Our Questions---Your Answers

Those of you who got the questionnaire concerning the FARM SCIENCE REPORTER (5,000 on the mailing list got questionnaires and over 1,500 returned them) may wonder whether or not there are to be changes as a result of our questions and your answers.

The majority seemed to favor leaving the magazine pretty much as it has been in the past issues. For example, of the 1,585 who returned questionnaires, 691 asked for more short, condensed articles, but 922 wanted the present balance of short and long articles continued; only 62 asked for more long articles.

The one outstanding exception to the present arrangement appeared to be whether it was easier to get information out of tables or written discussions. There were 698 who thought it easier to get it out of tables, as against 513 who thought it easier to get it out of a written discussion and 374 who thought there was no important difference between the two.

And so—you'll probably have more tables in the future.

Introducing the Authors---

Bruce M. Kilpatrick, former county agent of Mills County, is extension soils specialist at Iowa State College. He's conducted many demonstrations with fertilizers in past years in Iowa. Dr. Eugene G. McKibben is professor of agricultural engineering at Iowa State; Dr. J. B. Davidson founded and is head of the Agricultural Engineering Department at Iowa State College.

Dr. H. H. Plagge is research assistant professor of horticulture of the Iowa Station. Miss Carolyn Cason is instructor in Institution Management at Iowa State College. Dr. C. P. Wilkie is research associate professor in the Agronomy Section of the Iowa Station; E. S. Dyas is extension specialist in farm crops at Iowa State College; Dr. C. Y. Cannon heads the dairy household work at Iowa State College and the Iowa Station.

More About Civets and Rats

So interested was one gentleman after reading the article in the last issue by Mr. Crabb on assistance of civet cats in controlling rats that he asked where he might buy a pair of civets! We didn't know where he could purchase any, but Mr. Crabb told him how he might try trapping some in the same way he has—how to build the kind of trap that won't hurt the civet. Portion of letters from two others about civets follow.—Editor.

Farm Science Reporter, R.1 North Box 20
Ag Annex
Stanton, Iowa
Feb. 26, 1941

Dear Sirs: Enclosed find card signed, and thank you. The article on civet cats and their usefulness as exterminator of rats and pests has been a long time coming up. I have known that the civet is a good worker after observation long ago. We had a bad rat infestation about 18 years ago here, and the writer went after the rats with rifle and flashlight, after finding poison not any too sure. Rats have keen intuition, and will taste poison several nights, just to see what it feels like, I suppose, or the after effects, rather. They have more sense than some humans, and anything that has a "bad" after effect, they will invariably lay off. But with the rifle, and a good 7 cell flashlight, I shot 1,800 rats in 3 months of Dec., Jan., and Feb., layed them all on the hayrack, and it made quite a load.

Rats are attracted by the light, and their eyes reflect back green, so make an easy target. It was dur-
High-Lime Spots Can Be Improved by Sweet Clover, Drainage and Applying Fertilizers

IOWA'S high-lime or so-called alkali soils, which are a problem on many farms in 31 counties in the central part of northern Iowa, will produce as well as the other soils of the farm if they are handled right.

This is the conclusion we have reached at Iowa State College after more than 15 years of experimenting by the Iowa Station and numerous demonstrations conducted by the Extension Service and county agents, combined with the experience of many farmers.

Here are the steps you need to take if you have high-lime soils (These high-lime areas are commonly referred to by farmers as “alkali” or “hot” because of the burning effects crops show which grow on them.):

1. Make sure the ground is thoroughly drained. The tile must be adequate and have good outlets.
2. Grow sweet clover in a short rotation (such as corn, oats, clover) and allow the sweet clover to stand through the second season so that its deep roots can open up the soil and allow some of the excess lime to work out. (Another thing the sweet clover will do—it seems able to get the potash out of high-lime soils much better than other crops and will thus make more of it available to other crops which follow.)
3. Use potash or a phosphate-potash fertilizer on the land.

