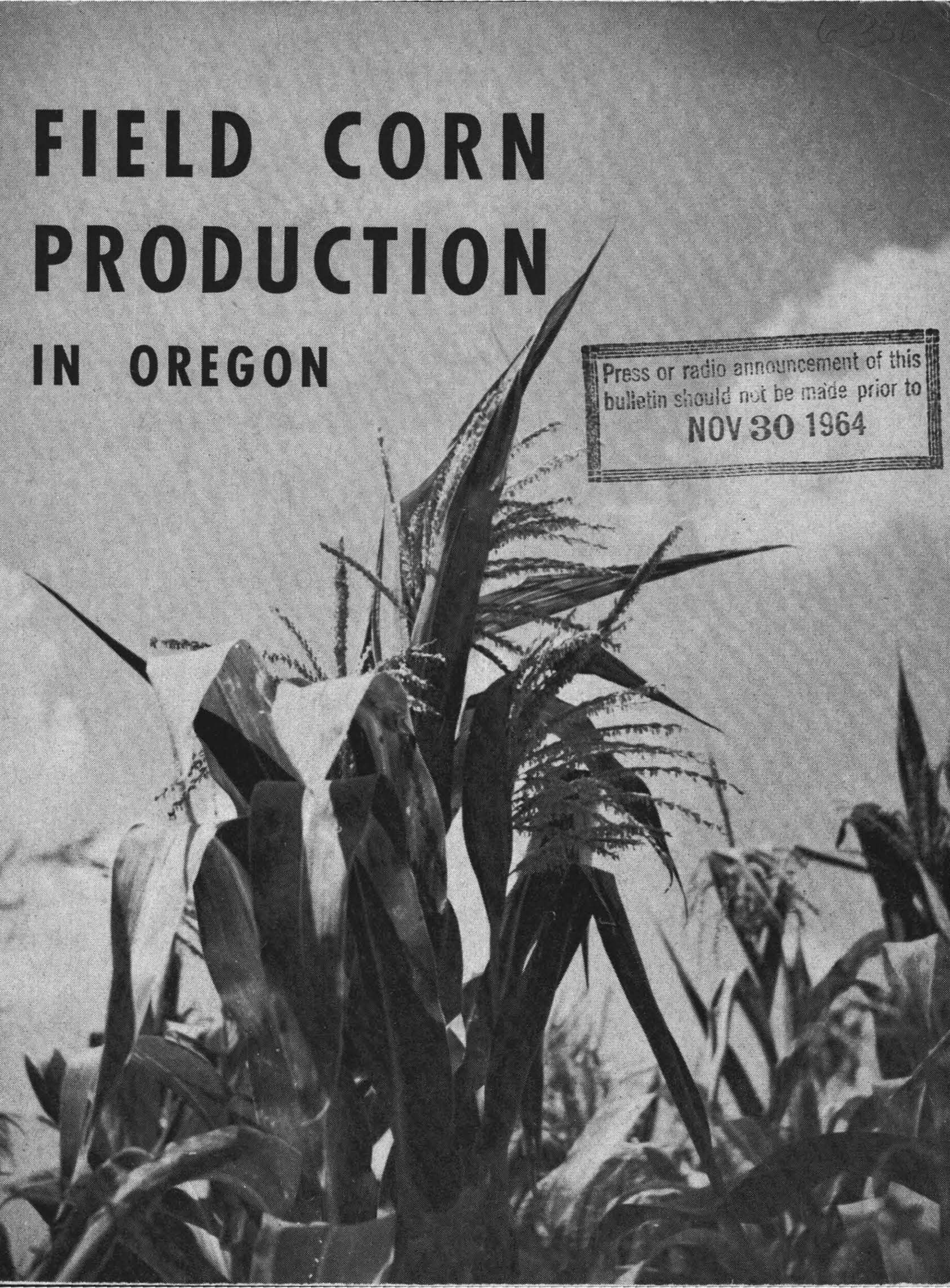
FIELD CORN PRODUCTION IN OREGON



Foreword

In the early years of Oregon's agriculture, field corn was generally regarded as not well adapted here because of climatic conditions. However, in such parts of the state as irrigated portions of Malheur County, Umatilla County, the Willamette Valley, and southern Oregon, corn has, in recent years, found a favorable place in the cropping system on many farms and production has increased substantially.

