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Growing Corn in Maryland

Field corn continues to be Maryland's most important field crop. About a third of the state's harvested cropland is occupied by corn; for many years its acreage has not ranked below third place in any of the state's 23 counties. In all counties, corn harvested for grain is well ahead of other grain crops in the production of total digestible nutrients per acre. Wherever grown on suitable soils in Maryland, corn is the heaviest per acre producer of quality silage.

Adaptation—Regions and Soil

Although most of the Maryland crop is grown below 800 feet of elevation, where the growing season permits use of medium and long season hybrids, several thousand acres are grown at higher elevations in the state's western section. Most of the latter acreage is in Garrett County at 2500 feet elevation where a short growing season demands the use of early maturing hybrids. In this area, early hybrids produce good yields.

From west to east, the regions of Maryland are the Limestone Valley, Piedmont, and Coastal Plain, the latter represented primarily by Southern Maryland and the Eastern Shore. Some of the soils in the state have a yield potential of 150 bushels or more per acre, while others will not yield more than 80 bushels per acre or less due to poor water holding capacity, short growing season and other factors.

With proper management and fertilization, good corn can be grown on soils ranging in texture from sandy loam to silt or clay loams. The best corn soil is a deep loam underlain by a subsoil permeable by both water and plant roots and capable of supplying moisture in dry periods. Swampy soils, shallow soils overlying impervious hardpans, shaly layers or gravel banks, and soils subject to excessive erosion should not be planted to corn.

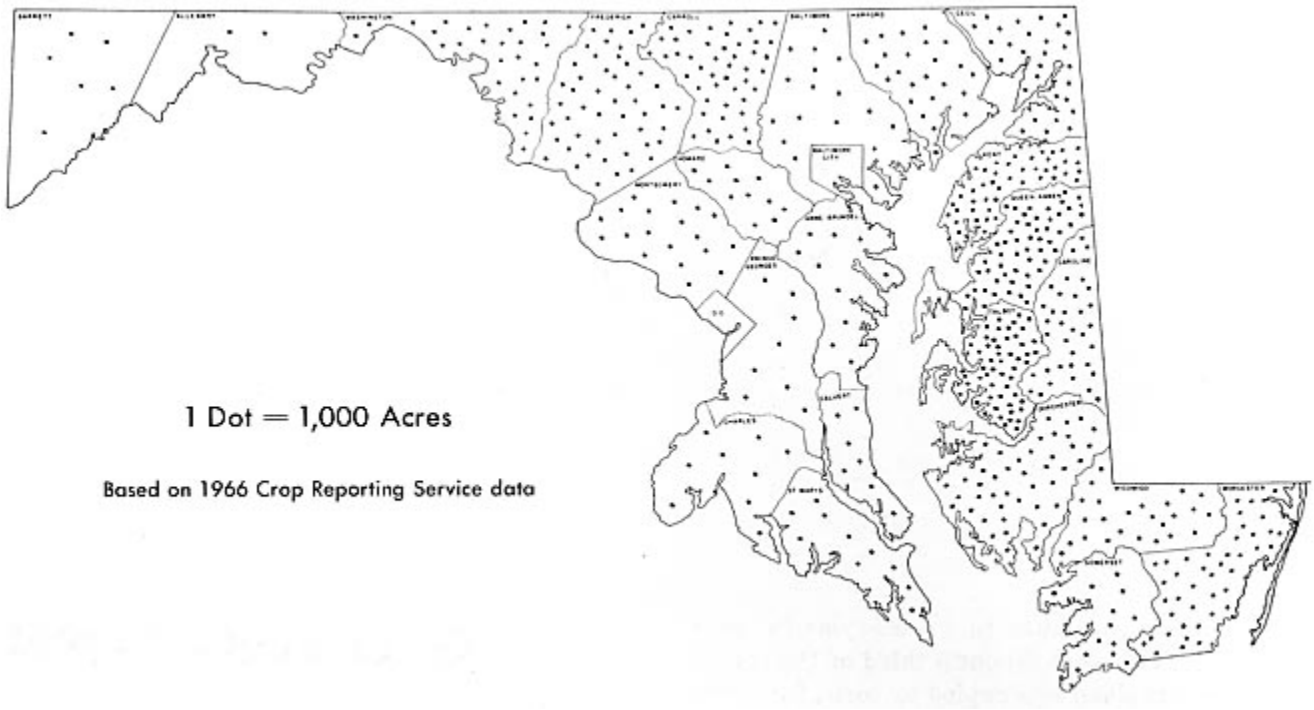

Figure 1. Distribution of corn acerage in Maryland

Water Requirements

Like most other summer crops, corn needs plenty of water for its growth. A good supply of water is especially important starting a week or two before tasseling and continuing through the flowering period of the crop.

