The Authors

H. J. Barre, assistant agricultural engineer, Iowa Station, and agent of the Bureau of Agricultural Chemistry and Engineering of the U. S. D. A., in this issue discusses storing the 1942 corn crop. Dr. Barre (Henry or "Hank" to many of you) has been at Ames for 12 years, the last 4 of which he has spent chiefly in studying grain storage. Henry was reared on a Kansas farm. Collaborating in this article is—

Leo E. Holman, agent of the Bureau of Agricultural Chemistry and Engineering of the U. S. D. A., who is stationed at Ames to work on grain storage. Leo served for 4 years as extension agricultural engineer at the North Dakota Agricultural College. He got his "start" on a North Dakota farm. Joining with Barre and Holman in this discussion of corn storage is—

E. A. Ellison, marketing specialist of AAA, United States Department of Agriculture, who has been working on grain storage problems since 1940. Ed Ellison operated a farm in Woodbury County for 32 years—1904 to 1936. He started with the corn-hog section of the AAA in 1933 and served as fieldman for that section from 1933 to 1937. He then became commodity loan supervisor for Iowa and served in that capacity for AAA from 1937 to 1940 when he moved to his present position.

Joseph W. Kelly in this issue discusses the use of artificial lights for your layers. Dr. Kelly came from the deep South—North Carolina and Georgia. He was reared in North Carolina and served on the poultry husbandry staff at the University of Georgia for about a year and a half before he came to Iowa State.

Frances M. Hettler, extension specialist in foods and nutrition and a once former Fayette County farm girl (probably known personally to many of you), tells us in this issue some of the possibilities of supplementing our meat supply if and when meat rationing is initiated. Joint author is—

Mary A. Burnham, assistant extension editor of Iowa State College, who "takes her bow" in this issue of the REPORTER as Home Economics Editor. Mary is a graduate of Iowa State College and comes from Baxter in Jasper County.

G. F. Sprague, agronomist of the U. S. D. A., who is stationed at Ames in charge of the corn breeding work at the Iowa Station, tells about the development and the possibilities of waxy corn taking the place of the tapioca which we once imported from the East Indies. Dr. Sprague is with the Division of Cereal Crops and Diseases, Bureau of Plant Industry. The investigation back of this article on waxy corn was cooperative between the U. S. D. A. and the Iowa Station.

R. M. Hixon has worked closely with the development of waxy corn, especially in working out tests for identifying the waxy starch and the testing of its properties. Dr. Hixon, head of the Plant Chemistry Subsection of the Iowa Station, joins with Dr. Sprague in discussing "Waxy Corn—a New Crop."

Elizabeth Peterson, extension clothing specialist at Iowa State College for the past 6 years, examines the possibilities of making our clothing last for the duration. Miss Peterson served at one time as home demonstration agent in Webster County.

CONTENTS

Cribbing This 1942 Corn......................... 3
Light up the Hen House ....................... 7
Stretching Our Meat Supply .................. 8
When Combining Beans ....................... 9
Waxy Corn—a New Crop ....................... 10
Clothes for the Duration .................... 12
Pheasants Take the Blitz .................... 14

Thomas S. Baskett, now naval officer in the U. S. Navy, worked for 3 years in wildlife research with the Iowa Station. All of that time he was studying pheasants—why they live and why they die. He tells in this issue some of the things he found out about this principal game bird of Iowa. For a few months after receiving his Ph. D. at Iowa State and before joining the navy, he served as extension specialist in wildlife here in Iowa.

"Soybean Inoculation"—It's Coming

The past season Dr. A. G. Norman of the soils staff at the Iowa Station has been digging up soybean plants here and there and prying into this problem of getting satisfactory inoculation.

In the next issue of the FARM SCIENCE REPORTER—which will be in January—he'll tell you some of the things he is finding out. With fertilizer restrictions, this problem of getting proper inoculation of legume crops is going to be ever increasingly important.

Plow Under Fertilizer?

Some of the experiment stations in recent years have been reporting that the way to get the best results in their states from fertilizers is to plow them under as you would manure.

Does that apply to Iowa? The Iowa Station soils men have been looking into that question and they'll have something to say about it in the January issue.

This whole problem of keeping up soil fertility in our " PUSH" for more and more food takes on new importance. Some of this work has been done with fertilizing soybeans, and the results of this will be reported in due time.

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Much of It May Not Keep if It Is Picked Too Soon and Isn’t Stored With Considerable Care

Some Iowa corn that is going into cribs this fall will mold unless farmers realize the situation and do something about it.

We have had more rain than usual in most parts of the state this summer and fall. Add to this the fact that we have had about four crops in a row that dried out pretty well in most of the state. As a result, many farmers have been getting larger and later hybrids that would yield just a little more.

There you have the reasons why we are in danger of some spoiled corn in cribs this fall—a wet year; strains of corn being grown that are too large and too late.

Some northern Iowa folks have been growing hybrids that were produced for southern Iowa. But in the last few years one could get almost any corn ripe anywhere in the state. This year may help us get back to strains adapted to our regions.