Here are our recommendations for applying fertilizers to these soils for various crops:

**Corn:** If the soil in more than half the field is very alkaline, apply 0-20-20 or 0-9-27 over the entire field at corn planting time with a fertilizer attachment on the corn planter at the rate of 100 to 125 pounds per acre, or you can broadcast 200 pounds per acre before planting. If the soil in more than half the field is slightly alkaline, then substitute 0-20-10 for 0-20-20.

If less than half of the field consists of small, high-lime areas, we recommend the following methods:

1. Apply 100 pounds of 0-0-50 per acre with cultivator or planter attachment on the high-lime spots, or
2. Broadcast 200 pounds of muriate of potash (0-0-50) per acre on the high-lime spots.

In addition it may be desirable on some fields where 0-0-50 is applied on the high-lime spots to apply 0-20-10 over the entire field at 100 pounds per acre with planter attachment.

**Small grain, soybeans, legumes:**

1. Where less than half the field is alkaline, broadcast 0-0-50 on high-lime spots or areas at the rate of 200 pounds per acre, or 0-9-27 at the rate of 350 pounds per acre.
2. If more than half of the field is alkaline, broadcast over the entire field 100 pounds of 0-0-50 per acre, or about 200 to 250 pounds of 0-20-20 or 0-9-27 per acre.

The problem of making these high-lime soils productive is more or less a continuous one. That is, tiling and growing sweet clover on the land 1 year does not solve the problem for all time. Applying potash or a combination of phosphate-potash fertilizer, in addition to drainage and growing sweet clover, will not bring about a final solution. The tile and the sweet clover are to some degree a permanent treatment because they help to get rid of some of the excess lime (calcium carbonate, bicarbonate and other salts) in the soil.

For corn it is essential to apply the fertilizer every year and with small grain or legumes every 2 or 3 years.
the soils do not show a deficiency of total potash. But when we have applied potash, it has greatly improved certain crops. So we have concluded that in some way the excess lime in the soil locks up the potash so that it is not readily available to the ordinary growing crops. That apparently is what happened to part of the potash when we applied 1,000 pounds to the acre. Most of that not used the first year became locked up and not readily available to the following crops. Therefore, until you can get some of these excess lime salts out of the soil through drainage and growing of such deep-rooted crops as sweet clover, you need to apply potash fertilizer in order to get good crop yields. In some instances, especially on mucky, high-lime soils, our tests and demonstrations have shown that a combination of phosphate and potash will give better results than potash alone.

Crops Best Test

How is one to know whether he has an "alkali"—high-lime—spot or area on his farm? There is a test that will tell whether the land is high in lime. Your county agent can make such a test, but it will only be an indication. If you want to know just how heavy the lime concentration is—how "hot" your soil is—your county agent can send a sample in to the Soils Department at Iowa State College for an analysis.

The real test for these high-lime spots, however, is the way the crops grow on them. Corn on these soils comes up all right, but, soon after, it begins to fire along the edges of the leaves. Many plants die and those that live are stunted and produce chaffy, immature nubbins. Oats and barley seem to grow better than corn, but the heads usually do not fill well and the straw generally is heavy and lodges badly. Alfalfa, red clover, flax and soybeans on these areas are stunted in growth and show some firing. Sweet clover has a somewhat stunted growth, but does much better on these areas than any other crop. The high-lime areas vary in size from a few rods square at the edge of a pond to occasionally several hundred acres which are dotted with high-lime areas of varying degrees of alkalinity. The highest concentration of salts is usually found at the edge of former ponds or depressed areas. Usually you can note a whitish deposit on the surface in the spring or summer. The whitish deposit you see is the excess lime which is causing the trouble. Some of these spots have so much excess lime that 2 1/2 tons of the soil have an acid-neutralizing value as great as 1 ton of good limestone. Usually these soils have plenty of nitrogen. Our tests have shown consistently good results with applications of potash, and sometimes phosphate helps too.

