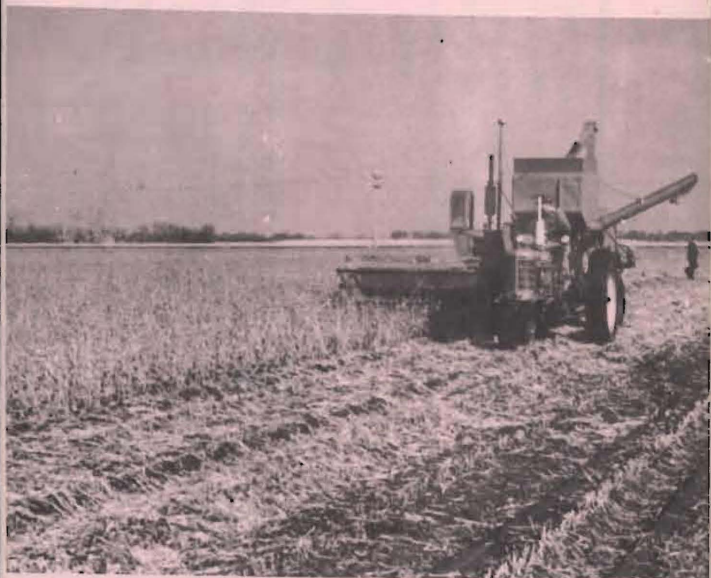


soybean production



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EXTENSION SERVICE

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FARGO, NORTH DAKOTA 58102

SOYBEANS IN RECENT YEARS have become an important cash crop in southeastern North Dakota. In 1946 the Crop Reporting Service showed only 6,000 acres harvested. Since then the acreage gradually increased to reach the record high of 265,000 acres harvested in 1958.

Acreage declined rapidly after 1958 to a low point of 67,000 acres harvested in 1962. During the last four years acreage increased rapidly, with 234,000 acres harvested in 1966. Favorable market price along with higher per-acre yields resulting from improved production practices and favorable growing seasons account for this acreage increase.

Soybeans are a long season crop. Their need for favorable temperatures, a long growing season, and generally satisfactory moisture throughout the the summer and early fall limits their westward and northern expansion in the state. They are grown mainly in southeastern North Dakota, which is also the commercial grain corn area. Two counties, Richland and Cass, harvest 93% of the total soybean acreage in the state. Very early maturing varieties are available that can be grown farther north in the Red River Valley. But these have limited yield capacity and quickly run into strong competition from other row crops such as potatoes, sugar beets and field beans, and from other well-adapted crops.

SOIL PREFERENCE

Soybeans need about the same soil conditions as does corn. A mellow, fertile, medium-textured loam soil usually is best. Heavier soils should have good drainage. Sandy loam soils warm up

faster, and this can help soybeans develop in a cool or short growing season when enough rain falls.

A soil relatively free of weeds is very desirable to avoid serious weed competition. Effective weed control is important for profitable soybean production.

ROTATION

Soybeans fit well into a small grain rotation to replace summerfallow or other row crops. They are a late season crop and leave less soil moisture reserve for next year's crop than fallow or early harvested small grains. Soybeans mellow the soil and plowing soybean ground in preparation for next year's crop is not necessary except where the straw is very heavy or the weed situation is bad.

While well-inoculated soybeans produce most of their own nitrogen requirements they do not leave a nitrogen carryover for next year's crop. Fertilization after soybeans should therefore be about the same as after corn or small grains.

VARIETIES SUGGESTED FOR SOYBEAN MATURITY AREAS

Choose a variety of soybeans that will mature under the average local growing conditions and produce a satisfactory yield of high-quality beans. In general, the farther north or west in the soybean area of North Dakota, the earlier the variety you need.

Suggested soybean varieties, based on maturity zones (Fig. 1), are listed in Table 1 for North Dakota.