Corn's suitability and attractiveness to Oregon farm operators in these favored areas has been enhanced by application of research findings in recent years. Improved varieties and new production practices have been brought to the attention of farmers in Experiment Station field days, Extension tours, meetings, news stories, and publications.

These activities are part of the current cooperative work of the Agricultural Experiment Station and the Extension Service throughout the state. All of these activities are designed to improve the efficiency of Oregon agriculture. They strengthen Oregon's competitive position and contribute to economic growth and the well-being of the people of the state and the nation.

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Field Corn Production in Oregon

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Field corn is adapted to Oregon areas with long warm growing seasons and available irrigation or soils capable of retaining enough moisture during the dry season to mature a crop. Approximately 85% of the total state acreage is planted in two areas: the Willamette Valley of western Oregon and the irrigated section of the Snake River Valley in eastern Oregon. Other production areas include parts of the Rogue and Umpqua valleys, irrigated areas of the Columbia Basin, and other minor areas having favorable climatic conditions. Plantings during the period 1960 to 1963 have varied between 50,000 and 60,000 acres.

Corn is used as either grain or forage; percentages vary widely in different parts of the state. About half of the acreage is harvested for grain and half for silage.

Successful field corn production requires adapted varieties and careful attention to the best cultural practices. Seeded at proper rates, it can profitably utilize large quantities of water and plant foods. A proper balance of plant population, available moisture, and nutrients produces high yields.

State average and potential yields of corn for both silage and grain have increased markedly in recent years. For example, grain yields averaged less than 1 ton per acre in 1930 and more than 2 tons in 1960. Many growers consistently produce in excess of 4 tons per acre (140 bushels) and silage yields of 30 tons or more of green material are common.

Soil and Seedbed Preparation

Corn is most easily grown on deep, well-drained sandy loam soils, but with proper culture it can be produced on the majority of tillable soils in areas having suitable climate.

A well prepared weed-free seedbed with adequate moisture is needed for seedling establishment. Final preparation should leave the top three inches of soil friable. This is in contrast to the firm seedbed used for small seeded crops. The usual seedbed preparation consists of plowing, disking, and harrowing before planting. Fall plowing is not generally recommended in areas of high winter rainfall but may be advisable if a heavy sod is to be plowed under on land not subject to excessive erosion. Land should be spring-plowed one month or more before planting.

Machinery capable of preparing seedbeds, planting, fertilizing, and spraying for weed control in one operation has been developed and used in some areas. This machinery may be economical for larger acreages under irrigation in Oregon. Nonirrigated land should be tilled before planting in order to kill weeds and thereby conserve moisture.

Two good corn varieties for western Oregon. Left: Ore. 355 for grain. Right: Ore. 150 for silage.

Varieties and Seed

Hybrid varieties adapted to local climatic conditions should be planted. Adaptation of a hybrid variety is determined by inheritance received from parental foundation lines and cannot be changed. Varieties requiring the full average growing season for maturity usually produce highest grain yields. Somewhat ranker-growing varieties, a few days later in maturity, can be grown for silage. Seed of adapted hybrid varieties is available from seed growers and dealers.

Variety trials are conducted annually in Oregon corn growing areas by Oregon State University. The latest recommendations are available from county Extension agents.

Seed is carefully graded for size and shape of kernel before being offered for sale. This facilitates uniform planting.

Grades of seed vary widely in weight per kernel and number of kernels per pound, but experiments indicate no appreciable differences in yield among the grades ordinarily marketed.

Planting very small seed not ordinarily offered for sale may result in less seedling vigor and reduced yield. Round grades produce yields equal to those from flat grades if proper planter plates are used to obtain a uniform stand.

Planting Corn

Planting time is determined by soil temperature. The best planting time is when soil temperature at 2-inch depth has warmed to 50° F. or above for several days. This usually occurs between April 15 and May 15. It is particularly important to plant as early as possible in western Oregon because cool summer temperatures and early fall rains often delay growth and maturity. Planting before the soil temperature has reached 50° F. is likely to result in poor germination and reduced stands.

