Just in Passing...

And Now We Are Two

With this issue FARM SCIENCE REPORTER begins its third year. Nearly 17,000 will get this issue as a direct result of having asked for it. But—you won't get the next issue (April) unless you fill out the card enclosed and return it to us. Of course if you wish, you may send a letter or a card of your own. The main thing is that you let us know if you want to get future issues. Postal regulations make it necessary to revise mailing lists once each year.

Many times in the past we have received cards for mailing lists which folks forgot to sign. Without your name and address, we can't decide who at "Someplace, Iowa" wants to be kept on the mailing list. And it would be well to put a stamp on the card too!

We should be very happy to have your suggestions and criticisms concerning the REPORTER. If there are particular things you should like to have discussed, we'd be delighted to know what they are. Won't you write to us?

The Authors

W. H. Allaway, author of the article on soil tests for determining phosphorus needs, is a research associate of the Soils Subsection of the Iowa Agricultural Experiment Station. In the 3 years he has been at Ames, he has made a special study of the phosphorus problem. Most of his time in the growing season has been spent out over the state working with the cooperative field tests. In the winter he has continued his studies in the laboratories of the Station. Allaway is a graduate of the University of Nebraska.

Frances Hettler, extension specialist in foods and nutrition at Iowa State College, was reared on a Fayette County farm and has both B.S. and M.S. degrees from Iowa State. Miss Hettler served for a time as home demonstration agent in Iowa and Poweshiek counties. Because of that work and the time she has spent since as extension specialist, she has become acquainted with many Iowa farm folk. Her article in this issue on cold storage food lockers is based partially on the research she did for a master's degree.

G. P. Wilsie is research associate professor in the Farm Crops Subsection of the Iowa Agricultural Experiment Station. Dr. Wilsie is engaged entirely in research with forage crops. With our eyes on the Pacific now, you may be interested to know that Dr. Wilsie spent several years in research in Hawaii.

H. D. Hughes has headed up the work in farm crops—teaching and research—at Iowa State College for more than 30 years. Reared on a farm in Illinois, he has never lost touch with the farmers' problems and their viewpoint. He is one of the men at the Iowa Station whose judgment and advice is sought by Iowa farmers.

C. Y. Cannon, head of the dairy husbandry work at the Iowa Station and Iowa State College, delves into the technical angles of the dairy farmers' problems, but he has not lost sight of the practical problems of the dairyman.

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Dr. Cannon is a native of Utah, but has been in Iowa for a good many years.

N. Kenneth Williams spent 3 years in research at the Iowa Station under the direction of Dr. Cannon. He received his doctor of philosophy degree at Iowa State College, much of the work for which was done on this problem of feeding soybeans to dairy cows. Dr. Williams is now with the dairy husbandry teaching and research staff of the University of Vermont.

D. L. Espe is research assistant professor in the Dairy Husbandry Subsection of the Iowa Station. Dr. Espe is chiefly engaged in the study of nutrition problems of dairy cattle. He is a native Iowan, farm-reared and worked on Iowa dairy farms after he finished college.

New Animal Science Journal

Some readers of the FARM SCIENCE REPORTER have expressed interest in following research work of other stations. Perhaps some of you who are interested in livestock might find in the "Journal of Animal Science," a partial answer to your problem of following work throughout the country.

This journal, just being started by the American Society of Animal Production, will be published in February, May, August and November. In it will appear articles dealing with all phases of animal production, including the fields of genetics, nutrition, physiology, general livestock, meats, wool, dairy cattle and extension.

Further information may be had by writing to Dr. A. D. Weber, business manager, Journal of Animal Science, Kansas State College, Manhattan, Kan.

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Can You Trust

PHOSPHORUS SOIL TESTS?

MORE PHOSPHATE FERTILIZER will go onto the farms of Iowa this spring than ever before. Iowa farmers want to produce abundantly for their nation and her allies to help win the war.

Farmers are asking, “Where shall I apply phosphate fertilizer? Can I get my soil tested by a chemical means and know where to put the fertilizer to get the most returns from it?”

Those are important questions. We have done some work here at the Iowa Station to find some of the answers. We have been “testing the soil tests” to see how accurate they are. So far we have not found a chemical test that can be depended on as the only measure of whether a soil needs phosphorus fertilizer. But we think some of the tests, in the hands of the right man, who has the right knowledge, are of some value. To use these tests best a man must be familiar with the soil types, weather conditions, general cropping practices of the locality and past management of the soil.

Knowing all of this, a skilled operator may use a test to help him make recommendations about the use of fertilizer on a certain field, but even then this information should supplement knowledge gained from actual experience under similar conditions.

And so we feel that chemical tests today for phosphorus needs are not a very acceptable sole guide. We have hope that some day a more accurate and dependable test will be found.