SOYBEAN MATURITY ZONES

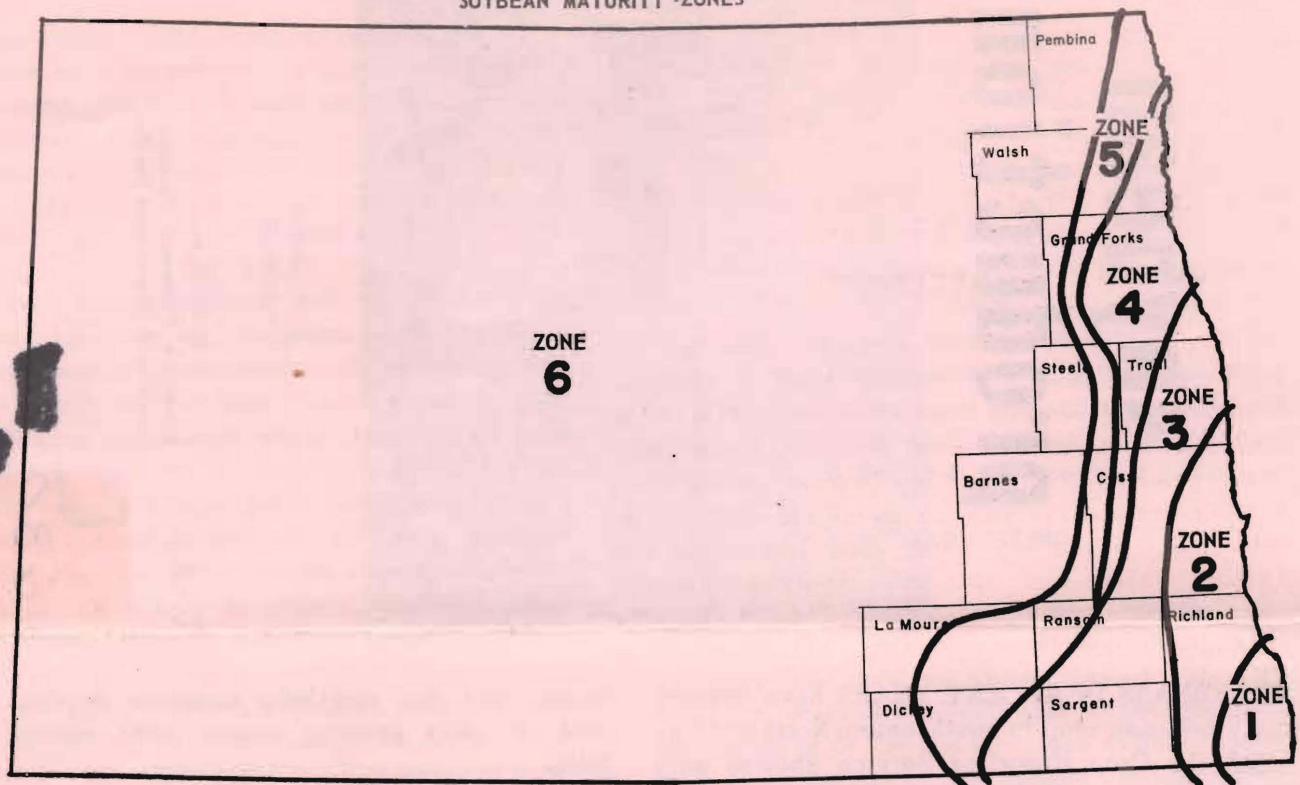


FIG. 1. SOYBEAN MATURITY ZONES OF NORTH DAKOTA

Table 1. Yields and other agronomic data of soybeans grown at Fargo. North Dakota Agricultural Experiment Station and USDA cooperating.

