We Burrow in Soil

For the first time since the birth of the FARM SCIENCE REPORTER last January, we are presenting a soils story. We thought you would be interested in knowing that when you get large yield increases from improving the fertility of your soil (either through the use of manure or commercial fertilizer, or both) that you are also likely to get large increases in the phosphorus content of the corn grain. Low yields apparently are associated with poor quality crops.

Dr. W. H. Pierre, head of the Agronomy Section of the Iowa Station, who is one of the authors of the soils article in this issue, has promised more about soils later.

The soils people have found that the amount of total and available phosphorus is much less in the lower soil layers than in the top ones. If rain and wind carry away the topsoil, either you must add more phosphorus or your crops are likely to suffer. There will be something about this problem in some of our future issues.

How do different crops respond to phosphate fertilizer additions? How does the depth of the topsoil layer influence the crop yield? How have alkali soils in Iowa been reacting to potash fertilizer? These questions will be discussed in coming issues.

Corn Picker Problems

Because of the increasing use of mechanical corn pickers, the Iowa Agricultural Experiment Station, in cooperation with the United States Department of Agriculture, has been experimenting extensively for more than 9 years with mechanical harvesting.

In this issue, we present some of the information derived from the experimental work carried on with mechanical pickers. The senior author, C. K. Shedd, is an agricultural engineer representing the United States Department of Agriculture. Mr. Shedd is stationed at Ames for studies of this and other agricultural engineering problems. The other author—E. V. Collins—is the man who invented the dynamometer used in horse pulling contests. He has had a hand in the development or improvement of many other farm implements.

One of the problems—largely mechanical—not yet satisfactorily solved about mechanical pickers is how to keep them from shelling a lot of the corn and leaving it strewn on the ground in the field. Mr. Shedd and Mr. Collins are working on this problem, as are many of the farm machinery manufacturers. They feel that some progress has been made. Some day a way will undoubtedly be found to prevent this large shelling loss.

Cod-Liver Oil Or—-

"Tell us about cod-liver oil, haliver oil and the vitamin D capsules that our druggists sell," farm women who have visited Iowa State College have requested. They suggested that we tell them about these various sources of vitamin D in the fall issue of FARM SCIENCE REPORTER.

The request has been fulfilled. Turn to pages 6 and 7.

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About Lard—Next Issue

In our next issue (January), according to present plans, we shall have an article about lard—a review of the vast amount of experimental work done at the Iowa Station in cooking with lard and some of the conclusions drawn from that work.

Miss Belle Lowe, who has done much of the experimental cooking, is preparing the article about lard. We have had a number of requests for such an article from farm women who are vitally interested in a satisfactory price for hogs. These women believe that lard must regain its former position, or at least slip no further, if hog prices are to be satisfactory.

Studying Muskrats

Before Iowa tilled out her sloughs and ponds, muskrats thrived in the marshy areas of the state. With most of those areas now converted to farm land and the water which once filled them flowing down the streams, most of the state's muskrats are now found along the streams.

Some farmers with cornfields adjoining the drainage ditches, creeks and rivers have been disturbed by the apparent damage which the muskrats have done to the corn. So we asked Dr. Paul L. Errington to tell us in this issue about the situation. Dr. Errington has made an intensive study of the habits, the living quarters, rate of increase and the like of muskrats as they are found now in Iowa.

FARM SCIENCE REPORTER

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Published in January, April, July and October by the Iowa Agricultural Experiment Station and the Iowa Agricultural Extension Service.

Address all communications to Farm Science Reporter, Ag Annex, Iowa State College, Ames, Iowa.


Agricultural Experiment Station, Iowa State College of Agriculture and Mechanic Arts, R. K. Buchanan, director, Ames, Iowa.
One Man with a tractor can plant and cultivate 125 acres of corn. The trouble is, he can’t husk it.

And so the farmer who husks corn by hand well knows that after his corn crop is laid by, his heaviest work on the crop is still ahead. He’s forced to put on extra help for several weeks to get his crop to the crib. Besides, if in adopting tractor farming he has disposed of most of his horses, both teams and men must be hired for the husking.

Using horses and a single-row cultivator, one man can grow 35 to 40 acres of corn. A good hand husker will sometimes harvest this acreage without additional help, but if there is much livestock to care for, extra harvesting labor may be required. With larger teams and a 2-row cultivator, one man can grow 60 acres or more of corn; about twice the amount he can husk by hand. General purpose tractors increase the amount which one man can produce to 125 acres or more.

Because of this, mechanical corn pickers have come into wide use, and they are undoubtedly here to stay. How to get the best use out of them is the problem.

Mechanical Picker Tests

We have been making extensive studies of mechanical harvesting here at the Iowa Station since 1931. This work has been done by the Agricultural Engineering Section of the Iowa Station in cooperation with the Bureau of Agricultural Chemistry and Engineering of the United States Department of Agriculture.

