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SOIL MANAGEMENT FOR PROFITABLE CORN PRODUCTION

An early start given to corn on a silt loam soil. The two rows in the middle of the photograph had no fertilizer, while those on either side received a complete fertilizer. Feed the soil for profit.

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SOIL MANAGEMENT FOR PROFITABLE CORN PRODUCTION

By M. M. McCOOL

Greater profits are derived from the production of high yielding crops of corn than are obtained from those of low yields. A bushel of grain from a 60, 80, or even 100 bushels per acre yield is naturally produced at a lower cost than is one derived from a yield at or below the average for the state. Likewise, a ton of stover is produced at a lower cost from a high yield than it is from a low one.

In view of these accepted facts, a review of production figures for the Michigan corn crop is of interest, and we find that the ten-year average yield in the state has not changed markedly since statistics were first made public. The average per acre yields by decades, according to United States Census reports, are as follows:

1871-1880	33.4
1881-1890	27.5
1891-1900	30.0
1901-1910	32.2
1911-1920	32.3

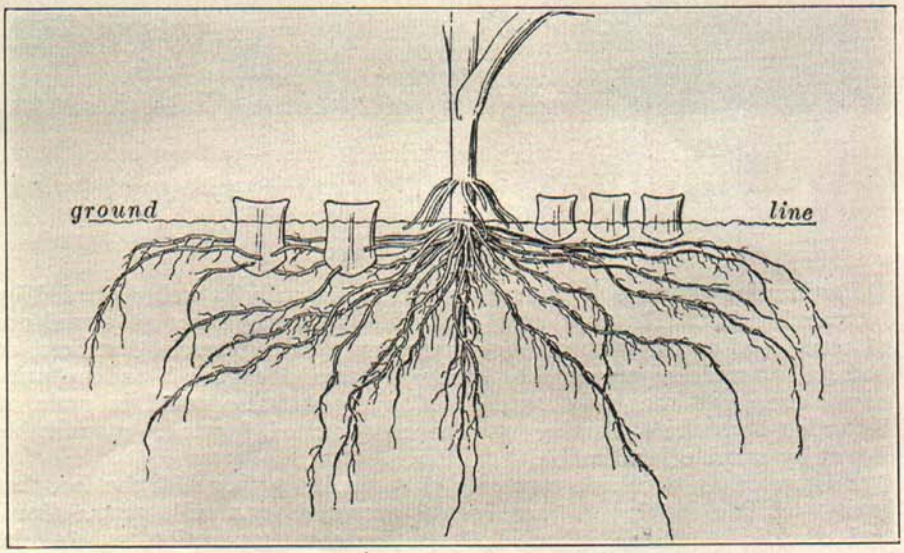

Fig. 1.—Avoid deep tillage when the roots begin to fill the soil; otherwise many roots will be destroyed and the corn plant injured. Yields so reduced are not uncommon. (Adapted.)

The average for the period 1921-1928, inclusive, is 34.2. What the average for the whole decade from 1921-1930 will be is problematical, but it is certain that greater attention should be paid to increasing the yields of this crop.

Although high yields of corn are obtained by many farmers, it should be borne in mind that these are not accidents. Such yields are the result of good husbandry, and a fertile soil is considered the most important factor in crop production. A run-down soil, for example, cannot be rejuvenated at once, this work usually requiring a few years time and careful planning.

Thorough fitting of the seed bed, with the soil well compacted to the depth of plowing, together with proper and timely tillage, are other important factors in the production of a large crop.

Fig. 2.—Corn on Fox sandy loam in Cass County—soil untreated.

Fertilization Pays

Fertilization of the soil for corn production usually is well rewarded by increased yields. The corn crop can utilize advantageously an abundance of plant food in the form of barnyard manure or commercial fertilizer, or both. An ample supply of phosphate will hasten the growth and maturity of the crop, and thus may avoid frost injury and also result in grain of better quality. Late planting may be compensated for to a considerable extent by suitable fertilization.

Because of its value as a cash crop or as feed, together with the fact that it fits well into certain rotations, corn is grown under a wide range of soil and climatic conditions. The ideal soil for corn production, where the growing season is long enough for the grain to mature or where forage production is the chief consideration, is a well-drained silt loam well supplied with organic matter. Soils lighter in texture, such as the sands and sandy

Fig. 3.—Soil treated with lime and complete fertilizer.

loams, mature the crop earlier than the heavier ones and thus are better for grain production in localities where the growing season is short.

Care must be taken in all phases of soil management if continued maximum production is to be obtained, even on ideal soils, because the crop removes a large amount of plant food from the soil. Furthermore, some soils erode or wash badly when devoted to a row or tilled crop, and in some sections wind erosion takes place.

Fig. 4.—Soil treated with lime, complete fertilizer, and manure. Soil fertility is basic; without it yields of all crops are low.