In 1925 the county agent of Hardin County conducted demonstrations in which muriate of potash was broadcast on high-lime soils. His results were good. Later the Iowa Station supervised plots on which potash and phosphate fertilizer, alone and in combination, were applied at varying rates, including the heavy (1,000 pounds per acre) rate. The results with potash on the Station plots the first year or so after application were good, but then the potash apparently became "locked up," and the crops began to show potash deficiency symptoms even on the plots getting 1,000-pound applications.

Treat Growing Corn

In 1935 the College and some of the county agents applied side dressings of potash fertilizer, 0-0-50, along the corn rows with a garden planter. Plots of this kind were laid out in several northern Iowa counties. We were not in search of a new method of applying the fertilizer, but we wanted to know whether or not you could apply potash profitably after corn started showing potash starvation symptoms. With this garden planter the potash was applied as close to the row as possible and at a depth of 2 1/2 to 3 inches—the approximate depth at which fertilizer would be applied with a cultivator having a fertilizer attachment.

Good results were obtained that year. On some of the plots 3 weeks after treatment the corn had turned back to a normal color, and the firing had disappeared. This work
Still another method of applying fertilizer is to broadcast it with a lime spreader or with an endgate seeder. If an endgate seeder is used, it must be thoroughly cleaned out after you finish. An old tire pump or good stiff brush is useful in cleaning. If the seeder isn’t cleaned the fertilizer is apt to cause corrodings. When the fertilizer is broadcast we find that about twice as much needs to be applied as when it is side-dressed with a fertilizer attachment on a planter or cultivator.

In the accompanying tables are shown some of the results from applying various fertilizers last year with the fertilizer attachments on planters and on cultivators.

**Handling Peat**

Through the same area of Iowa in which are found the high-lime soils are also numerous peat and muck soils. These, too, are the result of draining old ponds, swamps and shallow lakes. These soils have shown a definite need for potash and phosphorus fertilizers. After years of demonstrations and experiments on these soils we offer these recommendations for the Iowa peat soils:

1. Be sure they are properly drained by adequate tiling and proper tile outlets.
2. Plow deeply and cultivate well.
3. Use phosphate and potash fertilizer.

On peat and muck soils high in alkalinity, we recommend the following fertilizer applications for various crops:

**Corn:** Apply 100 to 125 pounds per acre of 0-20-20 fertilizer to the entire field with planter attachment at the time you plant your corn, or broadcast 200 pounds per acre before planting the corn.

**Small grains, soybeans and legumes:** Broadcast 200 pounds of 0-20-20 previous to seeding.

If the alkalinity is low, substitute 0-20-10 for 0-20-20.

Iowa’s peat and high-lime soils can be made to produce good yields and satisfactory quality crops by proper soil management. Our experiments and demonstrations and experience of many farmers have shown this.
Reduce Shock, Pull Easier and Pack Soil Less Than Does Steel

WHEN FARM machines are operated in the field or on the road at speeds higher than 2 1/2 to 3 miles per hour they should be equipped with rubber tires. And when these machines are pulled behind rubber-tired tractors the speed should be as high as the operating conditions and the design of the machines permit. In most cases the speed will be higher than 2 1/2 to 3 miles per hour for most efficient use.

That's the general conclusion we've reached here after conducting numerous laboratory and field tests with all kinds of steel wheels and rubber tires.

Our tests show that rubber tires are better than steel wheels on almost every count. Briefly, here are the advantages:

(1) Regardless of speed, rubber tires greatly reduce the number and intensity of shocks a machine gets on the road and in the field. This means reduced breakage and a much longer life for the machine plus added comfort for the farmer. A dollars and cents saving in the long run.

(2) Under most road and field conditions, rubber-tired machines pull easier than those with steel wheels. As a result considerable saving in time and fuel can be chalked up in favor of the rubber tire. The amount of the saving will depend on the number of days the machine is used per year and the conditions under which it is operated.

(3) Rubber implement tires pack soil less than steel wheels. Nor do they roll up as badly on wet, sticky soil or lift as much dust when the soil is dry. The exact savings from these advantages are hard to measure but they do exist.