Corn should be drilled in rows 36 to 40 inches apart, obtaining the desired planting rate by spacing the seeds in the row. Recommended planting rates for heavily fertilized irrigated land are 20,000 to 25,000 seeds per acre for grain and 30,000 for silage. Best rates for nonirrigated land are from 12,000 to 15,000 seeds per acre. Spacings required to obtain various rates of seeding are given in Table 1.

The pounds of seed required to plant an acre depends on planting rate and size of seed. Two commonly used grades of seed, large flats and medium flats, contain approximately 1,250 and 1,600 seeds per pound, respectively. To obtain a planting rate of 25,000 seeds per acre, 20 pounds of large flats or 15.6 pounds of medium flats should be used. Seed should be planted 2 inches deep in moist soil. There is no advantage in planting seeds deeper than necessary to insure moisture for germination. Depth of planting does not affect the depth of permanent roots.

Table 1. SPACINGS TO OBTAIN VARIOUS SEEDING RATES

Spacing in row	Row width			
	36 inches	38 inches	40 inches	42 inches
5 inches	34,848	33,051	31,364	29,870
5½ inches	31,680	30,015	28,512	27,157
6 inches	29,040	27,512	26,136	24,892
6½ inches	26,806	26,396	24,126	22,978
7 inches	24,893	23,583	22,402	21,336
7½ inches	23,232	22,010	20,909	19,914
8 inches	21,780	20,634	19,602	18,869
8½ inches	20,499	19,420	18,449	17,571
9 inches	19,360	18,341	17,424	16,895
9½ inches	18,341	17,376	16,507	15,711
10 inches	17,424	16,507	15,682	14,935
10½ inches	16,594	15,721	14,935	14,224
11 inches	15,840	15,007	14,256	13,578
11½ inches	15,151	14,354	13,636	12,987
12 inches	14,520	13,756	13,068	12,446
12½ inches	13,940	13,206	12,545	11,949
13 inches	13,403	12,702	12,063	11,489

Fertilizers

Fertility or available plant nutrients must be in balance with available moisture and plant population for most profitable yields. Shortage of any one nutrient can reduce yields and nullify the beneficial results of other elements.

Plant nutrients that most commonly limit corn growth are nitrogen, phosphorus, potassium, and sulfur. Annual applications of nitrogen are necessary, as this element is nearly always in short supply. Soil tests are helpful in determining application rates of phosphorus and potassium. Testing is done on a fee basis by Oregon State University. Consult your county Extension agent on soil sampling procedure and interpretation of results. Sulfur is deficient in some soils but usually can be supplied by using nitrogen and phosphorus fertilizers containing sulfur compounds.

Starter fertilizers

A starter fertilizer applied with a fertilizer attachment on the planter and placed in a band approximately 2 inches to the side and 2 or 3 inches deeper than the seed is helpful in getting seedlings off to a rapid start.

Placement of fertilizer so that the seedling roots can reach it quickly usually results in earlier maturity and higher yields. Test results have been particularly striking when wet, cold weather follows planting. Fertilizer should not come in contact with the seed.

The banded starter fertilizer should contain 20 to 40 pounds of nitrogen, all the needed phosphorus, and up to 50 pounds of potassium—if potassium is needed.

Nitrogen

The total amount of nitrogen needed depends on available moisture and previous cropping systems. Recommended rates are 40 to 70 pounds of actual nitrogen on nonirrigated land and 100 to 200 pounds under irrigated conditions. The lower rates should be used only when corn follows a legume crop such as alfalfa. Experiments at Corvallis show that 150 pounds per acre gives best results under average conditions on irrigated land.

Nitrogen, in addition to that supplied in the starter fertilizer, can be plowed under or disked into the soil during seedbed preparation on nonirrigated land. Side dressing after the corn is up is satisfactory if soil moisture is high. Additional nitrogen on irrigated land can be worked into the seedbed, side dressed, or applied through irrigation water. If you apply nitrogen through a sprinkler irrigation system, it should be put on at least 2 hours before the completion of the run so that all fertilizer will be washed out of the pipes and off the corn leaves. Particles of fertilizer left on the leaves and behind leaf sheathes will burn the plants.

Phosphorus and potassium

Rates of application for phosphorus and potassium can be determined from soil tests. (See Table 2.)

