Soybean Industry Program for Southeast Missouri

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Extension Division
University of Missouri - Columbia

(H. H. Barnes photo)

THE IMPORTANCE of the rapidly growing soybean industry in Southeast Missouri was recognized by agricultural educators at the University of Missouri.

Elmer R. Kiehl, dean of the College of Agriculture, Schell Bodenhamer, associate dean for Extension and B. W. Harrison, district Extension director, urged leaders in the Delta to launch a study of this industry and plan ahead for its improvement.

Local study groups were suggested to help a steering committee make an intensive study of the situation, set objectives, and make recommendations for achieving the objectives.

The Steering Committee appointed 12 study groups involving 140 people connected with the production and marketing of soybeans. Each group made an intensive and detailed study of their assigned segment of the industry. Members of the University of Missouri Extension Division and research staff of the University of Missouri College of Agriculture served on the committee as resource persons. At least one member of the Steering Committee served on each study committee.

Many hours were spent by members of each study group carrying out their assignment and making a complete report to the Steering Committee.

These reports are a part of this publication. As a result of them we feel that the soybean industry of Southeast Missouri can be strengthened.

The willingness, sincere desire, responsive attention, study, and quick action of the people of Southeast Missouri to apply themselves will surely make soybeans a great productive industry for our area.

WAYNE A. FRENCH, *Chairman*
Program Planning Steering Committee

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(Today's Farmer photo)

Soybean flower
(H. H. Barnes photo)

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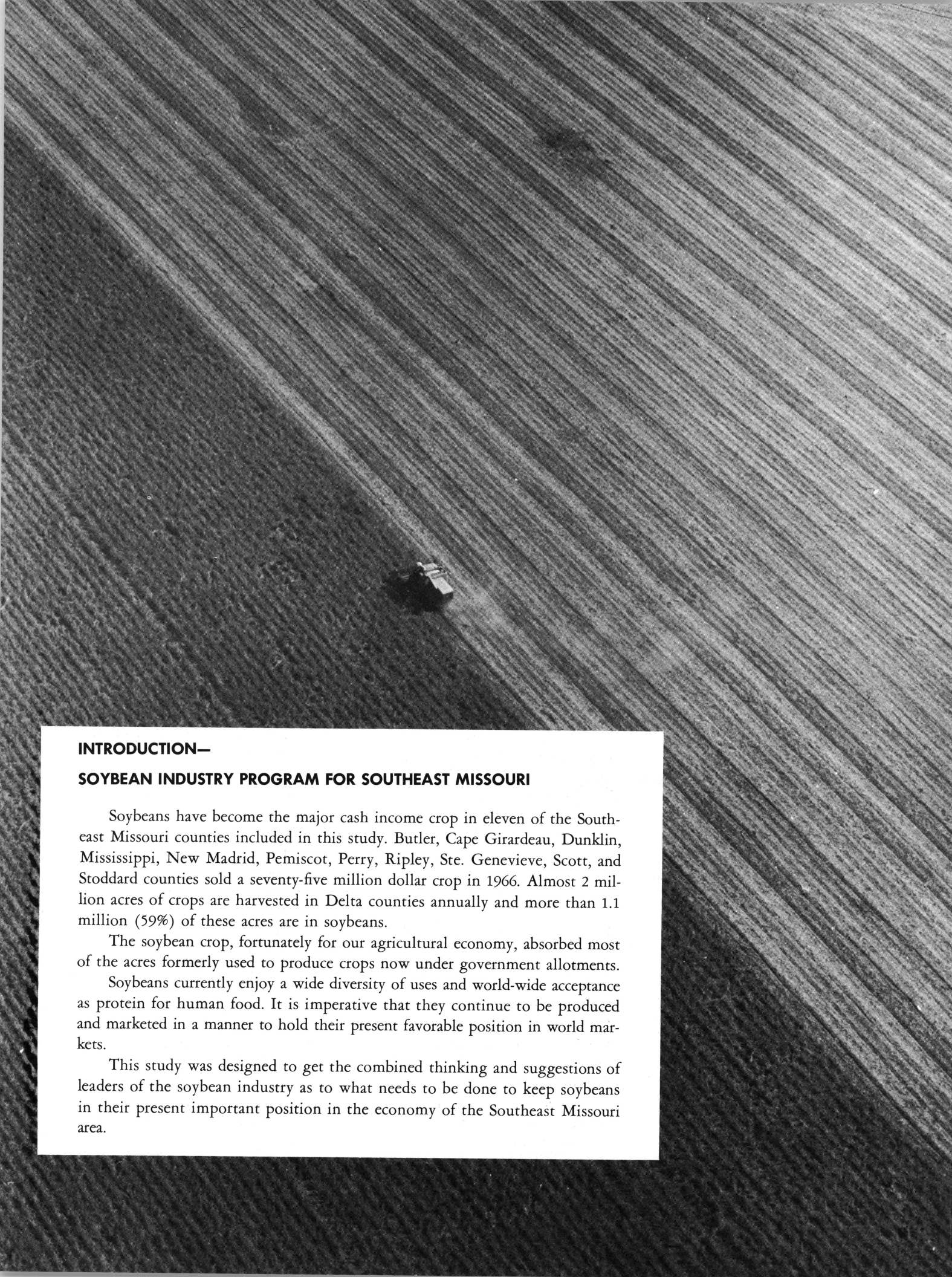


INTRODUCTION—

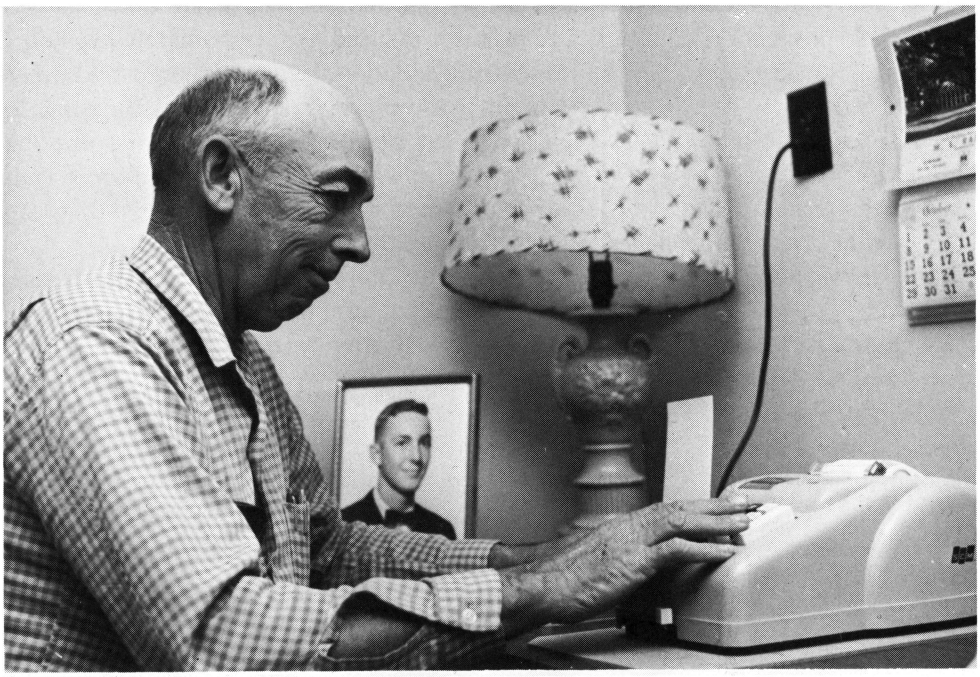
SOYBEAN INDUSTRY PROGRAM FOR SOUTHEAST MISSOURI

Soybeans have become the major cash income crop in eleven of the Southeast Missouri counties included in this study. Butler, Cape Girardeau, Dunklin, Mississippi, New Madrid, Pemiscot, Perry, Ripley, Ste. Genevieve, Scott, and Stoddard counties sold a seventy-five million dollar crop in 1966. Almost 2 million acres of crops are harvested in Delta counties annually and more than 1.1 million (59%) of these acres are in soybeans.

The soybean crop, fortunately for our agricultural economy, absorbed most of the acres formerly used to produce crops now under government allotments.

Soybeans currently enjoy a wide diversity of uses and world-wide acceptance as protein for human food. It is imperative that they continue to be produced and marketed in a manner to hold their present favorable position in world markets.

This study was designed to get the combined thinking and suggestions of leaders of the soybean industry as to what needs to be done to keep soybeans in their present important position in the economy of the Southeast Missouri area.



H. H. Barnes photo

Farm Management

Situation

Farm Management may be defined as the decision-making processes that enter into the organization and operation of a farm business. The operator has many combinations to choose from. Acreages of some crops are fixed by allotment. The farm manager must choose a combination of the alternatives that best suits his soil conditions, his desires, and his knowledge.

Usually, a combination is sought that will pay the highest net return to land, labor, capital, and management. But not always. For example, an older farmer approaching retirement may choose a farm organization that reduces his labor requirement while producing an adequate though lower income.

The present position of resources farmers have to work with may be described as follows:

LAND: Most of the land in Southeast Missouri that can be farmed has been cleared and is in production. Little land has changed ownership in the last few years and it appears that little will be offered for sale in the near future. Land prices are at an all-time high and appear to be leveling off. However, the price at present is above the agricultural returns that can be expected from it when interest payments, taxes, and up-keep are considered in relation to yields and prices of products.

Investments in land improvement are increasing. More fertility treatments are being added and more grading, forming, and drainage are being done. This trend will continue and accelerate as more attention is paid to the importance and amount of land that is devoted to soybeans.

The acreage of soybeans in the Southeast Missouri counties has increased steadily for 20 years but average yield has remained rather static.

The table below illustrates the dramatic increase in acreage, the effect of drouth, and the effects in a year of adequate moisture.

