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From Lincoln's Address at Gettysburg...

"...that this nation, under God, shall have a new birth of freedom; and that government of the people, by the people, for the people, shall not perish from the earth."

From Lincoln's Address at Gettysburg
Want the Next Reporter?

The time has rolled around to revise our mailing list for the FARM SCIENCE REPORTER—it must be done once a year, postal authorities insist. Therefore if you want the next issue, be sure to return the card which is enclosed, properly filled out and stamped, or let us know by some other means that you want to continue on the mailing list. Unless you do your name will be dropped.

We are beginning our fourth year. If you have any suggestions about what we are doing and shouldn’t be or what we ought to be doing and aren’t, your comments and opinions will be more than welcome. It helps to hear from you.

The Authors—

H. D. Hughes, head of farm crops at Iowa State College for many years, is undoubtedly known to most of you.

C. R. Weber, a former Illinois farm boy, heads the soybean breeding work at Ames. An agent of the U.S.D.A., he is joint author with Professor Hughes of our lead article on soybeans.

H. C. Murphy is a plant pathologist of the Bureau of Plant Industry of the U.S.D.A. and for 16 years he has been working on cereal crop breeding work at the Iowa Station. He has attacked the breeding problem from the standpoint of developing varieties that are resistant to rust, smut and the other diseases. Out of this work has come our new strains of disease-resistant oats. Still better ones may be in the making.

L. C. Burnett, joint author with Murphy on the article about our new strains of oats, has been with the Iowa Station many years (since about 1906) and has developed many superior strains of small grain. He is research professor of agronomy.

Enoch B. Norum, a former Minnesota farm boy, has been with the Iowa Station 2 years. In this issue he discusses the effect of soybeans on corn crops that follow.

Harold Gunderson, extension specialist in zoology and entomology, is known to a good many Iowa farm people because of his work over the state in insect and rodent control. He is also heard frequently over WOI. Because of his 6-foot 6", 7" or 8" stature, he has been "dubbed" "Tiny" by his friends.

Clawson Y. Cannon is another head at the Iowa Station who has been a frequent contributor to FARM SCIENCE REPORTER. He is head of the dairy husbandry work at Ames.

Dwight Espe, who collaborates with Dr. Cannon in discussing liberal feeding of dairy cows, likewise has been a frequent contributor to the REPORTER. His specialty is dairy nutrition and he has been with the Iowa Station about 17 years.

A. G. Norman, who looked into the inoculation of soybeans in Iowa and discusses in this issue what he found, has been with the Iowa Station 6 years. Prior to that he was with the world’s oldest experiment station—the Rothamsted Station in England. The Rothamsted is famous the world over for its work on soils. It specializes in crops and soils and their related subjects. Dr. Norman’s work at the Iowa Station is concerned with microbiology—he’s studying those very tiny “bugs,” so important to making soil available to plants, but so small that you can find them only under a microscope.

Elfriede F. Brown is associate professor of foods and nutrition at Iowa State College. She discusses another food conservation problem—that of handling our foods so that we lose the least amount of nutrients possible in preparing foods for the table.
What About SOYBEANS in 1943?

IOWA HAS SPRUNG into soybean production so fast that farmers still have many questions about the crop even though they grew 2½ million acres last year. But despite their questions, they have learned a great deal, for they are now getting average yields of close to 21 bushels an acre as compared with less than 15 a few years ago.

The government is calling on Iowa farmers to produce in 1943 94 percent of the 1942 acreage, which means another big bean year. Our work on soybeans at the Iowa Station may help farmers solve their problems in carrying out their part of the big program. Here are a few suggestions for soybean growing:

1. CHOOSE THE RIGHT VARIETY. Richland soybeans will give best results in the northern two or three tiers of counties. The Mukden and Manchu varieties are recommended for growers in north central Iowa and Illini and Dunfield are perhaps the best adapted varieties for southern Iowa.

2. HAVE THE ROWS SPACED PROPERLY. The highest yields are obtained from planting in rows 20 to 30 inches apart, although there is no advantage to this method unless the beans are cultivated. Rows of varied widths can be obtained by using a drill and stopping up part of the holes. Farmers without a drill can get a 21-inch row by doubling back with their corn planter. Plant in rows as close as possible to enable cultivation with the available machinery.

3. PLANT ENOUGH SEED. One bushel per acre of GOOD seed is the rate to plant medium-width rows spaced from 21 to 36 inches apart. Narrow rows drilled 7 inches apart require 2 bushels per acre, while wide, 42-inch rows require slightly less than 1 bushel—deduct 5 to 15 pounds. Seed planted at these rates must germinate 90 percent or better and must be free of sticks, stones and cracked beans, etc. If the seed germinates only 50 percent, twice as much should be planted.

4. PLANT EARLY. Plant from May 10 to 25 if grown in rows but delay seeding until May 25 to May 31 if drilled solid in order to kill as many weeds as possible before planting.

5. BE SURE TO INOCULATE. Failure to inoculate the seed may result in a significantly lower yield of beans with lower protein content, because of the large amounts of nitrogen required by the beans. Unless inoculated most of the nitrogen must come from the soil. Inoculated plants are able to obtain a considerable part of their nitrogen from the air through the bacteria in the nodules on their roots.

How Varieties Differ

Early maturing varieties of beans are desirable because they will ripen and can be harvested before it is time to start picking corn. Late maturing beans may be caught, as they were last fall, by an early freeze and be damaged seriously.

Among the early maturing varieties, Richland, released from Indiana in 1938, has been tested by the Iowa Station through a period of years and individual farmers have had enough experience with this variety to be enthusiastically for it. In the northern two or three tiers of counties one can expect it to be among the highest in yield.
as well as having the advantage in early maturity, lodging resistance and high oil content. There is a large stock of Richland certified seed—certified as to its genuineness of variety, freedom from mixtures with other varieties and from noxious weed seed. Certification also insures a satisfactory germination.