We have been comparing the results obtained from applying fertilizer on fields that showed by the chemical test “high,” “medium” and “low” phosphorus content. These comparisons have been made in many parts of the state on a good many soil types. The comparisons have been a part of our field tests carried on in cooperation with Iowa farmers, the Iowa Station and the Iowa Agricultural Extension Service.

In these cooperative tests various plots are treated with fertilizers and other plots alongside

By W. H. ALLAWAY
In this quick test, soil is mixed with acid, a tin rod is placed in the filtered solution. The depth of the blue color indicates the amount of phosphorus in the soil.

Comparison of Various Tests for Available Phosphorus With Response of Corn to Phosphorus Fertilization in the Field

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<td>Buckner fine sand</td>
<td>63.0</td>
<td>0</td>
<td>50</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Putnam silt loam</td>
<td>55.0</td>
<td>0</td>
<td>22</td>
<td>High</td>
<td>Low</td>
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<tr>
<td>Floyd silt loam</td>
<td>71.4</td>
<td>0</td>
<td>58</td>
<td>Med.</td>
<td>Low</td>
</tr>
<tr>
<td>Carrington loam</td>
<td>76.9</td>
<td>0</td>
<td>32</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Carrington loam</td>
<td>88.3</td>
<td>0</td>
<td>24</td>
<td>Low</td>
<td>Low</td>
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<tr>
<td>Grundy silt loam</td>
<td>72.5</td>
<td>0</td>
<td>32</td>
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<td>Low</td>
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<tr>
<td>Marion silt loam</td>
<td>66.1</td>
<td>6</td>
<td>40</td>
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<td>6</td>
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<td>Average of six non-responding fields</td>
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<td>28.4</td>
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<td>Low</td>
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<tr>
<td>Average of six responding fields</td>
<td></td>
<td></td>
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100 lbs. per acre of 0-20-0 applied in the hill

them receive no fertilizer. The field is seeded and cultivated along with the remainder of the field by the farmer who is cooperating. Some of these experiments are conducted on all of the major crops grown in Iowa.

At harvest time a representative of the college harvests and weighs the crop produced on each plot. We are trying in these tests to find out whether the chemical tests are accurate indicators of fertilizer needs, whether phosphate or other fertilizers will give profitable increases in crop yields and under what conditions they are likely to prove profitable.

Before the fertilizer is applied samples of soil are taken from various spots in the field and thoroughly mixed. These are tested by different chemical tests. When the crop is harvest-
ed we can then determine whether the actual increases, if any, are in accord with the indic-

http://lib.dr.iastate.edu/farmsciencereporter/vol3/iss1/1
tions of the soil needs as shown by the tests. And that is how we are "testing the soil tests."

In 1940 about 25 of these tests were conducted in which plots of corn receiving 100 pounds of 20 percent superphosphate per acre, applied with a planter attachment, were compared with plots receiving no fertilizer. The comparison of the results of three chemical methods with the increases in corn yield are shown in the accompanying table. The laboratory method used takes considerable time and requires equipment which is not ordinarily available for routine soil testing.

The quick tests used here are more nearly comparable to the types of tests used in routine soil testing such as is done by fertilizer companies and other organizations which sometimes test soil for farmers. Quick test No. 1 makes use of a strong acid for extracting the phosphate from the soil, and quick test No. 2 uses a weak acid to dissolve the phosphate. In this table are the results from six fields which gave the greatest response to phosphate fertilizer in comparison with six fields that gave no response.

This table shows that quick test No. 1 indicated a low or medium amount of phosphorus in three fields which gave no response to phosphate. On the other hand, two fields which showed a high amount of phosphorus according to this test gave increases in yield which would have returned a nice profit over the fertilizer cost.

If the farmers who owned these 12 fields had used the soil test as the only guide in deciding whether or not to use phosphate, three men would have used phosphate without getting any return from it, and two other men would have planted their corn without phosphate when they really could have used some to advantage. This means that 5 of the 12 farmers would have received the wrong information from the soil test.

Quick test No. 2 showed all of these fields to be low in available phosphorus. It would obviously be of no value in determining fertilizer requirements on the fields studied, since it does not indicate any difference between the six fields which responded to phosphate and the six fields where phosphate did not increase the yield.

The laboratory method was evidently a little better than either of the quick tests, but it is still far from perfect. According to this test the soils which responded to phosphorus were lower, on the average, in available phosphorus than the soils which showed no response. There are several inconsistent fields in each group, however, which indicates that this method, like the quick tests, would not be entirely reliable as a guide in determining fertilizer use.

