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CORN PRODUCTION

A 4-H Project

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UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE
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Project leader and county agent help 4-H club members harvest and measure their corn.

CORN PRODUCTION

(A 4-H Project)

Corn is the most important grain crop in Missouri both in acreage and volume of production. The value of the crop is usually two or more times that of the combined values of wheat, oats, rye and barley crops. While it is best adapted to the fertile upland and good bottomland soils, it is grown on approximately 90 per cent of all the farms in the state.

In the early agricultural development of the state, corn was one of the easiest and most profitable crops to grow, so the acreage devoted to it increased rapidly, reaching a peak of slightly over 8 million acres in 1917. Since that time, because soil erosion became a serious problem where corn was grown frequently on sloping land, the acreage was gradually reduced, averaging in recent years slightly less than 5 million acres. Despite this trend, however, corn will continue to be a very important crop because of its great value as a feed for livestock.

The average yield of corn for the state as a whole is seldom more than 30 bushels per acre and the best corn growing counties rarely exceed an average of 40 bushels. Individual growers, however, frequently have crops making 75 to 100 bushels and occasionally as much as 125 bushels per acre. These high yields are the result of using good seed, soil and cultural practices. Members of 4-H clubs who go into corn club work should do so with the idea of using the best practices possible under the circumstances to insure, in so far as they can, the highest practical yield of corn. Under a given price and cost set up for corn, raising the yield per acre is one of the most practical ways of increasing profits.

The following discussion is based upon those principles and practices of corn production which usually give the highest practical yields under a given set of circumstances. It is believed that by following recomended procedures 4-H corn club members can secure yields much higher than the average of their community.

Prepared by J. Ross Fleetwood, Extension Specialist in Field Crops, in collaboration with Robert S. Clough, State Club Agent.

Soil Fertility Requirements of Corn

High yields of corn are obtained only on deep fertile soils or where fertility has been built up to a high state. Corn draws heavily on the soil for nitrogen, phosphorus and potash. An 80-bushel corn crop takes from the soil approximately twice as much nitrogen, one-third more phosphorus, and three times as much potassium as 40 bushel wheat crop. To meet these heavy demands the soil must be able to deliver a generous supply of these nutrients throughout the growing period.

Mineral and Nitrogen-Rich Organic Soils Best for Corn

Soils rich in decaying organic matter or humus are best equipped to deliver sufficient nutrients for high corn yields. Soils which have been used in crop rotations with legumes or legmues and grasses, and have been treated with lime and mineral fertilizers and enriched by the return of crop residues and farm manures, are usually the highest in organic matter content. Such soils permit a more rapid intake of rainfall and reduce runoff of water and erosion, and, therefore, can deliver more moisture and nutrients to the growing plant.

Test Soil for Fertilizer Needs

On many soils commercial fertilizer is needed to provide balanced plant food through the growing season. Chemical nitrogen will likely be needed for best yields. If enough nitrogen is supplied through legumes, phosphate fertilizer usually is all that is needed on the dark upland soils and bottom lands. On light-colored soils which have been limed and have grown several crops of legumes, a phosphate-potash fertilizer will likely be needed.

The need for adding one or more plant foods through commercial fertilizers can be measured by soil tests. Your county agent will tell you how to take soil samples and how to get them tested.

When to Plow Under Green Manure

Green manure such as sweet clover should be plowed under when 10 to 12 inches high and while it is still green and succulent. When plowed under in this state the green manure will begin decomposing quickly and furnish the young corn plant nutrients in its early life, enabling it to grow rapidly, which in turn will make the first cultivation less tedious and often reduce the number of cultivations needed.

Applying Fertilizer

By broadcasting the greater part of the fertilizer on the surface and plowing it under, or drilling it in deeply after plowing, the nutrients will react more quickly on the soil, and become available

to the plant. Moreover, plowing the fertilizer under or drilling it deeply into the soil will put it in the feeding zone of the plant roots. Plenty of available nutrients near the feeder roots hastens growth and makes the plant less susceptible to insect damage. It is usually advisable to use some fertilizer in the row to supply the young corn plant available nutrients. With the exception of the deep black fertile soils, the row application should be used in conjunction with the heavier plow-under or drilled applications.