This problem of rubber tires for farm machines is becoming more important because nearly all of the tractors being sold today are on rubber tires, and much of the advantage of rubber tires for tractors is in their use at higher speeds. A farm machine pulled behind the tractor has to stand up to this increased speed. But the problem is more troublesome because it is different on every farm, depending on the types of machines the farmer has and the number of days they are used during the year. Each farmer will have to study the advantages of rubber tires in the light of his own particular situation.

A survey we conducted shows that, on the average, only six machines are used more than 10 days a year. These are the tractor plow, cultivator, combine, corn picker, manure spreader and wagon. The wagon and manure spreader are used the most days per year, and much of our experimental field work was done in comparing a rubber-tired spreader with a steel-wheeled spreader.
We pulled these two spreaders, identical except for the tires, over a course of 5 miles of gravel road at different speeds and measured the number and intensity of the shocks each received. The results were amazing! At 21⁄2 miles an hour, the average speed for horse-drawn equipment, the steel-wheeled spreader received five times as many shocks as the one on rubber tires. When we increased the speed to 5 miles an hour there were 42 times as many hard jolts on the steel-wheeled spreader, and at 10 miles per hour this figure had jumped to over 50. Not only did the number of shocks increase, but the intensity of the jolt on the steel-wheeled spreader was much greater.

It's easy to see what these tests show. Any farm machine with steel wheels that's pulled at speeds higher than 21⁄2 miles an hour is going to be subjected to a terrific pounding which will show up in lost, worn and broken parts. Even at the slower speeds, rubber tires will give better wear and longer life to the machine, and that means less expense for repairs.

When we went into the laboratory we found the same thing was true. The rubber tire acted as an air cushion, softening the jolt and allowing for much higher speed than was possible with the steel wheel.

Rolls Easier

The second advantage of rubber tires on farm machines is that they reduce the rolling resistance. The machines are easier to pull. This was a little more difficult to measure. We found that the rolling resistance of a wheel varies with soil conditions and the size and shape of the wheel. On the average, though, rubber tires pulled 23 percent easier than steel wheels.

Pneumatic tires, when used as transport wheels on agricultural machines, are most effective in reducing rolling resistance on rough or soft surfaces or soils, the conditions under which most farm machines are operated. In our tests a material reduction in rolling resistance was obtained in all trials made under these conditions—in one instance as much as 46 percent. The 23-percent average reduction in rolling resistance is based on a number of tests with different wheels. Of almost as much interest to us is the fact that rubber tires differ quite a bit in their ability to reduce draft. We found that it depends mostly on three factors: (1) The outside diameter of the wheel, (2) the inflation pressure and (3) the wheel arrangement.

In general, the larger the diameter of the wheel the easier it is to pull. This is particularly true on soft, loose surfaces. On hard, packed surfaces loads pull easier if the tire pressure is increased, but on loose soil the pressure should be reduced for easy pulling. So for spring work, on loose fallow soil, it would be a good idea to let some of the air out of the tires on farm machines even though such operation may shorten the tire life slightly. In regard to wheel arrangement, we found that the tandem arrangement, where one wheel is behind the other, is best, but in many cases that means redesigning the machine and for that reason it...
Most tractors now are sold with rubber tires. Many of these field machines can and should travel more than 2½ to 3 miles per hour in order to get the highest efficiency possible. Often old automobile tires can be used on such machines.

is not as practical as the dual or single wheel setup.

Whereas the reduction of shock by rubber tires gives long-run savings in the form of longer life for the farm machine and less expense for repairs, the reduced draft gives daily savings in the form of less tractor fuel consumption. But it’s hard to measure just how much these savings will amount to. It varies with the size and kind of machine, the type of work it is doing, the kind of a tractor that is being used, and the number of hours the machine is used per year. These are different on each farm.

Packs Soil Less

Little more needs to be said about the third advantage—the effects of rubber tires on soil conditions. This advantage also varies with different wheels and different soil conditions. In general, though, the rubber tires on implements don’t pack the soil as much as steel implement wheels, and this means less damage to temporary field roads. This is especially true when low inflation pressures are used.