The comparison of chemical tests with field response shows that these tests alone are not a very good indication of whether or not a field needs phosphorus. However, when we stop to consider the various things that affect the yield of crops, it is not
surprising that the tests do not give us all the information that is needed. The chemical tests may fail for one or more of the following reasons:

**Why Tests Fail**

1. The roots of the crop plants penetrate the soil to considerable depth and may feed on phosphorus in the subsoil. We have evidence indicating that the subsoil of some soil types contains much more available phosphorus than do others. Moreover, the amount in the subsoil is sometimes greater than in the surface soil. A test of samples taken from the surface of the field cannot measure, therefore, the amount of phosphorus that the plants may obtain from the subsoil.

2. Soils high in organic matter contain large amounts of phosphorus in the form of partially decomposed plant residues. None of the quick tests now used measure this phosphorus; yet when the plant residues are decomposed the phosphorus in them will become available to plants.

3. The past management of the field influences the general fertility of the soil and also the amount of phosphorus in plant residues. For instance, if a field has been manured regularly for some time, it will probably contain much phosphorus in this form. The results given in the table show that the fields which did not respond to phosphate were generally higher yielding than those which did respond. It would seem logical from this evidence that farmers who have been practicing good soil management for some time and are now getting good yields of corn are not as likely to need phosphate fertilizers badly as are farmers who are operating low-yielding, worn-out land.

4. Different plants vary in their ability to feed on the phosphorus in the soil. Just as some animals are "easy keepers" and maintain good flesh and healthy appearance on rough feed while other animals require some grain to stay in good condition, some plants may thrive and others starve on the same soil. In the last issue of the Farm Science Reporter, A. J. Englehorn discussed experiments comparing the response to phosphorus of different plants growing on the same soil. This article emphasized the fact that certain plants grow almost as well on unfertilized soil as on that fertilized with phosphate, while the yield of other plants growing on the same soil could be greatly increased by the use of phosphate. Therefore, a knowledge of the feeding power for phosphorus of the crop to be grown is essential to properly interpret soil tests.

5. Some factor such as moisture and not the plant food content of the soil may limit the growth of the crop. In a dry season applying fertilizers is not likely to be of benefit because lack of soil moisture limits the plant growth. Also, some other nutrient in the soil may be so deficient that plants do not make enough growth to utilize even a low supply of phosphorus. Fields which have not grown legumes for a long time may be low in nitrogen and also in phosphorus. In order to get good returns from phosphate fertilizers, legumes should be grown to increase the available nitrogen and thus enable plants to make enough growth to utilize the added phosphorus. A condition of this kind, however, would not be revealed in a chemical test for phosphorus. In order to use soil tests intelligently we must first determine whether the growth of the plants is limited by factors which cannot be measured by the tests.

**Need Better Tests**

We know most soils contain much more phosphorus than is removed by one crop, and yet phosphate fertilizers very often give increased yields. Evidently only a small part of the total phosphorus in the soil is available to plants.

The problem of soil testing, then, rests on separating the small amount of phosphorus that the plant can use from the large amount of unavailable phosphorus. We must devise tests which imitate the plant root in extracting phosphorus from the soil. In order to do this we must have laboratory experiments designed to separate the phosphorus of the soil into different types of phosphorus compounds, and field and greenhouse experiments designed to measure the availability of each type to different plants.

Laboratory research of this nature may seem to be far removed from practical farm problems, yet the discovery of some new method of separating one type of phosphorus compound from others would have immense practical value in improving our methods of soil testing.

**Crops Best Single Test**

When arguments for and against soil tests are summed up, it seems that although these tests may have a limited value when used to supplement other information, they are not very reliable if used alone for determining fertilizer needs for the soil and cropping conditions of Iowa. Further research on the problems of soil testing should result in new and more reliable types of tests. As of this date we feel that fertilizer recommendations based entirely on chemical soil tests should be accepted with a "grain of salt." The most accurate guide we know of now is to try phosphate on a small, average area of a field and compare the results carefully with the same crop on untreated soil alongside it.

In general, the greatest response to phosphate fertilizer will be obtained when they are applied to legume seedlings. Soils that have been poorly managed or have lost some of their productivity through erosion or heavy cropping are more likely to need phosphorus than well managed productive soils.
FROZEN ASSETS are a mighty good thing to have—when the assets are meats, vegetables and fruits. And they can be important to war effort by helping to provide an adequate and nutritious year-round food supply.

Refrigerated lockers may result in a real savings for farm families as well as providing them with a food supply of superior quality—if the locker is properly managed. This conclusion was drawn from interviews with 87 Fayette County farm families, patrons of the four refrigerated locker plants in the county.

These plants, with the exception of one, offered complete services to patrons. They were equipped to butcher animals, cut, wrap and freeze the meat, render lard and cure and smoke meat. Extra charges were made to the patrons for these services, however. Fruits and vegetables also were frozen at a minimum charge.