Out of our studies, these points seem to stand out:

1. Most corn hybrids are better adapted to mechanical harvesting than the open-pollinated varieties. Selection of a suitable hybrid has a good deal to do with the success of a mechanical picker.

2. The most successful use of mechanical pickers is early in the season. We have concluded that ordinarily one should plan to complete mechanical corn picking in October.

3. When conditions are just right, our tests show that a mechanical picker will leave no more corn in the field than will hand huskers.
But usually the losses will be considerably greater than with hand husking.

4. In our observation, when the corn is standing well, driving the picker at 3 1/2 miles per hour tends to decrease the ear loss but to slightly increase the shelled corn loss as compared to operation at slower speeds.

5. Shelled corn losses with the mechanical pickers can be kept at a minimum by selecting a suitable hybrid corn and by close adjustment of snapping rollers.

Mechanical harvesting has become of particular interest on farms growing more than 40 or 50 acres of corn. In some areas in north-central Iowa where fields are large and level, or gently rolling, a large part of the crop in recent years has been machine-harvested. With these machines, labor for harvesting may be reduced to less than one-fourth that required for hand-harvesting.

Measure Losses

But users of machine harvesters found that if they didn’t get busy at the job as early as possible the machines left a disappointing amount of the crop lying on the ground. Hand huskers generally leave but 2 to 4 percent of the crop in the field. But losses of 5 to 10 percent by machines are not unusual. And if stalks and ear shanks have been weakened or broken by storms or by extremely dry fall weather, losses may be 15 percent or more.

Losses increase as the season advances, and are likely to be excessive after the middle of November. For example, our tests showed under good conditions in 1937 the losses with a hybrid well adapted to machine harvesting were 2 percent of the yield on Oct. 28, 3.9 percent on Nov. 6 and 10.6 percent on Nov. 28. In tests last year under unfavorable conditions the losses were: Oct. 14, 7.3 percent; Oct. 20, 13.2 percent; Oct. 28, 11 percent; Nov. 6, 14.5 percent; and Nov. 15, 19 percent of the yield.

These results show that it’s well to get the corn out of the field during October, if you are using a machine.

Our tests showed that losses with Krug variety were fully twice those with the best-adapted hybrids early in the harvesting season. Shanks tend to increase shelled corn loss, and that limits the advantage to be gained from this characteristic.

“Faster” Equipment

Early studies showed that a great amount of time was taken in changing wagons at the picker. Since then wagon hitches have been improved on some of the pull-type machines so that the operator can change wagons quickly and without assistance. A telescoping wagon tongue was developed which enables the operator to couple a wagon to a mounted picker or to a tractor quickly, and without help.

On the mounted picker the wagon hitch pin is attached to a rope with which the operator can uncouple a loaded wagon without leaving his seat, and without bringing the tractor to a full stop. Attention to some of these small details will add many bushels to the total husked in a day.

In our early studies tractors and wagons traveled on steel wheels. Ordinary farm wagons of about 35 bushels capacity were used. A portable elevator was used to store the corn in temporary cribs. With this equipment it required two men to haul and crib the corn harvested by a 2-row picker. With yields of 60 to 70 bushels an acre, the total harvesting labor, including all miscellaneous labor, was 2 1/2 man-hours an acre.

Later an 8,000-bushel crib was built here at the Station experimental farm with inside truck scales and inside elevator. Tractors and wagons were mounted on pneumatic tires. Wagon boxes were changed to 70 bushels capacity. A light truck was used to pull wagons from the field to the crib. With this equipment one man hauls and cribs the corn from a 2-row picker with a half-mile haul and yields up to 80 bushels an acre.

Last year two men husked and cribbed 152 bushels of corn per...
hour. This amount was from 2.17 acres yielding 70 bushels per acre. The total harvesting labor was 0.92 man-hour an acre.

Records were taken of one man working alone. Using a 2-row mounted picker the operator coupled two wagons behind the picker when going to the field. After picking two loads he again coupled the two wagons behind the picker to tow them to the crib. In corn yielding 64.5 bushels an acre the rate of harvesting and cribbing was 1.10 acres an hour, 70.9 bushels an hour. Total harvesting labor was 0.91 man-hour per acre.

Accidents

Most operators of machine pickers can and do operate them safely, but it should be recognized that safe operation of power-driven machines requires care. The most important danger points are the snapping rollers and the husking rollers. The snapping rollers are built to take in cornstalks, and they cannot be mechanically guarded to prevent accidents in case hands or mittens are allowed to reach them. The only safe way is to keep away from the rollers while they are operating. Efforts to clear clogged rollers should not be made until the power is off.

A corn husker should have (and nearly all new machines do have) effective guards at all points where needed to prevent the operator's clothing from coming in contact with shafting, gears or other moving parts. The operator's clothing should be free from parts that might become tangled in the machinery. Overcoat tails and unbuttoned coats, dangling shoestrings, sleeves unbuttoned at the wrist and gauntlet-type gloves have led to accidents.