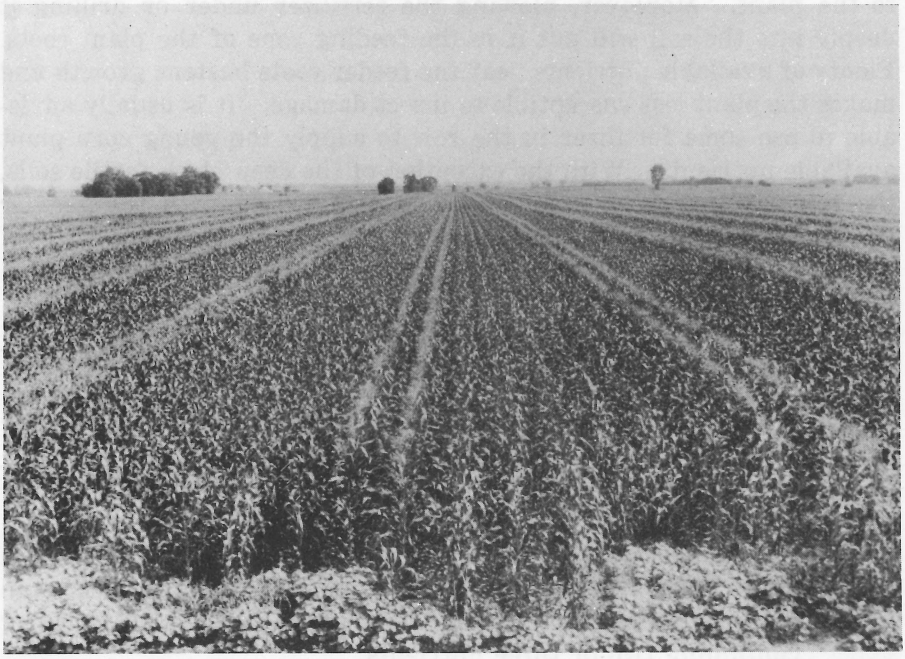
A summary of the good soil practices to use for obtaining high yield and quality of corn is as follows:

I. Supply decaying organic matter by one of the following practices:
   A. Plow under a green manure crop of either sweet clover, red clover, vetch or crimson clover.
   B. Plow under pasture or meadow sod or lespedeza.
   C. Plow under 6 to 10 tons of manure per acre.

II. Use commercial fertilizers according to soil tests. The various plant foods may be applied as straight materials with each material containing only one nutrient or in a mixed fertilizer containing two or three nutrients.
   A. **Nitrogen**—The rate will vary, from none or very little where a good stand of green manure or a heavy application of barnyard manure is turned under, to 300 pounds of ammonium nitrate or its equivalent where neither green nor animal manure is used. All, or at least a major part, of the nitrogen should be plowed under. If the full application is not plowed under, corn may be side dressed at the rate of 75 pounds of ammonium nitrate or its equivalent per acre at the second cultivation.
   B. **Phosphate and Potash**—Plow under enough phosphate or potash, or both, to give the soil the added plant foods needed for corn production. While spreading manure, add 25 to 40 pounds of superphosphate per ton of manure as it is loaded.
   C. **Starters**—Apply 100 to 150 pounds per acre of a complete fertilizer such as 3-12-12 or 4-24-12 in the row at planting time.

Fertilizer Grades

Fertilizer grades are known by the plant foods they contain. In listing the grades of fertilizers nitrogen is given first, phosphoric acid second, and potash last. For example, a fertilizer grade listed as



Double-cross field of U. S. Hybrid 13 at Malta Bend, Mo. Seed produced from this cross is the seed farmers will buy and plant next spring.

