Soybeans

Cooperative Extension South Dakota State University

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SOYBEANS

Cooperative Extension Service: South Dakota State University and U. S. Department of Agriculture
Soybeans are a good cash crop for the eastern South Dakota counties. Originally they were confined to the southeast counties, but now they are being grown farther north and west. New improved, and adapted varieties, more knowledge about growing the crop, and production of soybeans on acres taken out of corn have contributed to this expansion.

The acreage of soybeans in South Dakota has fluctuated greatly over the past years. In 1958, 259,000 acres were harvested, but only 100,000 acres in 1960. Since 1960, the acreage has increased gradually and reached an all-time high of 377,000 acres planted in 1967. The 5-year average annual production (1962-66) was about 4,534,000 bushels, representing an annual crop valuation of about $11 million. The 1968 soybean crop was 6,403,000 bushels, representing a crop valuation of about $16 million.

AREA OF ADAPTATION

In South Dakota, soybeans are best adapted to the eastern two tiers of counties. Some beans are being grown in the area immediately west of these counties, but when soybeans are grown out of their area of adaptation, they become a high-risk crop. Eastern South Dakota is recognized as the western border of the soybean belt.

While the soybean plant is drought resistant and will make vegetative growth when moisture is lacking, this condition is not conducive to good pod setting. High humidity and cooler temperatures during the blossoming stage favor good pollination and pod formation which in turn affect seed yields.

YIELDS

Soybean yields vary considerably from field to field and season to season. This variation is a result of soil fertility, soil type, weeds, cultural practices, crop variety, rainfall, and production practices. In 1963, South Dakota had its highest average yield of 24 bushels per acre, 35 to 40 bushels per acre were not uncommon. In 1959, the average yield was 11.5 bushels per acre with drought conditions making many fields a crop failure. The 1968 average yield was 19 bushels per acre. With good cultural practices and adapted varieties, yields from 20 to 30 bushels per acre and higher can be expected under normal to favorable growing conditions. Usually, the bean yields are 4 to 8 bushels per acre more in the southeast counties as compared to the yields in the east central and northeast counties.

SOYBEANS IN THE ROTATION

Soybeans may occupy any place in a cropping system but usually take the place of a row crop. Do not use soybeans after plowing down alfalfa or another legume crop as corn usually gives a greater response. Soybeans may follow soybeans, but this practice can increase erosion since soybeans leave the soil rather loose and unprotected. Small grains, flax (if weeds are controlled), or even corn are all good crops to follow soybeans.

SOYBEANS FOR FORAGE

If cut when seeds are ½ to ¾ developed and properly cured, soybeans make excellent hay of high feed value. Soybeans can be planted for silage with other forage crops such as sudan, sorghum, millet or corn. This mixture increases the total yield and improves the feeding value of the forage. When soybeans are used for hay or mixed with other forage crops, a later and taller variety is recommended.

PRODUCTION PRACTICES

Soybeans are not simple or easy to produce, but most farms are equipped with the machinery for producing them. If attempting to grow soybeans for the first time, consider the problems and hazards involved before planting any extensive acreage.

Soybeans are grown in the corn belt, and are handled much the same as corn. Frequently, beans are planted and cultivated with corn planting and cultivating equipment in 40-inch rows. Some farmers use regular soybean planters that space the rows about 36 inches apart. Under such a system the main differences between soybean and corn production are in fertilization, weed control, seed inoculation, harvesting, and storage.

Research indicates that yield can be increased by planting soybeans in narrower than 40-inch row spacings. Results from Iowa and Michigan indicate yield is not increased by planting rows closer than
12 to 14 inches in those states. In South Dakota, limited tests and observations indicate there is seldom any yield advantage from planting rows closer than 20 inches. Cultivation between narrow rows can sometimes be done with a sugar beet cultivator.

Planting with narrower row spacings tends to cause the soybeans to grow taller and bear pods higher off the ground which facilitates harvesting. Rows spaced too closely cause too much shading; beans tend to grow too tall and to lodge. Narrower row spacing also may make it more difficult to control weeds.