Year	Acreage	Average Yield/Acre	Total Yield Bushels
*1947	394,400	14.3	5,619,000
1948	399,900	21.1	8,413,700
*1953	546,900	12.2	6,666,000
1958	773,900	26.7	20,651,800
1960	867,800	21.9	19,036,400
1966	1,137,000	24.7	27,068,000

The drouth years, 1947, 1953, and 1954, show a drastic decline in yield, while 1958, a year of adequate moisture throughout the growing season, shows the highest average yield in the history of the crop in this area.

Average yields for the area have remained low for several reasons: (1) The land least suitable for cotton or corn has been planted to beans year after year with a consequent buildup of diseases and depletion of mineral fertility. (2) New land coming into production has been somewhat marginal until adequate drainage and fertility could be provided. (3) The soybean Cyst Nematode has built up rapidly in the last ten years.

LABOR: The supply of farm labor has declined drastically in the past 20 years, resulting in the substitution of capital for labor in the form of larger machines and chemicals for weed control. The amount of direct labor required to raise and harvest an acre of beans has been reduced to approximately five hours.

Presently, the labor shortage is rated by farmers as one of their most pressing problems. In some localities, labor has become so scarce that some machinery sits idle at times. Some of the laborers available are not trained or do not have the skill to operate large complex machinery.

It is becoming more difficult to keep farm labor that is skilled in machine operation, particularly the younger ones, as higher wages can be obtained in industry.

The minimum wage law has had little effect on skilled and semi-skilled machinery labor as this type of labor has been receiving the minimum or more for several years. The law has had a reverse effect upon unskilled labor for chopping; farmers do not feel they can pay this high a wage for chopping beans even if the labor is available, and have allowed weeds to grow that previously would have been removed.

In effect, farmers are competing among themselves and with industry for the skilled and semi-skilled labor that is left. This type of labor is in the strongest bargaining position for wages and fringe benefits that it has ever been in and its position is becoming stronger each year. Farm operators are beginning to devise all sorts of plans for keeping labor available.

To keep a labor supply on the farm, some of the following must be considered: modern, attractive homes; year-round employment; agreements on work hours; health and accident insurance; paid vacations; and other fringe benefits (bonuses and overtime).

Some effort may have to be made to locate city dwellers with agricultural backgrounds who would like to move back to the country, and train these people in modern agricultural machinery operation.

CAPITAL: It is becoming more difficult for farmers to accumulate operating capital as the ratio of costs and prices narrows. As a result, more borrowing is required.

For the most part, borrowed capital is easily obtained by farmers. In fact, the ease with which it can be obtained creates a problem with many people who do not pay close attention to how this capital is used in their operation. Much of this money is used for unnecessary updating of equipment long

Farm managers keeping up on technology at a Delta Center research field day. (Today's Farmer photo)

before its useful life is gone. Some operating capital is used for a higher standard of living.

Capital investment in land and machinery is high in relation to returns from the land. Labor costs also are high in relation to farm income.

Cash rent is being bid up by some who are seeking more land to operate. Some cash rent is already too high in relation to the land's productive capacity.

More capital is being put into land improvement such as irrigation, drainage, limestone and fertilizers. Adequate provisions for sharing of such high cost items between landowners and tenants need to be worked out and included in the formal lease or contract.

Many young people who would like to farm cannot muster enough capital and thus move on to industrial occupations. In later years, as older farmers retire, there will be no replacements unless some means are found to establish young men on the farms.

Most farmers do not keep adequate records and cannot compute income to capital. Net worth statements are not kept current.

MANAGEMENT: Comparison of average yield figures with those for the better farmers points out that good management is the key factor to success. At present prices, the farmer who makes only average yields can little more than break even when all the costs of capital, labor and land are paid, leaving little or no return for the operator's labor and management.

Better farm managers are exceeding average yields by 30 to 40 percent on wheat, and 70 to 120 percent on soybeans, cotton and corn. This is being done through better organization and operation of the farm business, and the application of modern technology.

Government controls often prevent individuals from exercising the best organizational and operational management of their farms.

Rent contracts often fail to spell out the rights and obligations of the two parties, resulting in misunderstandings. Many rely upon verbal agreements.

In some instances the size of the farming operation has become greater than the operator's ability to manage. Many farmers have enlarged their acreage without increasing efficiency of operation and production.

Some farmers are living beyond their income due to (a) social pressures; and (b) extravagance in

machinery and equipment purchases. This is caused partially by poor record keeping.

Few farmers keep an adequate set of records from which trends in the business can be found and strong and weak points understood. Little attention is paid to measures of efficiency. Very little long range organizational planning with objectives clearly laid out has been done. Enterprise accounting is rarely done and operators do not know which crops make or lose money or break even.

Financing of the farm business is sometimes done in a haphazard fashion. Money is borrowed from more than one lending institution and purchases are carried in open accounts. As a result, some operators do not fully realize the debt load they carry, and their lending agencies do not know about the open accounts being carried by merchants.

Recommendations

Organization of the farm business and effective operation of the farm plan appear to be the key factor in success. Organization involves a study of the land on the farm and a determination of what crops are likely to make the highest net returns. It also includes a close estimate of labor and capital needs for the present and future. In short, organization has to do with how to get the most efficient use of land, labor, and capital.

In making some of the organizational decisions, the manager must ask some questions about land use. Are soybeans the most profitable crop that can be grown on my land or would corn or grain sorghum be better? Should more of the land be double-cropped in wheat and soybeans or grain sorghum? What does the land need in the way of improvements in drainage or water management, fertility, leveling, or irrigation? Will the land pay for these improvements in extra yields and leave some income over for labor and management? Could a livestock enterprise be added profitably to use grain production and provide employment for labor during slack months? A thorough study of the farm business can help provide the needed answers.

In view of the scarce supply of labor, better ways of substituting capital for labor must be found. A new look at all the means of weed control, including pre-emergence and post-emergence chemicals, oils, and flaming needs to be made by farmers and researchers.

Farm operators are urged to begin up-grading housing and other benefits for prime labor before they are caught short.

Landowners and tenants need to be on a much sounder basis regarding the legal aspects of land rental. Written contracts or leases should be used more often to insure the rights and privileges of both parties. This is particularly true where the two parties are involved in large capital investments such as soil fertility and irrigation. Leases of more than one year or one year with a renewal clause are important where these large investments are entered into. This not only helps the tenant to be assured of regaining his investment, but also assures a lending institution in cases where the capital has to be borrowed.

The economic and management aspects of soybean irrigation need thorough research on a field basis on the various soil types and with the various kinds of systems—surface and sprinkler. Just how much irrigation contributes to yield and even whether or not it pays in the long run is not known.

The feasibility of growing other row crops on land presently planted to soybeans needs investigation by researchers. Could more profit per acre be made with corn, grain sorghum, or some other crop? It is estimated that almost one-third to one-half of the soybean acreage is on land that would grow high yields of corn or grain sorghums. Every individual farmer could decide this question for himself if he would make a thorough study of his farm business.

Some form of enterprise record keeping should be made available for farmers who would like to keep some enterprise records on various crops. This should include some guides as to how various machinery costs should be allocated to different crops. It is understood that with record forms and guidelines, the burden of keeping these records would still fall upon the individual farmer.

Since so few individual farm records from Southeast Missouri are being analyzed in the electronic data processing program, it is urged that some means be found for the University to work directly with public accountants and individual farmers to get analysis of records on some large operations. It is realized that few farmers operating large businesses keep their own records. This is either done by a bookkeeper within the organization or is contracted to a public accountant.

Soil Fertility

Situation

The average yield per acre of soybeans in Southeast Missouri has been about 22 bushels the past several years. Soybeans grown on research plots have averaged 40 bushels per acre or more where they have followed a highly fertilized crop in a rotation program. Major causes of the difference are that farmers do not rotate soybeans properly with other row crops and they do not usually plant soybeans on the most desirable soil.

Excellent increases in yield have been observed by many farmers when soybeans followed other crops (corn, wheat, cotton, etc.) that were previously fertilized according to soil test.

Approximately 70 percent of the 1.1 million acres of soybeans grown in Southeast Missouri is grown on the same soil every year. Soybeans follow soybeans with no type of soil improvement program.

Each bushel of grain removes 3.2 pounds of nitrogen, 0.8 pound phosphate and 1.4 pounds of potash. This means the average yield of 22 bushels has been removing approximately 70 pounds of nitrogen, 18 pounds of phosphate, and 30 pounds of potash for a number of years. The result of growing continuous beans without maintenance fertilizers could not help but result in decreased yields.

At present, less than 5 percent of the soybeans grown continuously on the same soil are fertilized. In some instances, where growers have applied fertilizer, limestone, or both according to recommendations they have not received an increase in yield the first year. This has discouraged direct application of fertilizer and lime for this crop. Generally, the visible effects of fertilizers on soybeans are not as clearcut as they are for corn or cotton.

The soybean plant is a legume. If it is properly inoculated and the soil pH is 6.0 to 6.5, the plant will fix approximately 60 to 70 percent of the nitrogen needed from the air. Nitrogen is not normally recommended for soybeans.

The soil amendment that would bring the biggest yield boost in this area would be the application of limestone on acid soils. The average soil pH for the seven Delta counties is 5.1, with thousands of acres falling below 4.5. This is critical. The tonnage of lime applied has increased gradually, but will never get land limed before application is needed again.

The shortage of potassium is reducing yields an average of seven bushels per acre on thousands of acres that test low in this nutrient. In some experiments in the Delta the application of potash has increased yields 12 bushels per acre.

Phosphate is a limiting factor mainly in Butler, Stoddard, Dunklin, and Scott counties. The other

three counties have low phosphorus soils in certain areas.

A soil test is the best and most practical way to tell if a soil needs lime or fertilizer. However, only 5 percent or less of the continuous soybean ground is currently being tested. In the case of corn and cotton about 20 percent is tested every year. Soybeans use more phosphate and potash than either of these crops.