All needed phosphorus usually can be applied in the starter fertilizer. If available fertilizer equipment will not handle the needed quantity, part of the phosphorus can be disked into the

Table 2. Phosphorus and Potassium Requirements

	Soil test value	Recommended rate
Phosphorus	Below 20 pounds	26 to 44 pounds P (60 to 100 pounds P_2O_5)
	20 to 40 pounds	18 to 26 pounds P (40 to 60 pounds P_2O_5)
	Above 40 pounds	13 to 18 pounds P (30 to 40 pounds P_2O_5)
Potassium	Below 150 pounds	66 to 83 pounds K (80 to 100 pounds K_2O)
	150 to 250 pounds	33 to 66 pounds K (40 to 80 pounds K_2O)
	Above 250 pounds	None

seedbed. If applications of more than 50 pounds of potassium are needed, it can be worked into the seedbed before planting.

Irrigation

Limited rainfall during part or all of the growing season is a problem in all Oregon corn growing areas. Proper irrigation removes this production hazard and, when combined with other desirable practices, insures high yields. A high level of soil fertility and planting at proper rates are necessary to obtain the desired benefits from irrigation.

The soil should be moist at planting time, to the maximum depth corn roots will penetrate during the growing season (4 to 5 feet). Winter rainfall will accomplish this in higher rainfall areas, but an irrigation prior to planting may be necessary in drier regions. Each later irrigation should provide enough water to refill the soil in the root zone to field capacity.

Proper frequency of irrigation can be determined best by checking soil moisture. Delaying irrigation until corn plants show deficiency symptoms is likely to reduce yields. Various instruments for measuring soil moisture or moisture tension are on the market and are helpful in determining the proper time to irrigate. Water should be applied when soil moisture is reduced to approximately 50% of field capacity. Three to four irrigations are usually sufficient in western Oregon, but 6 to 10 may be required on sandy soils in the low rainfall areas of eastern Oregon.

Annual weeds can be controlled successfully all season long with selective weed chemicals.

Deficiency of moisture during early growth stages slows vegetative growth and delays maturity but may not seriously reduce yields if the moisture supply is adequate from tasseling to maturity.

The most critical period is during tasseling, silking, and seed formation. Deficiencies of moisture during this period can reduce yields greatly. Irrigation after the grain reaches the dough stage has little effect on yield but may delay maturity. Corn usually reaches this stage near the middle of August, and irrigation should be discontinued at this time.

Corn planted at a rate of 25,000 seeds per acre. The spacing used was 40-inch rows with seed spaced 6.25 inches in the row.

Weed Control

Adequate control of weeds is essential for successful corn production.

Weed control begins with plowing and seedbed preparation. These operations kill early germinating weeds and leave the soil in good condition for later tillage. Annual weeds are killed most easily as they emerge from the soil. A spike-tooth harrow or rotary hoe can be used to kill small weeds before the corn emerges or at approximately the three-leaf stage. Later cultivations with row cultivators should be no deeper than necessary to kill weeds. Deep cultivation is likely to injure corn roots and will bring dormant weed seeds near the surface where they will germinate if moisture is available. Cultivators equipped with sweeps rather than shovels are best. It is not desirable to ridge the corn unless necessary to cover weeds in the row or to prepare for surface irrigation.

Atrazine sprayed on the surface of the soil at the rate of 2 to 3 pounds of active material per acre before the corn seedlings emerge will control all annual weeds for the entire season. This chemical is effective only in moist soil. Unless a rain occurs within a week after atrazine is applied, irrigation is necessary. Atrazine applied at higher rates will control quackgrass. It may be necessary to follow corn with corn when atrazine is applied at heavy rates, because other crops are likely to be damaged by residue.

Dinitro amine applied at a 6-pound rate at planting time will control broadleaf weeds for three to four weeks. Early weed control with dinitro allows the corn seedlings to get ahead of weeds and facilitates later control by cultivation. Dinitro can be sprayed in a band over the row at planting, thus reducing the material needed per acre. Weeds can be controlled between the rows by cultivation.

Application of 2,4-D at one and one-half pounds per acre has been effective in controlling germinating weeds if applied as the corn seedlings are emerging in eastern Oregon areas, but dinitro amine is generally preferred in western Oregon. Broadleaf weeds can be controlled with a one-half pound application of 2,4-D after the corn plants are larger, if drop nozzles are used to prevent the spray from getting into the whorls of leaves and causing damage to the plant.