A wide-awake operator is safest from accidents. A man should not operate a power-driven machine when he is sick, tired or sleepy.

LEFT: (Opposite page) In some of our tests, one man with two 70-bushel wagons coupled behind a two-row picker harvested and cribbed corn yielding 64 1/2 bushels an acre at the rate of 1.1 acres, 70.9 bushels an hour. A telescoping wagon tongue was developed which enables a man to couple a wagon to a mounted picker or a tractor quickly and without assistance. The hitch pin is attached to a rope with which the operator can uncouple a loaded wagon without leaving his seat and without bringing the tractor to a stop.

RIGHT: In early tests wagons of 35-bushel capacity were used. These traveled on steel wheels, but in later years rubber-tired wagons of 70-bushel capacity, as shown here, pulled by a small truck, have speeded operation.

Very early machines were single-row, horse-drawn and the mechanism was ground-driven. One man drove a five-horse team pulling the picker and a second man drove a team pulling a wagon to receive the picked corn.
COMES NOW NOVEMBER with its bleak, brief days and the reminder that it's time to increase Little Son's summer quota of 1/3 teaspoonful cod-liver oil to a full teaspoon. Sunless days increase the need for vitamin D, and vitamin in cod-liver oil has an effect similar to the action of sun's rays on a substance under the skin.

Cod-liver oil comes in a bottle from the drug store, but it isn't a medicine—it's a food. It isn't a dosage to make people well, but a food needed, especially by infants and children, to keep them well.

Vitamin D, or the "sunshine vitamin," promotes good bone formation and therefore it prevents rickets. Crooked legs or bodies may be the result of too little vitamin D in the diet. This applies particularly to the childhood diet when bones are forming fast. Lack of sufficient vitamin D also has been found to decrease linear length of bones—bones are not only likely to be deformed, but they also do not grow to their full length.

Cod-liver oil is rich in vitamin D and although the contribution of this one vitamin is reason enough for feeding cod-liver oil to both children and adults, there are other food elements it provides. Another vitamin, A, creates healthy tissues in the respiratory and gastro-intestinal tracts. It has been found to lessen possibility of infection in these tissues. That is why taking cod-liver oil is advocated in the fall and winter particularly, because it is an aid to prevention of colds.

Cod-liver oil also contains free fatty acids necessary to nutrition. These are rather important to the infant, because it receives no fats other than milk fats. We know little about these fatty acids, except that they are necessary to health and growth.

Another contribution of cod-liver oil to the diet is iodine. Since our soil in this region does not contain iodine, this goiter-preventing food element is definitely lacking in the diet. Adults may take it through iodized salt. The child's daily teaspoonful of oil guarantees the daily quota of iodine.

Commercial brands of cod-liver oil vary in vitamin content. Most of the well-known, reliable brands, however, are now standardized to contain at least 350 to 400 units per teaspoonful. Some contain more. Since this (350–400 units) is the amount the normal child and adult should have, a teaspoonful daily is recommended for winter months.

When the vitamin content is higher, less should be given.

In the summer, instead of discontinuing the child's cod-liver oil, it is best to keep up the daily habit, cutting down the amount to 1/3 teaspoonful. Children who have rickets, and pregnant women, need more, but under a doctor's direction.

Only brands put out by reliable drug companies should be purchased. Vitamin content can vary greatly, depending on, among other things, (1) the way the fish livers are handled before and during extraction of the oil, (2) the amount and kind of food the fish have eaten, and (3) the age of the fish. Since these are things the buyer cannot control, it is important to buy the fish oil put up by a reliable firm, to insure vitamin potency or concentration of vitamins. Use the kind manufactured by a company that has a laboratory to test vitamin content.

Children can be fed too much vitamin D. That is why it is important to watch the labels for content in the oil. Too much vitamin D has been found to cause lack of appetite for other foods and to keep the child from gaining as well as he should.

There are many concentrates of fish oils and vitamins on the market. Young Donald likes his cod-liver oil—in fact he cries for it. His mother started him early and feeds it to him every day in small portions.
COD-LIVER OIL STAINS
The simplest rule for avoiding cod-liver oil stains in children's garments is to feed the oil to the child when he is completely undressed for his bath.

Once the damage is done rinse the garment (if washable) immediately in warm, soapy water. Cod-liver oil forms a stain which soon turns brown. When this has happened, use a bleach; be careful to wash and rinse the garment thoroughly so that the bleach will not injure the child's skin.

In woolens, remove cod-liver oil stains immediately with carbon tetrachloride.

Cooking With FROZEN EGG YOLKS
Now that eggs are scarce and the price is going up, some of you are probably beginning to use some of the divided eggs you put into your refrigerated lockers last spring. The thawed whites, you have found, come out exactly as they go in, but the thawed yolks may have been thick, looking somewhat like a rich, golden cold cream.

