, thus the farmer is compelled to take an inferior class or workmen. With a rotation the crops come in all through the year and the labor is extended. Not such a large acreage of one grain is raised and hence each can be taken care of by the steady hands on the farm without any great inconvenience. For this same reason more land can be farmed by a man than where one crop production is practiced.

(j) Income Extended: Where several crops are raised the income is also extended through the year. There is not a season of starvation and then one of surfeiting. Where wheat alone is grown the harvest all comes in at one time and for the next few months there is plenty of money but by the next harvest it is all gone and if the crop fails there is nothing to fall back on.

(k) Disposing of the Crop: With one crop there is generally only one or two means of disposing of it. With all wheat the farmer must either sell it for what it will bring or resort to the poor alternative of feeding it to the animals on ~~an~~ ^{the} farm, as hogs, etc. Also it is when there is a large crop that the price is lowest so he is at another disadvantage. When there are several crops the farmer is likely to, or at least should, keep some cattle and hogs to consume part of the crop and turn it into a more concentrated form for the market. The "ten cents a bushel for corn" prices are thus avoided, and also the labor of hauling the grain to market. As several crops are not likely to fail in the same year so there is also little danger of the prices of all farm products being low in the same year, so that even if one crop must be sold cheap another will make up for it.

(l) Moral Influence: I have said that the probable increase of yield was the great question to decide the practicability of a rotation however there is one other question equally important if not more im-

portant than the yield, and that is the influence which the rotation has on the man himself. Look at the people in the countries where only one or two cereals are produced. As a general thing they are an uneducated, shiftless set of people who never amount to anything. They may work hard for a short time to take care of a crop, then they do nothing until the next season of returns. They are never as industrious a class of people as those who practice a rotation of crops. When different crops are raised the farmer must have a more extended knowledge of his vocation. He must know the conditions necessary for the best development of each crop, must know how to harvest it, sell it, and know its relative feeding value. More machinery is needed and he must run it, therefore another field of education is unfolded to him. To obtain this knowledge he must read up-to-date agricultural papers, books, etc. and at the same time he will unconsciously glean many facts which do not touch directly on agriculture but which will make him a broader minded man -- better able to cope with the many problems of life.

EXAMPLES: Rotations may be selected for any number of years but the common one is from three to six years duration. The length of the rotation and the crops in it must be governed by the soil, climate, and kind of farming adopted, and the circumstances of the farmer. The special advantages of one crop following another should always be taken into account. A few rotations might be given suggestive of the method, but each subject to change with the existing conditions of a locality. A few such rotations follow:

Corn	Wheat	Wheat
Oats	Corn	Corn
Wheat	Corn	Corn
-----	Alfalfa	Clover
Corn	Alfalfa	Clover
Oats	Alfalfa	Pasture
Wheat	Alfalfa	Corn
Wheat	Pasture	-----
-----	Pasture	Cane
Oats	Corn	Corn
Wheat		Wheat
Corn		Corn
Kafir-corn		Oats
Corn		

In several of the rotations some cover crop could be provided, as cow peas, to plant after the regular crop was harvested, and which could be plowed under later to supply humus to the soil.

CONCLUSION: If then a rotation has so many advantages it should at least receive a careful consideration from every farmer who intends to make a success of his vocation. If the soil is the farmer's capital, then growing the same crop year after year leaves part of the capital idle. A rotation causes all the capital to produce an income. Yet even if the income was not increased by the rotation the moral influence on the farmer and his family is enough to commend itself as a worthy factor in civilization.