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Soybean Project for 4-H Clubs

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OBJECTS

The objects of the soybean project are (1) to familiarize the boys and girls with the culture of soybeans and their value to the agriculture of Kentucky and (2) to increase the interest of the farm boys and girls in farm life.

REQUIREMENTS:

1. The club member must be 10 to 18 years of age (inclusive).

2. The club member must do the following things:

a. Enroll not later than June 1st.

b. Plant one acre of soybeans or more.

c. Use the best seed that he can get.

d. Follow the cultural methods given in this circular.

e. Cooperate in every way with his county agent and other club members.

f. Keep a record of the labor and cost of growing the soybeans in the space in the back of this circular provided for that purpose.

g. Write a short story of the project.

h. Attend club meetings.

i. Send the record book with record complete to the county agent not later than November 1st.

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Soybean Project for 4-H Clubs

By E. J. KINNEY

The soybean is a native of eastern Asia and has been an important crop in the countries of that part of the world for many centuries, especially in China and Japan. Many millions of bushels are produced, large quantities of which are used as human food. Large quantities are also utilized for the extraction of oil in which soybean seed is very rich. The residue, after oil extraction, is known as bean cake or, when ground, as soybean meal. It is rich in protein and similar to cottonseed meal in feeding value. In recent years, large quantities of soybean seed, soybean oil and soybean meal have been exported from China to the United States and European countries, and these products now are important items in the world's commerce.

Soybean oil is a very valuable vegetable oil and, in oriental countries, is utilized in the manufacture of foodstuffs, paints, soap, and for lubricating and lighting. In this country the oil is used largely in the manufacture of lard substitutes, soap, linoleum, and rubber substitutes of many kinds. It is also much used as a substitute for linseed oil in the manufacture of paints and varnishes.

In Kentucky the soybean is utilized chiefly as a hay crop. It is very drouth-resistant, and makes at least a fair yield of hay in seasons so dry that other forage crops give poor returns. On the other hand, the soybean thrives much better on poorly drained soils than most other legumes. The soybean crop matures quickly—a fact which makes it a valuable emergency crop to use in the event of the failure of other hay crops. Plantings made as late as the first of July produce good yields

of hay in Kentucky. Soybean hay, properly cured, ranks in feeding value with alfalfa and clover hay.

The production of soybean seed in Kentucky has not increased much, if any, in recent years, and it seems doubtful if the State will ever become an important seed-producing area. However, it seems very desirable to produce as much as possible of the supply of seed needed in the State, and there is no good reason why this should not be done. This would have the advantage of giving us seed of the varieties best adapted for hay, now sometimes difficult to obtain. Club members who can command facilities for harvesting and threshing a seed crop should consider a seed project.

The soybean is an annual legume and, like other legumes, the clovers, alfalfa, lespedeza, cowpeas, etc., is able to obtain most of its needed nitrogen from the air, if well inoculated. The root system of the plant is not extensive as compared with that of the clovers, alfalfa and sweet clover, and when the crop is removed it does not leave in the soil much of the nitrogen taken from the air. For this crop to be beneficial in soil improvement, therefore, the manure produced by the animals consuming the hay should be returned to the land. If a seed crop is grown, the straw should be returned, or better yet, used for bedding animals and returned in the form of manure. If these practices are followed, the soybean will prove an excellent soil builder.

Now we are ready to proceed with the directions for growing the crop.

THE KIND OF LAND TO SELECT

A better idea of the value of the soybean as a farm crop will be obtained if the beans are planted on land that represents the average, as regards productiveness, of the farm or region where grown—not the most fertile nor yet the poorest acre. Soybeans are well adapted to follow corn in the rotation

and, if available, a piece of corn stubble land would be a suitable selection for the soybean project.