The food stored in the average locker consisted mainly of meat—279 pounds of pork and 163 pounds of beef stored per family.* Although only 18 percent of the families stored vegetables there was a trend toward freezing the ones that are difficult to can successfully, such as corn and peas. One-fourth of the families froze fruits, principally strawberries.

Because of the services offered by the locker plants, farm women found they had more time to devote to other homemaking activities when they froze their meat supply. More than three-fourths of the women interviewed had reduced the amount of meat which they canned and almost half of them cured less meat. However, some curing and canning was continued to provide variety in the diet and to have a supply at home for emergencies. Freezing of fruits and vegetables seemed to be an experiment for most families and had no effect on the quantity of food canned.

Families generally are interested in whether or not using a locker is a saving. The records

The frozen meat supply is neatly wrapped in family-size packages and labeled to tell homemaker just what she's getting when she visits locker.

*Figures for Jan.-Dec., 1939, inclusive—the period covered by the study.
Locker History

In 1861 a man by the name of Piper invented a process of freezing fish. He used an ice and salt mixture placed directly over the fish, which were held in an insulated container. Work of a little different character was done by other men in 1869 and 1870. Since that time many improvements have been made in the quick-freezing process.

As early as 1910 a creamery in Crete, Neb., operated a refrigerated locker. The growth of separate locker plants really began in the Pacific Northwest among the fruit growers and has spread to the Midwest. Most of the plants are now concentrated in these two places.

Since 1935 when the first locker plant was established in Iowa the number has grown to about 600, placing Iowa at the top of the list of states.

of 24 families showed an average yearly saving of $11.23, or 2 cents for each pound of meat stored. One family saved as much as $36.43 while four families actually operated their lockers at a loss. These figures were obtained by comparing cost, processing and locker rental for home-produced meat with the cost of the same amount of meat at retail.

The management of the locker determines to a great extent the saving which may be realized from its use. To have the largest volume of food pass through the locker it must be kept as full as possible at all times. To do this it is necessary to butcher animals at frequent intervals.

The peaks for butchering still tend to come in early spring and late fall. It is obvious that this practice fills the locker to overflowing at these seasons and leaves them almost empty in late summer. Neighbors might cooperate with neighbors in spacing butchering dates or purchasing meat wholesale at various times to remedy this condition. To help fill the locker when the meat supply is low, fruits and vegetables might be frozen.

If desirable products are to be obtained, however, the proper kinds and varieties of fruits and vegetables must be stored. They also must be prepared according to certain methods based on careful research. The patrons interviewed depended largely upon the locker manager to provide directions for the preparation of fruits and vegetables; some managers recognized this responsibility and made it a point to have the latest and most reliable information available on this subject.

The Iowa law relating to storing of food in refrigerated lockers has the following specifications:

1. All food stored must be fit for human consumption.
2. All food must be sharp-frozen before it shall be stored in a locker.
3. Storage temperatures shall be kept at 12 to 15° F. (This is now interpreted to be not higher than the above temperatures.)

This law not only protects the patron but the operator of the plant as well. Cooperation in observing this law is of benefit to both parties.

Closely concerned with savings in the use of the locker is the distance which must be traveled to the locker. The families in this study made two trips to the locker each week, traveling an average of 4.5 miles per trip. As the distance increased the number of trips to the locker decreased. With good planning and refrigeration in the home, especially the mechanical type, trips to the plant may be kept at a minimum.

Many people who use refrigerated lockers are not so much concerned with the financial savings which the locker may provide but with the improved nutrition and satisfaction derived from the use of the frozen products. Better quality products and variety in the daily diet are frequently mentioned as advantages in using frozen foods. The fact that almost 85 percent of the patrons of the four locker plants of the county were using a locker for at least the second year is proof of their satisfaction with this method of preserving food.

Homemakers say that freezing their home-produced meat supply instead of putting it into jars frees more of their time for other household duties.
Seventeen percent of the families said they were dissatisfied with some of the locker-stored meat. Much of this dissatisfaction reflected back on their own practices, however. Pork and ground meat should be removed from the locker within 3 to 4 months after storage. Poultry must be prepared for the locker by methods that prevent loss of moisture—otherwise it, too, should be kept only 3 to 4 months. Vegetables caused more dissatisfaction than fruits, probably because they were not prepared properly for freezing.

Nutritionists recognize the contribution meat makes to an adequate diet and recommend that it be served at least once daily. The families concerned in this study consumed an average of 145 pounds of meat per person during the year, which is sufficient to meet adequate nutrition standards. Ninety-eight pounds, or about two-thirds, of this meat had been frozen and stored in the locker.

With a few exceptions families had a tendency to butcher animals in late fall and early spring, rather than at all seasons of the year. The largest proportion of the meat stored was pork. Beef, poultry and lamb were next, in the order named. Preservation of fruits and vegetables was still in an experimental stage for most families. They were stored more for occasional than for regular use. Most of the foods frozen were produced at home.