Our experience has given us some rather definite opinions about storing corn, ventilation, moisture in corn, crib construction and other related problems.

One of the biggest mistakes, we believe, that farmers make in corn storage is to start cribbing corn too soon. The moisture content of corn at the time it is cribbed should not be above 20 percent. Even then it should not be put into cribs wider than the recommended width for the locality. With narrower cribs and favorable drying conditions no excessive spoilage has occurred with corn cribbed at a moisture content 22 to 24 percent.

If the moisture content is down to 14 percent, or less, it can be stored safely in real wide cribs or in tight-walled cribs.

Corn will dry far faster in the field than it will in the crib. Triple A samplings of corn from all parts of the state from the time it has been sealed show that the moisture content of corn kernels actually does not drop between December and the middle of March in most years and usually goes up for a while instead of down. This is true with corn of both high and low moisture content when cribbed.

Don’t be surprised if the moisture content runs up after the corn has been in the crib for some time. Samplings which we have made here at the Iowa Station in our 5
have to get a machine when one is available. Then, too, the corn picks better with a machine early in the fall."

All of this is true and you will have to hit a compromise between picking early when the corn picks best and later when the corn has dried out more but the loss in the field is larger with machine picking. Corn which is to be fed before warm weather next spring can be picked early if weather is cool enough to prevent molding.

One must not judge the corn’s fitness this year to go into the crib by the calendar, by the date we picked it last year or even in the last 3 or 4 years. The only safe way is to keep checking the moisture by taking samples for tests until the moisture is down to where one feels reasonably sure that the corn will keep.

Where to Check

The place to take these samples in the field is not where the corn is driest, but where it is least mature. When corn in those areas reaches a safe stage, you needn’t worry about the rest. Some ears have a moisture content 10 to 15 percent higher than others, but a reliable sample usually can be secured by shelling two rows of kernels from each of 10 to 20 ears.

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Using Driveways

We had an opportunity to observe a crib of corn in North Central Iowa which was picked with probably about 24 percent of moisture. We did not have a check on the moisture content at cribbing time, but when we did check it later it ran 20 to 24 percent moisture. The percentage of damaged corn in that crib in some samples which we took during July ran as high as 85 percent.

Crib space on that farm was short, as it is on thousands of farms this year. The farmer had a double crib, the two cribs being each 8 feet wide, and there was an 8-foot driveway. Because space was short, the farmer boarded up the driveway and filled it too.

So this man was, in effect, using a crib 24 feet wide. It certainly was no economy to use the driveway and have spots in that crib with 85 percent damaged kernels.

There will be temptation this fall to use driveways of cribs. Our advice from the observation of cribs such as the one described above is, don't do it unless the corn is dry so that it will keep without ventilation (not over 14 percent) or ventilators between the driveway and the cribs are installed. The corn in those two 8-foot cribs probably would have come through all right, but when the two cribs and the driveway became a 24-foot crib, it was a different story. The corn didn't keep.

Ventilators

Many of you may be wondering about ventilators. Our studies and observation of farmers' cribs show that a ventilator will help if it is large enough and properly built. Some farmers have used with apparently good results in a rectangular crib a ventilator that runs the length of the crib and most of the way to the top. One way these ventilators have been built is to use slat cribbing to divide the crib so that you have really two cribs, each of which will be 4 or 5 feet wide instead of the 8 to 10-foot width if the crib had not been divided.

A good many round cribs have been used in recent years in our crib shortage. These almost always are greater in diameter than is safe for corn high in moisture.

On a Northwest Iowa farm we observed the successful handling of the ventilation of such a crib. This farmer had a crib 16 feet in diameter. On the floor he built a slatted wooden ventilator 12 by 16 inches across the center of the crib, each open end of the ventilator extending to the outside of the crib. In the center he built an 8-inch vertical slatted ventilator which opened at the floor into the 12 by 16-inch horizontal ventilator and extended to the top of the corn.

Corn went into this crib with 19 percent moisture. The next July a test showed the moisture had been reduced to 14.8 percent.

If that crib had merely the 8-inch vertical ventilator, the chances are that the corn would not have dried out nearly so well. The important
thing with ventilators is to make sure they are large enough and that there is a free movement of air through them. Small ones will help, but in a year when the corn is high in moisture, ventilators must be large and the air movement good.

Another type of ventilator for round cribs which we have been testing is the pressure or downdraft type. This is simply a swinging type ventilator on top of the roof connected to a large ventilating flue in the center of the crib. The ventilator always faces the wind, which makes the air go into the ventilator, into the flue, through the corn and out through the walls. Tests with fairly high moisture corn during the past two seasons show that the corn dries as well as that in a crib 8 feet wide. Tests were made with a 500 and a 1000-bushel steel crib, 14 and 18 feet in diameter.