The Mukden variety, distributed from the Iowa Station in 1932, is now the most extensively grown bean in the north central part of the state. It is a good yielding variety, well adapted to this area, and more resistant to lodging than the other varieties, except Richland, generally grown in the state.

Manchurian beans, also grown quite generally in central Iowa, have given satisfactory results. It lodges slightly more than Mukden and is a few days later in maturity. There are a number of strains of this variety.

In the south central and southern part of the state Dunfield and Illini are perhaps the best from the yield standpoint. They are later in maturity than Mukden and more susceptible to lodging on the richer soils. In normal seasons Dunfield and Illini will yield more than Richland in the southern half of Iowa.

Comparative yield, lodging, maturity, and plant height of the varieties discussed above are shown in the following table. These data were obtained from tests for a four-year period in northern and for a five-year period in central Iowa.

The planting of unknown or unadapted varieties of beans has been responsible for unsatisfactory returns in some instances. The old Midwest variety, camouflaged under such names as "McClave," "New London," and "the new bush bean," and for which extravagant claims were made and fabulous seed prices asked, gave such poor results in 1942 that it should be forever out of the picture. At Ames it yielded only half to three-fifths that of the standard varieties and in northern Iowa less than half.

Consideration of seed quality is of greater importance this year than for many years past. The early freeze last fall seriously damaged many lots, and we can't afford to risk low acre returns because of poor germination. We must make certain of the vitality of bean seed well in advance of planting time.

## Rotations; Fertilizers

Under most Iowa conditions soybeans should follow corn in the rotation. Corn stalks should be plowed under to permit preparation of a good seedbed. Soybeans may follow oats in the rotation when a grass or legume seeding has not been made with the oat crop.

Many new growers of soybeans are asking about the effect of a soybean crop on the yield of crops to follow in the rotation. In another article in this issue Mr. Norum discusses the results obtained from a study on Iowa farms of the effect of soybeans on the yield of corn the following year. In these studies, made in 1942, corn consistently yielded more following soybeans than following a corn crop. Studies have also been made at other Experiment Stations to determine the yields of crops following soybeans in the rotation. At the Ohio Station, as an average for a 14-year period, the yield of wheat following soybeans was 3.4 bushels per acre more than following oats. At the Indiana Station, over a 15-year period, the yields of corn, oats and wheat were all larger following soybeans than following any other crop except clover.

Fertilizers applied directly to the soybean crop usually have not given profitable increases. However, when fertilizers and lime are applied to other crops in the rotation, the productivity of the land is increased, and soybeans, like any other crop, respond favorably to increased productivity. Therefore, when fertilizers are used they should be applied to some other crop in the rotation.

## LEADING SOYBEAN VARIETIES COMPARED

<table>
<thead>
<tr>
<th>Variety</th>
<th>Yield per acre</th>
<th>Lodging</th>
<th>Month and day ripe</th>
<th>Height in inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kanawha—Northern Iowa—1939-1942 (7 tests)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richland</td>
<td>25.7</td>
<td>1.6</td>
<td>9-20</td>
<td>35</td>
</tr>
<tr>
<td>Mukden</td>
<td>24.0</td>
<td>2.2</td>
<td>9-25</td>
<td>45</td>
</tr>
<tr>
<td>B. H. Manchu</td>
<td>27.8</td>
<td>2.9</td>
<td>9-37</td>
<td>41</td>
</tr>
<tr>
<td>Dunfield</td>
<td>25.2</td>
<td>3.2</td>
<td>9-30</td>
<td>39</td>
</tr>
<tr>
<td>Illini</td>
<td>25.4</td>
<td>3.6</td>
<td>10-1</td>
<td>44</td>
</tr>
</tbody>
</table>

| Ames—Central Iowa—1938-1942 (9 tests) |
| Richland | 29.2 | 1.6 | 9-17 | 34 |
| Mukden | 29.3 | 2.5 | 9-22 | 40 |
| B. H. Manchu | 30.5 | 3.1 | 9-23 | 40 |
| Dunfield | 30.9 | 3.3 | 9-27 | 39 |
| Illini | 30.8 | 4.0 | 9-28 | 42 |

*Lodging grade 1 to 5 (1 erect, 5 lying down).
B. H. Manchu (Black Hilo Manchu) a strain believed to be slightly earlier and more lodging resistant than most of the strains grown throughout the state.
Easy Crop to Grow

All in all there is less risk in growing beans than in any other extensively grown Iowa crop. It is adapted to an unusually wide range of soils. It will make a relatively better growth on low fertility soils than any other crop. It can be grown successfully on distinctly acid soils as well as neutral soils. It is one of the most drouth-resistant of our crops. It is the one crop grown on an extensive acreage that is not subject to chinch bug injury. There is an unusually long planting period during which the crop will stand with comparatively little loss.

Getting the soybean crop harvested this past fall brought grey hairs to many farmers. But most fields of beans were harvested satisfactorily before winter set in, even though many fields were damaged by the early freeze. Using the earlier varieties and seeding soon after corn planting should avoid this trouble in the future.

Iowa farmers are definitely in the soybean program. With the 1942 experience the '43 crop should be the best ever.

Publications on soybeans, listed below, can be had by addressing the Bulletin Office, Iowa State College, Ames, Iowa:

Bulletin P30 “Soybean Production in Iowa.”
FS-51 “Soybeans—New Vegetable for Iowa Gardens.”
FS-52 “Harvest Labor Problems.”