Workers at the Iowa Station have not yet discovered why the consistency of some yolks does not change while others thicken after they have been refrigerated. But they have found that the thick yolks may be used very satisfactorily by following a few simple suggestions.

Thawed yolks to be used in cakes, cookies, custards, puddings, ice cream and bread dough—recipes calling for sugar—may be mixed thoroughly with the sugar or the sugar and fat until the whole mixture is light and fluffy.

In recipes calling for a small amount of sugar such as pancakes, waffles, muffins and other hot breads, the yolks may be beaten with one tablespoonful of hot water for each yolk. If beaten long enough the yolks become almost as light as beaten whites. The amount of water used is subtracted from the total amount of liquid in the recipe.

For omelette, the yolks may be beaten with hot water before adding the beaten whites. For scrambled eggs one yolk may be mixed with one tablespoonful of milk or cream before combining with the whites. For noodles, two yolks and one tablespoonful of water will take up about three-fourths cup of flour, the standard recipe for noodles.

If you want to use most of the frozen whites for white cakes and meringue desserts, the yolks may be used alone in custards, puddings, ice creams, breads, noodles, cookies and meat and fish loaves by using two yolks for each whole egg called for in the recipe.

In case you have forgotten—1 1/4 tablespoonfuls of white and 1 tablespoonful of yolk equal 1 whole egg.
If you get large increases in corn yields from improving your soil fertility, then probably your corn grain from the unfertilized land is deficient in phosphorus. It may contain less phosphorus than your livestock and poultry need for adequate nutrition.

This is the conclusion we have reached here at the Iowa Station following a study of the influence of soil treatment on the phosphorus content of corn. In our tests, when we got large increases in corn yields from fertility improvements, then we also got rather consistently large increases in the phosphorus content of the corn kernels; when fertilizers did not greatly step up corn yields, then the "step-up" in phosphorus content of the grain was relatively small.

Phosphorus is one of the minerals most likely to be deficient in the rations of farm animals. This mineral is found in all parts of the body. With lime, it forms the chief constituent of bone. Animals fed a ration deficient in phosphorus have been found to develop bone disease. One of the early symptoms of this disease is bone chewing or the gnawing of wood. This is usually followed by poor physical condition, poor appetite, stiffness in the joints and fragile bones.

Deficiency of phosphorus in the ration may exist long before symptoms of extreme phosphorus deficiency appear. In balancing a ration for farm animals a mineral supplement containing phosphorus is often fed. If we can make our crops richer in this substance, to that degree we reduce the necessity of adding phosphorus-containing mineral supplements to the ration.

The results of our study, briefly summarized here, show that the phosphorus content of corn is often quite low and that it varies considerably when the corn is grown under different soil and climatic conditions. More than 200 samples of corn obtained from different parts of the state were analyzed for phosphorus. The lowest value found was 0.17 percent and the highest 0.38 percent. This variation was found to be due in part to differences in the fertility of the soil and in part to differences in weather conditions.

The phosphorus contents of different hybrids and of a hybrid and an open-pollinated variety grown on the same soils were quite similar, indicating that the variety is much less important than the soil fertility and weather.

Yield, Phosphorus

Many Iowa soils do not contain enough available phosphorus to produce maximum crop yields. Field experiments we have conducted on different soils in various parts of the state show that phosphorus fertilizers often bring profitable increases in crop yields. This is true even on some of our more productive soils, but it is especially true on poor or poorly managed soils.

In order to see what effect good soil management has on the phosphorus content of crops, we took a number of samples of corn from the plots of 20 experimental fields located in different parts of the state. Samples were obtained from plots that had received no soil treatment over a period of years, and some from plots that had received lime to correct acidity and also manure and phosphate fertilizers at regular intervals. Manure was used at the rate of about 2 tons per year (applied to corn) and superphosphate was applied at the rate of 120 pounds per acre to all grain crops in the rotation.

The increase in yield from the use of manure, lime and phosphorus on two fields was as much as 31 bushels per acre, and the average increase for all fields was 13 bushels (21 percent). The increase in the phosphorus content of the grain as a result of good soil treatments varied from none on fields of high fertility to as much as 38 percent on a field of low fertility. The average increase in phosphorus on all fields was 14 percent.

The graph on page 10 shows that the average phosphorus content of the corn grown on the treated soils of the 10 fields which showed the least increase in yield from soil treatment (average of 7.4 percent) was 10.8 percent; whereas the
corn on the 10 soils which gave an average increase in yield of 37.8 percent from the use of lime, manure and superphosphate showed an increased phosphorus content of 19.1 percent.