In many cases limestone is applied improperly. Growers often expect lime to correct soil acidity if it is placed on top of the ground. Results are disappointing. It must be worked into the top five to seven inches.

Many farmers are hesitant to apply limestone or fertilizer because they do not own the ground. Annual leases and lack of landowner cooperation in sharing expenses has discouraged the application of lime and fertilizers.

Problems

Farmers continue to raise soybeans on the same soil instead of using crop rotation practices. This problem still exists even after several years of educational efforts.

How can farmers be motivated to take more soil samples from soybean fields? In many cases samples that are taken are taken incorrectly and in a majority of cases fertilizer and limestone are not applied according to soil test recommendations.

Growers have not recognized the importance of soybean production in their farming operation and have failed to examine the cost of production closely enough.

Applying fertilizer and limestone according to soil test does not always increase yields the first year. The research conducted in Southeast Missouri on the response of soybeans to fertilizers and limestone is limited. This is also true in other soybean growing states.

How can farmers be encouraged to attend winter educational meetings? In many cases the farmers that need the information presented at these meetings are not present.

Recommendations

The study committee suggests the following recommendations in order of importance:

1. A more intensive research program should be initiated in Southeast Missouri by the University of Missouri Agronomy Department on the following subjects.
   A. The best rate of fertilizer to apply per acre, best time of application, and best method of application according to soil type and chemical soil tests.
   B. The importance of micro-nutrients in increasing soybean yields.
   C. The response of different soybean genotypes or strains to various fertility levels. This would probably be a cooperative program with soybean plant breeders.
   D. The value of total plant analysis for various nutrients during the growing season. In many states plant analysis results are being used to supplement soil tests.
2. We recommend that more funds and, if necessary, more personnel be provided for the Delta Center to accomplish this research.
3. Soybeans should be rotated whenever possible to follow a crop that was fertilized according to soil test. Considerable time should be spent in advance planning of the rotation system.
4. Farmers should take soil samples from every soybean field on the farm every three to four years and apply limestone and fertilizer according to test results.
5. It is recommended that more material in the form of leaflets, M.U. Guides, news articles, and Experiment Station Bulletins be published on the response of soybeans to limestone, fertilizers, and crop rotation in Southeast Missouri.
6. More educational meetings should be conducted in the area for farmers, landowners, and agriculture-related people on the importance of soil testing, fertilizer, and limestone in soybean production.
7. If a high rate of fertilizer is used, it should be broadcast and if a low rate is used it should be banded beside the row. If more than two tons of limestone are recommended the material should be added in two applications.
8. The committee recommends that every farmer keep an accurate yearly record on every field on the farm. This should include items such as soil test results, fertilizer and lime applied, how and when applied, yield per acre, and trends.

Field drains are a must in the area.

Water Management

Situation

There are three major problems of water management in crops production in the Delta: (1) drainage; (2) prevention of run-off and consequent sheet and gully erosion in the hill parts; and (3) design and use of supplemental irrigation to overcome drouth conditions.

DRAINAGE NO. 1 PROBLEM: Drainage is still the number one problem in the flat Delta land. As better drainage is practiced on larger numbers of farms, main drainage ditches are becoming taxed in their capacity to handle run-off because water reaches the ditches earlier, and there are fewer potholes to retain water. As ditch capacity is reached, water backs into fields adjacent to them even though a good field drainage system is maintained.

The immedate problem seems to be too small a system of ditches to handle the increasing flow of water.

On individual rented farms, there is a problem of who is to pay expenses for drainage or how the expenses are to be shared between landlord and tenant. There are many farms owned by absentee landlords who are not acquainted with the drainage problems or what needs to be done and the benefits that will result with a better system.

EROSION: There is a larger acreage of hill land in the Delta Area that needs water management in the form of terraces and diversion channels. The problem is that water needed by crops runs off carrying with it large amounts of soil through both sheet and gully erosion. This run-off adds to the already existing problem of poor drainage in the flat lands.

IRRIGATION: While irrigation in itself is not a natural problem, with its use, problems arise about what kind of system is best suited to a particular soil type, when to use it, and how much water should be added to a given crop. Little research of consequence has been done on these problems in Southeast Missouri.

There is no doubt that soybean yields are severely reduced by dry periods, but it is not definitely known just how much the use of irrigation can contribute to increased yields or if the increase would more than pay for all the costs incurred.

Recommendations

Since many of the drainage ditches in some districts are grown up in brush and have silted in, cleaning of the ditch banks and bottoms is needed to increase the capacity and rate of flow.

A number of the ditches need enlarging to take care of increased amounts of water flowing through them. These ditches were not designed for present needs.

Sprinkler irrigation is necessary on sandy soils; flooding method is used on others.

In some areas, new drainage districts need to be formed or arrangements made to get into an existing district to get rid of excess surface water. Sikeston ridge is a good example.

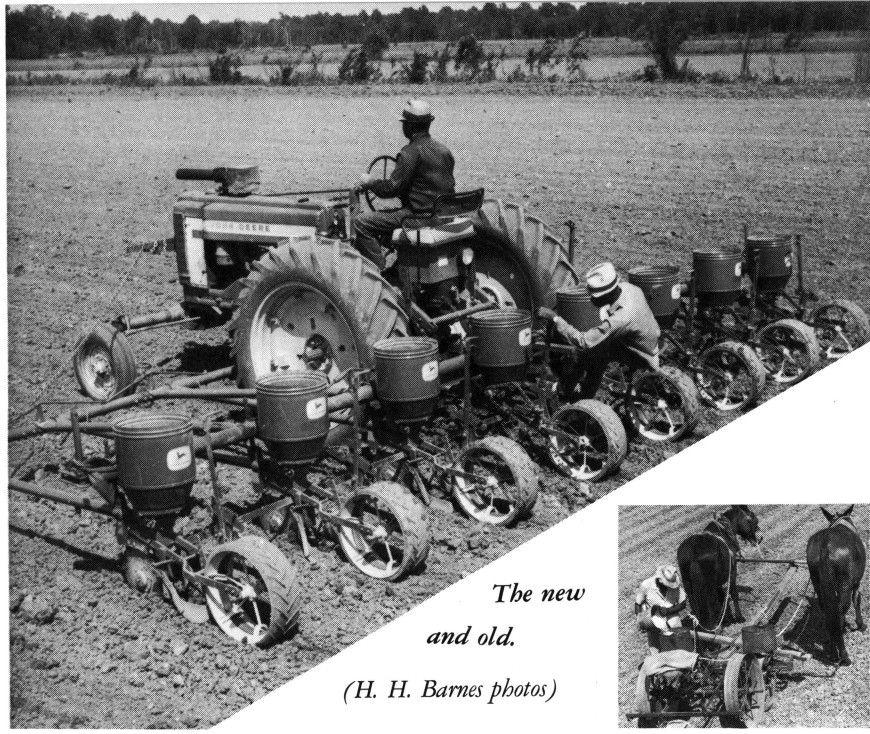
Educational work is needed on drainage design for individual farms. This should include land grading or leveling, and ditch design for easy maintenance and proper functioning.

More educational work on terraces, outlets, grassed waterways, and diversion channels is also needed in the hilly areas of the Delta. Both the hill and bottomland soils would be improved. Soil would be protected from washing on the hills and the bottomland protected from excessive run-off.

Research needs to be carried out on sub-soiling land that has a natural clay pan or a traffic pan to evaluate this method of getting more water to soak into the soil and do it faster. This practice, if feasible, would not only remove much standing water from the surface, but store it for future crop use.

Although both surface and sprinkler irrigation have been practiced for 10 years or more, there is little research on how to get the greatest benefits from the least costs. Efficiency of different systems on various soil types ought to be evaluated. Sprinkler systems which seem to be a "must" on the light sands may also be best on the heavier soils that are subject to water-logging. The view here is that a sprinkler could put on from ½ to 2 inches more uniformly than the surface method which tends to over-irrigate upper ends of slopes.

Soybeans, being the largest single crop in the Delta area, need investigation on their ability to return a profit under irrigation on the different soil types.



The new and old.

(H. H. Barnes photos)

Production Machinery

Situation and Problems

Machinery used in producing soybeans is greatly diversified according to soil types, seasonal conditions, irrigation used, and row spacing. Most of it was designed for use in producing other crops and has been adapted to bean production. Since soybeans are a relatively new crop, few special machines have been designed specifically for them. Practically all machinery available now is the same general design as that available long before soybeans were important.

Since machinery is the largest percent of the total production costs and soybeans have become a major crop, it is generally agreed that the need is now here for equipment for use in systems of farming developed around soybean production.

Not all land is suitable for leveling and furrow irrigation; thus, probably two systems should be considered. One system would be designed around land suitable for grading and the other around land that would not be graded. Each system should include soil types in its design.

Recommendations

The system of soybean production must first of all be a minimum tillage method. This method will begin with soil preparation. A machine for plow planting and chemical application at one operation is needed. This machine should be adjustable for row spacing and allow for use of additional units to achieve efficient use of horsepower.

The ideal machine would be adaptable for use in broadcast or bedded planting, depending upon soil conditions. The basic tillage could be rotary, special plow shape, chisel plow, or other methods, again depending upon soil conditions.

Bed forming and chemical application equipment should be available as attachments. Planting units suitable for use as attachments or in separate operation must be available.

Since no chemicals are likely to be available in the near future that will allow soybean production without some cultivation, further research is needed in the use of mechanical weed control methods, including some flame cultivation.

Studies of the separate operations that must be performed in a minimum till system should be completed so they can be combined when the machinery is finally available to fill this need. Research into the following is needed:

—Row spacing and planting rates as affecting machinery design.

—Strip tillage methods in sod, small grain, or other compatible crop.

—Bed shaping with and without planters.

—Fall incorporating or chemical application.

—Post emergent application equipment and methods.

—Double cropping with no cultivation other than planting.