4-24-12 means that the fertilizer contains 4% nitrogen, 24% phosphoric acid, and 12% potash. One hundred pounds of this grade of fertilizer would contain 4 pounds of nitrogen, 24 pounds of phosphoric acid and 12 pounds of potash. Likewise 0-20-0, known as superphosphate, contains no nitrogen, 20 pounds of phosphoric acid, and no potash. The remaining part of the 100 pounds consists of inert material used as filler to carry the plant foods.

The fertilizer grade also shows the ratio between various plant foods. For example, 8-8-8 is a 1:1:1 ratio (meaning 1 part nitrogen to 1 part phosphoric acid to 1 part potash), and 0-20-20 is a ratio of 0:1:1, while 0-20-10 is a ratio of 0:2:1. Likewise 0-14-7 is a ratio of 0:2:1, an 4-24-12 is a ratio of 1:6:3, the same as 2-12-6. But 100 pounds of 4-24-12 contains as much plant food as 200 pounds of 2-12-6.

Selection of Hybrid Variety

Hybrid corn has so well demonstrated its superiority in drought resistance, standing ability, disease resistance and productive capacity as compared to open pollinated varieties that it is rapidly replacing such varieties. In 1949, more than 96 per cent of all the corn in

Missouri was planted to hybrid seed and in some counties practically all of the acreage was in hybrid corn. A hybrid should be selected which is known to perform well in the locality and on the type of soil being used. The county agent can advise with local leaders and club members on the selection of good hybrids. Since all good hybrid seed has been tested, graded and treated, the seed is ready for planting when secured. The grade, or size of kernel, to be used will be determined solely by the ability of the machinery available to plant that size uniformly. In other words, one size is as good as another if they can be planted with equal success.

Methods of Planting

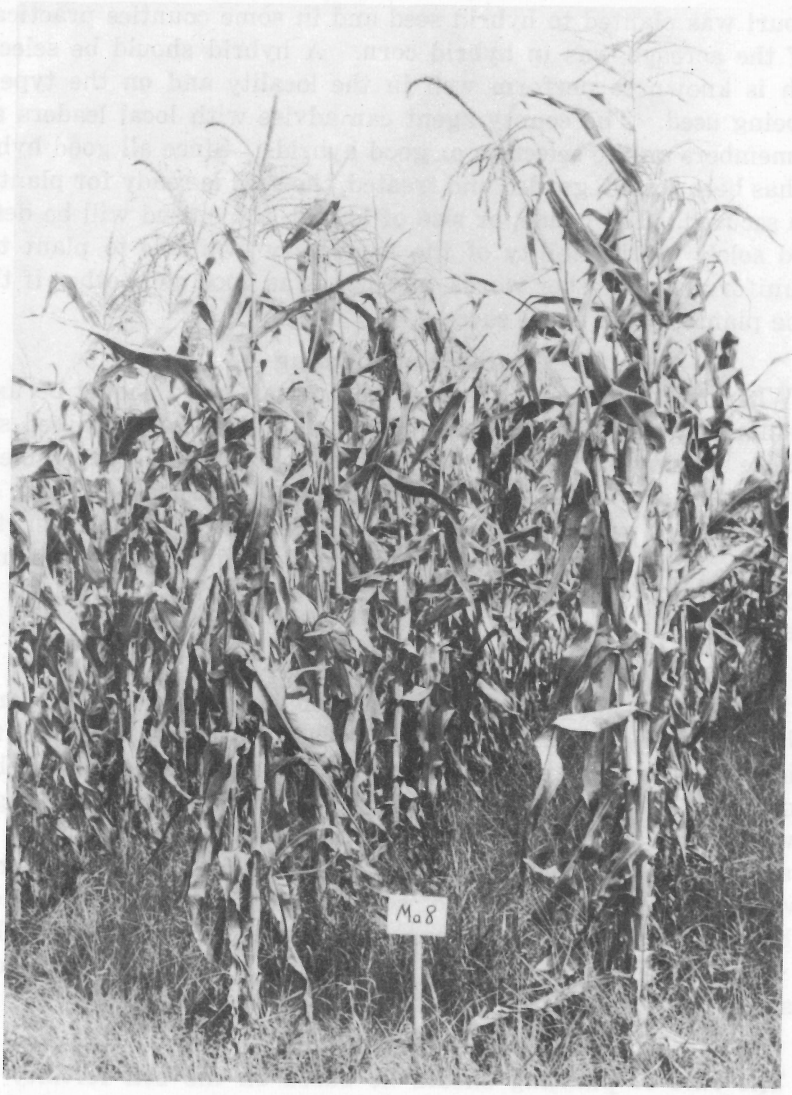
Where soil depth and drainage will permit, corn should be listed or planted with furrow openers. On shallow or poorly drained soils or those having tight subsoils, surface planting is preferable to either listing or the use of furrow openers. The use of listers and furrow openers where adapted gives increased yields over surface plantings. This is probably due to the fact that weeds are more easily controlled and cultivations are not so likely to damage the feeder roots.