Ventilators properly built will help, but no farmer should feel that he can put corn into the crib with say 25 percent moisture and expect it to dry out satisfactorily with ordinary ventilation. Corn driers, such as the ones with heat which hybrid corn companies use, would do the job, but few farmers can provide that kind of drying facilities.

One of the facts that few realize is that at picking time the moisture content of the cob is about twice that of the kernels, except when the corn is very dry. So if you have corn with 18 to 20 percent moisture in the grain, you can figure there is just about twice that much in the cobs, and that moisture in the cobs will increase the moisture content of the kernels. That is one of the reasons why our moisture tests show that almost invariably there is a rise in moisture content after corn is in the crib—the moisture in the cobs is absorbed by the grain.

To reduce a bushel of ear corn from 20 percent moisture to 13 percent, about 8 pounds—nearly a gallon—of water must come out. That's one reason why we can't just pick this corn when we get ready and expect ventilation to dry it out.

We have found in our tests and from AAA samplings that corn in single cribs will dry faster than in double cribs. That's because there is more free movement of air around and through the corn. So, if you have a double crib, keep the doors at the ends of the driveway open on good drying days when there is a good wind and low humidity.

**Move Elevator Spout**

Another thing that makes some difference in the way corn dries out is the way it is put into the cribs. That is, if the shelled corn and husks are dropped in one spot by the elevator and the corn is high in moisture, you can look for a moldy spot there.

Generally there is no trouble with husks and shelled corn piling in one spot where corn is hand picked and shoveled into a crib. The trouble comes with machine picking and an elevator if care is not used in moving the spout about the crib.

Now if the corn is cribbed with too high moisture content, what shall you do? Check the condition of the corn by taking samples once a month with an ear corn probe from different locations in the crib. If the samples show considerable spoilage the only alternative is to turn it. Get the corn out of the crib, sort out the worst ears, and recrib or dispose of it.

This sounds like a lot of hard work, and it is. But after all it's better than to have a crib spoil. The AAA followed that kind of procedure with a good many cribs in Northeastern Iowa in the spring of 1941. The 1940 crop in that region went into the cribs with a lot of moisture and it had to be turned in the spring to save it.

**Ventilator Tests**

Going back to ventilators, you may be interested in some studies we made in cooperation with the Illinois Station in 1937 and 1938. We had four 8-foot cribs, three with a 240-bushel capacity and one held 230. The corn put into these in late October, 1937, had from about 27 1/2 to a little over 28 percent moisture.

Corn was cribbed with too much moisture for successful storage and was removed in March to prevent complete spoilage. However, the tests show the effect of ventilation.

One of the four cribs was slatted with cribbing to the top, another was slatted one-fourth of the way up, and the other two were slatted one-half their height. One of the two slatted half way up also had an A-type ventilator extending the length of the crib and nearly half the height. Corn in this crib lost about 1 1/2 percent more moisture than corn in the identical crib which had no ventilator.

The moisture content dropped from 28 percent in October to about 21 percent in March in the crib slatted all the way up; that in the crib slatted a fourth of the way up dropped from 27.4 percent to 24.4 percent; the corn in the crib with the ventilator came down from 27.6 percent to about 21 1/2 percent; and the corn in the crib slatted half way up but with no ventilator was decreased from about 28 percent to 22 1/2 percent. So the ventilator did help, but the corn still was not as dry as that in the crib which had cribbing its full height but no ventilator.

The damaged corn in October

(Continued on page 9)
LIGHT UP the HEN HOUSE

IF I USE lights in the hen house will I get more eggs? That question is being pondered by a lot of Iowa farm folk. Most of them have more layers than in past years. They want to make them produce badly needed food to aid the Food for Freedom war effort as well as to boost the family income.

Using lights is likely to increase the production of eggs during the fall and winter, but you'll probably get fewer eggs in the spring and summer. Experimental work carried on in numerous states indicates that the total production for the year is no greater when lights are used on layers—the fall and winter production is merely increased at the expense of spring and summer eggs, which are lowest in price.

Probable one of the most significant reports on the use of lights comes from the Oklahoma Station. After a 10-year study with all-night lights, Oklahoma reported:

10 Years’ Results

1. All-night lights did not increase or decrease the annual production of eggs by pullets or hens.
2. Artificial lights increased the percentage of eggs produced during November and December in every year of the 10 except one.
3. Hens and pullets under all-night lights laid fewer eggs in March, April and May than similar layers that didn't have lights.
4. A greater response was obtained in October, November and December with yearling hens than with pullets or older hens.
5. All-night lights may be beneficial during hot weather (July, August and September) but the results secured are not conclusive.
6. All-night lights did not decrease the hatchability of the eggs or cause any increase in death loss.
7. The amount of feed eaten was about the same by the birds under lights as by similar ones getting no artificial light.

(Continued on page 15)
MEATLESS DAYS and rationing may be "just around the corner," but they need be no hardship for the American homemaker. Her only question will be "What alternates will supply the same food value as meat?"