Beans CAN Whip Weeds

Soybeans ordinarily are not considered good weed fighters, but at Cherokee, Iowa, where Dr. A. L. Bakke of the Iowa Station has been working on weed control, he found that soybeans properly handled are a valuable crop in smothering out weeds.

The plan followed there in smothering Canada thistle and creeping jennie is to plow the ground fairly deep and work the seedbed down, rolling it if possible, and planting soybeans the same day it is plowed. The beans have been drilled in at the rate of 3 to 3 1/2 bushels to the acre. They are either cut for hay or combined. As soon as the beans are harvested the ground is plowed. The next spring it is plowed again and the beans planted the same as the previous year.

Two years of this treatment completely whipped Canada thistle in a field they had badly infested for 20 years, Dr. Bakke reports.

Soybeans grow so rapidly and shade the ground so thoroughly that if the early weeds are kept down, beans are not bothered later in the season and may, in fact, be used to smother out some of the weeds such as Canada thistle and creeping jennie.
More Oats, Fewer Acres!

Enough Seed of New Disease-Resistant Varieties Available This Year to Plant Iowa’s Oat Acreage

IOWA FARMERS have been asked to reduce their oat acreage by 8 percent in 1943. But Iowa farmers are “holding an ace in their hands”—they have enough seed of the new disease-resistant varieties so that they can cut their acreage 8 percent and still produce as many bushels of oats as with the larger acreage of the older varieties.

Iowa oat yields will increase 5 to 25 bushels per acre over that obtained from older varieties if only the new, high-yielding, disease-resistant varieties are planted. Sufficient seed of the new varieties was produced in every part of the state in 1942 to sow the entire 1943 Iowa oat acreage. If the season is a “good oat” year these new varieties should raise the average yields 5 to 10 bushels per acre over what would be obtained from older varieties. Should we experience a severe crown rust (leaf rust) outbreak in 1943 the new varieties might easily yield 20 to 30 bushels per acre more than other varieties.

These new, high-yielding, rust and smut-resistant varieties are Tama, Boone, Control and Marion. They have yielded an average of 6 bushels more than the three leading older varieties during the good oat years (1939, 1940 and 1942) in tests by the Iowa Station at Ames and Kanawha. During the poor oat years (1938 and 1941), when crown rust was severe, they outyielded the older varieties by an average of 28 bushels per acre. The new varieties consistently have had a higher weight per bushel than the older varieties with the difference being very great when crown rust was severe.

The new varieties—Tama, Boone, Control and Marion—were developed cooperatively by the Iowa Agricultural Experiment Station and the United States Department of Agriculture. They are highly resistant to crown rust (leaf rust), stem rust and both smuts of oats. Older varieties, such as Gopher, Iogold, Iowa 105 (Richland), Iowa 103, Vanguard, have no resistance to crown rust and have suffered badly during years such as 1935, 1938 and 1941 when crown rust infection was severe.

Tama, Boone and Control were selected from a cross of Victoria x Richland. They inherit their crown rust and smut resistance from Victoria, a variety introduced from Argentina in 1927. From Iowa 105 (Richland) they inherit yielding ability, early maturity, stiff straw, yellow grain and resistance to stem rust. Tama, Boone and Control are definitely superior to their Iowa 105 parent in yield and bushel weight, the difference being very striking in poor oat years when crown rust is severe. Tama has outyielded Boone, Control and Marion in all Iowa tests by about 3 bushels per acre. Boone, Control and Marion are similar in average yield.

Marion was selected from a cross of Markton x Rainbow. High resistance to smut and some yielding ability were inherited from Markton, a variety developed at Moro, Oregon, from an unnamed variety introduced from Turkey. Marion inherited additional yielding ability, high resistance to stem rust and moderate resistance to crown rust from Rainbow, a selection from Green Russian developed by the

**CROWN RUST YEARS (1938 AND 41)**

| TAMA, MARION, BOONE | 60 |
| GOPHER, IOWA 105 | 32 |

**GOOD OAT YEARS (1939, 40, 42)**

| TAMA, MARION, BOONE | 71 |
| GOPHER, IOWA 105 | 65 |

*REPRESENTS 6 BUSHELS*
North Dakota Experiment Station. Marion is high-yielding, has superior grain quality, is almost white in grain color, thin hulled and averages high in bushel weight. It is taller than Tama, Boone or Control and is a few days later in maturity. Marion may lodge on rich soils, but it is as stiff strawed as the old standard varieties.

These new smut and rust-resistant oat varieties are not “wonder crops,” nor are they “hybrid oats.” They are well-adapted, early varieties which give higher yields and heavier weights mainly because of their resistance to diseases. It is true they are of hybrid origin, but that does not mean that they are “hybrid oats” in the same way that we speak of hybrid corn. Oat varieties of hybrid origin—such as Tama, Boone, Control and Marion—lost all of their hybrid vigor during the process of selection long before they were ready for distribution.

It is a well-known fact that hybrid corn loses its hybrid vigor rapidly in the generations following hybridization. For this reason corn growers purchase first generation seed each year. But it is not feasible to do this with oat hybrids, because at least 10 generations usually elapse between hybridization and the distribution of a variety.

Crossbreeding oat varieties is slow and tedious work since oats are a self-pollinated plant, and each flower within a seed head uses its own pollen to make a kernel. To cross oat varieties a plant breeder must go through a delicate hand procedure with each single kernel produced. He must carefully open each flower with a pair of forceps and pull out the male parts before the pollen ripens. After a day or two, he must dust on a tiny bit of pollen from the other plant involved in the cross. The production for an entire year of even an experienced man would not exceed a half peck of seed.