Plant on the Contour

In all cases where soil erosion is a problem, corn should be planted on the contour if at all practicable. There is ample evidence that erosion losses can be reduced as much as one-half by a good job of contouring. This method of planting also increases the soaking in of water, and yields are increased by about 10 per cent on the average. Since corn permits as much erosion as any crop generally grown in the state, the saving of soil fertility and water by contouring becomes especially important as a management factor. There are very few fields on sloping land which should be put in corn unless the cultivation is all done on the contour.

Rate of Planting

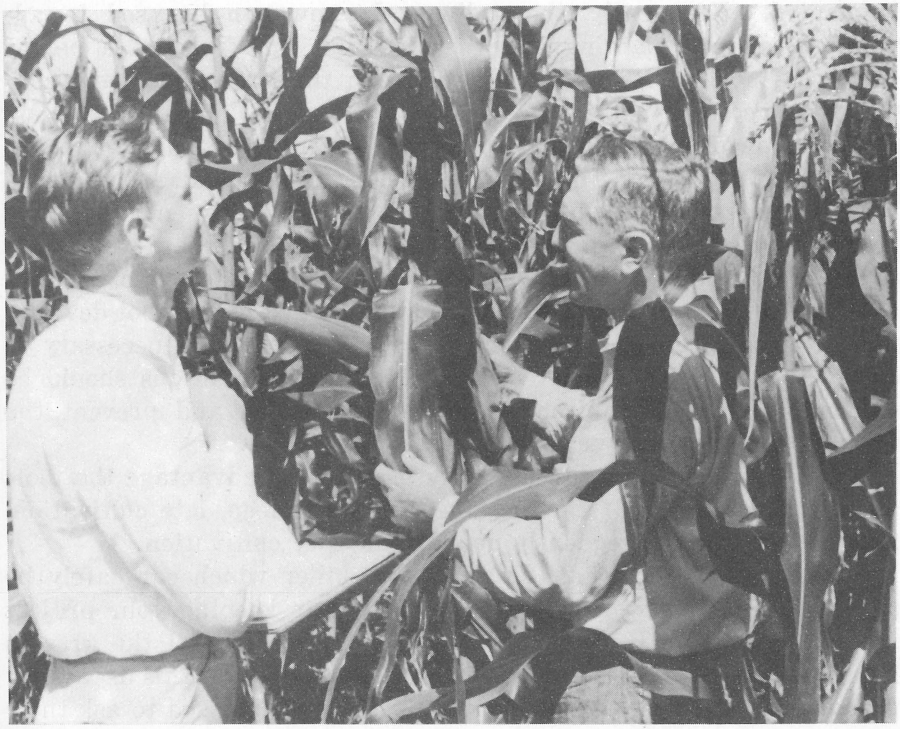
The rate of planting should be based on the soil fertility and moisture likely to be available in the soil where the crop is to be planted. Since corn, unlike the small grains, does not stool out to take advantage of high fertility and favorable moisture it is necessary to plant at heavier rates on highly fertile, heavily fertilized soils which have a good moisture holding capacity. However there is a limit to the number of plants which can be grown on an acre. The rows must be wide enough to permit the necessary cultivation, and plants must be spaced so as to permit enough light to reach the plant for full development. Finally a too heavy rate of planting may



Field grown from Missouri No. 8 hybrid corn.

seriously reduce yields in case of drought. Therefore the rate of planting should be based upon the average conditions to be expected.

