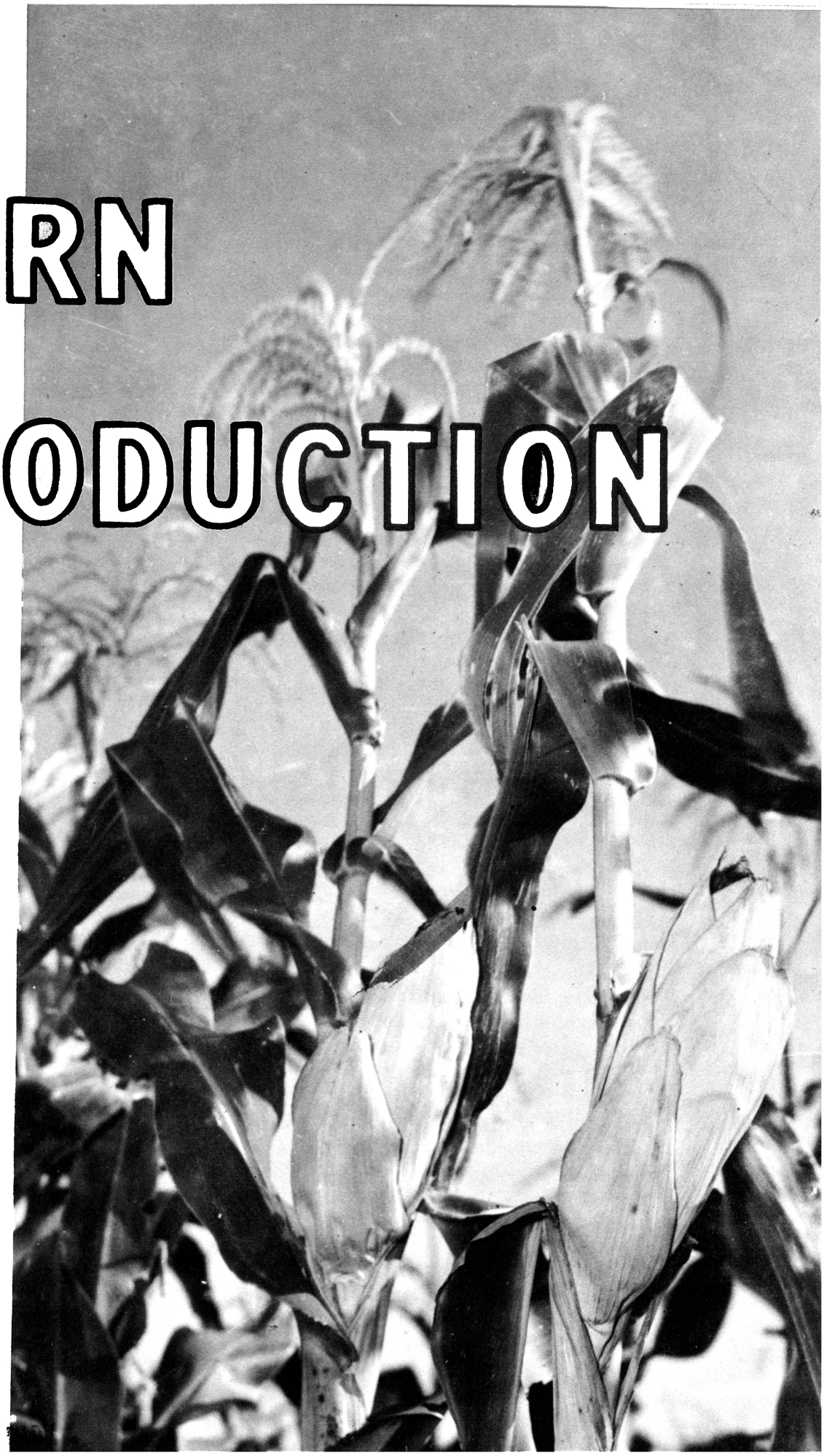
CORN PRODUCTION



A 4-H
Project

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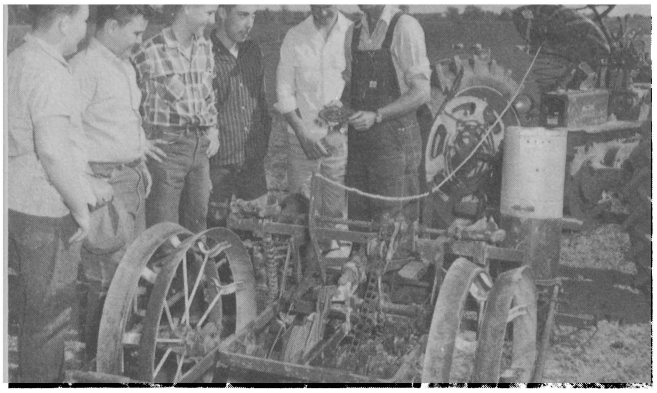

CORN PRODUCTION

HOW GOOD A CORN CROP can you grow?

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 our 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 percent of 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. The acreage devoted to it increased rapidly, reaching a peak of slightly over 8 million acres in 1917. Since that time, soil erosion has become a serious problem where corn has been grown frequently on sloping land. Thus, Missouri farmers have gradually reduced their corn acreages, averaging slightly less than 4 million acres in recent years. Despite this trend, corn will continue to be a very important crop because of its great value as a feed for livestock.

To grow the most profitable corn crop, you'll need to learn how to take samples of

Soil Fertility Requirements for Corn

Corn does best when you can plant it on deep, fertile, well-drained soil that has good organic matter, and supply it with any plant food elements that are in short supply.

You can supply extra organic matter by plowing under legumes, grasses, heavy crop residues or farm manures.

Corn draws heavily on the soil for nitrogen, phosphorus and potassium. It also needs calcium and some magnesium, both of which are usually supplied by applying limestone, which also serves to correct soil acidity. Some limestone does not contain magnesium. If your soil happens to be low in this mineral, use dolomitic limestone, which will furnish magnesium as well as calcium. If your soil has enough calcium and is not acid, do not use limestone but supply the need for magnesium by using a fertilizer that contains this element.

Test Soil to Learn Fertility Needs

Soil testing is the practical way to find out what levels of nutrients are in the soil. Soil samples for the test must be taken properly to be reliable. Your leader or county agents will tell you how to take good soil samples and how to get them tested.