THE QUESTION OF FERTILIZERS

One of the chief advantages of the soybean as a hay crop is its ability to give good returns without the necessity of spending considerable money for soil treatment, particularly for liming. Probably, then, the fertilizer treatment should be limited to the application of 200 pounds of superphosphate or other phosphate fertilizer per acre. In the Central Bluegrass region no fertilizer need be used. The fertilizer should be applied broadcast, after breaking the land, and disked into the soil or, if a grain drill with a fertilizer attachment is available, the fertilizer may be drilled in when sowing the beans. If the soil is in a very unproductive condition, a complete fertilizer may be somewhat more effective than the phosphate fertilizer. One may be used instead of a phosphate fertilizer if desired. Such a fertilizer should contain about 2 percent of nitrogen, 10 to 12 percent of phosporic acid, and 4 percent of potash—in other words, a 2-10-4 formula. Use 250 to 300 pounds per acre.

THE PREPARATION OF THE SEED-BED

The land should be plowed early, if possible, and worked at intervals with the harrow or other implement until planting time. It is especially important to harrow the ground after heavy rains, in order to prevent its crusting and consequent loss of moisture. Early plowing followed by several workings not only assures a well-pulverized seed-bed containing enough moisture to bring the beans up promptly, but is a great help in controlling weeds. The harrow brings the weed seeds near the surface, where they germinate, only to be destroyed by the next working. If the land can not be plowed until late, it should be dragged immediately after plowing, before the clods become hard and dry. This should be foliowed by the disk and, finally, the drag or spike-tooth harrow should be used until

the clods are pulverized and the surface is smooth. A finely pulverized, smooth seedbed is a great advantage, because the seed can be planted at a uniform depth and the young beans cultivated without injury.

WHEN TO PLANT

Soybeans may be planted as early as corn. They are not easily injured by cool, damp weather; in fact, the seed of some varieties will germinate after lying on the ground all winter. There is no particular advantage in very early planting, however, and as a general thing it is most convenient to plant soybeans after corn planting is finished. The best yields of both seed and hay are usually obtained by planting from the middle of May to June 1. Good yields of hay may be had by sowing as late as July 1, but not so good as from slightly earlier sowing. Beans intended for seed should be sown by June 1 if possible.

THE CHOICE OF VARIETY

It is best to choose a variety that is well known and popular in the State. This makes it easier to obtain seed and, if a seed crop is grown, gives a better opportunity for disposing of the surplus seed. For seed production only, the medium early varieties which ripen seed in late September should be used. Of such varieties, Virginia, Midwest and Wilson are most widely grown at the present time. Other good sorts are Lexington Haberlandt, Peking and Illini. For hay production, the same medium early varieties are most satisfactory also, as they reach the proper stage for harvesting in late August and early September while the weather is likely to be favorable for curing hay. Later in the fall, curing takes much longer because of the short days and cooler weather. The late varieties, such as Mammoth, are widely used for hay and are quite satisfactory if harvesting is not deferred until too late. It is urged that club members use one of the medium early varieties if seed can be obtained.

INOCULATE SOYBEANS

The ability of legumes to obtain nitrogen from the air depends entirely upon the activities of certain bacteria which live in nodules on the roots of the plants. These are known as legume nodule bacteria. If these are not present, legumes must use soil nitrogen, as do other kinds of plants. Apparently, some legumes cannot survive in the absence of the nodule bacteria. Alfalfa and vetch are examples in this group. Others, including the soybean, show lack of inoculation in reduced vigor and low yield. Legumes require much nitrogen for their growth and, when not inoculated, are more exhaustive of soil nitrogen than many non-leguminous crops.

There are a number of forms of nodule bacteria or, as they are usually called, "strains." Some of these strains have two or more legume hosts—that is, legumes with which they live. The soybean strain, however, is found only in association with the soybean. Ragardless, then, of what other legumes have been grown in a field, the soil will not be inoculated for soybeans unless the latter have been grown.

To secure inoculation of soybeans on land new to the crop, it is necessary to introduce the soybean nodule bacteria into the soil in some manner. Some legumes carry sufficient bacteria on the seeds to provide inoculation, but this is not true of the soybean. Inoculation is usually accomplished by treating the seed with inoculated soil or a commercial culture. For soybeans, the soil method seems more reliable, provided well-inoculated soil is used. To be suitable for this purpose, soil should be obtained from a field that has grown a crop of soybeans recently—preferably the previous year. Furthermore, it should be known definitely that the plants bore an abundance of nodules. Soil from a farm where soybeans have been grown a number of years is most likely to be well inoculated. Get the soil some time before it is to be used and spread out to dry in a shady, protected place. Just before the beans are

to be planted, pulverize the soil and screen out lumps. A piece of window screen may be used, or a screen from a fanning mill. Spread the seed on a floor or tarpaulin and sprinkle lightly with water. Stir the seed so that every bean may be wet. Then sift the dry soil over the seed, using about ten pounds of soil to each bushel of seed. The seed should be shoveled over several times, or until all are well coated with the soil. After drying a short time, the beans should be sown. It is best to inoculate just before sowing the seed.