SEEDBED PREPARATION

Soybeans need a relatively firm, clean seedbed. Weeds are often a problem, so make every effort to kill as many weed seedlings before the beans are planted as possible. This can be accomplished by early spring plowing followed by disk and harrowing. Perform at least one tillage immediately before planting to pack the soil, kill weed seedlings, and conserve moisture. More uniform depth of planting, assuring quick uniform germination, can be secured on a firm seedbed.

USE GOOD SEED

Plant seed of good quality and high germination. Use only sound seed free of mechanical injury. Soybean seeds that have severely cracked seed coats will not germinate satisfactorily; those that do germinate often produce abnormal or stunted seedlings. Certified seed of recommended varieties assures you of getting an adapted variety of high quality.

INOCULATE SEED

It is essential to inoculate the seed for successful results, unless soybeans have been recently grown on that ground with good nodulation. The soybean is a legume and requires specific bacteria in order for nodules to form on the roots. When properly inoculated, the soybean can get most of its nitrogen needs from the air. Commercial bacteria cultures are convenient and efficient to use. Use according to directions on the container. Pre-inoculation is generally not satisfactory as the bacteria will not survive unless the seed is planted soon after treatment.

DATE AND RATE OF PLANTING

The soybean, a warm weather crop, should not be planted in cold soil. Beans usually are planted right after corn planting time. If planted later than June 10, they may not have time to mature unless an extra early variety is used. However, the idea of using an early variety in this manner does not work as well with soybeans as with other crops.

Plant seeds about 1 inch apart in 40-inch rows, this is a better guide than pounds per acre. Medium size seed, such as Blackhawk (2600 seeds per pound), planted 1-inch apart in 40-inch rows, is about 1 bushel per acre. Good stands aid in weed control, and there is less danger of seedlings not emerging because of soil crusting.

A slight increase in seeding rate is warranted when beans are planted in less than 40-inch rows. Doubling the rate for 20-inch rows over the rate recommended for 40-inch rows usually will reduce yield potential considerably.

METHOD OF PLANTING

Row planting with a corn planter using soybean plates is the most popular planting method. Rows will be 36 to 40 inches apart. Some planters developed for soybeans place rows 36 inches apart; this distance between rows allows the use of the same planting and cultivating equipment as for corn and other row crops. Planting narrower rows (20 inches) can be done by going over the field twice with a corn planter, adapting a sugar beet planter, or using a grain drill with some of the feeder holes plugged.

Using furrow openers on planters, set to operate shallow, is highly recommended. Their use is most important where topsoil is dry to insure uniform planting of 1 to 1 ½ inches in moist soil for quick emergence. Soybeans, like all row crops, are conducive to soil erosion. Plant on the contour if there is a slope of 2 to 6% or do not plant on land that slopes more than 6%.

WEED CONTROL

Soybeans are fairly good weed competitors if they germinate immediately and get a head start on annual weeds. However, soybeans do not germinate in cool soil, but some weeds do. The importance of early weed control in successful soybean growing cannot be over emphasized. This can be accomplished by early spring plowing followed by disking and harrowing. Just before planting, make a shallow tillage operation to kill small weed seedlings. After planting, but before beans emerge, make at least one, and preferably two, harrowings.

More recently, better annual weed control has been obtained by use of rotary hoe, flextine harrow, and herbicides. These newer implements and herbicides are especially helpful when the soybeans are planted in narrower rows as compared to the conventional row spacing of 40 inches. Even though newer weed control methods are helpful and often replace cultivation, it is usually necessary to plan on at least one row-crop cultivation in order to get good weed control. Do not hill soybeans on the last cultivation as hilling can cause difficulty in combining.

ROTARY HOE

The rotary hoe can be effective in controlling annual weeds early in the season. Its efficiency depends
on using at a relatively high speed, 6 to 8 miles per hour, when weeds are just emerging. It is most effective if the soil is crusted as a result of drying after a rain, but it is also effective on moist soil. The rotary hoe can be used until beans are about 6 inches tall. If crop plants are large, use during the heat of the day when plants tend to be limp and less plant breaking will occur. The rotary hoe generally is not effective if the soil surface is too hard or if weed seedlings are big enough to develop a green color.