On the soils of medium or lower fertility a desirable rate is two stalks per hill, or drilling 20 to 24 inches apart. This rate, with a perfect stand, gives about 7100 plants per acre. On highly fertile soils, heavily fertilized, the rate can be stepped up to 10 to 12 inch spacing in 36-inch rows. This would mean 14,000 to 18,000 plants per acre.



Size and color of the leaves show whether or not the corn plant is getting what it needs from the soil.

For most 4-H projects, the most practical rates are probably between 10,000 and 15,000 stalks per acre.

Cultivation of Corn

The principal reason for cultivating corn is to control weeds; however, the fact that cultivated land will soak up more moisture and release more plant food is also important. Weeds compete with the corn for both moisture and plant food. Therefore, the yield secured may very well be in proportion to the control of weeds.

Since weed control is essential, the whole cultivation program should be built around getting this job done well. Land that is relatively free from weeds will obviously present less of a problem than one heavily infested. Therefore, careful attention to weed control in the whole farming system is a step toward satisfactory corn yields. Weed control can start with early spring plowing unless the corn is to be listed. This early plowing encourages weed seed germination, thus permitting destruction of many weeds before the corn

is planted. Frequently, the ordinary harrow can be used to advantage between planting and the time the corn reaches a height of 3 to 4 inches. Regular cultivation can then be started and continued as necessary.

Corn develops many of its principal feeding roots in the top 5 to 6 inches of the soil. These roots develop rapidly and, by the time corn is in tassel, are usually throughout the soil between and in the rows. Any cultural practice which interferes with the development of these roots may materially reduce yields. It is easy to see that the depth and extent of cultivation must be limited by the root development. Therefore, cultivation should be only as deep as necessary to control weeds. The number and frequency of cultivations should be determined by the requirements to control weeds and prevent the formation of a hard crust on the soil.

4-H Club members can normally use to good advantage the tools already on the farm if care is taken to avoid deep, late cultivation, and the ridging so frequently done at the last cultivation.

The introduction of 2,4-D as a weed killer which can safely be used on corn has given another valuable aid in keeping your project free from weeds. Unfortunately 2,4-D will not control the grasses but it will easily kill most broadleaf weeds. Since this is a new practice, 4-H club members and local leaders are advised to ask their county agents about the latest methods of using it. Of course 2,4-D cannot replace cultural practices but it has a very big place in weed control in corn.

Harvesting and Storing

4-H corn club members will want to harvest and crib their corn in most instances. This can be done either by hand or with a corn picker. However, there may be a few who would like to put their corn in the silo for feeding in that form. Either procedure is satisfactory, depending upon the primary need. Corn can usually be safely cribbed when the moisture content is 25-30 per cent or less. Unless the corn is stored in a good crib protected from rodents, the loss is likely to be quite high from weathering, rotting, rats and general waste.

At the time the corn is harvested the yield per acre should be determined. This is best done, of course, by weighing all the corn as it is harvested. Where this is possible, 100 pounds of corn can be dried thoroughly and weighed to determine the dry weight. This corn can then be shelled to get the shelling percentage. The harvested weight times this shelling percentage and divided by 56 gives the

bushels of dry shelled corn. This figure divided by the acreage will then give the yield in terms of dry shelled corn per acre.

If the entire plot cannot be harvested and weighed, the following plan will give the approximate yield with less labor.

Select in the field at representative and separate places a total of six rows. Measure off 175 feet on each row and husk the corn from the measured portion. Weigh the corn and determine the yield of dry shelled corn as stated above. The result is the yield in bushels of dry shelled corn from the selected rows.