—Continuous tilling and planting of same rows to lessen soil compaction.

Seedbed Preparation

REGULAR METHOD

Situation

Soybean growers would like to plant in warm, moist soil of a weed-free seedbed. This would help to get a rapid emergence of plants and would be a big step toward keeping a field clean through the growing and harvesting season. However, this is difficult to accomplish on some of our soils. Our present seedbed preparation practices usually cause the heavy clay soils to dry rapidly before or during planting and a rain is needed soon after planting to get a stand.

Soybean producers are also interested in lowering the cost of land preparation by combining operations and reducing the number of trips across the field.

The land preparation steps generally followed on sandy loam and clay soils are:

1. The old soybean crop is destroyed by disk harrowing. If previous crop was cotton or corn, shredding or chopping may be necessary in addition to disking.
2. The upper root zone is decompacted by (a) plowing to a depth of 6 to 10 inches or (b) chiseling to a depth of 10 to 12 inches.
3. The surface is smoothed or firmed with a disk harrow or field cultivator. This operation is sometimes repeated to destroy one or two crops of weeds before planting.
4. Some farmers are using a once over operation with a roto-tiller type machine.

The heavy clay soils are flat-broken or bedded in the fall or winter months, whenever possible. Bed conditioners are used to knock rows down in bedded fields. One method used is to knock the rows halfway down in early spring and re-bed with disk bedder. Beds are lowered to desired height at planting time. This method enables planting in moist soil and destroys weeds.

Cover crops are sown on the light sandy soils in the fall to cut down on wind erosion and to add humus. The cover crops are turned under two to four weeks before planting. Disk harrow or field cultivator is used in front of planter.

ROW SPACING: Soybeans are usually planted in 38 or 40 inch rows. This is the same row spacing of other crops and avoids having to adjust cultivating equipment for each crop. However, there are some growers going to narrow rows, 30 inches or less, as a method to increase yields. Also some beans are being drilled solid. The weed control problem becomes greater when rows are too narrow to cultivate. Effective herbicides can overcome this problem.

Problems

Seedbed preparation is a costly operation. Also, the many trips across a field to prepare a seedbed result in soil compaction. Combining seedbed operations for minimum tillage can cut seedbed preparation costs in half.

Another problem is getting a stand of beans on heavy clay soils in a dry season. A method of seedbed preparation is needed that will not dry out the top few inches of seedbed on this soil type.

Hardpan areas develop in many fields. These pans range in depth from 5 to 18 inches. Some hardpans are natural ones resulting from soil forming processes. Others are traffic pans caused by compac-

tion under implement traffic, as mentioned above. The hardpans result in shallower-rooted crops which suffer in yields in dry years.

Poorly drained fields are a hindrance to seedbed preparation and in surface irrigation. More land grading will help solve this problem.

Recommendations

Fields should be well drained to allow timely seedbed preparation and even emergence of soybean plants, and to facilitate irrigation.

Prepare heavy clay or gumbo soils in the fall or early winter to allow time for clods to melt. The soil should be stirred as little as possible in removing weeds before and at planting time.

Light soils should be broken in spring except where a large amount of residue needs to be turned under in the fall to rot or where deep breaking is needed in the fall to remove hardpans.

Seedbeds should be free of weeds at planting. Planting in late spring after soil warms up will allow time to destroy a crop or two of weeds before planting. Fields should be nearly flat at harvest time to keep combine losses at a minimum.

More research is needed in the Southeast Missouri Delta on:

—Seedbed preparation methods for all soil types, including minimum tillage and elimination of soil compaction.

—Row spacing on different soil types.

—Planting methods in combination with seedbed preparation and fertilizing methods to obtain rapid germination and emergence.

DOUBLE CROPPING METHOD

Situation

Double cropping is one means producers use in an attempt to counter economic pressures from high priced land, machinery, irrigation equipment, and other capital investments. The aim is to spread these investment costs and operational costs over more units of production and thereby increase income.

Farmers who can keep their labor and machinery gainfully employed on crop land longer benefit economically. This committee dwelt chiefly on seedbed preparation for double cropping small grain and soybeans. Its primary concern was the preparation of the soybean seedbed following small grain and preserving the moisture to permit ready germination and establishment of the stand.

Problems

Major problems hindering wider use of double cropping in the Delta include the following:

—Maintenance of adequate moisture to assure germination and establishment of stand.

Irrigation when lack of moisture is a limiting factor to germination.

—Disposition of straw aftermath in preparation of seedbed for the second crop without undue disturbance of the soil.

—No machinery designed specifically for soybeans. Machinery designed for double cropping must be less moisture depleting.

—Bedding is necessary for flood or row irrigation. This requires grading of land.

Weed control ranks second only to moisture among double cropping problems.

Observations

A roto-tiller type machine for rows only seems to work well. If the soil is too hard after beans emerge, this machine may be used in the middles; otherwise conventional rotary hoes and/or cultivators may be used.

Drilling beans solid with a grain drill should have a future if moisture and weed control problems can be solved.

Soil types of the area vary greatly in moisture holding capacity. Seasons vary from year to year; no two are the same.

Soybeans need a firm seedbed. Where hard packing rains occur after planting, a rotary hoe should be used to break the crust.

Land that is leveled to grade can be row-irrigated after sweeps are used through the middles.

Recommendations

Burn or remove straw aftermath if it appears necessary to prepare an adequate seedbed and obtain a stand.

More research on specialized minimum tillage equipment would be helpful. We suggest the strip tillage tool designed at the Experiment Station in Columbia be researched under Southeast Missouri conditions. It is available and can be towed.

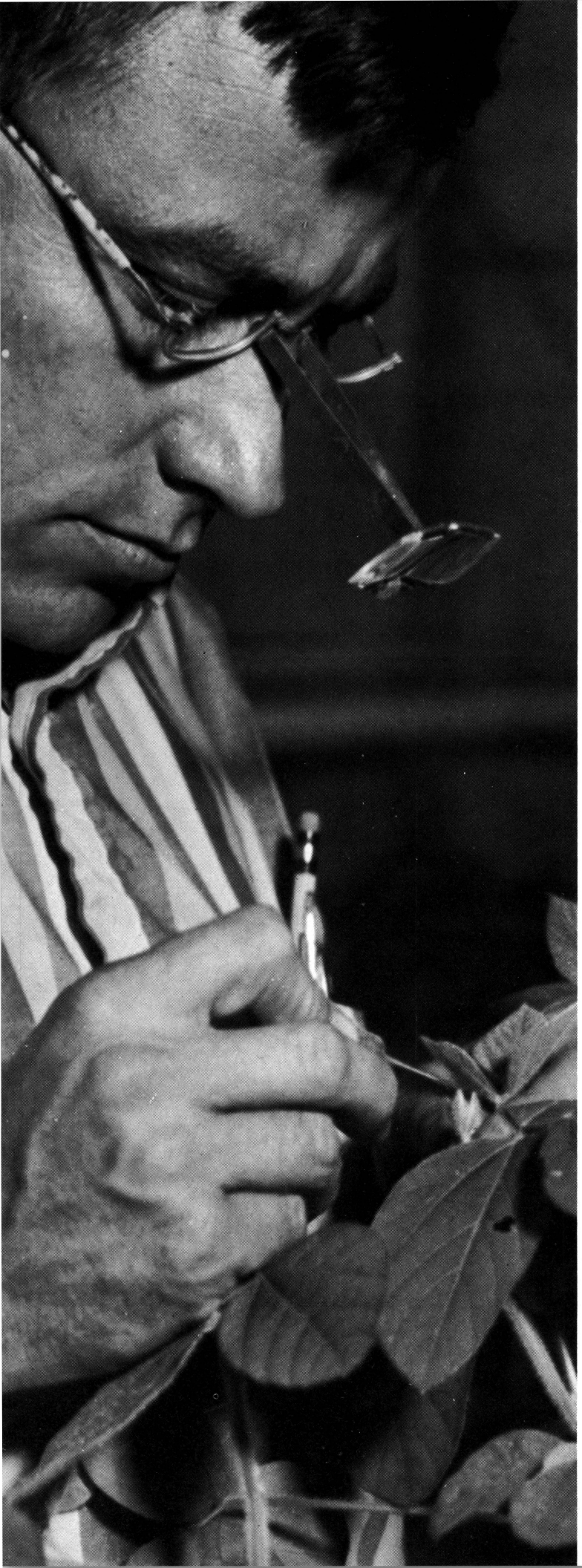
Studies on fertility programs specially designed for double cropping are needed, including methods and timing in relation to seedbed preparation.

Research on row width, especially in relation to time of planting, and research on timing of seedbed preparation and planting in relation to date of harvest of small grain would also be of great help. Studies on wheat drilling are needed.

Apparently, the less tilling and the greater speed with which the seedbed can be prepared the better, from the standpoint of moisture conservation and stand establishment.

Few producers are satisfied with methods presently used in seedbed preparation for double cropping soybeans. There must be a better way.

Harvesting wheat and planting soybeans the same day. (*Progressive Farmer photo*) →



Variety Improvement

Situation

Presently, ten varieties are recommended for planting in Southeastern Missouri. These varieties must cover considerable range in maturity, soil types, and cultural practices. Some of these varieties have been on the recommended list for more than 20 years.

Three new varieties were added to the recommended list in 1967. These varieties are improvements over existing recommended varieties only in limited respects. They are resistant to one of the major soybean pests in Southeast Missouri, the soybean cyst nematode. On nematode-free soils, the yields of the new varieties are comparable to yields of previously recommended varieties.

Yield increases in new soybean varieties have been relatively small. New varieties are generally superior in yield to existing varieties by less than a bushel and this superiority is usually a result of having resistance to soybean pests.

Average soybean yields in Southeast Missouri increased from 18.6 bushels per acre in 1944 to 23.8 bushels per acre in 1966. This represents an increase of 0.23 bushels per acre per year, which can probably be attributed to improved cultural practices.