Variety	Zone ^{1/}	Relative maturity	Height	Resistance to lodging	Yield-bu./acre		
					Seed size	Fargo 1958-1966 ^{2/}	Fargo 1964-1966
Portage	4,5,6	v. early	short	good	large	3/	
Crest	4,5	early	short	good	v. large	20.1	18.9
Flambeau	3,4,5	early	medium	medium	med. large	25.2	23.9
Norchief	2,3	med. early	medium	good	med. large	26.8	23.9
Merit	2,3	medium	medium	good	small	29.4	28.0
Hardome	2,3	med. late	tall	medium	medium	26.8	21.3
Traverse	1,2	med. late	medium	good	med. large	---	28.6
Early Manchu	1,2	med. late	tall	medium	medium	29.8	23.9
Grant	1,2	med. late	medium	med. good	medium	31.0	27.5
Capital	1,2	late	medium	medium	small	30.0	26.0
Chippewa ^{4/}	1	v. late	tall	v. good	med. small	29.8	25.0

^{1/} See map, Fig. 1. soybean maturity zones.

^{2/} Seven-year average -- 1959 hail, 1962 flood.

^{3/} In northern Minnesota and southern Manitoba trials Portage yields about 10 per cent less than Flambeau.

^{4/} Chippewa 64 is very similar to Chippewa but has resistance to Phytophthora root rot which has not been a problem in North Dakota.

Consider your zone location and your own experience when you choose from the several varieties suggested. Table 1 showing Fargo Experiment Station yields, variety characteristics, maturity classification and zones of adaptation may help you select the variety to grow.

Table 1 lists the soybean varieties in order of their maturity. Earliest are at the top and the later maturing ones toward the bottom.

The yield figures (Table 1) show only slight yield differences among the several varieties best adapted to the area. If you now plant a variety adapted to your area, cultural practices such as early planting and weed control will affect yield more than selecting another variety.

SEED TREATMENT

Treating soybean seed generally does not increase yield when high quality seed is planted. Seed treatment benefits most when the seed used is low in germination (below 80 per cent) due to age, frost, weather, kernel damage (broken seed coats), or when germination and emergence are slow due to cold soil. Commonly used seed treatments are Thiram, Captan and Spergon. Apply them at the manufacturer's recommended rate. These treatments generally do not hinder nodulation, but if used should be applied before inoculation.

INOCULATION

Inoculate soybean seed with "soybean bacteria" before planting. This provides the necessary bacteria in the soil that let the soybean plants function as a legume, utilizing and storing nitrogen from the air. This inoculant is different from that required for alfalfa, sweet clover, and other legumes.

Inoculate soybeans close to planting time and after treatment if the seed is treated. Applying inoculum is cheap insurance of good nodulation which benefits not only the soybean crop but the crops that follow.

SEEDBED PREPARATION

Soybeans respond to good seedbed preparation. Shallow spring tillage to kill weeds before planting is effective on fall plowed fields. On soils where spring plowing is practiced, plowing is usually done just before planting. Prepare a firm, moist seedbed, as free from weed seed as possible. The sooner you plant soybeans after the last cultivation the better their chance to compete with weeds.

FERTILIZING

Soybeans do best in fertile soil but have been erratic in their response to commercial fertilizer. If a soil test of the field or response in other crops indicates distinctly low phosphate availability, a row application by planter attachment of 10 to 40 pounds of phosphate per acre is recommended. Five to 10 pounds of nitrogen per acre are recommended on non-fallow.

Fertilizer results have varied considerably, so experience on your farm is your best guide. Leave an unfertilized check strip for comparison. If you fertilize, apply it in a band along the row away from the seed to prevent possible germination injury.

PLANTING

Plant soybeans after the soil has warmed up and air temperatures are favorable, usually around corn planting time. Delayed seeding gives you time to kill early weeds before planting soybeans.

On good land where weeds are not a serious problem, plant as early as favorable temperature conditions permit so the beans can take full advantage of the entire growing season and produce top yields. Four years' data from "date-of-planting" studies made at the Fargo Experiment Station show that plantings made after the middle of May had lower seed yield, poorer seed quality, lower oil content, shorter plant height, pod set closer to the ground and more lodging. Late planting may be justified only where weed control is of primary importance.