During the war when it is so necessary to keep every individual in top-notch physical condition the following recommendations for the use of refrigerated lockers may prove helpful in having the best of products and avoiding waste space.

1. To insure large volume, which means keeping the locker comparatively full at all times, one or more of the practices given below may be followed: Butcher at all seasons of the year if it is possible.

2. Prepare vegetables and fruits according to directions prescribed by a recognized authority. (You may write to Iowa State College for information.)

3. Do not allow pork and poultry to remain in storage too long.

4. Obtain from a reliable source information concerning the preparation of food for the locker.

5. Treat frozen foods as perishables when removed from the locker.

6. Freeze those vegetables which are difficult to can and those fruits whose palatability is materially lessened by canning.

7. Store those kinds and varieties of fruits and vegetables which are recommended for freezing.

Most locker plants offer complete butchering, cutting, wrapping and freezing services to their patrons. They also will render lard and cure and smoke meat. After giving a few directions, the homemaker may leave the butchering process, often an ordeal in the home, to the locker plant. A small fee is charged for these services.
It took the blistering, hot, drouthy summers of 1934 and 1936 to get Iowa farmers interested in bromegrass as a pasture crop. In those years—and in other hot, drouthy periods—bromegrass pastures have been far superior to bluegrass.

Iowa farmers who have bromegrass pasture say that it will carry a half more to twice as many livestock per acre as bluegrass. C. Y. Cannon estimates that a bromegrass pasture at the dairy farm of Iowa State College provides approximately a half more feed to the acre than bluegrass.

A few farmers in western Iowa have fields of bromegrass 25 to 30 years old. During 1934 and 1936, Kentucky bluegrass pastures were ruined by the excessive heat and lack of moisture, but bromegrass pastures in the same communities came through the drouth with little or no permanent injury. Because of this fine record, farmers during the past 5 years have taken a real interest in bromegrass and during that time have greatly increased its acreage.

We consider bromegrass (its scientific name is Bromus inermis) one of the most promising grasses for Iowa farms today. It's not only drouth-resistant and high-yielding, but a winter-hardy, long-lived perennial that is highly palatable to all kinds of livestock. It is really not a new grass, though it is new to many Iowa farmers. A native of Western Asia and probably Central Europe, it has been growing in the United States for nearly 60 years. Other names by which bromegrass is known are awnless brome, smooth brome, Hungarian and Russian brome.

Bromegrass appears to be climatically adapted to much of the North Central Region from the Dakotas on the west to Ohio on the east. Iowa conditions are favorable; bromegrass remains green throughout the summers and is not injured by our severe winters.

Bromegrass spreads rather rapidly by rhizomes (under-
By C. P. Wilsie and H. D. Hughes

Bromegrass may well be sown for fall seedings, following the first 3 weeks in July. The seed are long, flat and chaffy, weighing usually from 12 to 14 pounds to the bushel.

Bromegrass starts growing in early spring and continues until late in the fall.

Types or Strains

Bromegrass from different regions may vary a good deal as to plant type, leafiness, growth habits, rhizome development, resistant to disease and seed producing ability. While at present there are not different varieties as we know them in other crops, several improved strains of bromegrass have been developed in the United States and Canada.

Our experiments at the Iowa Station indicate that the best seed comes from old Iowa fields planted some years ago or from fields more recently established with seed from old Iowa fields. We have not tested strains from other regions adequately, but we believe that those from Kansas and Nebraska may be well adapted to Iowa.

Canadian strains appear to be less productive than those developed in the Middle West. Bromegrass is sensitive to day length, and Iowa summer days are considerably shorter than those in Saskatchewan and other Canadian areas. This may account in part at least for the less favorable results obtained from the Canadian strains.

Preparing Seedbed

Bromegrass seedlings are somewhat slow in becoming established. The seedbed should be moist, fine, firmly packed and as free from weeds as possible. Bromegrass may well be sown in the spring on fall-plowed land. On cornstalk land not plowed in the fall, or on old pastures, a thorough discing usually is preferable to plowing. Using the harrow and cultipacker following discing will aid in preparing a compact and fine seedbed. Cultipacking both before and after seeding often is helpful.

For fall seedings following small grain, the field should be plowed or disced thoroughly as soon as the grain has been removed. This gets rid of many weeds and enables one to get a good seedbed prepared by planting time.

About Seeding

The best two times for seeding are as early in the spring as the land can be prepared, and late summer, Aug. 15 to Sept. 10. The weather will determine whether spring or fall planting is best, but usually weeds bother less in the fall than in the spring. Seedings made later than Sept. 15 may winterkill.

Bromegrass seed will germinate rapidly if the soil is moist, and if it is planted from \( \frac{1}{2} \) to \( \frac{3}{4} \) of an inch deep. Failures to establish stands have been due in many instances to deep planting. Shallow seeding should always be practiced.