We have found that less soil sticks to the rubber tire than steel when the ground is wet, and neither does the tire sift so much dust into the air when the soil is dry.

Although our tests do show conclusively that rubber tires are better than steel wheels under most road and field conditions, they don’t show just how much rubber tires are going to cost the user. As we mentioned before, the cost problem is different on every farm, depending upon the kinds of machines, the conditions under which they are used and the number of days they are used each year. The cost of any tire will depend upon such factors as first cost, depreciation, interest, taxes, insurance and maintenance.

We do know that the daily cost of the tire will depend largely on the life of the tire and the number of days it is used per year. Most observers seem to think that a rubber tire on a farm machine will have as long a life as rubber tires on tractors—about 7 years. And most observers believe that the life of the tire is more or less independent of the number of days it is used. This simply means that the more days you use the tire the less it will cost per day, and the tire goes to pieces very little faster even with more daily use. This fact brings up an interesting possibility. How about changing tires on farm machines?

The accompanying table shows a list of the common farm machines and the average number of days they are used each year.

Six of these machines are used more than 10 days per year, and of these six, four are used during different seasons. If tires could be changed from one machine to the other as it was used, the savings would be considerable. Manufacturers of farm machines and rubber tires have been aware of this problem, and considerable work has been done to reduce the number of different tire sizes. It is expected that more of this work will be done in the future. Each farmer should study the possibilities for interchanging rubber tires on the farm machines that he uses.

Old Auto Tires

There is still one other point that should not be overlooked by the average farmer who is convinced of the advantages of rubber tires. Often new wheels and tires may be too expensive for farm machines, and the wheel can be purchased without the new tire and mounted with used automobile or truck tires. Most farms have or can purchase at low cost old tires that are unsafe for fast road use but which would be entirely suitable for field work on farm machines.

Another procedure to follow if the steel wheel on the machine is in good condition is to cut off the rim and weld on a drop-center rim on which a tire can be mounted. This often is much less expensive than buying the new steel wheel, but it requires some special tools and equipment. Complete details for mounting drop-center rims on steel wheel hubs can be found in our illustrated popular bulletin P9, “Rubber-Tiring Farm Machines.” This bulletin will be sent to anyone upon request to the Bulletin Office, Iowa State College.
Careful Preparation and Packing Are Essential in Locker Storage

"MY BEANS that I put in the cold storage locker are tough. Can you tell me what’s the trouble with them?"

More than any other complaint about the storage of vegetables in locker plants is this one about beans. We are a little puzzled here at the Iowa Station when that question is thrown at us, because in 3 years of work in storing vegetables in two different commercial locker plants, we never have had tough snap beans.

But the answer, we think, is that the beans were tough when they were frozen and put in the locker. No matter how we have packed or stored the beans in our trials—whether packed dry, with brine, in various kinds of containers and held at different temperatures—under any and all circumstances, we have never had trouble with tough beans. We have made sure that the beans were in the proper stage when they were frozen and have not wasted our time and locker space on snap beans that were past the right maturity stage.

One of the things which too few people realize with lockers is that the product you take out will be no better than the one you put in. If snap beans go in that would be tough if cooked, they’ll be tough when they come out. Freezing—no matter how it’s done—won’t make them tender again. With peas, if you wait until they are past the best stage for the table and then suddenly decide “those peas are getting away from us so we’d better pick them and put them in the locker” you are pretty likely to be disappointed in the way they taste.

The same rule holds with the other vegetables commonly stored—asperagus, sweet corn, spinach, carrots and others.

What is the right stage of maturity for putting the various kinds of vegetables in the locker? There is one rule that works—put them in the cold storage locker at the stage when they would taste best if cooked right then.

A lot of people seem to be concerned about whether they have the right variety for storage in the locker. In general, if the variety is one that tastes good on the table, it probably will be good when frozen and stored in your locker. In other words, our experience indicates that the variety is not nearly so important as many people believe. If you have a variety that you like on the table, it will probably be all right in the locker—providing, of course, that you put it in at the right time and do the other necessary things.