If properly distributed, the average monthly rainfall for the corn-growing areas of Maryland will result in good yields of corn. Unfortunately, total monthly precipitation varies widely from year to year, and distribution is equally erratic; thus, yields are often reduced because of inadequate moisture. Weather records indicate that, depending somewhat on location, corn in central and eastern Maryland suffers from lack of moisture at least one year in three to five.

Although nothing can take the place of water, plowing down plant food, following good cultural practices, using water-conserving practices and planting tolerant hybrids will make drought less damaging. By growing corn on good land with proper management, some growers have been able to average 100 bushels or more per acre without irrigation.

Where practical, irrigation can be used to supplement rainfall. Each irrigation project should be thoroughly studied and planned with expert help. Irrigation must be done properly and at the right time in order to be successful.

Irrigation is not likely to be profitable on corn unless water is readily available and systems can be developed that require little labor for applying water. To justify irrigation, the price of corn must be favorable and all cultural practices must be scaled to produce maximum yields.

Plowing and Preparing the Seed Bed

It is important to maintain good soil structure at all times. Do not plow or till heavy soil when it is too wet. Do not overpulverize the soil.

Plow the cover crop under at least two to three weeks before heading to help conserve moisture and promote decomposition. Turn under the cover crop and plant refuse well to aid in disease and insect control.

Final seed bed preparation is usually done just prior to planting time with one trip over the field with a disk, a harrow, and a roller or cultipacker. This operation will usually leave a firm seed bed with the top three to four inches free of large clods and air pockets. Overworking will cause crusting when rains come.

Liming

The soil in corn fields should be limed to pH 6.5. Using the proper amount of lime results in more efficient use of the plant nutrients in the soil and bigger yields of corn. Often each dollar invested in lime will return four dollars or more in extra profits from increased corn yields. The best way to determine the kind and amount of lime you should apply is through a soil test. You can have your soil tested free through the University of Maryland Soil Testing Laboratory at College Park. (See your County Extension Agent for information on how to have your soil tested.)

Table 1. 1967 Corn Acreage and Yield by Counties[1]

County	All Purpose* (acres)	Grain Only* (acres)	Yield (bushels per acre)
Allegany	1,700	1,400	61.4
Anne Arundel	9,500	8,000	69.8
Baltimore	17,500	14,500	85.1
Calvert	6,000	5,600	61.4
Caroline	36,500	35,900	77.4
Carroll	47.000	39,000	85.7
Cecil	28,500	25,000	92.0
Charles	9,500	9,000	72.7
Dorchester	43,000	42,400	83.3
Frederick	53,000	25.000	85.2
Garrett	6.800	3,000	69.7
Harford	24,500	21.500	93.0
Howard	10,500	8,300	83.1
Kent	45,500	43,700	88.6
Montgomery	18,000	13.000	79.7
Prince George's	9,000	8.400	76.9
Queen Anne's	57,000	55,500	82.9
St. Mary's	13,500	12,700	59.4
Somerset	11,500	11,300	86.7
Talbot	56,000	53,500	87.9
Washington	31.500	20,600	83.3
Wicomico	25,000	24,500	81.0
Worcester	45,000	44,200	67.4
East of Bay	348,000	336,000	82.5
West of Bay	258,000	190,000	81.1
State	606,000	526,000	82.0

[1] Maryland Crop Reporting Service USDA.
* Difference used for silage.

Fertilizing

Broadcast
With corn, best results have been obtained when the fertilizer is broadcast and plowed down. In a number of experiments conducted in Maryland, plow-down applications of fertilizer have given about 10% higher yields than the same amount of fertilizer broadcast on the surface and disked in after plowing. Usually, the fertilizer is plowed down in the spring; but on most soils, phosphorus and potassium can be applied in the fall also.

An exception is on very light sandy soils where leaching of potassium is a problem. Nitrogen should not be applied to corn in the fall except on heavy soils and after the soil temperature has dropped to 45 °F; then, be sure to use an ammonium form of nitrogen. In most cases spring application or sidedressing of nitrogen is preferred.