The recommendations made from the soil test by your county agents will tell you which and how much of these plant foods will be needed to make a good yield possible. Study your soil test report and make certain you understand it. Your leader can help you with this.

Know Your Labels

Fertilizer grades are known by the plant foods they contain. In listing the grades of fertilizers, nitrogen is given first, available phos-

soil and have them tested, how to balance fertility in the soil, how to control insects, how to control weeds and diseases, how organic matter fits into the picture, how to conserve water and control erosion, what hybrids do best in your region, the best harvesting and storage methods, and when to market.

This sounds like a big assignment, but you can do it! Our state's good corn growers have learned to do these things and more. They generally get 75 to 100 bushels of corn per acre if the weather isn't too severe. And you occasionally hear of farmers getting as much as 125 to 150 bushels. Yet the state average seldom reaches 45 bushels, 55 bushels in the best corn counties. So you can grow a better crop than the average corn producer if you will apply the things that are known about growing good corn.

Yield per acre will not tell the whole story on the profitableness of your crop. The fertility of the soil you start with will determine how much plant foods needs to be added, so this will affect your costs. Such items as weed control chemicals and insecticides cost, too. Investment in such good practices increases cost per acre, but it reduces cost per bushel. For example, a University of Missouri experimental field has a long time average of 35 bushels per acre without fertilizer and 80 bushels per acre with fertilizer applied according to soil test. The cost, not including labor, has averaged $30.00 per acre without fertilizer and $45.00 per acre with fertilizer. This figures about 85¢ per bushel on the 35-bushel yield and 57¢ per bushel on the 80 bushel yield.