Actually, the 2½ pound ration proposed for Americans is two and one-half times as large as the weekly ration in England and is about the same as the average amount consumed by Americans during the last 10 years. In comparison to Germany’s ¾ pound ration, Holland’s ½ pound and Italy’s ¼ pound, even England’s 1 pound allowance looks large.

So one has no reason to get panickey over meat rationing. We can still all have meat, and we should continue to use all we are allowed. There is no patriotism in deciding to drop meat entirely, or nearly so, from our diets. We need the meat; farmers need the market. Not nearly all of our meat can or will be used by the armed forces and our allies. Meat

By FRANCES M. HETTLER
and MARY A. BURNHAM

rationing seems to mean only that some of us may not always be able to get as much meat as we are accustomed to eating and we may not be able to buy just the cuts we should like. But there will be meat.

In European countries unrationed poultry and fish are virtually unobtainable for the average individual because of their prohibitive prices. Poultry in this country is more plentiful than ever before, and Iowa is the top poultry-producing state. Chicken is one meat it’s patriotic to serve—at least once a week—and it will save on the weekly ration. Poultry prices are higher than those of most meats, but when a food is rationed, it sometimes becomes necessary to buy another product at higher cost.

One reason for rationing meat is to assure an adequate supply for the armed forces of the United States and for lend-lease. Men in uniform consume an average of 300 pounds a year or almost a pound a day. The nature of their activity demands that they be given a hearty, filling diet. To be the best army in the world they must be the best-fed army in the world, and the same is true of the other branches of service.

While rationing may change the eating habits of Americans temporarily, it also may give the homemaker an opportunity to experiment with a casserole, salad or vegetable plate she has been wanting to try. Most families eat what is set before them, so it is up to the American homemaker to see that her family is well fed despite rationing and to use her ingenuity to vary wartime meals.

Meat alternates are numerous. It might be interesting to see just how many other foods contain the same nutrients as meat. Nutritionally speaking, meat is high in protein, the food element which provides building materials for new body tissues for children and re-
intake of calcium.

The third animal protein which may be used as a meat alternate also is patiotic, in view of the fact that Iowa is the top poultry-producing state and increased egg production is being encouraged. The recommended egg-a-day can profitably be increased by using eggs alone, as meat alternates or in other dishes. Besides the other food value in eggs, the iron content is 100 percent usable by the body—and that's more than is true even of such recognized sources of iron as liver and beans.

The iron content is not the only reason beans are suggested as meat alternates, for navy and lima beans, as well as dried peas and soybeans, are sources of protein. Soybeans may be used more and more as transportation facilities are used for carrying vital war goods. Although the proteins in these vegetables are incomplete, they might be combined with a little meat—like salt pork in baked beans—as a satisfactory alternate for meat.

It may be a good idea anyway, from a flavor standpoint, to use meat with vegetables and in casseroles. Stews, combining meat and vegetables, or a pot roast with the vegetables cooked around the meat, also provide variety in the limited-meat diet. The vegetables cooked around meat absorb some of the flavor and help to satisfy the desire for meat.

Another advantage of combinations of meats with vegetables is the fact that smaller quantities of higher grade cuts—prime and choice—will be available. Economy of good and common grades is greater due to fewer trimmings and less fat. These serve as well for combining with other foods as the higher grades and have just as much food value. A nutritious combination that also stretches the meat supply is the use of whole cereals with meat in loaves. Wild or brown rice, for instance, can be used in meat loaf. The loaf may be baked in an angel food cake pan, then turned upside down and its center filled with vegetables. Rice contains proteins that are of good nutritional quality. Although it is more expensive than other cereals, rationing and shortages sometimes necessitate use of less economical products.

Whole cereals are a good source of protein and may become more and more important as the war continues and transportation facilities are required for moving troops and vital war materials. The proteins of whole cereals are not as good nutritionally as animal proteins, so milk and other animal proteins should be used generously with them. They are rich sources of vitamin B1 and some minerals.

CRIBBING THIS 1942 CORN

(Continued from page 6)

when the corn went into the cribs ran from about 2 to nearly 4 percent. The next March, that in the crib with no ventilator and with cribbing only a fourth its height had 22.2 percent of damaged corn as compared with 10.7 percent in the crib slatted half way up and with the ventilator. The crib slatted its full height had only 5.4 percent of damaged corn in March.

Our Food for Freedom production program is closely tied to this business of having good corn in sufficient amount for feed. We cannot afford to take chances of its spoiling. We must make sure that corn isn't cribbed until it is ready even if some has to stay out part of the winter.

When Combining Beans

Mature, dry soybeans are easily knocked from the pods, but because they often do not ripen uniformly, or owing to adverse weather, some threshing action is needed. But soybeans tend to crack as a result of the action of the cylinder, and therefore the threshing action should not be too severe.

The speed of the cylinder should be reduced to about half that used for other grains. On most combines the cylinder speed is reduced by varying the size of the cylinder and drive pulleys, and, in some cases, by interchanging the cylinder and drive pulley.