Boone and Control were not available for distribution until 1940, 10 years after the original cross was made between Victoria and Richland in 1930. Likewise, the Vanguard oat, a late, stem rust-resistant variety developed by the Dominion Rust Research Laboratory at Winnipeg, Canada, was first distributed in 1936 from a cross made between Hajira and Banner in 1926.

Oat varieties selected from hybrids do not “run out” in the sense that hybrid corn does, and providing the seed is kept pure it is not necessary to obtain new seed of a particular variety from year to year.

The yield and quality of the oat crop can be increased by sowing early. A delay in sowing after the earliest possible date will usually decrease yield about 1 bushel per acre for each day of delay.

For best results oat seed should be cleaned and treated with New Improved Ceresan or some other approved fungicide. Even though the new varieties are resistant to both smuts, seed of these varieties should also be treated. There are many other diseases besides the smuts, such as the root rots and seedling blights, which can be controlled wholly or in part by seed treatment. For the small cost involved, cleaning and treating oat seed pays bountiful dividends.

Farmers can obtain a list of those selling seed of Tama, Boone, Control and Marion from their county extension director (county agent). A list of growers having certified seed of Tama, Boone and Marion for sale also can be obtained from the same source or by writing to the Secretary of the Iowa Agricultural Experiment Association, Ames, Iowa. By purchasing certified seed, a farmer can be sure of obtaining a start with good, pure seed of the variety he desires.
You can expect a larger yield of corn following a soybean crop than if the field had been in corn the previous year with conditions as they were in 1942.

That, in brief, is the conclusion we have drawn here at the Iowa Station following some tests to try to find the answer to whether soybeans are hard on the land.

Farmers have not always agreed on whether soybeans are hard on soil fertility and how they affect following crop yields. Since soybeans have become one of the state's important crops, it seemed rather important to learn all we could about this question.

The first test, which we made in 1942, was to find out the comparative yield of corn following soybeans and following a corn crop. Thirteen fields in Story and Hamilton counties were selected. These were all handled uniformly except that in 1941 part of each field was planted to corn and part to soybeans. Then, in 1942, field samples were taken from the corn grown on corn ground and from the corn following soybeans to determine yields and moisture content. Since both parts of the field had been handled alike, the differences in yield were probably the result of the effect of the soybeans grown in 1941.

We confined our study to soils of the Webster series and to Clarion loam. The results of the yields are shown in Table 1. On the Webster soils the yield in one field following soybeans was 18.8 bushels an acre more than when corn followed corn. The average was 8.3 bushels more from the land which had been in soybeans the previous year.

On the Clarion loam, as on the Webster soils, all fields yielded more following soybeans than following corn, with one field producing 14.4 bushels more. The average was 9.5 bushels larger for the corn following soybeans.

From what we know of the nitrogen needs of corn, the results are about what would be expected, especially on the Clarion soils. A 60-bushel corn crop may be expected to remove about 60 pounds of nitrogen, whereas a 25-bushel soybean crop may actually add a little nitrogen if the plants are well inoculated. As a general rule one may expect more nitrogen to be available for a crop following soybeans than for a crop following corn.

The importance of nitrogen to corn yields is shown by the results which gave the largest percentage increase (field 10) had the most sand and was the shallowest of all the Clarions we used. One would expect a larger increase in yield where the soil is well drained and the land is not so hard on the fertility.

TABLE 1. YIELD OF CORN FOLLOWING CORN AND FOLLOWING SOYBEANS.

<table>
<thead>
<tr>
<th>Field No.</th>
<th>Following corn (bushels per acre)</th>
<th>Following soybeans (bushels per acre)</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>95.8</td>
<td>114.6</td>
<td>18.8</td>
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<td>4</td>
<td>75.6</td>
<td>89.0</td>
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<td>5</td>
<td>56.3</td>
<td>61.1</td>
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<td>6</td>
<td>67.7</td>
<td>73.3</td>
<td>5.6</td>
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<tr>
<td>7</td>
<td>49.6</td>
<td>55.3</td>
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<td>8</td>
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<tr>
<td>9</td>
<td>48.5</td>
<td>52.0</td>
<td>3.5</td>
</tr>
<tr>
<td>Av.</td>
<td>63.4</td>
<td>71.7</td>
<td>8.3</td>
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<table>
<thead>
<tr>
<th>Field No.</th>
<th>Following corn (bushels per acre)</th>
<th>Following soybeans (bushels per acre)</th>
<th>Differences</th>
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<tbody>
<tr>
<td>1</td>
<td>63.1</td>
<td>72.1</td>
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<td>2</td>
<td>62.7</td>
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<tr>
<td>Av.</td>
<td>64.6</td>
<td>74.1</td>
<td>9.5</td>
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</table>
expect such a soil to furnish less nitrogen from native sources than the less sandy and deeper soils. Why was this field out in front? The operator of the farm told us that in 1941 the soybean crop had carried unusually heavy nodule development. We assume that from the extra nitrogen furnished by the soybean nodules came this large increase in corn yield the next year.

Soybeans may affect the yield of crops that follow in other ways besides adding nitrogen—they have a loosening effect which is particularly marked in soils with much clay. We think that probably accounts for some of the increase we obtained on the Webster soils.

In an experiment run for several years at the Ohio Station, soybeans had a beneficial effect on corn, oats and sugar beets that followed. The yield of corn following soybeans was 34.8 bushels an acre as compared with 21.6 bushels following corn and 34.2 bushels for corn following sugar beets. The beneficial effect in this test was attributed to the loosening action of soybeans on the heavy soil used.

In our tests, there was some indication that corn following soybeans may be significantly lower in moisture at harvest time than corn following corn. Of course we had a number of exceptions, especially on the Webster soils. On the Clarion loam, corn following soybeans was lower in moisture than corn following corn in all but one of eight fields. The detailed results of this trial are shown in table 2.