Soybean yields of more than 85 bushels per acre have been reported in the state from varieties which are on the recommended list. These yields demonstrate potential yielding ability; however, these high yields were attributed mainly to cultural practices and are two to three times the yields of the same varieties grown under standard cultural practices.

The state has two soybean breeders working on the development of new varieties. One, employed by the University of Missouri, is located at the Delta Research Center, Portageville. The major portion of his efforts is toward the development of cyst nematode resistant varieties adapted to areas inside and outside the quarantine. He also conducts studies in basic research.

The other breeder, employed by the U.S. Department of Agriculture, is located at the University of Missouri - Columbia. His efforts are directed toward development of new improved varieties and conducting basic research in soybeans.

Pollination is a delicate process in variety improvement.

There are no private soybean breeders in Missouri engaged in the development of new varieties.

Problems

The major problem in variety improvement seems to be the difficulty in obtaining higher yields in new varieties. It's a matter of breaking the yield barrier in soybeans.

If yield is a measure of how well adapted a variety is to a given area, then this major problem may be divided into more specific problems concerning variety adaptability.

Shortcomings which most of the existing varieties possess are:

1. Lack of resistance to major soybean pests; cyst nematode, root knot nematode, phytophthora root rot, and bacterial blight and pustule.
2. Not well adapted to narrow rows: heavy branching; broad leaves.
3. Do not resist such changes in environment as moisture stresses and temperature stresses.
4. Do not reach maximum performance following small grains.
5. Are not resistant to chemicals being used for weed control.
6. Will not withstand extreme variations in cultural practices.
7. Other difficient characters: pods too low to ground, shatter resistance, lodging resistance, and lack of response to fertilizers.

Recommendations

Since obtaining higher yields in new varieties is considered the major problem in variety improvement, perhaps yielding ability should be studied to determine what factors actually contribute to yield. Once these factors are located they could be concentrated into a single variety.

A study of this nature would require many years of research, however, and the results would probably show that factors contributing to yield were primarily factors contributing to the adaptability of a variety to its immediate environment. Therefore, recommendations which follow have to do largely with the development of more adaptable varieties.

1. All new varieties released in Southeast Missouri, with only major exceptions, should contain resistance to the soybean cyst nematode, root knot nematode, and phytophthora root rot, and other diseases.
2. Growers should be encouraged through educational programs of the Extension Division to plant cyst nematode resistant varieties on soils suspected or known to be infested.
3. Studies should be conducted as to which row spacings and seeding rates are optimum for currently recommended varieties. Consideration should be given to development of varieties best suited for particular row spacings and seeding rates which might give high yield responses.
4. New types of plants should be studied for their adaptiveness in high yielding populations. Possibly plants of non-branching, narrow leaf, and short internodes would be better adapted in narrow rows and high populations.
5. New varieties that resist changes in environmental stresses, such as moisture and temperature stresses, should contribute to increases in yield and lower the losses due to such fluctuations in the environment.
6. Since a major portion of the land in small grains is followed with soybeans, consideration should be given to the development of a variety specially suited for this purpose.
7. The advancements in chemical weed controls necessitate development of varieties which resist chemicals being used for weed control. They should also withstand extreme variations in cultural practices such as flame cultivations, minimum tillage, narrow rows, double cropping, and chemical weed control.
8. A major portion of soybean losses in the field is header loss. This loss may be attributed to shattering by header reel and inability of machines to get lower pods and pick up lodged plants. New varieties are needed with pods higher above ground, more shatter resistance, and more lodging resistance.
9. New varieties should be considered which respond to fertilizers.
10. Varieties should be considered for specific uses. Such varieties might be high in oil or protein content or possibly vegetable types.

Weed Control

Johnson grass made this a non-profit crop.

Situation

Weeds are a major roadblock to increasing yields and profits from soybeans in the Delta. Research has shown that one pigweed plant in every 40 inches of row can reduce the yield four to seven bushels per acre. One cocklebur in 20 feet of soybean row reduced the yield 4 bushels per acre. One foxtail plant every foot of row reduced yields 1.7 bushels per acre.

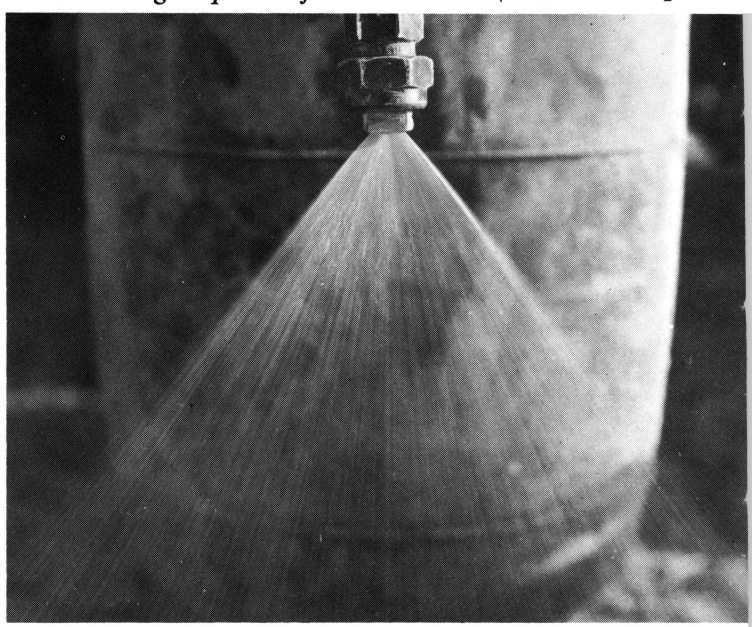
If we could increase our average yield by four bushels per acre through weed control we could add over 12 million dollars to this 11 county area.

Weeds cause other losses besides those due to competing with the soybean for light, water, and nutrients. They cause extra land preparation trips and extra cultivation. Harvest losses result when you attempt to separate beans from weeds. Weed seeds and trash add to the foreign material in soybeans, causing reduced prices.

Control Methods We Are Now Using

Farmers are now using a method of weed control they think will solve their particular weed problem. About 50 percent of the soybean acreage in the 11 county area is being treated with herbicides. Practically all of this has been with a pre-emergent type herbicide. However, recently some farmers have been trying post-emergence herbicides to control broad-

Nozzle set in good pattern for weed control. (H. H. Barnes photo)



leaf weeds. Success has varied from poor to fair.

Soybean producers have been fairly successful in controlling annual grasses and small shallow-seeded annual broadleaf weeds with pre-emergence herbicides. But deep seeded weeds such as cocklebur, morning glories, velvet leaf, ragweed and Johnsongrass have presented problems. Regular cultural practices such as destroying a crop of weeds before planting, early rotary hoeing, and prevention of seed production in preceding crops are being used by many growers to keep fields free of weeds.

Use of herbicides will continue to increase and results will vary depending on season, soil, weed problems and application methods until better methods that include more effective herbicides are developed.

The sensitivity of soybeans to day length makes planting dates important. Some varieties may be planted later than others. This, in turn, can affect weed control results.

Problems

Present herbicides and cultural methods are not giving satisfactory full season weed control of grass and broadleaf weeds. For example, soybeans laid-by clean may be weedy by harvest time due to late emergence of fast-growing weeds such as cocklebur and morning glories. Also, some herbicides are too dependent on moisture after application for consistent kill.

Mechanical weed control still needed.

A major need of soybean producers in the Delta is a system that will give full season weed control under varying weather and soil conditions, with a minimum of residual effect. This system might include a combination of herbicides plus cultural practices. It needs to be reliable, cost competitive, and relatively simple to use. New specialized equipment designed for soybeans should be developed.

Many producers are not aware of the importance of controlling weeds when they are small and easy to kill.

Recommendations

The committee recommends development of more research information on the many different soil types of the Delta area. Experimental plots will have to be located across the Delta on the different soil types.

Weed control methods are needed that will be reliable despite rainfall, soil temperature, and the sunlight variability that is characteristic of Southeast Missouri.

More emphasis on agricultural Extension and concentrated effort on agricultural research in the Delta counties for the solution of our problems is desired.

Research people are needed to work closer with private industry, other universities, and research agencies to give us a quicker evaluation of herbicides.

We should make more use of research on weed control that is available from the Delta Center, reviewing research and recommendations before using available chemicals. Continued educational effort is needed to acquaint farmers with these results.

Systems of weed control must "mesh" with the systems of cropping practiced in the area. To do this, "all-inclusive" research, plenty of freedom in planning, and specific budget allocations are needed for the Delta Center.

Except for experimental use, it is urged that chemicals not be used on major crops unless they carry USDA label clearance.

Resources now available for research and education include: (1) herbicides developed by private industry; (2) one professional weed researcher and his staff; (3) extension agronomist and area agents responsible for field crops education; and (4) plenty of land available for research plots.

Insect Control

Insect scouting important for control.

Situation

For years, many scientists as well as farmers mistakenly believed that soybeans were relatively immune to attack by insects. To their dismay, soybeans are now turning out to be appetizing to a wide variety of insects which attack the soybean plant from planting until harvest. The expansion in acreage of soybeans has brought an expansion in numbers of the insect pests that like to feed on these plants. This occurs with all crops as production expands.

It is impossible to set an annual loss figure on insect damage to soybeans. Outbreaks are usually local in their occurrence.

Many thousands of dollars are being spent annually on soybean insect control in Missouri. Whether or not this money is spent wisely is a subject of much debate.

Although there is a great variance in the occurrence, prevalence, and rate of reproduction of soybean insects, most of them can be controlled by timely applications of recommended insecticides.