Never reduce the speed of the cylinder by throttling down the tractor engine for this reduces the speed of the entire combine.

After the cylinder speed has been reduced, the concaves should be adjusted to produce the desired threshing action.
When Japan took the Netherlands East Indies, we not only lost our main supply of rubber and tin, but also our tapioca starch. "So what?" you may wonder. "Can't we get along without tapioca pudding?" We can, but most of the tapioca starch we imported wasn't for pudding—it was used in the manufacture of gums, mucilages, adhesives, wood glues and for cloth and paper sizings. We need that kind of starch and we have been importing about 350 million pounds each year.

Perhaps the most promising substitute is the cornstarch made from waxy corn. Waxy corn isn't exactly a new crop—the United States Department of Agriculture got its first sample of it in 1908 from a missionary in China. It is rather unlikely that waxy corn will be the sole substitute for tapioca starch. Sweet potato starch can replace tapioca starch for some purposes and a considerable quantity of waxy sorghums will be milled in 1942. Waxy types are also known in barley, millet and rice. It is not possible at this time to predict the relative importance of the several waxy cereals in replacing tapioca starch.

If waxy corn were used to supply all markets formerly met by tapioca, it would require more than 10 million bushels of this corn annually. The price of tapioca starch varies with the grade. Since 1930 the price of tapioca flour, the cheapest grade of such starch, has been consistently around one-half cent a pound less than that of cornstarch.

Of course, for a nation that produces more than 2 billion bushels of corn annually and Iowa with crops of over 500 million bushels, obviously this new crop cannot be used profitably by many farmers. But for a limited number it may pay well because the substitute for tapioca is needed badly.

In 1936 small quantities of flint, flour, dent, pop, sweet and waxy corn were milled and studies made of the resulting starches. Their physical characteristics were quite similar, except for the waxy starch which closely resembled tapioca rather than ordinary cornstarch. Pastes of waxy starch are viscous and relatively transparent in appearance. Upon standing they do not set to a stiff gel, as will other unmodified starches. Added to these interesting properties is the attractive possibility that hybrid waxy corn would provide starches of greater uniformity and ease of standardization than imported tapioca starch.

Although waxy corn has been known for many years, it has always been grown on a very limited scale. The plants of waxy corn cannot be distinguished from ordinary corn. Ears of waxy corn appear to be somewhat more starchy than ordinary corn. The only safe way to distinguish between the two types, however, is by staining. Ordinary cornstarch stains blue with iodine solution, whereas waxy cornstarch stains a reddish brown.

Dr. G. N. Collins of the U.S.D.A. made a special study of the waxy character and in 1909 reported that it was inherited as a simple genetic recessive. For a number of years this character was used extensively by those interested in inheritance problems in corn. In 1926 Brink and Abegg of the Wisconsin station reported that normal and waxy cornstarch had different physical properties.

On the basis of actual tests carried out by several manufacturers of adhesives, paper sizings and food products, it was apparent that waxy starch could be substituted...
for tapioca in most of its important industrial uses. Before waxy corn could compete as a starch source, however, it was necessary to develop strains with better yielding ability. The waxy strains used by the geneticist were low in yield and had small seeds which were often red or blue in color. Rather than attempt to develop satisfactory inbred lines from such material, it was decided to introduce the waxy character into some of our standard lines by means of backcrossing. The majority of this work was done by Dr. Merle T. Jenkins of the U. S. Department of Agriculture.

Each of the four inbred lines involved in Iowa 939 were crossed with a waxy strain. The resulting hybrid was then crossed back to the original inbred line. Back-crossing to the original line was continued through seven or more generations. Tests were made in each backcrossed generation to insure holding the waxy character. The waxy character was thus freed from most of the undesirable characteristics of the original stock and then reisolated by selfing.

These recovered waxy lines can't be distinguished in the field from the original lines. A limited number of yield comparisons involving Iowa 939 and waxy 939 have indicated that the waxy type is about 10 percent lower in yield. A number of additional inbred lines are now being converted to waxy. With this newer material it may be possible to produce high yielding waxy hybrids.

In November, 1941, when it became apparent that there would be no further imports of tapioca starch, it was decided to increase the existing waxy corn stocks as rapidly as possible to relieve the shortage. Only 335 seeds of one waxy single cross and 3800 seeds of another were then available.

A part of this seed was planted in the greenhouse at Ames to produce a “winter” crop of seed and the rest was grown by Dr. Merle T. Jenkins in the greenhouse at Beltsville, Maryland. The increase from these 4,135 seeds we have used at the Iowa Station this year to plant a 20-acre double crossing plot, and 19 acres are being grown for increase under isolation to produce advanced generation seed stocks.

Assuming normal yields in 1942 and 1943, sufficient double-cross waxy hybrid seed can be available by 1944 to plant the entire acreage required to produce the 350 million pounds of waxy starch necessary to replace completely the tapioca starch previously imported.