Now, let's look at the profit if corn is worth $1.20 a bushel. The 35-bushel yield would give a profit of 35¢ per bushel or $12.25 per acre. The profit on the 80 bushel yield would be 63¢ per bushel and this would return $50.40 per acre.

phate second, and available potash last. For example, a sack of fertilizer marked "4-24-12" means that the fertilizer contains 4% nitrogen, 24% available phosphate and 12% available potash. Thus, 100 pounds of this grade of fertilizer would contain 4 pounds of nitrogen, 24 pounds of available phosphate, and 12 pounds of available potash. Super-phosphate, 0-20-0, contains no nitrogen, 20 pounds of available phosphate, and no potash. The remainder consists of inert material used to carry the plant foods.

Manures Are Valuable

Green Manures: When deep rooted legumes such as sweet clover and alfalfa are turned under for green manure, they add about 40 pounds of nitrogen per acre for the next crop. Red clover and ladino add about 30 pounds. These crops, when pastured, add three-fourths as much as when all the forage is turned under.

Green manure crops such as sweet clover, red clover, alfalfa, or vetch should be plowed under in the spring when 10 to 12 inches high and still green and succulent. Decomposition will begin quickly and nutrients will be available for the young corn plants to grow rapidly. Rapid growth of the corn will make the first cultivation easier and may reduce the number of cultivations needed.

Barnyard Manure: Average barnyard manure contains 10-5-10, or 10 pounds of nitrogen, 5 pounds available phosphate, and 10 pounds available potash per ton. The corn crop does not obtain all of this the first year—so plant food value to the first crop following use of manure is considered as 4-2-6. Manure is low in phosphate, so the use of phosphate fertilizer with it will about double the fertility value of manure. Use 40 pounds of 20% super-phosphate or its equivalent per ton of manure.

How to Apply Fertilizers

If fertilizers are plowed down or worked in deep, they react quicker with the soil and help develop a stronger, deeper root system. Plants grow faster and can withstand disease and bad weather better if they have plenty of the right foods available near their feeder roots.

Two types of treatment will concern you in growing corn. The first, called *corrective treatment,* is designed to make up the shortages of plant foods that are revealed in a soil test. The

KNOW THE DEFICIENCY SIGNALS

Watch your corn carefully. It may be injured by insects, diseases, or deficiencies of moisture or nutrients. Here's a key to help diagnose corn ailments.

HEALTHY—Leaves shine, wide, rich dark green, stalks normal in size.

PHOSPHORUS SHORTAGE—leaves of young plants may have reddish-purple tips and edges. Stalks weak, spindly and often barren of ears. Ears small, twisted, and rows missing.

POTASSIUM SHORTAGE—leaves browning along edges. Ears chaffy and tips not filled.

NITROGEN SHORTAGE—lower leaves begin firing from tip along midrib. Ears small and tips unfilled.

WATER SHORTAGE—leaves twist during the heat of the day, then wilt and fire from the top down.

Tissue tests can add to your diagnosis. Ask your leader or county agent for further information.

other, called a *starter treatment,* is used to get young seedlings off to a good start.

Corrective treatments of limestone, phosphate and potash can be spread and worked in anytime before planting. On silt loam or clay soils, the nitrogen fertilizer can be put on early too. Plowing these plant foods under in late fall or winter is especially good if you turn under material such as stalks, straw, or a grass sod. The fertilizer helps speed decay of these materials, releasing plant food that your corn plants can use.

Sandy soils do not hold nitrogen tightly. If you have this type of soil you will be wise to wait until spring to apply nitrogen. Then plow down or work in deep only ½ to ⅔ of the nitrogen, and sidedress the remainder by "lay-by" time.

Starter treatments for corn are applied near the seed with a planter attachment. Almost any analysis of complete fertilizer is satisfactory if used at a rate to give at least 30 pounds of phosphate per acre—providing *corrective* soil treatments have been made.

Caution: It is not safe to apply more than 20 pounds of nitrogen or 40 pounds of potash per acre in a starter for corn. Heavier applications can hinder seed germination.