The phosphorus content of corn grown on the same soil varies in different years. We found this true in all fields studied. Table 1 shows that the corn on the untreated plot of the Storm Lake field (Webster silty clay loam) contained 0.27 percent phosphorus in 1932 but only 0.24 percent in 1938. Similar differences were obtained on the plot receiving manure and phosphate fertilizer. The corn from the untreated plot in 1932 contained nearly as much phosphorus as that from the treated plots in 1938. These and other data show that the kind of growing season may influence the phosphorus content of corn considerably. Differences due to soil treatment still persist, however, even though the actual percentage of phosphorus in the grain may vary from year to year.

Test Hybrids

During recent years many questions have been raised as to the relative merits, from the feeding standpoint, of open-pollinated and hybrid corn, and also of different hybrids. We, therefore, compared the phosphorus content of various hybrids and of open-pollinated and hybrid corn when grown on the same soils. In 1938 one-half of the plots in the experimental field at Independence were planted to Iowa Hybrid 942 and the other half to open-pollinated corn. The analyses of the corn samples from these plots showed that there was little or no difference in the phosphorus content of the hybrid and open-pollinated variety.

In order to study this problem further a number of single crosses were planted side by side on the fertility plots of the 4-year rotation at Ames in 1939. Some of the plots had not received any soil treatment for 20 years, while others had been well manured and fertilized during this period. Although the 10 different hybrids all gave higher yields and a higher phosphorus content on the well manured and phosphated plots than on the untreated plots, there was no significant difference in the phosphorus content of the different hybrids. The protein content of the corn, on the other hand, varied more with the kind of hybrid than with the fertility of the soil.

Agronomy Farm Results

At the Agronomy Farm near Ames where the experimental plots have been under different treatments for 25 years, the increase in the phosphorus content of corn from the use of lime and manure has been somewhat greater than for the average of outlying tests. The phosphorus content of the corn was about 30 percent greater on the plots receiving lime and manure than on the untreated plots in 1939. The increase in yield from the lime and manure treatment in the same experiments varied between 18 and 25 bushels per acre. The use of phosphate fertilizers on this well manured land in a good rotation gave very little increase in corn yields, and the phosphorus content of the grain from the phosphated plots was only slightly higher than from the plots receiving manure and lime. This indicates that with the large applications of manure on a relatively fertile soil, enough phosphorus was supplied to meet the needs of the crop.

The phosphorus content of the corn from some of the untreated plots at the Agronomy Farm in 1939 was quite low. Corn from one of the untreated plots contained 0.17 percent phosphorus, whereas the corn on the other untreated plots varied from 0.20 to 0.26 percent phosphorus. The corn from several of the treated plots in another rotation contained 0.34 percent phosphorus.

Because we found corn containing as little as 0.17 percent...
TABLE 1. PHOSPHORUS CONTENT AND YIELD OF CORN GROWN ON THE SAME PLOTS IN DIFFERENT YEARS.
Webster Silty Clay Loam—Storm Lake.

<table>
<thead>
<tr>
<th>Year</th>
<th>Phosphorus in grain (%)</th>
<th>Yield (bu. per A.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Untreated plot</td>
<td>Manure &amp; phosphate plot</td>
</tr>
<tr>
<td>1932</td>
<td>.27</td>
<td>.31</td>
</tr>
<tr>
<td>1938</td>
<td>.24</td>
<td>.28</td>
</tr>
<tr>
<td>Average</td>
<td>.26</td>
<td>.30</td>
</tr>
</tbody>
</table>

Manure was applied at a rate of approximately 8 tons per acre every 4 years, and 20-percent superphosphate was applied at the rate of 120 pounds per acre to all grain crops in the rotation.

TABLE 2. COMPARISON OF THE PHOSPHORUS CONTENT OF CORN AND OF RED CLOVER HAY.

<table>
<thead>
<tr>
<th>Experimental field</th>
<th>Corn grain</th>
<th>Red clover hay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Untreated plots</td>
<td>Treated* plots</td>
</tr>
<tr>
<td>Princeton field (Clinton silt loam)</td>
<td>Percent P .31</td>
<td>Percent P .36</td>
</tr>
<tr>
<td>Independence field (Carrington loam)</td>
<td>.23</td>
<td>.29</td>
</tr>
<tr>
<td>Average</td>
<td>.27</td>
<td>.33</td>
</tr>
</tbody>
</table>

* Treated plots received ground limestone, manure and superphosphate. Manure was applied at a rate of approximately 8 tons per acre every 4 years, and superphosphate was applied to all the grain crops in the rotation at the rate of 120 pounds of 20-percent superphosphate per acre.

The Princeton field was in clover in 1931 and in corn in 1932; the Independence field was in clover in 1931 and in corn in 1932.

Phosphorus and many samples with less than 0.28 percent, a farmer may wonder how these amounts compare with the amounts needed in the ration of farm animals. Animal husbandry men have studied this problem for many years, and they have come to the conclusion that for young growing cattle and for pregnant or milking cows, the ration should contain about 0.30 percent phosphorus, whereas for large fattening cattle a ration containing 0.20 percent phosphorus is satisfactory. For growing chickens, brood sows and growing pigs the minimum requirement is about 0.5 percent phosphorus. Mature or fattening animals require less than growing animals.