The commercial plantings of waxy corn in 1942, totaling 326 acres, were made from advanced generation seed of a double-cross. The use of such seed is normally discouraged because of its decreased yielding ability, but now it is necessary to produce the largest amount of seed in the shortest period of time. The increase from the 1942 commercial plantings will provide the first milling test of waxy corn on a commercial scale. The 1943 commercial plantings will be made in part from first generation double-crossed seed and in part from advanced generation seed. The production of waxy corn on a commercial scale will present some new problems. Since the waxy characteristic is inherited as a simple recessive and is masked by pollen from normal plants, it will be necessary for fields to be semi-isolated from other corn. If this is not done the resulting crop may be so badly contaminated with pollen from other corn that the peculiar starch properties will be lost. Care will also be necessary to avoid mixing with ordinary corn in the crib, elevator or in transit.

Just as waxy corn-starch has special properties which make it satisfactory for certain purposes, so does ordinary corn-starch have certain special properties and uses. A mixture of unknown proportions of these two types could well be useless from the starch consumers' standpoint. To avoid any difficulties arising from these two types of mixtures it seems likely that waxy corn will be produced under contract in restricted localities.

Until we have more knowledge concerning isolation and production problems, our waxy corn stocks will not be released for general production.

When one speaks of 350 million pounds of starch it is an impressive-sounding figure. When this is converted to the acreage required to produce this amount of starch, however, the figure is much less impressive, because it will require roughly only 300,000 acres. This acreage estimate is based on the assumptions of a yield of 40 bushels per acre and 30 pounds of starch per bushel.

The extent to which waxy corn-starch will replace tapioca remains to be determined. However, from the natural increase of stocks now available we shall be able to satisfy any reasonable demand by 1944.
These are days when nothing can be wasted. Materials are scarce, time is precious, and energy is at a premium. Every member of every family must cooperate if rationing of clothing is to be avoided.

To know where the next new dress or suit is coming from may be a question before the war is over, so every effort to conserve present supplies may put off rationing that much longer. Clothing manufacturers, in cooperation with the government, are doing their part to make materials go as far as possible, but civilian cooperation also is necessary.

Families will want to take stock of their clothing—in the closet, tucked high on a shelf or safely stored away in grandmother’s trunk in the attic. There may be numerous garments laid away because they had “good material” but were no longer in style or had damaged places. Maybe the homemaker didn’t have time to make them over or repair them.

With the clothing collected, however, the job is just begun. Each garment must be examined thoroughly for damage—tears, ripped seams and moth holes. If it is found in good condition, it is ready to be studied for wearability.

Nothing should be thrown away. Some of the clothing may be so badly worn or may be unsuitable to members of the family so that it would be unprofitable to make it over. But it might be good for several months’ wear for someone else. These are the kinds of things salvage committees and welfare organizations are looking for.

Any number of uses may be made of clothing. Dresses may not be dresses, and suits may not be suits when “Conservation Days” are over, but all those old garments will be doing someone some good. Maybe there’s a good zipper, some buttons or other fastenings in an otherwise useless garment; fastenings are precious these days and worth salvaging. Mother’s dresses and suits may be suitable to make over for one of the girls in the family; dad’s suits may make lovely suits for mother or the girls, or even for little Johnny, and mother’s fall coat may make a fine coat or snow suit for a younger member of the family. Worn spots can be taken out in these remaking and remodeling processes, and the resulting garment may look like new.

But that’s not all. Those old wool socks of dad’s may be all gone except the tops, which will make perfect wristlets for the snow suit. The black may be a little green with age, but mother needs only to buy the right kind of dye, and the snow suit will look like one from Fifth Avenue!

Sister may forget, in her desire to be helpful, that the texture of dad’s suit is too coarse and heavy for Sue or Johnny, and mother may suggest that she make the suit over for herself. Mother will caution her to rip the suit—or anything else she may be working on—carefully before it is washed so that stitching and pleating marks will be removed before she starts to remake it.

Clothing need not be worn out before it’s repaired. Retreading the seats of men’s trousers will lengthen their life just as surely as retreading tires makes them good for another 1,000 miles. It isn’t hard to do, either, for all that’s necessary is to tack lining material in to reinforce the seat, knee, or elbow. This may well be done when the suit is new and should surely be done when it begins to show wear.

Fireproofing also may be done at home to protect clothing and lessen fire hazards. A simple homemade solution may be used to wash dresses and ironing board covers or to spray into coats and rugs. Here’s the formula for the fireproofing solution:

- Borax 7 ounces
- Boric acid 3 ounces
- Water (hot) 2 quarts

No elaborate equipment is necessary for fireproofing, and it does not affect the appearance of the garment. This mixture of boric acid and borax with water not only
Mother stands ready to lend a helping hand as "Sister" measures the water for making the fireproofing solution.

fireproofs fabrics but also prolongs their serviceable life.

If powdered boric acid is used, dissolve it by first making a paste with a small quantity of hot water. If allowed to stand, this borate solution usually will become cloudy and sometimes jellylike, but warming will quickly restore it to its original condition.