Planting Time Problems

What to Plant

Select a hybrid which is known to perform well in your locality and on the type of soil on your farm. The county agent can advise local leaders and club members on the selection of good hybrids. He also has yield test bulletins that show how many of the hybrids compare in performance.

Since all good hybrid seed has been tested, graded and treated, the seed is ready to plant when you buy it. One size of seed is as good as another if your planter can plant it uniformly. Round kernels produce as good corn as flat kernels, and usually are sold at a discount.

Most planters can be equipped with plates that do a satisfactory job of planting round kernels. The usual grades of seed corn are:

Small Flats (SF)
Medium Flats (MF)
Regular Flats (RF)
Large Flats (LF)
Small Rounds (SR)
Medium Rounds (MR)
Large Rounds (LR)

How to Plant

Where soil depth and drainage will permit, list the corn or plant it with the furrow openers. Surface planting is preferable on shallow or poorly drained soils or those having tight subsoils. Listers and furrow openers give increased yields over surface plantings where they are adapted. This is probably due to the fact that weeds are more easily controlled and cultivations are not so likely to damage the feeder roots.

A method known as "minimum tillage", "plow-plant", or "wheel track planting" is being tried by a number of farmers. This "plow-plant" method consists of plowing the field

and immediately planting without other seedbed preparation. Adjustments are made to make the planter run in the tractor wheel tracks. Thus the corn is actually planted in a finely compacted area, but the area between the rows is left in a rough condition. There are many variations of this system in tractor and planter adjustment and in giving some tillage besides plowing before planting.

Plant on the Contour

In all cases where soil erosion is a problem you ought to consider planting on the contour. There is ample evidence that erosion losses can be reduced by as much as one-half by a good job of contouring. More rain soaks into a contoured field, too, increasing yields about 10 percent on the average. Contouring works best on terraced fields. Sheet erosion is greatly reduced by contouring unterraced fields, but if water gathers at low spots between the rows during a heavy rain and then "breaks over" there will be an increase in gully erosion. Even so, the advantages of contouring will usually more than offset this disadvantage.

Rate of Planting

The rate of planting has a direct bearing on corn yields. If you plant too thin, not enough ears are produced to make full use of the moisture and plant food available. Too thick a planting rate can cut yields, too.

Experimental work indicates that for one-eared hybrids, ears averaging slightly more than one-half pound give the best yields. Thus, ears much over one-half pound indicate the rate was too light and ears under one-half pound indicate it was too heavy for that year.

At the one-half pound ear size, a one-eared hybrid will require 7,000 plants to produce 50 bushels per acre, 10,500 plants to give 75 bushels, 14,000 to make 100 bushels, and 17,500 plants would be required for a 125 bushel yield.

Good seed and average planting conditions should give 85 stalks per 100 kernels planted. You can never hope to get a perfect stand so this must be taken into account in aiming for a certain number of stalks.

Deep soils with high amounts of organic matter and medium texture, especially bottomland soils, are least subject to drouth conditions. They can use the highest rates of planting. Sandy soils, heavy clays and badly eroded soils generally require lighter rates. The plant food available naturally in the soil and that added through fertilizers and manures, and the rainfall expected in an average season must also be considered.

The maximum planting rate on good upland soils should be around 14,000, while around 17,000 to 18,000 is top for any soil, unless you gamble on having an unusually favorable season.

The accompanying table gives the number of plants per acre at various row widths and average distance between plants in the row in drilled corn. Where corn is hilled, divide the average number of plants per hill into the distance between hills to get "inches apart in row".

RATE OF PLANTING

Inches Apart in Row	Stalks per Acre		
	42 In. Rows	40 In. Rows	38 In. Rows
9	16,590	17,420	18,340
10	14,930	15,680	16,510
12	12,450	13,070	13,760
14	10,670	11,200	11,790
18	8,300	8,710	9,170

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 foods. Thus, weed control can make a big difference in your yields.

Since weed control is essential, the whole cultivation program should be built around getting this job done well. Land with few weeds obviously presents fewer problems than heavily infested land. Therefore, careful attention to weed control in the whole farming system is a step toward improving corn yields.