**FLEXTINE HARROW**

The flextine harrow can be used in much the same way as the rotary hoe except that it must be operated at 2 miles per hour or less. The rotating action of the flexible tines makes it an effective implement for killing weed seedlings. A much larger acreage can be covered than with the row-crop cultivator. Several harrowings generally are required to replace one-row crop cultivation, but three harrowings cost about the same as the first row-crop cultivation. It is not effective if weed seedlings are taller than ¼ inch.

**HERBICIDES**

Several herbicides are available for controlling annual weeds in soybeans. Amiben and Trifluralin (tradename Treflan) are two pre-emergence herbicides that have proven satisfactory in South Dakota. The herbicide 4(2,4-DB) is used for cocklebur control and applied post-emergence about 7-10 days before soybeans bloom. These herbicides generally are used only when soybeans are grown for oilseed production as they carry certain restrictions if the forage is fed to livestock. Be sure to read the label on the herbicide container for the latest restrictions.

Extreme care must be followed in the use of these herbicides or damage to the beans will result. More complete information and recommendations on use of herbicides in controlling weeds in soybeans are given in the fact sheets entitled: “Chemical Weed Control in Crops” and “Weed Control in Soybeans.”

**FERTILIZER**

Soybeans resemble other legumes in their nutrient needs. Proper inoculation of seed usually will assure that the crop will be able to supply most of its nitrogen needs.

Soybeans are relatively heavy users of phosphate and potash. Experimental data indicate soybean response to fertilizer is rather inconsistent. But recent evidence suggests it is profitable to apply fertilizer containing these two elements.

When soil tests rather low in either or both P or K, significant soybean yield increases can result from fertilizer applications. Make applications at planting time as a starter with a planter attachment. Recommended phosphate ($P_{2}O_{5}$) rates for soils testing low would be 30 to 45 pounds of $P_{2}O_{5}$. Recommended potash ($K_{2}O$) rates for soils testing low would be 25 to 40 pounds of $K_{2}O$.

**HARVESTING**

“Direct combining” is the most common method of harvesting. Set the cutter bar as close to the ground as possible. Excessive hilling of the rows in cultivation will prevent harvesting of lower pods, resulting in an unnecessary loss of 2-5 bushels per acre. Do not start harvesting until the moisture content of the beans is 14% or less. If harvesting is delayed until the beans are very dry (9-10%), excess shattering losses and cracking occur.

Avoid excessive harvesting losses. Four seeds per square foot on the ground represent a loss of about 1 bushel per acre. Any loss over this is unnecessary. Lodged plants or branches often are missed in combining. A special attachment reel with extended fingers is available to help prevent some of this loss.

Splitting and cracking beans in the threshing operation results from running the cylinder too fast or threshing when beans are very dry. Damaged beans will not germinate normally and could cause problems in storage. Reduce cylinder speed as much as possible, but still thresh out the beans. Adjust concave clearance so that beans are still threshed, but cracking is held to a minimum. Operate other combine parts at normal speed. Remember that continual adjustments are necessary. The combine setting used in the forenoon when beans are tough could cause considerable damage in the afternoon.

All machinery companies provide an operator’s manual for proper adjustment and operation of their combine. Read and follow these instructions.

**STORAGE**

Cracked and damaged beans do not keep well. Do not store large quantities if moisture content is over 13%. Check the stored beans occasionally and if trouble is anticipated, move the beans, or run them over a fanning mill to remove cracked beans and foreign material.

**RECOMMENDED VARIETIES**

Since there are fairly well defined soybean maturity areas in South Dakota, it is important to select the variety of the right maturity. In general, later varieties are grown in the southern counties; select earlier varieties as you progress northward. In local areas with sandy soils or in the northeast counties with low altitude a later variety can be grown than in the surrounding area.
Since South Dakota lies in the northwestern corner of the soybean belt, select early to medium-early maturing varieties for each area. Following is a brief description of recommended varieties listed in order of maturity.

** Traverse** is early, being similar to Grant. The yield is about equal to Grant but under South Dakota tests has been no better. It grows about 2 inches taller than Grant and has good lodging resistance. It produces a large, yellow seed of excellent quality. The seed has a colorless hilum. The variety is recommended for the northeast areas of the state.

** Grant** is an early recommended variety, best adapted to the northern soybean area of the state. It has medium plant height, good lodging resistance, and has proven to be a superior, early variety. Pods are light brown and hila are black.