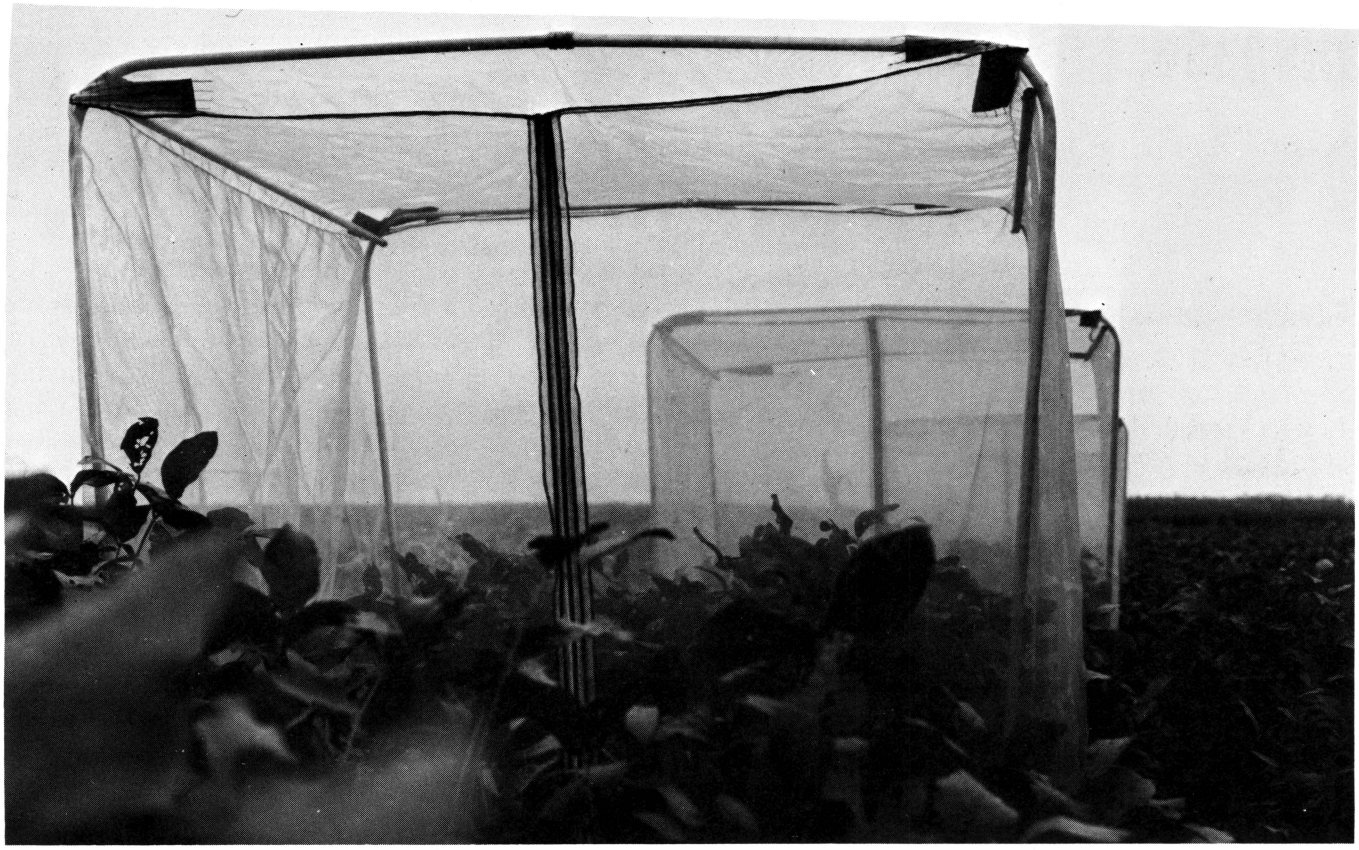
Problems

Missouri is probably doing more research on insects of soybeans than any other state, primarily because the USDA's soybean insect research personnel headquartered at the University of Missouri. Much of this research is carried on at the Delta Center Research Farm. In addition, the University spends approximately $6,500 annually for soybean research. This is equivalent to one half-time researcher.

Someone has suggested, "the number of insect problems is directly proportional to the number of entomologists working on a given crop." Certainly no unwarranted insect problems need to be created; however, answers are needed to the following questions:

What insects cause economic damage to soybeans? Are the enemies of soybeans among the soil insects? The stem feeders? The forage feeders? The pod feeders?

What amount of insect damage can be tolerated before it is considered economic? (Examples: 40 percent foliage loss; 1 corn earworm per 3 ft. of row.)



Insect control research in progress at Delta Research Center.

What techniques should producers use to determine extent of insect damage?

Does the general trade price include an automatic discount for insect damage or injury?

Is a preventive control program justified?

Is it economical to apply an insecticide at any particular stage of plant development in order to reduce insect damage? (Examples: at bloom or at pod set.)

If answers to all problems above were known, would we get producers trained and willing to scout fields on a regular schedule?

Recommendations

The committee recommends that the University of Missouri Extension Division increase its emphasis on soybean insect damage and control during winter educational meetings. Special meetings are needed to train producers, custom applicators and pesticide dealers on insect identification and scouting techniques.

Extension Division should continue to keep clientele groups informed of insect situation by newsletters, news articles, radio, and other means.

Greatly increased funds should be directed into research on soybean insect damage and insect control.

The University of Missouri's Extension Division could encourage chemical dealers, banks, aerial applicators, and others to offer an insect scouting service to producers. The University of Missouri Extension Division might offer scouting service to producers until private interests become organized to provide this service.

The use of cultural and biological controls should be encouraged whenever economically feasible. Scouting and evaluation of beneficial insects should be carried out before an insecticide is applied. Producers can be urged to scout all fields at regular intervals from bloom until maturity or harvest.

Cautious handling, application, storage, and disposal of insecticides should be emphasized. Insecticide drift, residues, and intervals between application and harvest need prime consideration by producers, custom applicators, pesticide dealers, and educators.

Disease Control

Cyst nematode damage.

Situation

Most of the disease losses in soybeans can be attributed to about 12 diseases. The severity of these varies a great deal from year to year. At the national average of 14 percent reduction in yield, the disease bill for Southeast Missouri was a little more than $17 million in 1966 and an additional $3 million damage due to the special cyst nematode problem brought our total disease losses above $20 million.

When any crop becomes a major one, grown on much of the land in an area, the plants' diseases build up unless they are checked. It is important that farmers and professional and business people connected with agriculture be informed on disease hazards to soybean production and quality.

Problems

Root Rot

A number of root rot fungi cause severe injuries to young seedlings and the roots of older plants. Under certain environmental conditions they can be damaging to yields.

Phytophthora rot has been serious in Missouri. Control lies in planting soybeans in warm, well-drained soil and avoiding low-lying areas. Varieties with Blackhawk parentage incorporating the "Muckden gene" have resistance to this disease. Several of the current soybean varieties are susceptible, including Scott, Pickett and Dyer.

Rhizoctonia root and stem rot also attacks young seedlings and young plants, especially in fields where soils are heavy and may remain wet. Control is obtained by planting the beans in warm, well-drained fertile soils. All soybean varieties are susceptible to this disease.

Brown stem rot is one of the most serious and often overlooked diseases because it is difficult to recognize in the field. Soybeans grown in the same soil more than once every three or four years face a possible brown stem rot buildup. This disease has been identified in all parts of Missouri. With heavy infestation of this disease in a soybean field, production can be curtailed rather drastically. There are no resistant varieties at present. Crop rotation is the only control measure available to keep brown stem rot in check.

Charcoal rot is also a widespread disease of roots and stem bases of soybeans. The disease is expressed after flowering and is believed responsible for yield reductions because of premature killing of plants.

Interactions among several root and stem base diseases are responsible for death or a premature maturity that cuts yield.

Nematode

The soybean cyst nematode has been a very important malady, especially in the Delta counties where it has been under Federal quarantine. The disease has shown a consistent yearly increase in damage since the early 1960s; the estimated loss in Southeastern Missouri was nearly $2¼ million in 1965 and more than $3 million in 1966.

Neither crop rotation nor nematocides have been effective but efforts to provide plant resistance have been successful. Pickett has revealed resistance to cyst nematode but is susceptible to *Phytophthora* and *Pythium* seedling blights in heavy soils. Two other soybean cyst nematode resistant varieties have been produced; Custer and Dyer. Custer also has resistance to Phytophthora root rot. Dyer does not.

The soybean cyst nematode problem is a serious one. Careful adherence to the Federal quarantine will be necessary for many years to prevent build up and spread to other areas.

Several species of the root knot nematode are the source of another serious problem for soybean growers. Because a very wide host range is involved it is difficult to use rotations to control them.

Leaf Diseases

Several leaf diseases of soybeans are caused by bacteria and fungi. Some years, depending upon

Soybean root knot nematodes.

weather conditions, these diseases can cause serious losses.

Bacterial blight is one of the most widespread diseases of soybeans. It is prevalent most years in Missouri and can be found in 40 to 90 percent of the soybean fields. The bacteria causing the blight are seed-borne and also can survive in dead leaves from one growing season to the next. Seedlings grown from infected seed are often stunted and blighted and usually die prematurely. Little resistance to this disease is found in our commercial varieties.

Most of our present commercial soybean varieties have some resistance to *bacterial pustule* and *wild fire* so that these bacterial diseases are not as prevalent as they were some years ago.

Fungus diseases such as *brown spot, downy mildew,* and *frog eye leaf spot* will be found in most fields. Under certain weather and soil conditions, these diseases can cause severe losses. Resistance has not been fully obtained in many of our commercial varieties.

Stem and Pod Diseases

Stem canker and a closely related fungus, *pod and stem blight,* may be rather serious, especially in wet seasons. It can reduce both seed quality and yield. Infected seed can cause seed-borne infections which kill seedlings either before or after emergence.

Control measures for stem canker, pod and stem blight, and another similar fungus disease, *Anthracnose,* involve sowing disease-free seed, rotating crops, and plowing down diseased crop residues after harvest. None of the commercial varieties have any apparent resistance to these diseases.