Weed control can start with early spring plowing unless you plan to list the corn. This early plowing encourages weed seed germinations and you can destroy many weeds before the corn is planted.

Frequently, the ordinary harrow or a rotary

hoe 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. By the time corn is in tassel, they are usually throughout the soil, between and in the rows. Any cultural practice which interferes with the development of these roots may 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.

Avoid deep, late cultivation and the ridging so frequently done at the last cultivation.

Another valuable aid that can help keep your corn project free of weeds is 2, 4-D. It is not a substitute for cultivation, but a supplement to be used to remove excessive weeds that cannot be eliminated by normal cultivation. Post-emergence spraying—spraying after the corn and weeds are up—is most commonly used. It can be expected to control annual broad leaved weeds but does not affect grasses.

Pre-emergence spraying—spraying the ground after the corn is planted but before it comes up—will usually control annual grasses as well as annual broadleaved weeds for a period of 4 or 5 weeks. This means you can expect to eliminate the early slow tedious cultivation.

There are new chemicals that may soon have a place in controlling weeds in corn; 4-H club members and local leaders are advised to ask their county agents for the latest information on chemical weed control.

Harvesting and Storing

Most club members will want to harvest and crib their corn. Harvesting may be done by hand, with a corn picker, or with a picker-sheller. A few of you, however, may want to put corn in the silo for feeding in that form. Either procedure is satisfactory depending upon your needs.

If you intend to sell your corn, it will usually pay you to store at harvest time and sell later, providing you take care to avoid storage losses. This is because so much corn is ordinarily sold at harvest time that prices are lowered more than it normally costs to store sound corn.

Storage losses from weathering, rotting, rats, insect damage and general waste are often quite high. Attention to the following seven rules for storing grain will keep such losses low:

Your county agent can furnish information on storage structures, grain drying, insecticides to use in cribs, and fumigation materials.

Proper adjustment and operation of mechanical pickers, corn combines, and picker-shellers is important to keep field losses low.

1. Use adequate storage structures—preferably rat-proofed.
2. Thoroughly clean structure and treat with a recommended insecticide before cribbing the grain.
3. Never mix old and new grain.
4. The grain needs to be sound and relatively free from foreign matter.
5. Moisture should be low enough for safe storage unless you have drying equipment available. Ear corn needs to be down to about 21 percent moisture, and shelled corn to 14 percent, or to 13 percent for long time storage.
6. Fumigate the grain 4 to 6 weeks after putting into storage. This is especially needed in the south half of Missouri. Fumigation usually won't be needed before spring in the north half of the state.
7. Examine the grain regularly to detect any deterioration in quality.

The operator's manual that comes with the machine gives instructions on this.

You may want to measure the field loss that you have when picking with these machines—the amount left in the field is often surprisingly high.

A Way to Measure Field Losses

1. Pick up the ears left on one-tenth of an acre. Where ears have been crushed, pick up the crushed parts, too. (With 40″ rows. 4 rows 330 feet long will make approximately one-tenth of an acre.)
2. Weigh the corn, multiply by 10, and divide by the proper factor from the table on page 8 to get bushels per acre of corn on the ear left in the field.
3. At 10 different places, avoiding places where ears have been crushed, count the kernels on the ground in an area 3 ft. long and the width of the row. Add the number of kernels found at each place to obtain the total. With 40″ rows, this will give the number of kernels in 100 square feet. Since approximately two kernels per square foot equal 1 bushel of corn per acre, divide this total number of kernels by 200 to get the bushels per acre of shelled corn left in the field.
4. Add the results of (2) and (3) to obtain field loss per acre.

Yield per acre should be determined at the time the corn is harvested. The best method, where possible, is to weigh all the corn as it is harvested. One hundred pounds of the corn can be dried thoroughly and weighed to determine the dry weight. This quantity of corn can then be shelled to get the shelling percentage. The harvested weight times this shelling percentage divided by 56 gives the bushels of dry shelled corn. This figure divided by the acreage gives the yield in terms of dry shelled corn per acre.