Planter Application
The planter application of fertilizer should receive top priority in the corn program. This application helps to get the corn off to a good start and yields are often increased by 20 bushels or more per acre with the row application. On most soils in Maryland, fertilizer in addition to that applied in the row must be used to get top yields and profits. This additional fertilizer should be plowed down, and on light sandy soils a part of the nitrogen should be sidedressed. In most cases, about 200 to 400 pounds per acre of fertilizer is recommended for the row application.

Some experiments have been conducted with "pop up" fertilizer. With this type of application, a small amount of fertilizer is placed in direct contact with the seed at the time of planting. Research results are not yet conclusive enough to recommend this practice.

Sidedress
A part of the nitrogen should be sidedressed on the lighter, more sandy soils (loamy sands, sandy loams) when the corn plants are 6 to 18 inches tall. On medium to heavy soils (loams, silt loams, clay loams, etc.), leaching is a less serious problem, and, therefore, the nitrogen can be plowed down or sidedressed depending upon convenience to you.

How Much Fertilizer to Use?
The amount of fertilizer needed to grow a corn crop will depend upon the level of nutrients in the soils, the sod crop to be plowed under, and the manure available. The best way to determine the amount of fertilizer needed is to have your soil tested. On soils that are medium in phosphorus and potassium, apply 1.1 pounds of nitrogen (N), 0.8 pound of phosphate (PgOs) and 0.8 pound of potash (KaO) for each bushel of corn anticipated. For example, if you expect 100 bushels per acre, you will need 110 pounds of nitrogen, 80 pounds of phosphate and 80 pounds of potash. On soils testing low in nutrients, larger quantities of fertilizer will be required; on soils testing high, smaller amounts of fertilizer will suffice. If you plow under a sod crop and manure, subtract the plant food supplied by these sources from the total plant food requirement of the corn.

The following is an estimate of the nutrients supplied by manure and several different sod crops:

Material	Lbs. Nitrogen	Lbs. Phosphate	Lbs. Potash
1 ton stable manure	5	3	2.5
1 ton poultry manure	11	6	3.0
Alfalfa	80	—	—
Alfalfa-grass	60	—	—
Crimson clover	50	—	—
Red clover, grass	40	—	—
Lespedeza	30	—	—
Mostly grass or stalks	0	—	—

Several examples will illustrate how to determine the amount of fertilizer to apply.

Example 1. Your yield goal is 150 bushels of corn per acre, and soil has a medium level of phosphorus and potassium. Ten tons of stable manure and a red clover-grass sod are to be plowed under.

Plant Food from Manure and Sod

	N	P_2O_5	K_2O
10 tons per acre of stable manure	50	30	25
Clover-grass sod	40	—	—
Total from manure and sod	90	30	25

Plant Food Needed by Corn

	N	P_20_5	K_20
150 bushels of corn	165	120	120
From manure and sod	90	30	25
Amount needed from fertilizer	75	90	95

Meeting Fertilizer Needs

	N	P_2O_5	K_2O
Plow under	55	55	55
Planter	20	40	40
	75	95	95

Example 2. Your yield goal is 125 bushels of corn per acre, and soil has a medium level of phosphorus and potassium. A rye cover crop and corn stalks are to be plowed under with no manure. Since a rye cover crop and no manure are to be used, the plant food requirement must be supplied from fertilizer. Under these conditions, 140 pounds of N, 100 pounds of P_2O_5 and 100 pounds of K_2O will be needed.

Meeting Fertilizer Needs

	N	P_20_5	K_2O
Plow under	30	60	60
Planter	20	40	40
Sidedress[1]	90	—	—
	140	100	100

[1] On medium to heavy soils (loams, silt loams, clay loams, etc.) where leaching is not as great a problem, 120-60-60 (Ibs/A N—P_20_5—K_2O) can be plowed under instead of 30-60-60. The sidedressing of nitrogen is then eliminated.

Example 3. Your yield goal is 100 bushels of corn per acre, and the soil is medium in phosphorus and potassium. Corn stalks are to be plowed under with no manure. This will require 110 pounds of N, 80 pounds of P-^Os and 80 pounds of KgO from commercial fertilizer.

Meeting Fertilizer Needs

	N	P_20_5	K_2O
Plow under	25	50	50
Planter	15	30	30
Sidedress[1]	75	—	—
	110	80	80

[1] On medium to heavy soils 100-50-50 can be plowed under instead of 25-50-50. The sidedressing of nitrogen is then eliminated.