It is evident from these figures that corn is not a concentrated feed in regard to phosphorus, and that when fed along with low quality roughage, it will not meet the phosphorus needs of growing animals.

Corn vs. Clover Hay

The phosphorus content of hay crops is also increased as a result of good soil treatment. In fact, the increase is usually larger than with corn. Moreover, the phosphorus content of good legume hay, such as red clover or alfalfa, may be as high as that of corn grown on poor soil. This is shown in the results obtained on two experimental fields where samples of clover hay and of corn grain from the different plots were analyzed for phosphorus (see table 2). On the untreated plots the corn averaged 0.27 percent phosphorus and the red clover hay averaged 0.19 percent. On the treated plots corn averaged 0.33 percent and clover hay 0.25 percent. But note that the clover hay on the well manured and phosphated plots of the Independence Field contained a higher percentage of phosphorus than corn on the untreated plots.

Hay crops will, of course, vary considerably in phosphorus content. Grass hays are usually considerably lower in phosphorus than legume hays. If in making hay the leaves are lost, it will lower the phosphorus content, since leaves are considerably higher in phosphorus than the stems. Young plants are also much higher in phosphorus than the older plants. This means that pasture forage, when young and nutritious and grown on good soil, contains relatively high amounts of phosphorus.

GOOD SOIL TREATMENT INFLUENCES BOTH YIELD & PHOSPHORUS CONTENT OF CORN
(Summary of 20 experimental fields in different parts of the state)

GROUP I - 10 FIELDS
(increases in yields from soil treatment less than 20%)

- Average increase in yield: 7.4%
- Average increase in phosphorus: 10.8%

GROUP II - 10 FIELDS
(increases in yields from soil treatment more than 20%)

- Average increase in yield: 37.8%
- Average increase in phosphorus: 19.1%

Average increase in yield from soil treatment
Average increase in phosphorus content of corn from soil treatment
Dairy cows fed plenty of silage, properly balanced with a grain mixture, will produce just as well and keep in as good condition as those fed both alfalfa hay and silage as roughage. In other words, apparently cows do not need a dry roughage along with silage.

These are the conclusions we have reached following experiments in two different winters at the Dairy Farm of the Iowa Station.

If you find that your hay is not going to last through the season, but you have plenty of silage, then you can reduce the feeding of hay to a small amount or even if you run out, you can maintain the production of your cows if you will step up the protein content of the grain sufficiently to equal that which the cows would have got had they been fed grain, legume hay and silage.

There is no advantage to be gained in adding straw to the ration of silage and grain in order that your cows may have some dry roughage. Our experiment the second year demonstrated this.

Legume hay is not too plentiful during drought years on some dairy farms—especially tenant farms—in the Corn Belt. Many of these farms have an abundance of silage.

Because of this situation, we wanted to find out just how well dairy cows could get along, if necessary, with only silage and grain, instead of the usual silage, hay and grain ration.

Corn silage is much lower in protein than legume hay. So if corn silage entirely replaces hay, then extra protein must be supplied in the grain to make up the difference. Another problem presents itself in using corn silage as the sole roughage: Legume hays are much better supplied in minerals (calcium in particular) than corn silage. It therefore seemed wise to try adding minerals to the silage-grain ration to find out whether minerals would help.

Test Three Lots

The results which we obtained were from two trials, each lasting about 6 months. In the first trial we used three lots of cows. Each lot was made up of five cows, and the cows were carefully selected to try to eliminate differences which might occur because of age, breed,
The cows fed bone meal along with grain and silage produced more than those getting no mineral supplement.

The differences in weight gains of the three lots of cows were small but Lot III with alfalfa, silage and grain increased slightly more than the others.

**Straw Didn't Help**

A year intervened between the first and second trials because of uncontrollable circumstances. In the second trial we used two lots of cows, with five in each lot. Lot I got corn silage and a grain mixture of corn, wheat bran and soybean oilmeal. Lot II was fed exactly the same except that the cows were allowed to eat as much straw as they wished. Besides having access to their bedding, we tossed clean, bright oat and wheat straw into their mangers. In this second trial the grain mixture was supplemented in both lots by bone meal and oyster shell. One percent by weight of each of these mineral substances was added to the grain. Salt was added to the grain and was also offered free-choice the same as in the first experiment.

In this second experiment the grain mixture was: Ground corn (yellow) 4 parts, wheat bran 4 parts, soybean oilmeal 3 parts, salt 1 percent and bone meal 1 percent. The cows in both lots got all of the silage they would eat and were given enough grain to supply the necessary nutrients for maintenance and their milk flow.