Most of the commercial cultures sold today give effective inoculation if not too old. If necessary to use a culture, be sure that it is not more than a few months old. Usually, the manufacturer prints on the label of the bottle or can containing the culture a date indicating the limit of the time during which the culture may be expected to give effective results. Full instructions for inoculating the seed are also given, and these should be followed carefully. In no case should the seed be inoculated until a few hours before sowing.

Inoculation is highly important. Do not neglect it.

SEEDING OPERATIONS

For hay production, soybeans should be sown with the ordinary grain drill just as wheat and oats are sown. If a grain drill is not available, it is best to sow the beans in rows about thirty inches apart, using a onehorse corn drill. In the absence of any kind of drill, the ground may be marked out and the seed sown by hand. Soybeans grown in rows require considerable cultivation to keep down weeds and are likely to make rather coarse hay, so that broadcast drilling with the grain drill is the preferable method.

In sowing soybeans with the drill, the oats runs should be used except for varieties with very small seeds, such as Laredo, Peking or Wilson 5. For these, the wheat runs should be used. For Midwest, Virginia, Lexington, Wilson or other

varieties with seeds of medium size, set the indicator at five pecks on the oats scale. For Mammoth and Haberlandt or other sorts with large seeds, set the drill at eight pecks on the oats scale. The varieties with very small seeds should, as stated, be sown through the wheat runs with the indicator set to sow three pecks of wheat per acre. Drills are not always accurate and seeds of the same variety vary greatly in size. It is advisable, therefore, to observe the spacing of the seed. This can be done by running the drill a short distance over a roadway where the seeds will not be covered. The disks should just touch the ground. An average of four to five seeds per foot of drill is about the proper spacing. This gives a seeding rate of approximately six pecks per acre for the varieties with seeds of medium size, and eight pecks per acre when the seeds are large.

In sowing in rows, an effort should be made to sow from eight to twelve seeds per foot of row.

For seed production, the method of sowing will be determined by the way the crop is to be harvested, which depends, of course, on the machinery available. If one of the harvesters which thresh the seeds from the rows is to be used, the beans should be planted in rows thirty-six to forty-two inches apart. Planting in rows is also best if the harvesting must be done by hand. Where the crop can be cut with a mower or binder, the beans may be either planted in rows or drilled solid as in hay production.

In sowing soybeans it is of the greatest importance that the seed be planted only deep enough to assure germination. Unless the soil is very dry, a depth of a half-inch is sufficient. Deep planting, especially if followed by a heavy rain and a crusted soil, is likely to give a very poor stand.

CULTIVATION

Soybeans, while small, may be cultivated, without injury, with a spike-tooth harrow or weeder. A new implement—the rotary hoe—is well adapted to broadcast cultivation. Such cultivation is very effective in keeping down weeds until the soybeans are large enough to prevent much further weed growth. The successful use of the harrow or weeder is possible only where trash has been buried perfectly in breading the land, and a good seed-bed has been prepared. Whether the beans are drilled or planted in sows, one or more cultivations should be given with one of the above-named implements. The first working should be given about a week after the beans are up. In using the harrow, slant the teeth slightly and run across the rows or drills. If the surface is crusted, the harrow may be weighted slightly. Now, the beginner will doubtless feel sure he is ruining the stand and will want to stop. He must not be frightened; the plants will not be hurt. After a few days, another harrowing may be given, at right angles to the first. Beans planted in rows must be given two or three row cultivations in addition to the broadcast cultivation with the harrow or weeder.