The following method is used by 100-bushel corn clubs to get the approximate yield before field losses with less labor. If it is impossible for you to harvest and weigh your entire corn plot, this method may be used.

1. Measure off at least three, preferably five, 1/100 acre samples in areas that seem to be most representative of your corn plot. 1/100 acre equals 435.6 square feet. This is two rows—

62.2 feet long	if 42 inches apart
65.4 feet long	if 40 inches apart
68.8 feet long	if 38 inches apart
72.6 feet long	if 36 inches apart

2. Count and record number of stalks per sample. Average these and multiply by 100 to get the number of stalks per acre.
3. Harvest, weigh and record the weight of each sample separately. Average these weights and multiply by 100 to get the pounds of ear corn per acre.
4. Count number of ears per sample and divide into the weight per sample to determine the average size of ears. This will give you an indication as to whether your planting rate was too light, about right, or too thick for the season and your fertility program on this particular field.
5. Take a sample for moisture determination. Shell off 2 to 4 rows of grain from 12 to 15 representative ears and put in a moisture proof container, such as a sealed fruit jar or a tightly tied cellophane bag. Most grain elevators are equipped to make moisture determinations and will be glad to make one for you.
6. Use the accompanying table to determine the number of bushels per acre of 15.5% moisture shelled corn. For example, if you had 6000 pounds of ear corn per acre that tested 20% moisture, you would divide 6000 by 73.96, giving 81.1 bushels per acre.

DETERMINING YIELD OF SHELLED CORN

Percent Moisture in Grain at Harvest	Field Weight of Ear Corn That Will Yield 56 lbs. Shelled Corn Containing 15.5% Moisture
10 %	63.49 lb.
10.5	63.86
11	64.25
11.5	64.65
12	65.06
12.5	65.60
13	65.95
13.5	66.42
14	66.89
14.5	67.39
15	67.89
15.5	68.40
16	68.94
16.5	69.51
17	70.09
17.5	70.69
18	71.31
18.5	71.95
19	72.60
19.5	73.27
20	73.96
20.5	74.60
21	75.36
21.5	76.07
22	76.79
22.5	77.53
23	78.25
23.5	79.01
24	79.76
24.5	80.50
25	81.25
25.5	82.03
26	82.82
26.5	83.50
27	84.19
27.5	84.90
28	85.62
28.5	86.32
29	87.04
29.5	87.76
30	88.50
30.5	89.22
31	89.94
31.5	90.67
32	91.43
32.5	92.13
33	92.85
33.5	93.55
34	94.28
34.5	94.98
35	95.71

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J. W. BURCH, Director, Agricultural Extension Service

Insects and Diseases

Corn is grown so widely that crop rotation is apparently only a minor help in combatting the many insects and diseases that attack it. Use of good seed that will give vigorous plants is a first step in disease control.

Seed treatment will help control seedling diseases. It is especially important for early planted corn. Most hybrid seed corn will be treated when you buy it.

Good cultural practices and soil treatments insure favorable conditions for growth and aid corn plants in overcoming disease conditions. If diseases appear, your local leader and county agent can help you identify them.

A soil insecticide can be considered as insurance—insurance against having to replant a field because of soil insect injury. It protects against virtually all insects which damage corn below the ground. The increase in stand will pay the costs nearly every year, and occasionally, when insects are especially numerous, returns will be large.

Since recommendations on soil insecticides may change, it is best to consult your county agent for the latest information. *Careful observation to note the appearance of such insects as the European corn borer, web worms, chinch bugs, and grasshoppers is essential. When these insects appear, local leaders and county agents can advise on specific controls to use.*

Popcorn

Check carefully to make sure you have a market outlet before going into popcorn production. It can be a profitable project if a good market is available.

The soil requirements, fertilizer practices, and culture are similar to those for field corn. The planting rate, harvesting, storage, and marketing are markedly different. Obtain a copy of Bulletin 718 "Popcorn Culture in Missouri" from your County Extension Agent for this information.