Although the results of our studies at the Iowa Station agree with results obtained at other stations, one needs to keep in mind that our results are from only one year of study. With conditions as they were in 1942, there seems to be little doubt but that corn following soybeans will yield more than corn following corn—at least on these soil types.

The results indicate that more nitrogen is available following a soybean crop than following a corn crop and this is of benefit to corn. The loosening effect of soybeans may be important in increasing yields on heavy soils. In other years, however, differences in rainfall, differences in season and other factors that vary may lead to results different from those we obtained in 1942.

When plowed under for green manure, soybeans, like other legumes, are a soil building crop. When grown for hay, however, soybeans may deplete the soil of some nitrogen and organic matter. In contrast, alfalfa and clover grown for hay will result in the addition of nitrogen and organic matter. The main reason for the difference is that alfalfa and clover roots make up about one-fourth of the total growth of these plants, whereas soybean roots make up only about a tenth of its growth. If grown for grain, a well inoculated crop of soybeans may add a little nitrogen if the straw is left on the ground.

From the standpoint of removing mineral nutrients, soybeans rank about average among the crops grown in the Corn Belt, providing the straw is left on the ground. A 25-bushel crop of soybeans will remove from the soil about the same amount of phosphorus as a 60-bushel corn crop and about twice as much potassium, but only about half as much potassium as a 2-ton crop of clover hay.

### TABLE 2. PERCENTAGE MOISTURE IN CORN FOLLOWING CORN COMPARED TO CORN FOLLOWING SOYBEANS.

<table>
<thead>
<tr>
<th>Field No.</th>
<th>Webster soils (Silty clay loam and loam)</th>
<th>Percentage Moisture</th>
<th>Following corn</th>
<th>Following soybeans</th>
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<tr>
<td>3</td>
<td>21.0</td>
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<td>31.6</td>
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Hughes et al.: Farm Science Reporter Vol. 4 No. 1

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Are you paying room and board for 5,000 rats? Are you losing $10,000 down rat holes each year? Some farmers lose this much and are not even aware of it. Rats are so secretive that you will be surprised at the amount of damage they are doing on your farm—here is a quick way to estimate it.

If you never see rats, but see signs of rats and rat damage, there are from 1 to 100 rats on your farm. If you see rats occasionally at night, there are from 100 to 500 rats. If you see rats every night and a few occasionally in the daytime, you are boarding from 500 to 1,000 rats. If you see lots of rats at night and several every day, you probably have 1,000 to 5,000 rats.

Now, with each rat costing you fully $2 each year for living expenses, you can easily determine just how big a hotel bill you are paying.

Rats do a terrific amount of damage on the average Iowa farm. Because of this waste, rat control will play an important part in our war effort. Three rats eat as much as two laying hens. One hundred rats will eat 100 bushels of corn, and they will destroy and contaminate an additional 300 bushels each year. Rats undermine and destroy foundations and feeding floors. They chew holes in crib roofs and crib slats. And they also give hogs a serious disease—trichinosis.

All of this sabotage continues unchecked on most farms, even in the face of the national war emergency, which calls for highly increased production of feed and livestock while at the same time curtails the construction of farm buildings. In any case it will pay each individual farmer to control rats.

Many farmers refuse to believe that rats are bleeding their pocket-books because they have seen only a few signs of rats or because they have seen only one or two at night. Actually rats very rarely venture from their nests except at night and are very shy of humans. In fact, you won’t see a rat at all unless it is forced out of its home by sheer pressure of high population.

By Harold Gunderson
ground, rolled into small baits and distributed around your buildings, both inside and out. It's a good idea to practice up for the big day of poisoning by shutting up all livestock during the prebaiting period. One night of this will show you how many chickens can remain on the loose after the average roundup. If these chickens are loose the night you poison, they might be dead the next morning—so don't take chances.

Let's assume that your prebaiting is under way and that you discover from it that your chicken house is literally teeming with rats. You certainly won't want to poison around the hen house if you can help it, so you will have to drive the rats to some other shelter. First move the chickens to another yard, and then gas all rat burrows thoroughly with calcium cyanide or car exhaust gas. Then fill up all of the rat excavations with dirt and

Rats find corncribs of this type excellent places in which to live. This picture was taken at night and shows only a few of the many rats that were running about.

Take Census First

Rat control, in the minds of too many people, is a minor job that needs to be done only once or at most twice during the year. But a good job calls for constant alertness, continual planning and periodic slaughter of rats. In general, best results are obtained during the fall and spring months. In late fall the rats move into your farm buildings for their winter quarters and will be on hand when you get ready to poison them. In the spring, when the breeding season begins, rats are hungry for any kind of food, and thus are very susceptible to baiting. Effective control during summer and winter months will call for a little more skill and painstaking care, but the results can be just as good.

The first thing to do in rat control is to take a rat census. This can be done roughly through observation, as has already been outlined. On the basis of this census you can start prebaiting—that is, putting out unpoisoned meat or fish. This is the most important step in rat control. In prebaiting, always assume that you are feeding the highest figure in the census range your farm falls into. If you never see rats but have some damage, prebait for 100 rats by distributing 1 pound of meat or fish.

Always pick up the uneaten baits the next morning.

Prebaiting serves several purposes. First, it accustoms rats to the food. Second, it tells you where the rats are congregated. Third, it gives you some idea of how many you have. The meat should be

Right: Rats can ruin a lot of corn. It has been estimated that 100 rats will eat 100 bushels a year and contaminate an additional 300 bushels of the grain.

Below: Cyanide pumped into their runs with a "gun" accounted for this kill.
spray or sprinkle the surface of the ground around the chicken house with creosote oil. Use plenty of creosote and see to it that the foot of ground next to the wall is well soaked. Rats don’t like creosote and will leave this area if there are no other hiding places in the immediate vicinity.