Insect and Disease Pests

Various insect and disease pests attack corn in Oregon, but they are seldom destructive over wide areas. Chemical control for local outbreaks is sometimes necessary, but consistent general spray or dust programs are not generally needed.

Crop rotation is an effective control for some pests that do not attack other commonly grown crops. Corn smut, for example, tends to build up in soil cropped continuously to corn. Production of other crops on the land for 3 to 4 years gives effective control. Thorough plowing to cover all debris and weed control in waste lands and fence rows will help control some pests.

Hybrid seed corn is commonly treated by the seed producer for control of fungus diseases attacking seed and young seedlings. This treatment is particularly beneficial in cold, wet springs. Insecticides are sometimes added to the seed treatment material. Since seed treatment chemicals commonly used are poisonous, unused seed should not be fed to livestock.

The garden symphylan is an insect-like pest causing serious damage to corn and other row crops, particularly in western Oregon. This pest lives in the soil, moving up and down with moisture and other conditions, and hence is difficult to control. Heavy infestations will kill corn plants by eating the roots and may completely destroy the crop. Control measures are (1) application of 5 pounds per acre of parathion worked into the soil, and (2) soil fumigation. Chemical treatments must be properly timed and applied to be effective. These chemicals are dangerous. Consult county Extension agents for the latest recommendations and always observe the precautions listed on the labels.

Special equipment can make substantial savings in time and labor and is justified for large operations. It is possible to seed, fertilize, and control weeds and insects in a single operation.

Harvesting for Grain

Larger acreages of corn usually are harvested with combines or picker-shellers and the shelled grain is dried immediately to below 15% moisture for storage. Small acreages can be handshucked and the ears stored in small, well-ventilated cribs until fed. A small percentage of Oregon's corn acreage is harvested directly with livestock, principally hogs.

Corn is physiologically mature and has attained maximum yield by the time the grain has dried to approximately 40% moisture. Harvest can be started any time after this stage, but harvest and drying will be less expensive if the corn can be dried to a lower moisture content in the field. Grain dries slowly, if at all, after fall rains start. In western Oregon it is often necessary to harvest when grain moisture is above 30%.

Grain maturity can be judged by experienced growers from the appearance of the plants and ears. Leaves and husks are brown and the entire plant has a dry, dead appearance. Ears have fully dented kernels that shell off the cob easily. Testing equipment is available from some feed and seed dealers for quick determination of the exact percent of moisture in the grain. An estimate of grain moisture can be obtained by harvesting and drying a few ears. The ears should be weighed, dried over a radiator or other available source of heat, and reweighed. Then the percent moisture can be calculated.

Silage

General production practices are the same for either grain or silage production. However, higher rates of planting and slightly later (10 days) maturing varieties can be used for silage. The usual recommended planting rate for silage is 30,000 seeds per acre, but experimental plantings grown under high fertility and high moisture conditions have given increased yields from as high as 90,000 seeds per acre. Higher rates of planting require more fertilizer and water and are more likely to lodge before harvest. Extremely late maturing varieties may produce a high tonnage of green material but will be too high in moisture content and too low in percentage of grain to produce best quality silage.

Corn is ready to harvest for silage when approximately half of the kernels are dented. Ear husks have started to turn brown at this stage but leaves and stalks are green. Corn harvested at the dent stage will contain approximately 70% moisture, best for packing and processing in the silo.

Corn silage is generally harvested with field choppers and hauled to the silo immediately after harvesting.

Undesirable Practices

Removing the portion of the corn plant above the ear before maturity is an undesirable practice that may severely reduce yields. Some of the reasons heard for topping corn are to hasten maturity, reduce the labor required in moving irrigation pipe, provide green feed, reduce the danger of lodging, and facilitate harvest.

Cutting tops shortly after pollination reduced yields in OSU tests by as much as 40% and delayed maturity.

In view of possible reductions in yield, topping cannot be justified.

Removing suckers from growing corn plants is also an undesirable practice.

Experiments indicate that sucker removal is likely to reduce—and never increases—yields. Pulling or cutting suckers is likely to injure the main stalks and root system.

Weed, insect, and disease control knowledge changes rapidly. Your county Extension agent can furnish crop production information on corn and other crops, based on the latest research findings and local experience.

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