HARVESTING SOYBEAN HAY

Soybeans make the best hay and are easiest cured if cut when the seeds are less than half-grown—say about the size of B. B. shot. After the pods fill out, the hay becomes woody and tough, and the pods require a long time to dry. Cutting at an earlier state—even when the plants are still in bloom—may be desirable for late varieties. At such a stage, excellent hay is produced, but the yield is smaller.

Opinions differ as to the most practical way of handling soybean hay. The practice followed depends much on the machinery available for doing the work. The following plan is probably as practical as any for the average club member:

Let the beans lie in the swath for two days after cutting. If a tedder is owned, use it the second morning. The third day, rake the beans into small windrows, doing the work in the morning while the leaves are limp. Use a side delivery rake where one is available. The next day, put into tall, narrow cocks and leave until fully cured. The use of hay caps or curing frames greatly lessens the danger of injury by rain. The length of time required to finish curing varies, depending upon the weather. It is seldom, however, that a heavy crop can be safely housed in less than six days. In all operations care should be taken to prevent the loss of leaves, which are the most valuable part of any legume hay and which comprise 30 to 40 percent of the weight of the cured plants.

HARVESTING SOYBEAN SEED

When soybeans are harvested with a row harvester, they must be allowed to become dead ripe. These machines give effective results only when the beans are dry, and their use should not be attempted on damp days. For harvesting with the mower or binder or even by hand, the best stage to cut is when about two-thirds of the pods are brown. At this stage handling causes little shattering, yet the beans dry quickly. If the crop becomes dead ripe before it can be harvested, serious shattering may be avoided by cutting in the early morning when the plants are damp with dew. Where a mower is used, each swath of beans, as cut, should be moved to one side, out of the way of the team and mower on the next round. If this is not done, the seed will shatter badly. Soybeans cut with the mower should be left in the swath for a day or two and then carefully shocked. When the binder is used, the bundles may be shocked at once.

It may be of interest to club members to know that the combined harvester and thrasher—a machine which has gained much popularity recently in the great wheat-growing regions—is said to be ideal for harvesting soybean seed.

THRESHING SOYBEANS

Club members who produce soybean seed will probably find it most convenient to thresh the beans by hand. Of course, if a threshing outfit is used to thresh other beans on the farm, or cowpeas, the club member should have his crop threshed at the same time. On a dry day, soybeans shell very easily, and a good many bushels may be flailed out in a day.

The best way to store the beans in order to avoid danger of heating and consequent damage, is to put them into burlap sacks, which should be ricked in a well-ventilated room. The seed, if it happens to be slightly damp, heats rather easily where considerable quantities are stored in bins.

RECORD OF SOYBEAN PROJECT

Year.....

Name of club member.....

Post office..... County.....

Variety of soybean .....

Size of plot .....

Kind of soil, rich or poor.....

What was grown on land last year?.....

What kind of fertilizer used?.....

How much fertilizer? .....

When did you plow (break) the land? .....

Number of hours required to plow (break) land.....

How did you prepare the seed bed?.....

.....

.....

.....

Number of hours required to prepare seed bed.....

Did you inoculate the seed?.....

What method did you use? .....

.....

.....

Did you sow the seed broadcast or in rows? .....

Date of planting .....

Time required for planting .....

Date of harvesting .....

Time required for harvesting .....

State whether harvested for hay or grain .....

BUSINESS ACCOUNT

Go thru your records and determine the total number of hours you spent on your crop and multiply this number by ten. This gives the value of your time in cents. The total number of hours adult help was used valued at 20c per hour gives the cost of help. Find the notal number of hours team was used and value this time at 10c per hour per horse. Use the following table:

	Amount	
EXPENSES	Dollars	Cts.
Rent or use of land at $5.00 per acre		
Use of machinery and tools at 40c per acre		
Value of member's time		
Value of help's time		
Value of team's time		
Value of seed		
Cost of fertilizer		
Other expense (Inoculation)		
Total expense		
RECEIPTS		
Number of bushels produced		
Value per bushel		
Tons of hay produced		
Value per ton		
Total value of crop		
Less expense		
Net income		

This is to certify that this project has been carried on to the best of my ability.

_____ Club Member

Approved _____ Local Club Leader

Approved _____ County Agent

STORY OF HOW I GREW MY SOYBEANS

STORY—Continued