The *purple seed stain* fungus attacks leaves, stems, pods, and seeds. This disease affects the quality of seed by causing a purple discoloration, cracking, and rough, dull seed coats. It lowers seed quality and a heavy infection may taint the oil. There are some variations in varietal resistance, but the principal control measures for purple seed stain are the same as for the stem canker and pod and stem blight fungi.

Virus Diseases

Among the different virus diseases of soybeans, *soybean mosaic, yellow mosaic,* and *bud blight* are encountered most frequently. Common mosaic and yellow mosaic are found most years but do not generally cause serious losses in production. Bud blight, however, is destructive. Serious crop losses can occur when this disease is in abundance. There is no known resistance to the bud blight virus in any soybean variety. Planting virus-free seed and destroying infected plants in seed producing fields are the only known control measures. This is a potentially dangerous disease.

Recommendations

Research support is needed in Southeast Missouri for plant pathological studies of root rot. Charcoal rot is primarily responsible for premature killing. Other root rot fungi include *Rhizoctonia, Fusarium,* and *Cephalosporium* (brown rot). None have been studied in detail.

Plant pathological research must be encouraged and properly financed in the state so varieties that are resistant to diseases may be obtained as quickly as possible. Due to the peculiarity of certain area problems in soybeans, it is suggested that resident plant pathologists serve at the Portageville station to work cooperatively with soybean breeders.

Educational programs to inform farmers, seed dealers, machinery dealers, and other professional people of the seriousness of soybean diseases need to be continued in the state.

The Federal quarantine program for the soybean cyst nematode must be kept in force as long as there is any danger of the spread of this soybean disease. Careful cooperation with the administration of the quarantine program needs to be emphasized.

Research into the production of higher quality soybeans needs to be amplified.

Since several diseases that cause production and quality losses are seed-borne, improvement associations are encouraged to further emphasize inspection and screening methods to secure higher quality seed. The need for improved quality seed is evident, but it is also acknowledged that the problem of seed quality has many facets. As a first step, plants expressing virus symptoms could be rogued from foundation and registered seed fields to reduce this source of infection.

Soybean harvest in the Delta. (H. H. Barnes photo)

Harvesting

Situation

Soybean losses from improper harvesting and timing frequently run as high as 15 to 20 percent with an average of slightly more than 10 percent. Some of these losses are unavoidable, but proper timing and adjustment on combines will minimize these losses. Both the quantity and quality of soybeans harvested per acre are affected by these two practices.

Problems

Major harvest losses are associated with cutting the beans. Shattering, bean pods left below the cutter bar, lodged stalks, and stalks cut but not gathered into the combine account for about 80 percent of soybean field losses. Improper adjustment of combines and the fact that a large number of farmers harvest for quantity and not quality contribute to these problems.

Moisture contents of beans on the same plant frequently vary as much as 20 percent at harvest time. This makes it difficult to select the optimum time to harvest.

Recommendations

Harvest losses can be reduced and higher harvesting efficiency achieved by the following:

Education: More operator schools could be provided through cooperation of the University Extension Service and farm machinery dealers and representatives.

Research: This committee feels that there is a definite weakness in the present combine header system. We strongly recommend that more research be done by the University of Missouri and machinery manufacturers in developing a combine head specifically for soybeans.

Study Grade Requirements: Greater knowledge of market conditions should influence the operator's decision, especially knowledge on how price is affected by the moisture content, splits, and foreign material.

Weeds: Weeds and grasses not only reduce soybean yields, but add to the inefficiency of harvesting by making the seed separation more difficult.

Level Fields: Land forming will greatly enhance the job of harvesting by allowing the header to cut lower and more uniformly.

Varieties: Select varieties that mature out with your farm planning and ones that stand well and fruit up off the ground.

Planting Rates: Reduced rates of planting can sometimes mean less lodging.

Moisture Content: Harvesting soybeans at a moisture content of from 13 to 18 percent will minimize the amount of cracked beans and field losses.

Dust Control: In dusty field conditions, a vacuum or air blast is needed to move the cloud of dust away from the cutter bar, allowing the operator to control his cutter bar height with more accuracy.

Cylinder Speed: An automatic feature is needed that adjusts the cylinder speed on the go with that of the moisture content. The addition of a tachometer to the control panel, showing cylinder speed, would aid the operator.

Header Control: The use of automatic header control is recommended to aid in cutting at minimum height and operating at night and in dusty conditions.

Ground Speed: Most drivers tend to push their speeds to the maximum to get their harvest completed as early as possible. Slower speeds normally mean smaller field losses.

Reel Control and Speed: Proper speed and height of the reel are very critical. Automatic speed drivers are needed to aid in control of the reel.

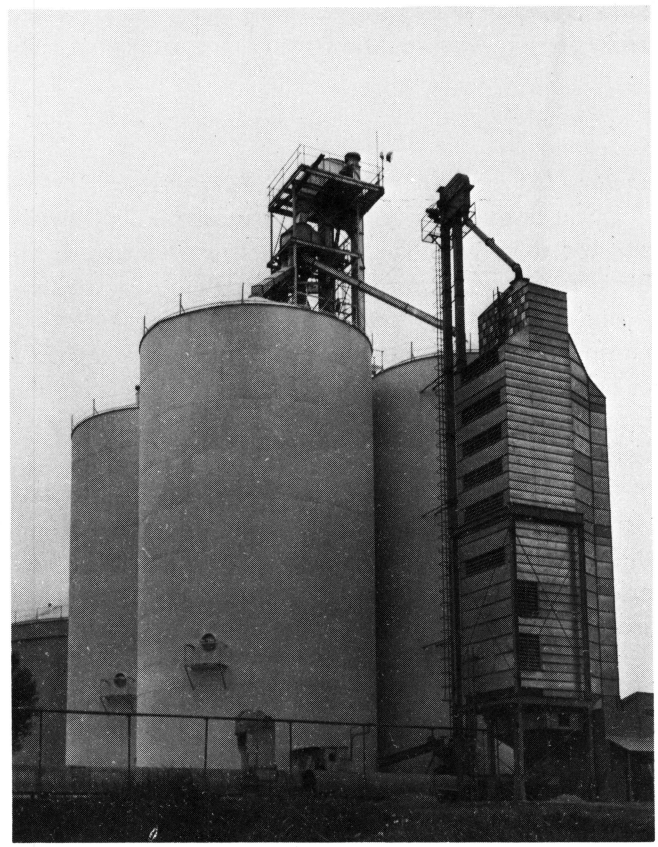
Header Width: Select the correct header width to match your row spacing. Prevent the header from overlapping onto adjoining rows.

Marketing

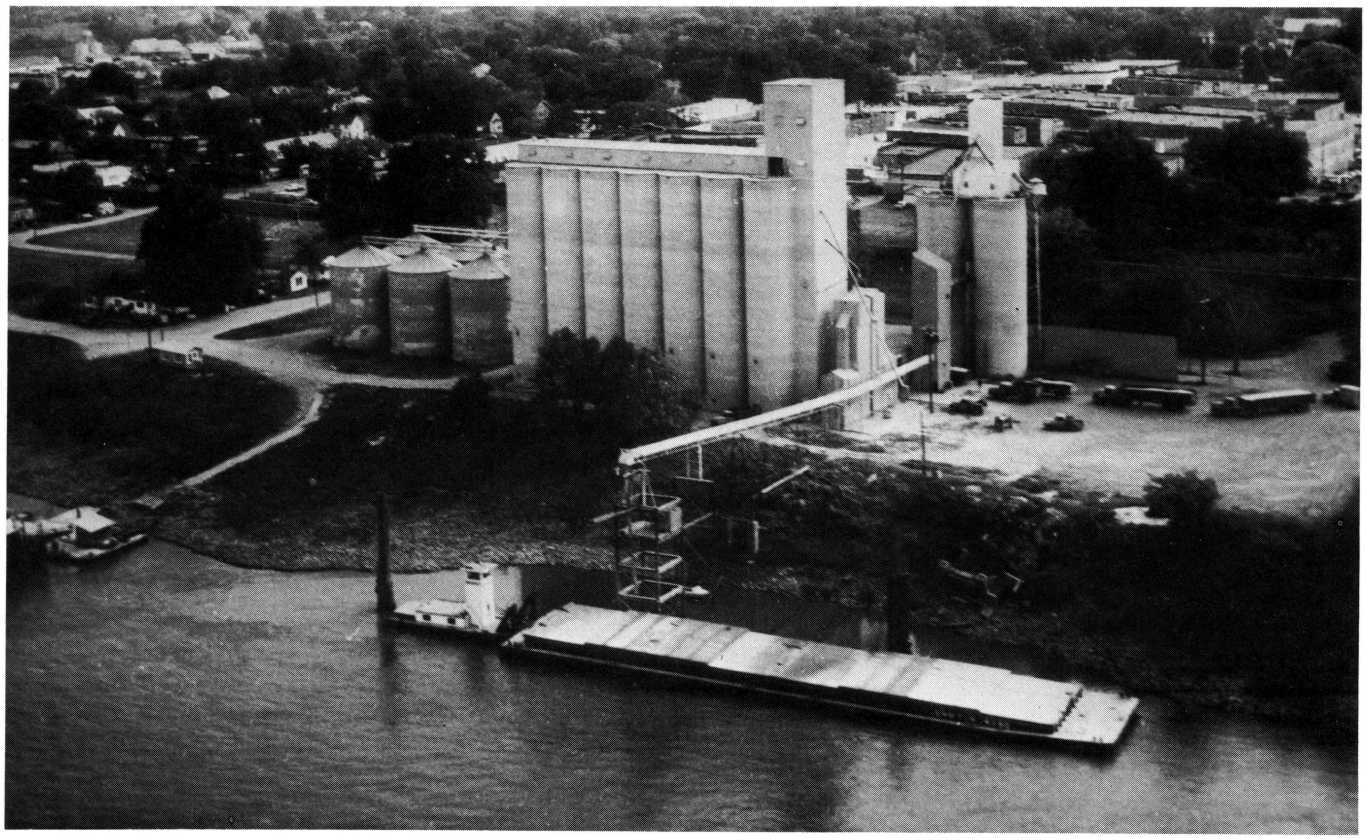
Situation

The spectacular expansion of the Southeast Missouri soybean industry is unparalleled in most major crops in this country. This did not happen by accident. The forward-looking leadership in the soybean industry, including organizations of production, research, processing, and exports, has guided the rapid expansion of this crop without even approaching the troubles of crops which are plagued by burdensom surpluses. This can be attributed in general to two main activities of these organizations:

1. The continued insistence that support prices be kept relatively low in comparison with world prices; and
2. An impressive market expansion program coupled with product research and development to keep utilization of the soybean and its products in line with production.