Secondary Nutrients

The secondary nutrients essential for plant growth are calcium, magnesium and sulfur. Calcium and magnesium can be supplied to corn through a good liming program. In some cases where the soil pH is satisfactory and the magnesium level is low, magnesium can be supplied in the fertilizer. Magnesium deficiency is more prevalent on the light sandy soils of the coastal plain section of the state.

Sulfur deficiency has not been a problem in Maryland. This is due to the large amount of industry in the state and the sulfur contained in many of the sources of nitrogen, phosphorus and potassium used in Maryland.

Micronutrients

Deficiencies of micronutrients in corn have not been widespread in Maryland. Manganese de- ficiency has been found in a few of the light sandy soils that have a pH above 6.0-6.2. On manganese deficient soils, 6 pounds of manganese (Mn) per acre is the suggested application. This can be mixed with the fertilizer to be used in the row at corn planting.

Boron deficiency may cause blank stalks and barren ears in corn fields. This deficiency is more prevalent during extended dry periods. In cases where the boron level is low in your soil and an excessive number of blank stalks and barren ears have been found, it is suggested that 1.1 pounds of boron (B) per acre be applied. The boron can be mixed with the fertilizer to be plowed down for the corn. **Do not apply a borax fertilizer in the row.**

Zinc deficiency has been found in corn grown on the Coastal Plain. This deficiency is very limited in Maryland and occurs during the early stages of growth. The leaves of the corn plant show a wide yellow striping with the mid-rib and outer edges remaining green. The deficiency is associated with cold wet soils, high soil phosphorus levels, and a pH above 6.5. On fields where zinc deficiency has been a problem, apply 3½ pounds of zinc (Zn) per acre. The zinc can be mixed with the fertilizer to be used in the row when planting the corn.

To help diagnose problems relating to the micronutrients manganese and boron, the University of Maryland Soil Testing Laboratory can test soil samples for these elements.

Choosing Seed

Choose hybrids of the right maturity—they are available in the short, medium and full season groups for all regions. Although the longerseason hybrids are usually more productive, they are not necessarily your best choice. Your farm operations may require late planting or early harvest of some of the corn, and then you would choose a short or mid-season hybrid. Often it may be important to get the corn off in time for fall planting of small grains.

Choose hybrids on performance. The acreage should be planted to hybrids that have proven themselves in the neighborhood and are recommended by dependable agencies. It is not wise to plant large acreages of one hybrid—use several of the good hybrids available from several sources. No one hybrid has a monopoly on all desirable characteristics, and no seed producer has a monopoly on all good hybrids. Also, good hybrids are constantly being replaced by better ones. Your county extension agent can provide you with the results for variety trials conducted by the University of Maryland. As a rule, good grain-producing hybrids are also good for silage. Since silage corn is harvested before cribbing maturity, earliness is not as important as it is for grain production. This does not mean, however, that silage production need be restricted to late hybrids. Mid-season and early hybrids may be useful depending upon dry matter production and cropping management.

The corn seed you purchase should be dry, well-graded, treated with a fungicide, and labeled as to hybrid, producer, seed size, and seed analysis. The analysis tag should show a germination of 90% or better, and the test date on the tag should be within the last nine months.

Buy the right size of seed—one for which you have or can get the proper plates in time for planting. Do not take a chance on planting accuracy. Check the seed in the planter before going to the field. With the possible exception of the smallest sizes, seed size has a negligible effect on field performance so long as the proper seed plate is used to give accurate planting.

Planting Time

Corn should be planted late enough to escape damaging stand losses from late freezes and cold seed beds, but early enough to mature before fall frosts. Germination for most hybrids starts around 50 °F, but below 55 °F the rate of germination is quite slow. If the seed has been properly treated with a modern chemical fungicide, it will usually tolerate a short period of storage in soil before temperature is up to the germination level.

It has been demonstrated that it is practical to start corn planting earlier than formerly recommended if soil type and soil temperature are taken into consideration. However, corn planting on most soils should not start until the soil temperature at a depth of two inches is up to 55°F.

Due to the wide variations in growing seasons in Maryland, the following planting periods are suggested as a guide:

Eastern Shore and Southern Maryland	April 21—June 20
North Central Maryland	May 1 —June 15
Western Valleys	May 5 —June 5
Western Mountains (2000 feet)	May 15 —June 1

Full-season hybrids should go in by the first third of the appropriate planting period; medium-season hybrids by the end of the second third; and short-season hybrids by the final date. All maturity groups may be planted early.

If you wish to spread the harvest period by planting several hybrids of different maturity, the earliest hybrid should be planted first, followed at intervals by successively later maturing hybrids.