The method of treating the fabric with the solution depends on its washability.

For washables—dip into the solution, squeeze through a clothes wringer or by hand and hang up to dry (the fabric being treated should be dry or it will not absorb enough of the solution to make it fireproof).

Instead of being dipped, washables may be sprinkled with the solution just before ironing. More dampening is necessary than for sprinkling with water.

For non-washables—(rugs, drapes etc.) hang the fabric over the clothesline and spray the solution on; let it hang until dry. A common garden sprayer can be used.

For new fabrics that are heavily sized and water-resistant, use soap in the solution as a wetting agent.

To check the success of the method used, treat scraps of the fabric and test the fire resistance after drying.

Fireproofing is removed by laundering and rain, so the fabric should be treated again after each washing.

Mother and dad have another job if they expect the youngsters to hang up their clothes—and that's to put rods and hangers within easy reach of the little folks. They can't be blamed for throwing their clothing at the hangers or just dropping it where they step out of it if the hangers are high above their heads, not in easy reach.

Another responsibility mother and dad must assume is buying good quality clothing in the first place. It need not necessarily be expensive but should be of good quality. It takes as many men, as much machinery and as much freight-car space to ship goods of inferior quality as those of good quality.

Buying will create another problem this fall when new materials appear on the market. The homemaker will find it more important than ever to read labels if she is to know what kind of material she is getting and whether it is completely shrunk and dyes are fast.

Because military demands are met first, supplies of cotton and wool will be sufficient only to meet absolute needs of civilians. Rayon is being used more than ever before, and new synthetic fibers are being manufactured to help supply the civilian demand.

Blended fibers—rayon with wool, cotton and aralac with wool—will become more common as wool supplies are reduced. The more blended fibers and new alternates on the market, the more informative labeling will be needed.

Ready-made clothing from now on will be made according to government specifications designed to make materials go as far as possible. Homemakers who use patterns in their home construction of clothing will find that they, too, conform to the government's 'material-stretching' regulations—regulations which limit the fullness of skirts and sleeves, length of skirts and jackets and width of hems, collars, belts.

Suit at the left has patch pockets of wool, 26 1/2-inch jacket, a skirt 76 inches around the bottom; deep front and back pleats. The same suit with War Production Board regulations applied has a jacket 24 1/2 inches long, a gored skirt 58 1/2 inches around the bottom and patch pockets simulated by means of stitching.
Pheasants Take the BLITZ

IF TWO out of every five of their nests are successful, pheasants have had an extremely favorable spring and summer. Only a third to a fourth of the nests customarily hatch. And out of the nests that succeed, an average of five of the little pheasants die before they reach shooting age.

These were facts we found in a study in Winnebago County in 1939, 1940 and 1941.

Why do so few nests hatch? Man is responsible for much of this loss, chiefly through farming operations. In this intensively-farmed area of northern Iowa, we found the nests distributed roughly as follows: In hayfields, one-third to one-half; fence rows, one-tenth to one-fourth; small grain fields, one-fifth; road ditches, one-tenth; in other areas, one-fifth or less.

Nesting in all other types of cover except fence rows is affected directly by farming operations. Even in fence rows nests are sometimes destroyed by the turning farm machinery, or the female pheasant may desert the nest after being flushed by men, machinery or horses.

Many nests are plowed up or disked early in the spring, and some destroyed during the cutting of small grain. The principal damage, however, is during haying operations, we found. Mowing, raking and loading form a triple threat against pheasant nests, and many are destroyed.

In mowing, eggs are often broken, pheasant hens are injured or killed and chicks cut to pieces. Injuries to hens arise from their reluctance to flush while incubating. Often their legs or heads are clipped off.

Even if the hen isn't injured, a nest exposed by mowing has little chance for success. Desertion often follows if the hen is flushed, and the predation (stealing of eggs and young) rate on exposed nests is high. If the hen escapes injury during mowing, the nest may be trampled or crushed during the raking and loading of the hay.

Losses of nests in hayfields are of great importance to pheasant production, since hay land harbors such a high proportion of nests. Unfortunately, this waste is usually unavoidable, because the farmer doesn't know where the nests are before he mows. Means of preventing some destruction of pheasant nests are: Remove smashed eggs if there are few; cover the nest with a little hay to protect the eggs from sunlight and from easy view of predators—cats, skunks, wea-

By THOMAS S. BASKETT

She lost a leg because she was faithful to her nest and was caught by the mower.
Picture at the extreme left (opposite page) shows pheasant hen nesting. In the scene next to it you see what happens when a nest is mowed over just after it has hatched out. All but three of the chicks were killed and the foot of the pheasant hen was amputated and fell into the nest.

sels, crows, etc.; and mark the nests carefully so that they will not be disturbed during other haying operations.

Nests whose locations are known before the mowing have a slightly better chance if “islands” of uncut hay are left around them. If the whereabouts of a brood of young chicks is known, raising the bar slightly in their vicinity may save them.