** Chippewa** is about 3 days later than Grant and about 5 days earlier than Hark. It stands very erect and is a high yielder over a wide area of the state. The seeds have black hila and pods are brown. The variety is adapted to the east central and northeast counties.

** Hark** is of medium maturity, being slightly earlier than Corsoy but about 5 days later than Chippewa. It has a high yield potential where it is adapted. Hark has an upright growth habit, good lodging resistance, and grows about 2 inches taller than Chippewa. It is especially suited to narrow row planting. The seeds are yellow with a yellow hilum. Hark is recommended primarily for the east central counties where soybeans are grown. However, it can be grown on the more favorable soybean areas in the northeastern counties or as an early variety for the southern counties.

** Corsoy** is slightly later than Hark and about 2 days earlier than Amsoy, with fair lodging resistance. It has an excellent yield record, being the top yielding variety in a large portion of the soybean production area. Plant height is intermediate between Hark and Amsoy.

The seed is of medium size, yellow with a dull luster, and has a yellow hilum. The pods are borne high enough for convenient combining. Corsoy appears to have a relatively wide range of adaptation. The area of best adaptation is in the southeast counties with the northern boundary being about Moody County.

** Amsoy** is a medium- to late-maturing variety for South Dakota, being about 2 days earlier than Hawkeye. It has a very good yield record. The variety has excellent lodging resistance. The seed is yellow with a yellow hilum. Amsoy is not resistant to Phytophthora root rot but appears to have some field tolerance to the disease. It is recommended for the southeast area of South Dakota with the northern boundary being about Minnehaha County.

** Hawkeye** is a medium-late variety recommended for the southeast counties but grown farther north in the state when used for a forage crop. Hawkeye stands erect, has good lodging resistance, bears pods high enough for convenient combining, and has given high yields.

** Wayne** is a late variety for South Dakota, recommended only for the southern tier of counties in the southeast area of the state. It is about 7 days later than Hawkeye. Wayne is high yielding, grows fairly tall, and has good lodging resistance. The seeds are shiny yellow with a black hilum. Wayne does not have resistance to Phytophthora root rot, but, like Amsoy, it has field tolerance to the disease.

** Chippewa 64 and Hawkeye 63** are varieties similar to the original parents, the important difference being that Phytophthora root rot resistance has been added. Phytophthora root rot is not a serious disease problem of soybeans in South Dakota as yet, but is of concern to many soybean-producing states to the east. Certified seed growers may find it advantageous to raise root rot resistance varieties if they plan to market their seed outside of the state.

** OTHER VARIETIES**

The following varieties are not being recommended because other varieties in their maturity ranges have given superior yields according to Experiment Station performance tests.

** Clay** is a very early variety being 6 to 7 days earlier than Grant. Its area of adaptation is in the northeastern counties and then only in areas where an extra early soybean is desired. It produces a very short, branched plant that stands well but tends to pod close to the ground. The seeds are shiny yellow and have colorless hila.

** Blackhawk** is of the maturity range of Hark. It lacks standing ability and its yield potential is inferior to Hark. The Blackhawk acreage is expected to be replaced by Hark.

** Lindarin** grows medium in height and has good lodging resistance with spreading foliage. The variety has resistance to seed shattering and the seeds are usually of high quality. It is very similar to Corsoy in maturity.
**Harosoy**, a Canadian variety, is about 3 days earlier than Hawkeye. Its yield has been comparable to that of Hawkeye, but under some conditions it may lodge. Lindarin and Harosoy are no longer recommended because their yield potential is inferior to Corsoy in that maturity range.

**Beeson** is a new Indian variety that is about 3 days later than Amsoy. This new variety is not recommended in South Dakota because yield tests have shown its yield potential to be below the more adapted varieties. Beeson is resistant to Phytophthora root rot and was developed to satisfy the need for Phytophthora resistance in a variety of the Amsoy maturity class for the eastern soybean region.

**Ford** is a late variety for South Dakota and has been grown only in the southeast area of the state. It is about 4 days later than Hawkeye. The plant is tall, erect, and has good lodging resistance. Ford is a good yielding variety, but Wayne has had some yield advantage.

*Use of a trade name does not imply endorsement of one product over another.*

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