The milk production of the cows getting silage as the sole roughage was 31,516 pounds milk and 1,049 pounds of butterfat for the 173 days of the test. In comparison, the cows getting straw in addition to silage and grain produced 29,725 pounds of milk and 958 pounds of fat—somewhat less than the cows getting only corn silage as roughage. Straw appeared to be of no especial value when fed along with silage.

The weights of both lots of cows increased during the trial, but those getting straw increased slightly more than the others.

Our conclusion from the two
tests is that cows fed silage, properly balanced with grain and minerals, will produce practically as well as similar cows fed hay along with silage and grain. We felt that probably the addition of bone meal in the first trial was responsible for some of the increase in milk and butterfat production over the other two lots of cows which got no mineral. The difference was small enough, however, that it might have been due to variations in the cows making up the lots and not to what they were fed.

Cows Were “Pushed”

In both of the trials no effort was made to limit the consumption of roughage, and grain was always fed in accordance with the milk production of each cow. The intention was to make the cows produce as heavily as possible on the rations used. When cows are not limited in feed, they sometimes gain in weight. In the first trial, Lot I gained a total of 43 pounds, Lot II lost 10 pounds and Lot III gained 31 pounds. Any of these changes might have been due to differences in fill and not to actual growth.

The second trial sustained the results of the first in that dry roughage is not necessary for satisfactory production and condition. At all times and in both trials, the cows which got no dry roughage appeared to be in excellent health. Their hides were pliable and their hair glossy. In both trials the milk yield was high—considerably above the average level of cows tested in the Iowa cow testing associations.

If you have a silo on your farm that provides an ample supply of silage, you need not worry much about whether you have hay or not, or just how much hay if you will supplement your silage with grain and minerals. The results which we got here at the Iowa Station are similar to those obtained in tests at the Ohio and some other stations.

**Sweet Clover Builds Best**

A comparison of the soil-building value of red clover, Hubam clover and biennial sweet clover over a period of 16 years at the Iowa Station has shown spring-plowed biennial sweet clover to be superior to red clover and Hubam as measured in yields of oats and corn.

The comparison was made in a 2-year rotation of corn and oats. One plot had no legume seeded with the oats and was used as a check against the plots in which one of the clovers was plowed under. Taking this check plot as having a 100-percent yield of corn for the 16 years, red clover had a value of 105 percent, Hubam 108 and biennial sweet clover 114.

Although the cows in the two experiments were allowed all of the silage and hay or straw they wanted, records were kept of how much was consumed by weighing it. Cows fed both silage and hay in the first experiment ate 3 pounds of silage to 1 of hay.
In the Corn

Damage in Fields Tends to Look Worse Than It Is
And to Be Less Than Value of the Muskrat Pelts

By Paul L. Errington

If you happen to be one of the Iowa farmers who in recent years has had some trouble with muskrat damage in your cornfield along a creek, dredge ditch or the like and had asked Dr. Paul L. Errington of Iowa State College to come out and look over the situation to help you, the following story might be about what he would say to you. Dr. Errington had in mind just such a situation when writing this story so that he might talk to you in a natural way.

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Editor.

You can see that muskrats have been working in this field, all right. There are ears of corn scattered along the trails on the way to the creek and more in the water. In front of that main set of burrows must be a half bushel, or so, counting old cobs and chewed up roasting ears as well as the freshly carried ripe ones. The burrow entrances are those shadows below the surface, near the places where the trails over the bank are plastered with mud.

Here, some cutting of corn plants was done about July, when the stalks were tender and tasty. Many of the outer stalks were broken by turning of the cultivator, but these—gnawed off at a slant, from a few inches to a foot above ground—were cut by muskrats. Altogether, several hundred stalks have doubtless been cut in parts of the field adjacent to the stream.

Most of the summer cutting appears to be localized and to represent the work of individuals rather than the general population, and it may be suspected that whatever raiding of the field for unripe ears occurred was also a local and an individual matter. On the other hand, almost any Iowa muskrats that are situated as these are—with corn rows extending practic-ally to the edge of the banks—may be expected to utilize the ripe ears as a chief food and to lay in a supply for cold weather.

Measuring Damage

The actual loss of corn chargeable to muskrats is hard to appraise on short notice. Figures from detailed investigations carried on in past years should, however, provide something of a yardstick for comparisons. We measured from spring to early winter, 1937, very conspicuous muskrat damage in the cornfields bordering a half mile of a Story County drainage ditch; the reduction in yield we found to be about 20 bushels. You may say that’s plenty, but it looked far greater, with one corner of a field virtually denuded for 5 or 6 rods inward.

Indeed, damage of this sort is easy to overestimate. It seldom exceeds a couple of bushels for particular fields, even for those more or less regularly visited by muskrats. Then, too, the majority of Iowa cornfields lying within convenient reach of water courses frequented by muskrats are subject to light if any foraging, and those surrounding natural marshes are not often resorted to. As a rule, these animals do not habitually leave the safety of water farther than a few rods behind them.