Planting in rows is the most common method used and permits cultivation for weed control which is important in getting good yields. A corn planter with the proper plates, a grain drill, or a sugarbeet planter, may be used. Plant about 1½ to 2 inches deep to place the seed in moist soil. Planting too deep, or in a soil which crusts, may result in poor emergence.

The most common row spacing is 36 to 40 inches, the same as for corn. This makes it possible to use regular corn planter and cultivator equipment. Experiment Station results at Fargo show that row spacings narrower than 36 inches have not given higher yields except for short or early maturing varieties and for all varieties when planted late (after June 1).

Row spacing down to 22 inches have not decreased yields even when planted early. Growers faced with late planting in some seasons and who have equipped themselves with narrow-row planting and cultivating equipment or have this equipment on hand for other crops can use this same equipment when planting early. Increased yields from early planting in narrow rows may occur in some years.

Close drilled or solid seedings will produce satisfactory yields only if the land is relatively

free of weeds. Some weed control early in the season can be obtained with a harrow or rotary hoe, but control often is unsatisfactory if the field is very weedy. Chemicals may also be useful in weed control.

RATE OF PLANTING

Plant soybeans about 1 to 1½ inches apart in the row in 36 to 40-inch plantings for best yields and competition with weeds. This takes about 45 to 60 pounds of live seed an acre depending on the row spacing and size of seed. About 3,000 medium-sized soybeans weigh one pound. For 20 to 24-inch row spacing about 75 to 100 pounds of seed an acre are needed to maintain the same spacing in the row. Plant about 120 pounds an acre for solid plantings. In all cases adjust the planting rate for size of seed and results of germination test.

WEED CONTROL

Start weed control early. You can use a rotary hoe, spike-tooth harrow or weeder after planting and before the soybeans emerge. Do not cultivate this way when the beans are just emerging.

When soybeans are 3 to 8 inches tall, frequent cultivations with a rotary hoe, light harrow or weeder are very effective in killing weed seedlings in the row with little damage to the plants. Do this when the soybeans are slightly wilted during the warm part of the day.

After the soybeans are up, you can cultivate row plantings with an ordinary corn or beet cultivator. Two or three cultivations usually are needed. Shallow cultivation with sweep-type shovels is recommended to prevent ridging which makes harvesting more difficult, and to prevent serious injury from root pruning. Do not cultivate soybeans when the leaves are wet to prevent the possibility of spreading diseases which may be present.

Pre-emergence or pre-plant chemicals offer the best opportunity for selective weed control in soy-

beans but have been erratic and undependable in North Dakota. The following pre-emergence chemicals are suggested. For annual grasses (except wild oats), use Randox at 4 to 5 pounds active ingredient per acre. For annual grass and broad-leaf weeds, apply Amiben at 2 to 3 pounds active ingredient per acre. Band application can be used to reduce the cost per acre. For preplanting application, Treflan when mixed 4 to 6 inches in the soil before planting controls both grass and broad-leaf weeds except mustard. Carbyne can be used for wild oat control as a post-emergence treatment. Soybeans are somewhat susceptible to injury from 2,4-D or MCPA and drift onto soybean fields should be avoided.

HARVESTING

Straight combining is the most satisfactory and commonly used method of harvest. It is important to follow the combine manufacturer's recommendations for necessary adjustments to prevent splitting and breaking of the beans. Open cylinder concaves or bars as necessary and reduce cylinder speed by about half.

Harvest soybeans when the plants mature and the beans are dry, containing not more than 14 per cent moisture. When the beans are very dry (8 to 10 per cent moisture), harvesting will generally cause more shattering and seed injury. Under these conditions, you may have to combine only in the morning or evening when humidity is high. About 40 shattered beans per square yard represents a loss of one bushel an acre.

STORING

Soybeans may be stored safely for short periods during the fall or winter with a moisture content as high as 14 per cent. For safe storage during the spring or summer, soybeans should not contain more than 12 per cent moisture. Beans free of foreign material and split beans store better and stay in condition longer.