Pile all lumber, fenceposts, wagon boxes and other farmyard objects on sawhorses 18 inches to 2 feet off the ground to destroy all possible rat hideouts. Clean up the empty cans, scrap metal and other junk around the yard. Make the rats find new homes. See to it that chicken feed and livestock feed are not available to them at any time. Over a period of 3 to 5 days you are, therefore, concentrating the rats into a few colonies where they can be poisoned more easily.

Don’t use too much cyanide, and don’t shoot too frequently at rats during this period or you may actually drive most of the rats away from your buildings for a short time. Your purpose is to get rid, permanently, of as many of them as you can.

Feed Them Poison

Now comes the big day—you are all set to slaughter your rats. You have found through pre-baiting that the rats on your farm will eat about 10 pounds of ground meat every night and that they are concentrated in and around the corncrib. So you mix 10 pounds of meat and 2 pounds of barium carbonate together thoroughly and make 1,200 individual baits, each about 3/4 inch in diameter. Next you round up and pen safely all of your livestock and pets because barium carbonate is poisonous to all animals, and we don’t want any accidents.

Twilight comes, and the rats are hungry. You quickly distribute the 1,200 baits—enough baits so that each rat can eat at least one without fighting off his neighbors. Each bait contains enough poison so that if the rat eats only half of it, he will die.

When the baits are distributed, leave the area and don’t come back until morning. You don’t want to scare or disturb the rats before they have eaten their fill. If you do, most of the rats will just get sick, hide out for a few days and then be back as strong as ever.

Early the next morning go out and pick up all uneaten baits. Don’t be surprised if there seem to be quite a lot of them left. Remember that a rat with a stomach-ache can’t eat as much as one that is in good health.

Since barium carbonate is a slow-acting poison, you probably won’t find a large number of dead rats the first day. But you will pick up dead ones for a week after the poisoning. These should be buried where no other animal can get at them. Probably less than 50 percent of the rats will die in the open, so the odor may be a trifle unpleasant for a few days. But your farm will be quieter than it has been for a long time.

You are still a long way from finished with rat control. Now you should start repairing foundations, closing rat holes and burrows around all your buildings, gassing in favorable places with cyanide or car exhaust gas, and shooting stray rats. The first baiting can be expected to kill from 50 percent to 90 percent of the rats on the farm. So there is still some work left to do.

About 10 days after the first poisoning, start pre-baiting again. Use a different bait this time. If you first baited with ground meat, bait with ground fish now. Pre-bait for at least three nights and then poison again. Since barium carbonate is tasteless and odorless, you can use it again, but best results will probably be obtained by using a different poison. Red squill is good if you can obtain the full strength, pure powder. It is poisonous only to rats, but it is still a good idea to lock up the livestock.

A third baiting is sometimes necessary, especially on heavily infested farms. Pre-baiting should be started 10 to 15 days after the second poisoning. Change the bait again since the rats now left on the farm are probably the smartest ones and the hardest to kill.

Once your foundations are repaired and your farmyard is free of junk, lumber piles and garbage, you can keep your farm free of rats by encouraging your dog to seek out and catch stray rats, by occasional shooting and by pre-baiting and poisoning spring and fall. Make this practice part of your regular farming routine. You will save money by doing so.

Lime Helps Corn

The average Iowa farmer with acid soil can expect an increase of 5 bushels an acre in corn yields from applying lime to correct the acidity, tests conducted cooperatively by the Iowa Station with farmers in their fields over a period of 15 to 20 years indicate.

Corn is not sensitive to the acidity in soils, but when a soil is acid it does not grow most legumes well. As a result, many of these fields become low in nitrogen. A good corn crop requires rather large amounts of nitrogen. By liming just before legumes are seeded, the legumes are given a large "lift," and with a large and vigorous legume growth, the nitrogen is built up—preparing for larger corn crops.

Soil testing to determine just how much lime is needed on various fields can be done by the county extension director (county agent), the local vocational agriculture instructor, or the farmer may take samples and send them in to the Soils Department, Iowa State College, Ames.

The fineness of lime is important in determining its value. Coarse lime is slow in neutralizing acidity in soil.

http://lib.dr.iastate.edu/farmsciencereporter/v04/iss1/1
Feed Dairy Cows Liberally

With feed and butterfat prices as they are now, it pays a dairymen mighty well to feed grain liberally. As long as butterfat stays at near 50 cents a pound and the price of balanced grain feeds remains at near $35 a ton, a dairy farmer should feed grain liberally. It is patriotic as well as profitable in our food for freedom war effort.

We conducted some experiments here at the Iowa Station from 1938 to 1940 to try to find out whether it was profitable to feed grain, or whether roughage alone might be more profitable, even though production would be less.

In that period it would have paid farmers to feed at least a limited grain ration to their dairy cows, but the prices were not as favorable for grain feeding as now. Our tests indicated, however, that if butterfat should drop to say 25 cents a pound while grain remained around $30 a ton and hay at $10, dairy farmers might find it wise to decrease the amount of grain fed or eliminate it entirely.

So the dairymen needs some kind of "profit-detector" to determine when it is profitable to feed grain. Our tests show that a balanced grain mixture can be fed to cows profitably if 100 pounds of this mixture does not cost more than 3 ½ times the price of butterfat plus the value of 100 pounds of hay. For example, if butterfat is worth 50 cents per pound and alfalfa hay is worth $10 per ton, then the farmer can afford to pay as high as $2.25 for each 100 pounds of his balanced grain mixture without losing money (3 ½ times 50 cents, the price of butterfat, equals $1.75, to which is added 50 cents, the price of 100 pounds of hay—this totals $2.25). If the farmer had to pay more than $2.25 for each 100 pounds of grain mixture under these conditions, he would lose money. If he could buy it for less, his profit would be equal to the difference between the price he pays for the grain and $2.25, which is the highest profitable price that can be paid under these conditions.