Predation causes failure of many pheasant nests, especially the earlier ones. In Winnebago County, the principal egg-eaters are crows, skunks, cats and weasels.

Crows commit the most robberies, but their activities are most pronounced on early nests in poor cover and nests exposed by mowing and harvesting. Thus, many of these nests would have little chance of success even if the crows left them alone.

Depredations by cats are not common, but cause serious losses, for the cats often kill the hens on their nests. Killing stray cats and known egg-eaters are sound measures.

Considering the heavy losses of nests, one might wonder how there can possibly be so many pheasants in northern Iowa. The answer is that it doesn’t take very many successful nests to produce lots of young birds.

In 1939 an average of six chicks from each successful nest studied reached shooting age, and in 1940 this average was only slightly lower. Fifteen successful nests to a square mile produced about 90 shootable young to that square mile in 1939.

Another factor which has helped the pheasants stage a comeback since the hard winter of 1935-36 is the tendency for females to re-nest until they have brought off a successful brood. In a favorable year some 60 to 80 percent of the females, through repeated trials, are able to produce a brood. This habit accounts for most of the late nests and broods. It isn’t likely that pheasants have second broods regularly.

Early clutches are larger than late ones, and chicks hatched early are likely to be heavier at hunting time than younger chicks. Thus, saving early nests has some advantages.

A method of providing nesting cover all through the spring and summer is to leave undisturbed areas of sweet clover which were planted with a small grain nurse crop the year before.

A few birds banded early in the fall in Winnebago County were shot, all within a half-mile of the place of banding. So it is likely that in northern Iowa a farmer has a chance to shoot at the pheasants which were produced on his farm.

LIGHT UP THE HEN HOUSE
(Continued from page 7)

The theory advanced when artificial lights were first used on hens was that the lights caused the hens to lay more eggs because it gave them a longer working day and they, therefore, ate more feed. Later, experiment station workers began to conclude that the reason lights stepped up fall and early winter egg production was because of the stimulating effect of the lights on the pituitary gland— which, in turn, stimulate the reproductive processes. With the reproductive processes stepped up, the layer eats more feed to keep in pace with her increased egg production.

General Rules

Here are some general rules for the use of artificial lights which may be helpful:

1. Group the birds in pens according to age—pullets together, older hens in another pen. If possible, some grouping should be done according to the condition of the birds.

2. A MUST is to keep an adequate supply of mash and water before the birds at all times that the lights are on.

3. Good body weight must be maintained if a winter molt and a consequent slump in production are to be avoided; feed grain liberally.

4. Be regular with the lights. You can’t turn them on at 4 one
morning, 6 the next and expect good results.

5. Artificial lights may be discontinued when the normal length of the day is about 13 hours. This will be around April 1 in Iowa.

In normal times in Iowa the highest prices for eggs are during November and December when farmers get the fewest eggs. Whether price ceilings in these war times will change this picture temporarily is questionable at the fall and early winter than in the spring months.

Though we have not done a great deal of experimental work here at the Iowa Station with artificial lights for layers, Ohio, Kansas, Oklahoma and New York, in particular, have done considerable, as have other stations. A study of this work shows other benefits from lights in addition to those listed above from the work at Oklahoma.

Other Benefits

Using lights in the late summer and early fall may help reduce the amount of winter molt among yearling and older hens. Lights may hasten the development of late-hatched and slow-maturing pullets.

Even “cull” pullets may be stimulated to produce well for a few months by the use of lights, and by culling out these birds when they stop laying they can be made to pay their way. By holding them off the early fall market, these cull pullets usually will bring a better price when sold.

Lights have a definite place in management of breeding stock, too. The late fall molt can be shortened by turning the lights on about the middle of December. This should bring the birds back about the middle of December. Light may hasten the development of pullets.

How much light is needed? For morning or evening or morning and evening lights, use 40 to 50 watt bulbs with 14 to 16-inch reflectors, and provide one bulb and reflector for each 200 square feet of floor space. The lights are suspended above the floor so that the roosts are well lighted. The height of lights from the floor varies from 4 to 6 feet, depending on the type of roosts used. The feed hoppers and water vessels should be placed under the lights.

In the accompanying table is a schedule for turning on lights for Iowa, where only morning lights are used.

SCHEDULE FOR TURNING ON MORNING LIGHTS IN IOWA

<table>
<thead>
<tr>
<th></th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
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</table>
| Time     | 4:00 a.m.| 4:15 a.m.| 4:30 a.m.
| 25-30    |         |         |
| 20-25    |         |         |
| 15-20    |         |         |
| 10-15    |         |         |

Better Oats Coming

Approximately 11,000 oat selections were grown at the Iowa Station, Ames, last year in search for strains with higher yields and greater rust resistance than the Tama, Boone and Marion varieties.

The new rust-resistant varieties, Boone, Marion and Tama, had an average yield of 51.5 bushels at Kanawha in comparison with an average yield of 38 bushels for three older varieties, Gopher, Richland (Iowa 105) and Iowa 103.