Rate of Planting

The rate should vary with the type of soil, the hybrid, likelihood of drought injury and method of harvest. The more favorable the growing conditions the thicker the stand could be. Relatively thick stands usually make larger acre yields by increasing ear number at the expense of ear size. Thick stands, however, often have more "down" plants and more "nubbins" in dry seasons. Popular row widths are 30, 36, 38 and 40 inches. New equipment is on the market for 30 inch rows and is rapidly being accepted. Research work conducted at several experiment stations has shown that at high yield levels narrowing the row width from 40 to 30 inches has resulted in yield increases of 5 to 10 bushels per acre or more. In many tests, no further increases in yield have been obtained when row widths were narrowed from 30 to 20 inches.

The following table shows the kernel spacing needed in different row widths for various plant populations:

Desired Plant Population*	**Kernals Per Acre Needed**	**Inches Between Kernels in Row**			
		30"	36"	38"	40"
13,000	15,294	——	11.4	10.8	10.3
14,000	16,471	——	10.8	10.0	9.5
15,000	17,647	——	9.9	9.4	8.9
16,000	18,824	——	9.3	8.8	8.3
17,000	20,000	——	8.7	8.3	7.8
18,000	21,176	9.9	8.2	7.8	7.4
20,000	23,529	8.9	7.4	7.0	6.7
22,000	25,882	8.1	6.7	6.4	6.1
24,000	28,235	7.4	6.2	5.9	5.6

* Assuming 85% of kernels produced plants.

Important Items to Remember When Planting

1. Seed bed should be deep and loose, but not overworked.
2. Avoid deep planting—1.5 to 2 inches deep is sufficient on most soils.
3. Check planter plates for size. Make a trial run.
4. Watch seed and fertilizer tubes for stoppage.
5. Prevent planter from placing fertilizer in contact with seed.
6. Maintain accurate row spacing to facilitate cultivation.

Cultivating and Controlling Weeds

The purpose of cultivating corn is for weed control, soil aeration and moisture conservation. The use of rotary hoe or weeder before corn emergence and while plants are small is a fast and effective cultivation on fields fairly free of stones and trash. Hard soils reduce the effectiveness of these implements.

One additional row cultivation is usually sufficient. This cultivation is very important on soils that crust over even if no weeds are present. Avoid excessive injury to corn roots; reduce depth of cultivation as corn increases in size. Use level running sweeps at last cultivation. **Chemical Weed Control**
Chemical weed control is essential in many cases, but it should not replace all cultivation. Even with the same degree of weed control, yields on most soils have been better with some cultivation.

Weed control chemicals, applied early when great numbers of weed seeds are germinating, usually eliminate the need for the first (and most tedious) cultivation. The cost is about the same, and weeds are held in check for two or three weeks even if the soil is too wet to cultivate. Spraying can be done more quickly and on wetter land than can cultivation—a fact of much importance.

Insects, Diseases and Other Pests

A number of insects and diseases attack field corn in Maryland. They may cause considerable injury every year, only occasionally or in restricted areas. For some, effective control measures are at hand, while for others no practical control is available. Publications are available from your County Extension Agent which give specific information on the control of corn insects. Fields should be observed for flea beetle, sod webworm and army worm. When infestation warrants, spraying should be done. Resistant hybrids, seed treatment, crop rotation, early

plowing, adjustment of planting date and generally good cultural practices guard against loss from insects and disease.

Stalk rot may be helped by the selection of a variety with some resistance as well as by keeping the fertility level in balance, particularly nitrogen with potash.

Birds do considerable damage to corn in Maryland. Mechanical noise devices have been used with varying degrees of success. Varieties with tight husks extending well over the ear tips help discourage birds.

Winter Cover Crops

On soils where erosion is a problem (sloping fields and light sandy soils), seed a cover crop immediately after corn harvest or in the standing corn before harvest.

A good cover crop containing a legume will often furnish 50 pounds or more of nitrogen per acre; however, getting a good stand of the cover crop is a problem. Seeding at the last cultivation of corn is convenient, but the chance of getting a good stand at this time is poor, especially for

the legumes. Risk plus seed cost all but rule legumes out for this type of seeding. The chance of getting

a stand is much better in late August or early September, but proper seeding in the tall corn at this time requires special procedures.

If no cover crop is growing in the corn when harvested, disk stalks down and seed winter rye at 112 pounds per acre or annual ryegrass at 30-50 pounds per acre as early in the fall as possible.

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