In our feeding trials one group of cows was fed roughage alone, a second group was fed roughage plus a limited grain ration (1 pound of grain for each 8 pounds of milk produced), while a third group was fed roughage plus a full amount of grain (1 pound of grain for every 4 pounds of milk produced). We found that cows can be expected to increase their milk yield 15 percent when they are shifted from a straight roughage diet to a ration including roughage and a limited grain mixture. When the cows are fed a full amount of grain, they can be expected to increase their milk yield a little more than 25 percent over feeding roughage alone.

One of the important results we noticed was that when the cows were fed roughage alone, their total consumption of feed was not as large as when grain was added to the rations. The cows were not as thrifty looking as the grain-fed cows and most of them lost weight, indicating that they were using body reserves in sustaining milk production.

By CLAISON Y. CANNON and DWIGHT ESPE

They Will Make Profitable Use of Grain With Feed and Butterfat Prices at Present Levels
original respective rations. The third group of cows served as a check on the other two groups and received a ration of roughage plus a full amount of grain throughout the experiment.

The second year a new design was devised in which 18 Holstein cows were used in the investigation. These cows were divided into six groups of three cows each, the animals in each group being selected with as much uniformity as possible in age, size, stage of lactation and production. The experiment consisted of three 6-week periods with 1 week out between periods to adjust the cows’ rations.

The system in this trial was such that each cow in each group received a different ration during each period. The rations fed this second year were quite similar to those of the first year. They consisted of roughage alone, roughage plus a limited amount of grain (1 pound of grain to each 7 pounds of milk produced), and roughage plus a full amount of grain (1 pound of grain to each 3½ pounds of milk produced). These rations were fed in different order to each group so that each ration was preceded in its feeding order by every other ration an equal number of times throughout the trial. This was done to evaluate the carry-over effects of nutrient consumption on milk production which might occur in changing from one ration to another.

Farmers who look for immediate responses to changes in rations will do well to remember that such responses do not come quickly. It takes time, for instance, for a cow which has been fed roughage alone to increase her milk yield once you begin to feed her grain. Part of the grain must be used by that cow to restore the reserves in her body which have been removed to sustain the flow of milk during the time she was fed only roughage. On the other hand, a cow will continue to produce at a relatively high level after grain is dropped from her ration because she will use her body reserves to keep up the flow of milk.

Inoculate Your Soybeans

Survey Indicates One Field in Four or Five Is Not Inoculated or Is Not Inoculated Properly

By A. G. NORMAN

if they know that beans have previously been grown on any particular field. They assume that sufficient bacteria will live over in the soil to bring about proper nodulation. While this is often the case, it may not always be so because the soybean nodule bacteria are “weak sisters”—they’re not particularly vigorous when free-living in the soil. Under such circumstances they have to compete for food with the better-adapted organisms that are always in the soil, and may slowly die out.

No one has had any very definite information as to the percentage of beans inoculated at the time of planting or, what is perhaps more important, as to the actual amount of nodulation to be found in the field in Iowa. Estimates of the latter made by persons in a good position to express an opinion on this subject have ranged all the way from one-third to nearly 100 percent of the fields.

In order to obtain a more satisfactory answer to this question the Iowa Station made a survey this past season in two counties, Hardin and Monona. We restricted the survey to the bottomland townships of Monona County because almost all the beans are found there. Both counties had a substantial acreage of beans in 1942, but they differed markedly in past history. In Hardin County the soybean acreage has expanded for the past 5 years, whereas in Monona County soybeans are almost a new crop.

Accordingly, nodulation would only be general in Monona County if the seed was inoculated in 1942. In Hardin County, on the other hand, many of the fields must have

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“Estimate made by County AAA officers, others from assessors’ records.”

http://lib.dr.iastate.edu/farmscienceporter/vola/iss1/1
been planted to beans before and nodulation could occur either because the seed was inoculated or because sufficient bacteria remained in the soil from a previous crop.

In making the survey we sampled fields at random in the county, digging plants at several places in the field. If nodules were absent, or if the plants were only poorly nodulated, we examined the field more carefully.

The results in the two counties were not greatly different and indicate that the major part of the soybean acreage was, in fact, well nodulated. We reported nodulation as poor when nodules could be found only on occasional plants or if nodulation was patchy in the field. In both counties there must have been failure to inoculate or to inoculate properly between one-fourth and one-fifth of the fields.

Most of the unnodulated fields were normal in appearance and only in a few cases did the plants appear to be of a lighter color, which is ordinarily a symptom of nitrogen deficiency. These unnodulated plants, however, were not living a legume existence—they were getting all of the nitrogen they used from the soil. If a soil is quite high in nitrogen content, then the difference in yield and growth between nodulated and unnodulated beans may not be great.

If the soil nitrogen supply is low, then the effect of nodulation in increasing the yield and nitrogen content of the plant is likely to be greater. This is the reason why we cannot say definitely that inoculation will always increase the yield by a certain and exact percentage. But we can say that with beans at $1.60 per bushel (or somewhat less if they were frosted), it took only a very small yield increase to pay for the inoculant and the extra time taken in inoculating the seed.

The various commercial inoculants now on the market are almost all satisfactory as a result of regulatory laws in a number of states. (Iowa has a special labeling requirement for inoculants.) Failure to obtain satisfactory nodulation when seed has been inoculated is not likely to be due to poor inoculant but usually to lack of care in handling the inoculant or the inoculated seed.