Wandering muskrats may, to be sure, go almost anywhere. They may live in corn shocks, under cribs, or in dry land nests or lodges constructed of dirt, weeds and cornstalks, but they rarely stay long in such places. Nevertheless, permanent quarters may be established in wet culverts and tiles in or next to cornfields, in which case a thriving family group can destroy as much corn as any muskrat family living in a stream or ditch environment.

Damage to Profit

There are measures you might take to protect your corn from the muskrats, though you are hardly suffering enough loss to justify going to much trouble. It would make a difference if they were undermining road grades or earth dams of reservoirs, and the like, but here, as on most Iowa
land, the problem isn’t really serious.

Have you considered trying a modest experiment in what could be called a form of diversified farming? The raw skins of muskrats taken in this region during the trapping seasons of late years have usually brought trappers between $0.50 and $1.00 each. On parts of the creek that you control, you should easily be able to harvest one pelt when the fur is “prime” and legally available for less than each quarter-bushel of corn lost, the latter of which might then be regarded as a small investment in “livestock” feeding. This wouldn’t make you rich, but the income from the furs could, quite conceivably, be as much as your wife gets from her fruit trees.

You wouldn’t have to do the trapping yourself. There should be a reliable trapper in the neighborhood willing to catch muskrats on shares. Or maybe your boy could do it before and after school hours. That would be a way for him to earn the camping outfit he has been teasing for. It would probably be a good idea to show him first how to set the traps so that the animals drown and hence do not suffer needlessly—and also to insist that he tend his traps on schedule and take them all up when he is through. And don’t neglect to give him a little coaching at the start on proper handling of the skins.

Suppose someone else cleans out the muskrats that grew up on your corn, or suppose the year is a poor one for the animals, or they die off or leave, or are generally too scarce (despite local concentrations) to justify an open season? What if the market price goes way down? These are possibilities you would have to accept as you do the uncertainties of many farm ventures, but you wouldn’t be risking much in this type of project.

**Good Muskrat Food**

Corn is splendid food for muskrats, and stream-side corn-
With Lights—More Eggs

By R. E. PHILLIPS

THE INSTALLATION of electricity on many Iowa farms the last few years is going to make it possible to get a lot of poultry flocks to lay during the fall and early winter months when eggs are scarce and the price highest.

Farm flocks in Iowa usually lay the fewest eggs in November when the price is highest. The most eggs then are laid in the spring months when the price is low. By proper use of lights in the laying house, this situation can be improved.

Many commercial poultrymen have told me that their laying flocks produce most satisfactorily when the hens have a 13 to 14-hour working day, and during the winter months there is no way to obtain that long a "day" without using artificial lights.

We are now conducting here at the Iowa Station an experiment to determine the optimum illumination necessary for egg production. The hens are kept in total darkness except for the period the electric lights are on. The work has not progressed far enough to make any extended report, but indications are that when hens are kept in total darkness in small pens the illumination from a 50-watt light is not sufficient for optimum egg production.

In the first trial there was little difference in the total number of eggs produced between a pen receiving 100 watts of illumination for 14 hours per day as compared to another pen receiving 200 watts of light. The control pen which received morning lights and then daylight throughout the day produced the greatest number of eggs. At least one more duplicate trial must be run before any definite conclusions can be drawn about this extreme method of lighting.

We know that when the laying hen's working day is shortened, she lays fewer eggs and eats less feed. Research work has gone further and proved that it is not the reduction in the feeding time that causes lower egg production as much as it is the absence of the rays of light which indirectly activate the reproductive organs.

One should not conclude that merely "turning on the lights" will solve the egg producing problem. How the hens are fed, watered, housed and managed in general are quite as important. But the primary cause of increased egg production from the use of artificial lights is the rays of light, while the secondary stimulus is increased or normal feed consumption.

Several methods of lighting are used. Some poultrymen prefer to use lights only in the morning. Others use only evening lights, while a third group uses a combination of both morning and evening lights. A few poultrymen are using all night lighting, but personally I think this is a dangerous management practice.

Electric lights should be suspended from the roof or ceiling so as to give the maximum amount of light on the floor and a small amount of light on the roosts. A 40 or 50-watt bulb covered by a reflector is needed for each 200 square feet of floor space.

One should start using lights for pullets in September or October and continue lighting until March. The shifting of the flocks' working hours should be done gradually. If the plan of using only morning lights is adopted the lights should be turned on about 4 a.m. and off at daylight. If a fixed time of turning the lights on has been established, no change should be made unless it is done very gradually.

If lights are not properly used, many failures will occur. One of the most common mistakes made is that the lights are not turned on each morning at the same time, and the birds go into a molt which is accompanied by a drop in egg production. Many poultrymen are solving the problem of turning the lights on regularly by connecting an alarm clock with the light switch in such a way that when the alarm goes off it throws the switch and the lights come on.