A local elevator with drying facilities.



Delta growers have an advantage in their river ports which give ready access to foreign markets.

Delta Has an Export Market Advantage.

Southeast Missouri counties are particularly well-situated to provide large amounts of soybeans to fill the demand for export shipments. Being located adjacent to the Mississippi River, where barge transportation affords low rates to Gulf ports, has resulted in prices to local growers consistently five to eight cents per bushel higher than the prices paid for soybeans going into domestic uses.

This grower's price advantage has had an opposite effect on local crushers, however. Crushers in this area had to compete for soybeans at the export price and compete in sales with crushers in other areas who could buy all their beans at domestic prices.

The several soybean oil mills which were once located along the rivers have been forced to cease operations. The last one closed about eight years ago. Three mills remain in Missouri, at Kansas City, St. Joseph, and Mexico. These three, if operated at full capacity, could process only 15 to 20 percent of the state's production.

A critical examination of the location of existing soybean oil mills shows Decatur, Ill., to be the center of this industry. This is the area where production first began and it was only natural that soybean oil mills should be located close to producing areas. However, in recent years the production of the crop has expanded to the west, to the south, and other distant places without a corresponding expansion in processing industries in these areas.

For example, Arkansas produced negligible quantities of soybeans only a few years ago, and in 1967 production of more than 90 million bushels will place this state in third position among soybean producing states in this country. This certainly suggests that people concerned with the structure of the soybean processing industry should pay increasing attention to areas of production and the location of suitable outlets for soybean oil meal and soybean oil.

It is believed that the proper location of small to medium sized soybean oil mills using the latest extraction method could easily result in the closing

down of many of the older mills which employ obsolete processing methods and which are located in the old producing areas in the middle west.

A report on the structure of the soybean processing industry by Hieronymus, University of Illinois, in 1965, indicates that there should be many places in Missouri for new soybean processing plants.

Since most of the production in the Southeast Missouri area goes into foreign markets, quality becomes critical. In many of the foreign countries—notably Japan and the Far East—soybeans are used primarily for human consumption. Shipments to these areas from the United States have been severely criticized because of foreign material and noxious weed seeds which are poisonous to human beings.

Some of the most troublesome foreign seeds found in soybeans in this area include: Morning Glory, Ironweed, and Crotalaria. These are particularly troublesome and the presence of only *small* amounts give U. S. soybeans a bad reputation in these countries.

Most soybeans produced in the area continue to be sold at harvest time with very little attention being paid to altering the marketing. This has improved greatly in recent years but good opportunities remain for extra farm income to those who market the soybean crop in an orderly manner.

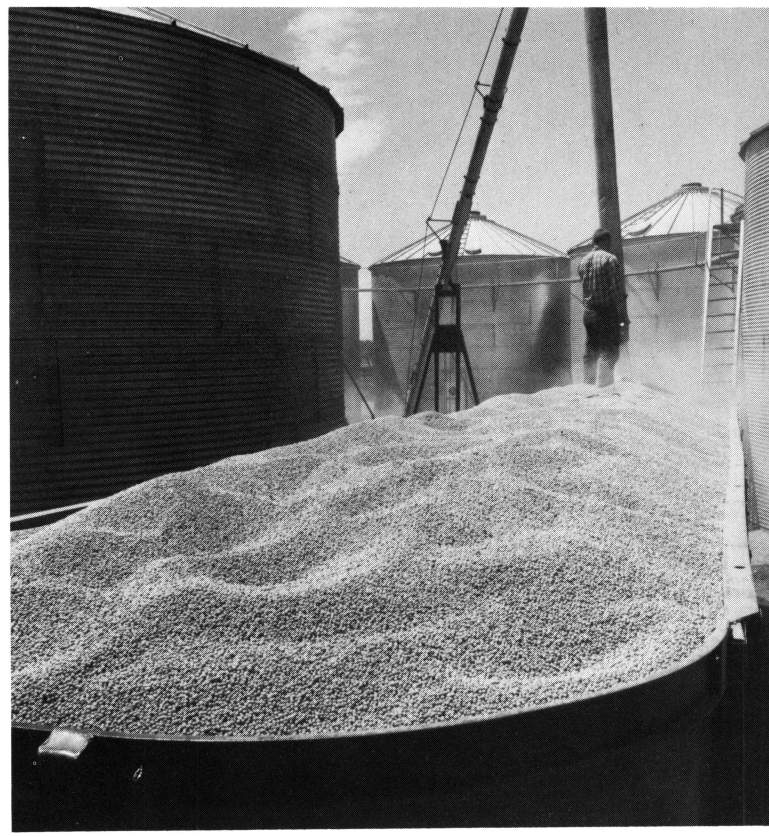
Farm storage of soybeans at harvest time was profitable during six of the last ten years. During some years, 1967 for example, farmers who held soybeans lost considerable income. However, in three of the ten years there were handsome profits to farmers who stored their soybeans at harvest for sale at later dates.

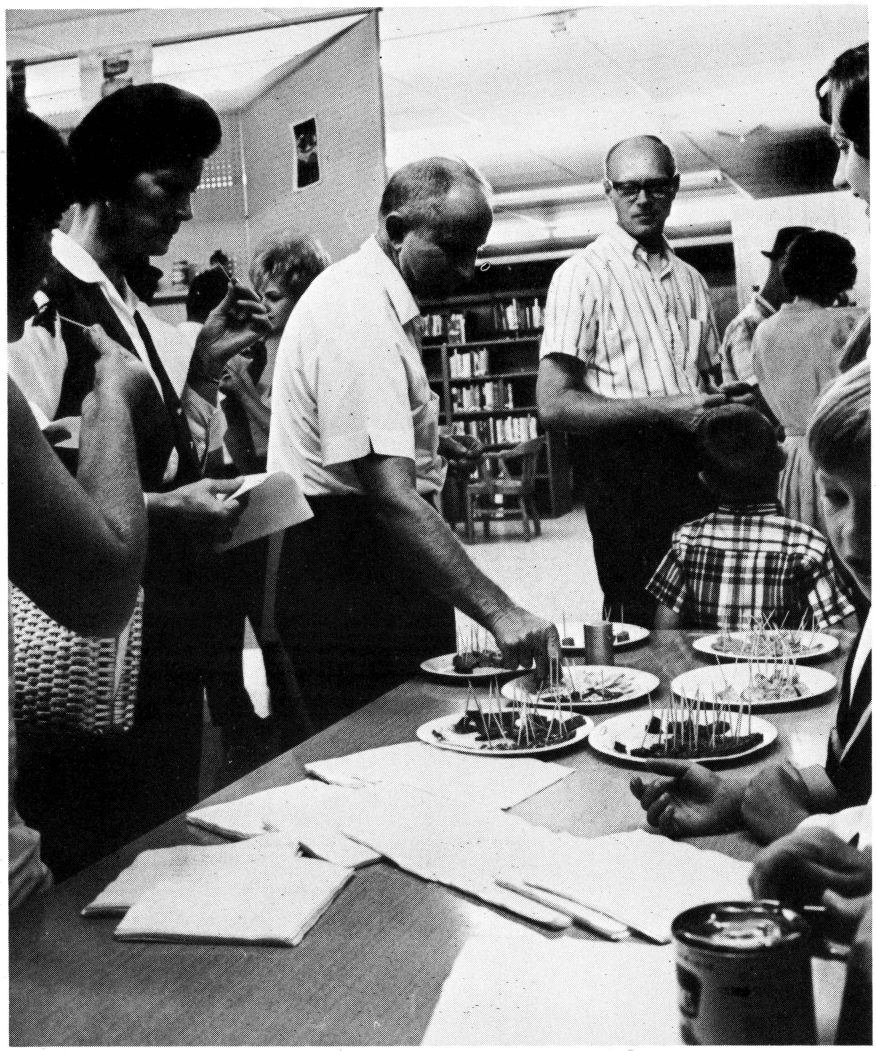
The expanded use of futures markets can help in the production and marketing of soybeans, primarily by using these markets to fix the price of growing soybean crops and sometimes to hedge prices of harvested crops.

Recommendations

In view of the current marketing situation, the committee makes the following recommendations:

1. To do the best job of marketing producers need to be adequately informed. (This would indicate improvements in the crop and price reporting by state and federal agencies. Particularly as to production, prices, and consumption of end products.)
2. Quality factors should receive increasing attention. (This is particularly true of beans from this area that find their way into export channels. Quality must continue to be improved if we are to maintain and expand foreign markets for soybeans).
3. Since noxious weeds have an important bearing on quality, research on this type of weed should be quickly expanded.
4. The Committee favors reasonable price supports with support prices low enough to permit soybeans to move freely in commerce. Tied in closely with low price supports would be freedom from acreage controls.
5. The Committee recommends soybean processing plant feasibility studies be made, not only in this area but in the entire state of Missouri, to find if and where new plants could be located.
6. The Committee recommends that some thought be given to a plan whereby a check-off of probably one cent per bushel could be made by producers to further research and promotion of soybeans and their products.





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