Two types of inoculant are available: the "humus" type in which the bacteria are grown first in a liquid and then this liquid is absorbed by mixing with finely ground peat; the "jelly" type in which the bacteria are grown directly on jelly. Many farmers find the former type the more convenient, but drying-out must be avoided. Inoculant should not be part-used, left open on a shelf in the barn, and then used later when dried up. For the same reason, inoculated seed should be planted reasonably soon and not left in the drill or planter out in the field over the week-end or put back in the sack for later use without re-inoculation.

Some Iowa farmers have been asked to produce hemp in 1943 for war aid.

Fifteen counties in north-central Iowa have been designated as the probable growing area.

Only level, well-drained, fertile fields are recommended for hemp growing. Uniform soils are necessary to produce hemp with a uniform height. Hemp closely resembles corn in its plant nutrient requirements, so that farmers are generally advised to select their hemp area from the best corn land on the farm.

The production of hemp in the United States has become a war necessity. Since the source of other strong fibers has been cut off, large quantities of hemp are needed for the manufacture of rope and other types of cordage for the army, navy, merchant marine and essential civilian uses.

The government has agreed to furnish the hemp grower with seed and harvesters, binders or "pickers," these to be provided at the grower's expense. A harvesting schedule will be arranged to insure efficient and equitable use of harvesting machinery, and the grower must agree to observe this schedule.

Hemp is an annual crop that is sown in the spring like small grain and produces a thick stand of slender, unbranched stalks, growing usually to a height of 6 to 10 feet.
Conserve the Nutrients

With Rationing and a Possible Shortage of Certain Foods, Conservation Is a "Must"

By ELFRIEDE F. BROWN

CONSERVATION is a key word on the home front these days. Every civilian is conserving rubber, home equipment, farm machinery and energy. He must latch the doors of waste.

Here is a story of another conservation "must"—the conservation of food. It's a story for homemakers who cook three square meals a day. Their job is more than one of "filling up the family." It is one of cooking available nutritious economical foods in such a way that the nutrients are retained.

And that's where the problem comes. Food nutrients have a peculiar way of escaping quickly from their original habitat—whether it be in carrots, beans or cabbage. It is important that the homemaker realize that her methods of storage and preparation may be the means of retaining or losing color, flavor, aroma, texture and, most important of all, nutritive value.

Doctors and dietitians are agreed that no class of foods suffer greater losses of food value through preparation than fresh vegetables. Yet those are the foods that most people rely upon to furnish an important share of the minerals and vitamins needed in the diet.

Vegetables are a vast storehouse of essential nutrients, but homemakers must remember that the sooner they are used after gathering the greater will be their vitamin value. Farm families with a summer vegetable garden east of the house have no summer storage problem. They can send one of the youngsters to the garden less than an hour before dinner.

During the winter months, however, the problem is not so simple. Vegetables either must come from the supply in the cellar or be purchased at the store and kept in the refrigerator. Washing the vegetables before they are stored is desirable, but soaking is undesir-

able so far as soluble nutrients are concerned.

The best storage place for fresh vegetables is a closed container in the refrigerator. There the moisture in the air is relatively high, and moisture is an aid in preserving quality. Hardy vegetables also should be kept cool, although they need not be stored in the refrigerator. Potatoes and onions like the dark.

When it comes to preparing vegetables, nutritive losses may be small or great. The losses come from discarding edible parts, from peeling, from cutting and cooking in small pieces and from improper cooking methods. No homemaker would deliberately throw away the most nutritious parts. Yet that is exactly what happens when she discards the green outer leaves of lettuce and cabbage. They are richer in vitamin A, in calcium and iron than are the bleached inside leaves. Tender green beet and turnip tops, which actually have a higher nutritive value than the roots, likewise should not be tossed away as waste.

Vegetables should be cooked in their skins whenever possible. Nature's jacket holds in the nutrients, and little or nothing will be lost. When vegetables are pared and cut up, it is advisable to leave the pieces large so fewer cut surfaces will be exposed. With less surface of vegetables directly exposed to air and water, nutritive loss will be minimized. If vegetables must be peeled, the peeling should be thin or the vegetable scraped instead of pared.

Peeling vegetables results in loss, because some of the nutrients are present in largest quantities just under the skin. Some earlybird homemakers like to get their pota-

toes peeled and carrots scraped just after they wash the separator in the morning, but they are breaking a law of conservation, for some minerals as well as the B vitamins and ascorbic acid are soluble in the soaking water.

How much food value will be lost in cooking will depend largely upon the methods used. No minerals are lost in baking, and mineral loss in frying, panning or quick sautéing is negligible. In other cookery methods, the losses of calcium, phosphorus and iron are influenced by the kind of vegetable, the amount and kind of water used in cooking, the time of cooking and the size of pieces of vegetable. If all the cooking water is served, no minerals are lost.

Leafy vegetables like spinach naturally offer a larger surface area for food loss than compact vegetables like carrots, which lose most when large amounts of water are used, and when they are cooked in small pieces or are over-cooked.

Some leafy vegetables may lose half or more of their calcium, phosphorus and iron during the cooking process. Smaller losses result when the vegetable is steamed or cooked in the pressure cooker, where cooking water is small or the time is short.

The age and quality of vegetables also affect their vitamin value. That is, tender young carrots are richer in vitamins than are old, tough ones. Crisp young snap beans have a higher vitamin value than beans that are wilted and limp. When vegetables are in the prime of condition, they probably are highest in vitamins.

In cooking vegetables, "Heat, air, water, take their toll; keep all three under control." Homemakers must seek to minimize the storage and preparation losses if they would be specialists in conserving the nutrients of victory foods.