We recommend seeding bromegrass in mixtures with legumes, rather than alone. When sown with alfalfa, sweet clover or red clover, 5 to 10 pounds of seed per acre is used. The legumes, if inoculated, will add nitrogen to the soil and will tend to keep the grass from becoming sodbound. Because of the vigorous rhizome development, a scattered stand of bromegrass will spread and cover the ground, forming a thick sod within a few years.

Method of Seeding

Farmers sometimes have difficulty in sowing bromegrass because the seed is so light and chaffy. In the ordinary grain drill or seeder the seed bridges over and does not feed down through the spouts freely. Oats, barley or cracked corn are sometimes mixed with bromegrass in order to make it feed through the drill-spouts uniformly.

For early spring plantings bromegrass seed may be mixed with oats at the rate of 1 pound of bromegrass to 3 to 5 pounds of oats. The oats will serve as a nurse crop which may be pastured off in early summer or cut for hay. For late summer seedings, where a nurse crop is not desired, cracked corn may be used or small grain that has been heated sufficiently in an oven to prevent germination. Some farmers in western Iowa have used the newer grain drills equipped with agitators in the grain box and report good results without mixing in any other kind of seed.
Seed may be broadcasted with an endgate seeder or a Cyclone seeder, although an even distribution and uniform depth is difficult to obtain. Going over the field twice in broadcasting—the second time at right angles to the first—aids materially in obtaining a good distribution of seed. The cultipacker should be used after seeding, and in some instances it may be necessary to use both the harrow and cultipacker in order to cover the seed and make the ground firm.

Young bromegrass plants are small and grow rather slowly. The small grain nurse crop in spring seedings preferably should be pastured off or cut in the early dough stage for hay. If many weeds are present they should be clipped early in the summer. If rainfall is abundant, the weeds may need to be clipped two or three times the first season.

### As a Pasture Crop

Bromegrass is one of the most palatable grasses adapted to Iowa. Its carrying capacity is especially high when grown with alfalfa or sweet clover. Neither alfalfa nor bromegrass withstand continuous close grazing without injury to the stand, so that a growth of 6 to 8 inches should be maintained during most of the season. Under-grazing when growth is most rapid in May and June is not serious, for later on in midsummer, when growth is slow, the more mature forage will be eaten readily.

To maintain a high level of production through a period of years, legumes must be maintained with the bromegrass. The pasture must be so managed that the alfalfa or clovers will not be overgrazed during the fall, or much winter injury will result. Heavy late fall grazing injures bromegrass so that it may result in markedly inferior pasture the following season.

When it is harvested in the early bloom stages bromegrass makes excellent hay. An alfalfa-brome mixture may be especially useful as a hay-pasture combination on rotated cropland. The first year such a mixture will produce mostly alfalfa in the first crop, and the second crop might be used as pasture. In the second year the first crop could be used profitably for either hay or pasture, depending upon which is needed most.

Hay yields may range from $1\frac{1}{2}$ to $3\frac{1}{2}$ tons per acre, the higher yield being obtained from two cuttings per season. Bromegrass hay is considered approximately equal to timothy hay in feeding value.

### Soil Conservation

Where well adapted, bromegrass is excellent for reducing soil erosion. The grass cover, coming on early in the spring, is valuable in holding water, and the thick mat of roots and rhizomes aids in reducing soil losses on slopes and in waterways. Bromegrass also withstands considerable siting without injury, growing up through the new deposit of soil within a short period. It is an excellent grass for terraces, drainage outlets and buffer strips in strip cropping.

### Seed Production

In western Iowa, farmers have been growing bromegrass for seed for several years. With an increasing demand for locally-grown, well-adapted seed, this enterprise becomes highly important.

Seed yields range from 200 to 600 pounds an acre, depending upon soil fertility, previous management and moisture. Abundant rainfall in May and early June favors seed production. The price of seed from dealers has ranged from 15 to 25 cents a pound during the last few years but probably will be lower as the crop is grown more extensively.

Clean land—free from weeds—is one of the first considerations in seed growing. Clean cultivation, with special care to rid the field of weeds for 1 or 2 years before seeding the bromegrass is desirable.

When approaching maturity
the seed turns to a purplish color, and when completely ripe they are brown. The color and firmness of the seed are important in determining when to harvest. Completely ripe seed are hard and stiff, but at the proper stage for binder harvesting they are firm and will bend but not crush easily when squeezed between the thumb and forefinger.

A grain binder may be used for harvesting bromegrass. It should be adjusted to make small bundles, bound rather tightly. Bundles will shrink greatly in drying and should be set up in small shocks to allow good air circulation.

Probably the most popular method of harvesting will be the use of the newer small combines. Proper concave adjustment and the use of a special bromegrass screen to remove pieces of stem from the seed are important in threshing.