Decide from the following table what fractional part of an acre the six rows represent.

Distance between rows	Fractional figure*	Distance between rows	Fractional figure*	Distance between rows	Fractional figure*
2 feet 0 in.	20.743—	2 feet 9 in.	15.086—	3 feet 5 in.	12.156
2 feet 1 in.	19.913+	2 feet 10 in.	14.642+	3 feet 6 in.	11.852—
2 feet 2 in.	19.147+	2 feet 11 in.	14.224—	3 feet 7 in.	11.577
2 feet 3 in.	18.438+	3 feet 0 in.	13.829—	3 feet 8 in.	11.314+
2 feet 4 in.	17.779+	3 feet 1 in.	13.455—	3 feet 9 in.	11.063
2 feet 5 in.	17.167—	3 feet 2 in.	13.101—	3 feet 10 in.	10.822+
2 feet 6 in.	16.594+	3 feet 3 in.	12.762—	3 feet 11 in.	10.592+
2 feet 7 in.	16.059—	3 feet 4 in.	12.446—	4 feet 0 in.	10.371+
2 feet 8 in.	15.577+				

*This number will be the number below the line in the fraction which shows the part of an acre six rows, 175 feet long, make of the width given opposite.

Multiply the weight of the dry shelled corn from the six rows by this fractional figure. The result will be the number of bushels of dry shelled corn per acre.

Six rows each 175 feet in length (1050 feet of row) represent the following fractional part of an acre. The fraction in each case is one over the number given; thus 1/20.743.

To illustrate the method of determining the yield per acre we will suppose the following case:

The weight of ear corn husked from the six rows is 380 pounds. The distance between the corn rows is three feet, four inches. The 100 pounds of ear corn when dried out and shelled weighs 78 pounds, which is the shelling per cent. Seventy-eight per cent of 380 pounds is 296.4 pounds.

Completing the calculation: 296.4 pounds divided by 56 equal 5.29 bushels; 5.29 bushels multiplied by 12.446 (fractional part of an acre which the six rows 3 feet, 4 inches apart represent) equals 65.84 bushels of dry shelled corn produced per acre on the field under consideration.

Control of Diseases and Insects

The corn plant is subject to the attacks of many insects and diseases. The total loss from these sources will vary from year to year but the average annual loss is significant. The Illinois Agricultural Experiment Station estimates the average annual loss from disease alone in that state amounts to at least 20 per cent.

Since corn is so generally grown and so many diseases and insects are harbored in old corn plant refuse and in the soil, sanitation and crop rotation are essential in disease and insect control. Club members who start out their project on legume or sod ground have taken a very effective first step in controlling diseases. The use of good hybrid seed is recommended as a second step. The use of good cultural practices and soil treatments to insure favorable conditions for growth could very well constitute the third step. The fourth step is careful observation to note the appearance of special insects such as cutworms, army worms, chinch bugs and grasshoppers. When these insects appear, local leaders and the county agent can give specific steps to take at that time.

Popcorn

In recent years the production of popcorn has grown rapidly in some areas. If you are located in one of these areas or where a ready market is available you can profitably grow popcorn.

The soil requirements, fertilizer practices, and culture are similar to those for field corn. The planting rate, harvesting, storage, and marketing are markedly different.

The three most popular hybrids, Purdue 31, K4 or Purdue 32, and Purdue 38, are all adapted in Missouri and the seed is generally available. Plant at about 1½ times the rate for field corn.

Popcorn should be allowed to mature fully in the field, but full maturity before the first killing frost is essential for good quality. The harvested ears should be stored until ready for use or market. Since popcorn is used for human food, it should be kept free from insects and rodents. Corn seems to pop best when the moisture content is around 13 per cent. Under 11 or over 15 per cent moisture will interfere with poping. The moisture content should be watched closely where selling direct to individual users or to the retail trade.

You will be wise to check carefully on market outlets before raising popcorn as a 4-H project.

UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE AND THE UNITED STATES DEPARTMENT OF AGRICULTURE COOPERATING
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