Fitting the Seed Bed

Although correct plowing is one of the most important steps in preparing the soil for a profitable corn crop, some farmers do not pay sufficient attention to this operation. The fitting of the seed bed should have as its object the compacting of the soil to the depth of the furrow slice, with the production of a mellow but not too loose surface layer for receiving the seed. On fall plowed land, this condition may be brought about in the spring by using a disc or spring-tooth harrow. In extreme cases, the roller or cultipacker can be used for compacting the soil and crushing the larger lumps. Some successful corn growers prefer to roll or cultipack immediately after plowing in the spring and to follow the roller with the disc or spring-tooth harrow. Others consider it advisable to use the disc before rolling.

Where corn follows sweet clover, rye, or other crops seeded especially for the purpose of adding organic matter to the soil, plowing should be delayed as long as practical in the spring in order to obtain a maximum growth of the green manuring crop. Plowing must not be delayed too long, however, as the removal of water from the soil may result in an insufficient supply for the corn crop, and a low yield will be obtained.

Careful Tillage is Important

On both early spring and fall plowed land where weeds are troublesome, cultivation should be repeated at sufficiently frequent intervals until planting time to prevent their development, for it is during this period that weeds can be destroyed with the minimum of labor. This practice also may reduce the subsequent tillage operations. The corn plant has a large and well-distributed root system which gives it access to considerable moisture. Care should be taken, however, not to cut the roots which occur near the surface between the rows, for injury to the plants in this way will cause them to suffer from an insufficient amount of moisture and perhaps of plant food. During periods of intense heat and deficient rainfall, root pruning reduces the yield of grain and stover materially. The best practice consists of deep cultivation while the corn plants are young and before their root systems are extended, and then shallow cultivation as needed.

Selection of Fertilizer

In selecting the most suitable system of fertilization for the corn crop, such important factors as the soil type, crop sequence, amount of farm manure available, and other provisions made for adding organic matter to the soil should be considered. Since a sound soil fertility program calls for regular additions of organic matter to the soil, plans should be made to accomplish this. Sweet clover has proved its worth as a soil builder and is rapidly increasing in popularity. The practice of seeding it in small grains and turning it under the following spring is a good one. Numerous farmers who make use of sweet clover for pasture do not graze the late growth closely, thereby making it possible to turn under considerable organic matter. Where either red clover or sweet clover is grown, some top growth should be turned under. Corn responds especially well to fertilization with barnyard manure. In a number of experiments conducted in various parts of the state by members of the Soils Section of the Michigan Experiment

Station, manure has proved to be more satisfactory when reinforced with phosphate than with any other fertilizer tested. Unfortunately, the amount of manure on most Michigan farms is limited, and very often the farmer wishes to use some of the supply on other crops, such as potatoes or beans. It has been found that supplementing the manure with commercial fertilizer is a very profitable practice. Super-phosphate is an excellent material to use for the purpose, because it supplies the plant food element in which the manure is most deficient; namely, phosphorus. The corn makes use of the available nitrogen and potash in the manure to far better advantage because of the presence of the phosphate.

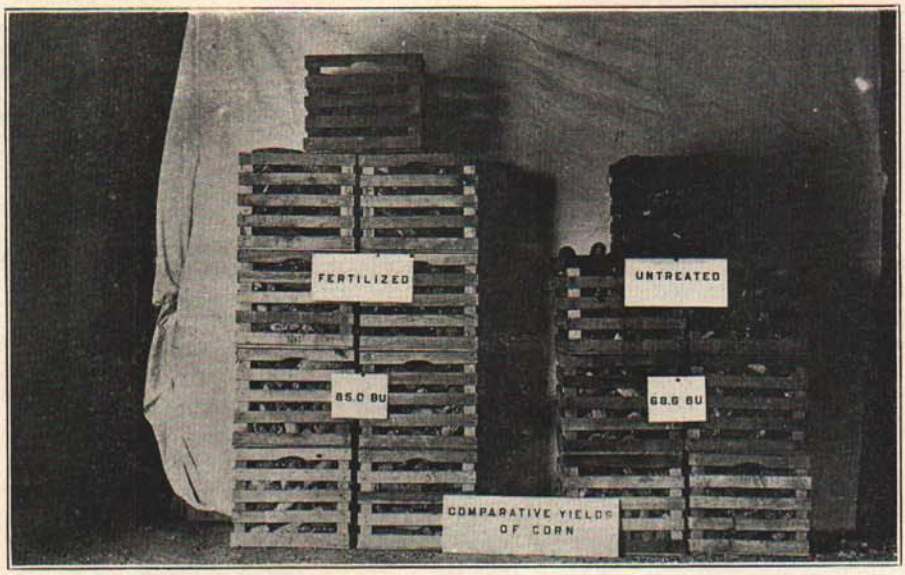

Fig. 5.—68.6 bushels of corn from manured soil, and 85 bushels from soil treated with manure and phosphate—Miami silt loam soil type on W. C. Kemster farm, near Coldwater. It pays to feed the soil.