Another method of harvesting is by means of farm-constructed stripping machines built onto old binder frames. The reel is built so that the heads of the bromegrass are raked through teeth which are spaced closely enough together to strip the seed from the plants. A hopper in place of the binder platform apron catches the seed. Fairly clean seed has been harvested in this way.

When seed is harvested with a relatively high moisture content it should be spread in shallow layers on an open floor and turned frequently until completely dry. The viability of the seed may be injured easily in storage if the moisture content is high enough so that the seed starts to heat.

We hope that a number of Iowa farmers, especially in the western part of the state where bromegrass does so well, will continue to be interested in producing seed. As the acreage of bromegrass expands, a good source of high quality, well-adapted seed is most important. The majority of farmers in Iowa, however, will be interested in bromegrass because of its value as a highly productive, palatable and most dependable pasture crop.

**Sow Flax Early**

Iowa farmers are likely to get the largest yields of flax from early seeding. Tests during a 11-year period by the Iowa Station, from 1931 to 1941, inclusive, uniformly gave larger yields from early seeding.

It has been found that treating the seed with dusts will increase the yield if the seeding is early. For late seeding, treating the seed does not seem to make much difference.

Comparisons were made of flax yields following sugar beets and corn. The flax following corn produced about twice as much as that following sugar beets in the station tests.

These cows are feeding on the bromegrass pasture at the Iowa State College Dairy Farm. Bromegrass pastures have a distinct advantage over bluegrass in years of drought, probably largely because bromegrass is much deeper-rooted than bluegrass.
Cows Are Good

Dairy cows will produce more butterfat on a ration in which whole (cracked) soybeans provide the protein supplement than on an ordinary ration of mixed grains which uses such a protein supplement as soybean oilmeal.

This has been our experience here at the Iowa Station in 3 different years in which we were studying the use of whole soybeans for dairy cows.

As long as the price for whole soybeans hovers around $1.25 to $1.75 a bushel or more, no farmer is likely to worry much about getting rid of beans. During recent months, a man could sell the soybeans and buy back soybean oilmeal, linseed oilmeal or some similar protein supplement and make the exchange on a profitable basis.

But if and when we produce so many beans that the price drops too low, or if it drops for any other reason, such as it may at the termination of the war, the man with dairy cows has a ready and profitable "market."

The results we obtained are very different from those obtained in other tests (some of them at other stations) when soybeans have been fed to hogs and fattening cattle. When fed in large quantities to hogs, they produce soft pork, as tests at the Iowa Station and elsewhere have shown; when fed to fattening cattle, they have a tendency to cause the cattle to go off feed if more than 2 or 3 pounds per steer are fed daily.

But in our tests with dairy cows, we were able to feed 8.5 pounds of beans to some cows daily without the cows going off feed, or with no other apparently serious results.

In general our results with the feeding of whole soybeans to dairy cows were:

1. The cows produced more total butterfat than on the comparative rations which did not include whole soybeans.
2. The butterfat test of the milk was increased in the rations containing whole soybeans.
3. The yield of milk dropped slightly with the feeding of soybeans.
4. Cows on a soybean ration maintained their body weight about the same as those on the usual ration.
5. The color of the butterfat
Bean Market

decreased on a soybean ration—it was whiter than that produced on the ordinary rations.

6. Silage seemed to have more influence on milk flavor than soybeans in the ration.

7. It took longer to churn butter from cows fed large amounts of soybeans or soybean oilmeal to which soybean oil had been added.

Our conclusion is: Feed whole (cracked or ground) soybeans whenever they provide a lower cost of protein supplement than one will have if he goes to the cost of selling and delivering the beans and buying and hauling back soybean oilmeal or some other high protein supplement.

One needs to keep in mind that in our tests we were working only with dairy cows. While the general results with feeding them to cows were good, they might not be equally good with other classes of livestock.

The foregoing conclusions are based on tests over a period of 3 years. The tests in the different years were not set up exactly alike. In the first tests—in the winter of 1935-36—we took 8 cows and divided them as nearly equal in number and quality as possible. The cows of one group were fed a grain mixture of 4 parts cracked corn, 4 parts ground oats, 1 part soybean oilmeal, 1 percent salt and 1 percent bone meal; silage and alfalfa hay daily for each 100 pounds weight of each cow.

The four cows which made up the other group—the "soybean" group—were fed corn silage and cracked soybeans, 1 pound for each 5 pounds of milk produced. Soybeans were their only grain. They got no hay, but had access to a mixture of equal parts of salt and bone meal.

The cows getting the silage-soybean ration consumed large quantities of this feed. The average amount of silage eaten ranged from 50 pounds for the Jerseys to 75 pounds for the larger Holsteins. The consumption of soybeans ranged from 5 to 81/2 pounds per cow daily.

While on this soybean-silage ration the cows maintained their weights about as well as the similar cows that were on the mixed grain-silage-hay ration. Those on the soybean-silage ration produced a little more total
butterfat, but slightly less milk. The fat percentage in the milk of the soybean-silage ration was enough higher so that their total butterfat production was above that of the other lots of cows.

The surprising thing in this test was the ability of the cows to eat so much cracked soybeans without going off feed. Other tests had indicated that when steers were fed more than 2 to 3 pounds of cracked beans a day, they would go off feed. Our theory of this difference is this: Steers being fattened are laying the fat from their feed on their bodies. If the fat comes to them faster than they can store it, they go off feed. With dairy cows, fat is being removed from their bodies with their milk. So a cow probably can consume as much fat as she is putting into her milk and not go off feed.

We wanted to check further on certain aspects of our test of 1935-1936, so another test was conducted the following winter. In this test we had two experimental lots of cows and a third check lot. All got silage and timothy hay and the same grain mixture except that for one of the lots ground soybeans were used as the protein supplement and some additional soybean oil was added to make the mixture very high in fat content. In the other experimental lot the fat content of the grain was about half as much, with enough starch added so that the two grain mixtures contained the same energy value.

In this test, “the double reverse method” was used. That is, both groups were fed each ration at different periods. The check lot got the regular college herd grain mixture throughout the test. The feeding schedule was arranged so that when the cows were fed the grain containing the larger amount of fat, they were fed approximately as much fat as that yielded in their milk. The cows getting the smaller fat ration obtained one-half the amount of fat they produced in their milk.

The medium fat ration in this test produced more milk but a lower fat percentage and a lower total fat yield than the high-fat ration. Without exception every cow when she was shifted from the low-fat ration to the high-fat ration produced milk with a higher percentage of fat.

In the third year of our tests (1937-38) the ration consisted of alfalfa, hay, corn silage or sorghum silage and a grain mixture consisting of 1 part each of corn and cob meal, rolled oats and 2 parts of cracked soybeans, or an equal amount of soybean oilmeal and soybean oil - the oil having been extracted at a very low temperature so as to affect the protein as little as possible. The grain was fed at the rate of 1 pound daily for each pound of butterfat produced during the preceding week. Thus each cow received about 80 percent as much fat in her grain as the fat secreted in her milk.

Without exception the cows produced more butterfat when they were on the “soybean” ration than when they were on the “soybean oil-soybean meal” ration. Again in this test, the butterfat test came up and the yield of milk went down when soybeans were fed.

And so from our 3 years of tests, we must conclude that the feeding of whole soybeans is likely to increase the percentage of butterfat in the milk and the total yield of butterfat, but it may decrease the yield of milk. It seems good business to crack the soybeans and feed them to your dairy cows unless the difference in price is great enough to pay for hauling the beans to market, hauling oilmeal home and to offset a slightly lower fat production from your cows.

These tests clearly indicate that Iowa farmers who can grow soybeans are situated to take care of the protein needs of their dairy cows without buying a dollar’s worth of commercial feed.

Flax needs to be sown on land that is free from weeds and fairly fertile - it doesn’t do well on thin land. It should be sown as early in the spring as the ground will permit.

Soybean Growing Pointers

The main factors of successful soybean production are:

1. **Prepare a good seedbed.** One needs to plow, except possibly where the land was in soybeans the previous year. Plow in the fall or early spring. Work the land with a disc and harrow to kill as many weeds as possible before planting.

2. **Inoculate the seed.** The Iowa Station has obtained marked increases in yields by inoculating the soybean seed. The bacteria which enable soybeans to take free nitrogen from the air are not commonly found in Iowa soils. Some Iowa farmers who have grown soybeans on their farms many years inoculate their seed every few years.

3. **Choose a suitable variety.** The commonly grown varieties - Mukden, Manchu, Dunfield and Illini—are still the best “bets.” Avoid so-called “new” varieties under such names as McClave, Prolific, Bell, New Bush and other names. These are indistinguishable from an inferior discarded variety called the Midwest. Manchu and Dunfield may be grown in any part of Iowa. Mukden is suitable especially for the northern half of the state; Illini is later and is best suited for central Iowa south.

4. **Seed Thickly.** In rows, the best yields are obtained by planting the seed about an inch apart, regardless of whether the rows are as close as 21 inches or as far as 42 inches apart. When drilled solid with a grain drill, 2 bushels of Manchu an acre has given the best yield. Manchu beans are rather large, so the rate for other varieties might need to be varied accordingly.

5. **Control the weeds.** Soybeans and weeds don’t get along well together. If you can’t control the weeds, you won’t get many soybeans. Planting in rows is usually best in Iowa so that weeds can be controlled by cultivation.