Fertilizer ingredients affect the length of the growing period of crops. Phosphate is notable for its action in hastening maturity, whereas nitrogen and potash act in the opposite manner, or delay it. Thus, where the growing period is short or planting is delayed on account of the corn borer or other causes, this handicap may be overcome somewhat by using super-phosphate or a fertilizer carrying a large amount of it in proportion to nitrogen and potash. As a general rule, an abundance of phosphate may be expected to shorten the growing period of corn about ten days.

Fertilizer plays another important part in corn production. Corn grown on fertilized soil has been found to be more frost-resistent than that grown without fertilizer treatment. Thus, in localities or regions where the crop is likely to be injured by frosts appearing late in the spring, the use of fertilizer to make the young plants more frost-resistent is important.

The soils of Michigan are notoriously variable. They may differ widely,

not only texturally in adjoining areas, but also chemically or in their composition and power to produce crops. Such variations, together with the differences in farm practices, make it difficult to offer recommendations that will fit all conditions. The price of the ingredients which make up commercial fertilizers also enters into this question. If the cost of one or more of the materials were to decrease, it follows that the possibilities for profit from the use of such would increase. Under such conditions the business-like procedure would be to use mixtures containing more of these cheaper materials than would be the case if the reverse were true. Still another consideration is the tendency for the potash deficiency to increase as the soils continue to be farmed, or as the age of agriculture increases. Field experiments are necessary and will continue to be in order to obtain desired information. As the information is gained, changes will be made in recommendations.

Investigations on the use of fertilizer in this state have brought out certain principles, which, if followed, will be of assistance and economic value to the farmer.

Sandy Loams

The soils which belong to the sand and light sandy loam groups usually respond most profitably to complete fertilizers. Those soils in this group which have been poorly managed or on which there has been no use of mixed meadows, manure, or green manure recently, are most responsive to fertilizers which carry the nitrogen, phosphoric acid, and potash. Where the soils have been somewhat better managed or where mixed meadow, clovers, or alfalfa have been included in the rotation, the amounts of nitrogen used can be reduced in most cases. Where good management has been practiced a number of years and manure has been applied during a three or four year rotation, the amounts of both nitrogen and potash, in comparison with those in the fertilizers for the less productive soils, can be reduced.

The heavy sandy loams, silt loams, and clay loams as a rule require less nitrogen and potash for general crops than do the lighter groups of soil. If these soils have been poorly managed and no mixed meadow, manure, or green manure has been used during the rotation recently, a complete fertilizer is the most economical. When clovers, green manures, or mixed meadows are grown in the rotation and good management has been practiced, some of the ammonia and potash could be left out of the fertilizer. If barnyard manure is included in the rotation and good management has been practiced, phosphoric acid is the chief plant food to consider.

Fertilizer Suggestions for Corn

Soils	When not following mixed meadow, manure or green manure in rotation	When following mixed meadow, clovers or alfalfa	When land is manured
Sands and light sandy loams	4-16-4 or 2-12-6	2-16-2 or 2-12-6	2-16-2
Loams, silt loams and clay loams	2-16-2 or 2-12-6	0-20-0 or 2-16-2	0-20-0

MUCKS. 0-8-32 or muriate of potash. If the muck is strongly acid, limestone or marl should be applied.

In the preparation of the above table it has been impossible to include all the mixtures offered for sale which would be adapted to the corn crop. It may be cited, for example: a 2-14-4 could be used in place of a 2-16-2, and a 4-12-4 instead of a 4-16-4.

How to Apply the Fertilizer

When acid phosphate is used in conjunction with manure, it may be mixed with the manure as the latter is removed from the stables. There is an added advantage in this practice in that the acid phosphate serves as a preservative and so prevents loss of ammonia and organic matter, especially if the manure is not to be applied at once. Sprinkling from 30 to 40 pounds of acid phosphate on each load of manure as it is thrown on the spreader also has proved to be a good practice.

When the fertilizer is used to replace either all or part of the manure, it may either be spread over the entire surface of the field and dragged in, or drilled in the rows of corn, or applied in the hill. From the standpoint of the crops which are to follow the corn, the broadcast application is best, since the residues of the fertilizer will be distributed evenly over the soil. When this method of application is used, a somewhat larger amount of fertilizer should be applied—from 200 to 300 pounds per acre being a reasonable application and in addition 100 to 150 in the row.

It is possible, with the fertilizer attachment for the corn planter, to apply the fertilizer at the time of planting, thus saving one entire operation and localizing the fertilizer near the plant, with practically the same results to corn as follow using the larger amounts broadcast. In case the hill method of application is preferred, the amount of fertilizer should be reduced to about 125 pounds per acre; for larger amounts, especially of the more concentrated fertilizers, may result in damage to the germinating seeds, due to the fertilizer being dropped with or very near the seed. When the fertilizer is drilled along the row, as much as 200 pounds may be used without damage.

The opinion sometimes expressed that fertilizer dropped in the hill or row will limit the root development of the corn has been proved unfounded by a number of experiments. More fibrous feeding roots will develop in the vicinity of the fertilizer, and, by a greater extension of the mainroot system through the soil, the water absorbing power of the plant will be increased.