Spinach thrived in 1940 weather as these five varieties which were grown for frozen food locker experiments at the Iowa Station show. On the other hand, asparagus did poorly in 1940 and was not as good in locker storage as that of the previous year.
An ordinary refrigerator basket is excellent for use in scalding corn or spinach. Note the long hook-in handles to avoid burning hands, the large 15-gallon wash boiler, the teakettle for supplying extra boiling water and the cooling pan (at the woman's left). Scalding properly is one essential.

The work we have done in freezing foods indicates that the season may be more important than the variety. For example, last year (1940) was a cold, wet spring in Iowa. Peas and spinach thrive with that kind of weather, but asparagus doesn’t. Asparagus was rather tough and not of good flavor.

The peas and spinach which we stored last year are exceptionally fine, but the asparagus is a disappointment. It is one of the convincing proofs that the product you take out of a cold storage locker will be no better than the one you put in.

This experience with last year’s vegetables raises another question: If the season is just right for certain vegetables, why not store an extra quantity of them and store very few or none of the vegetables that the weather hasn’t favored? Our asparagus stored in 1939 is much better than that we stored in 1940.

How long can one keep these vegetables satisfactorily? We don’t know for sure. We are holding some for 18 months to test that length of storage. While it appears that some vegetables can be held that long very well, we are not for the present, at least, recommending holding any longer than a year.

The stumbling block for many a locker renter seems to be the processing and packing of vegetables. One of the common and serious mistakes that people make is to fail to scald (blanch) the vegetables before they are frozen, or to fail to do the scalding as it should be done. All common vegetables, except rhubarb, have found require a short scalding process.

It is essential in scalding vegetables to have the water boiling and that enough water be used so that it does not stop boiling. That means far more water in proportion to the amount of vegetable being scalded than is commonly used. A 6 to 7-gallon canning kettle of aluminum or enamelled ware is satisfactory for many of the vegetables. It should contain 4 to 5 gallons of rapidly boiling water before the vegetables are placed in it. The level of the boiling water can be maintained by having a teakettle ready to add more boiling water.

About 1 pint of vegetables is enough to scald at one time in this 4 to 5 gallons of water.

It may sound ridiculous that you can’t scald more than a pint of vegetables in 4 to 5 gallons of water, but our experience indicates that is enough if the job is done right. Of course there is no reason why you can’t have two kettles going at the same time to speed the processing. For such vegetables as spinach or sweet corn, a 15-gallon tin-plated wash boiler works satisfactorily. In it should be 10 to 12 gallons of water.

A small wire basket of fine mesh with a bail handle works nicely for holding the vegetables inside the canning kettle. In the wash boiler, a long refrigerator basket works well. It may be necessary with spinach and greens to line the basket with two layers of cheesecloth to prevent the loss of leaves. The refrigerator basket can be held up with wires that hang on the sides of the boiler. The wire basket in the canning kettle can be set at a convenient height on the wire rack which comes with the kettle. It is important to keep the vegetables completely under water while in the scalding process. Move spinach or leafy greens up and down so that all the leaves are reached well with the boiling water.

People often make the mistake of either under-scalding or over-scalding. From our tests we have worked out a schedule for scalding (shown at top of next page).

As soon as the vegetable is removed from the boiling water, cool
Asparagus ... 2 1/2 minutes
Snap beans ... 3 minutes
Peas ... 60 seconds
Spinach and other greens 2 minutes
Carrots (sliced or diced) ... 3 minutes
(Large, whole) ... 4 minutes
Lima beans ... 2 minutes
Cut corn (scalded on cob) ... 2 minutes
Corncob (small ears) ... 6 minutes
(Large ears) ... 8 minutes

it as quickly as possible by putting it into cold water. If you have running cold water, that is best. If you don’t, you can use well water, or if the water is not real cool, you can use ice with it. For best results the water should stay below 60 °F. At least 3 to 4 gallons of water should be used for cooling the vegetables.

Cooling vegetables after scalding them assists in preserving color and in immediately stopping the scalding or pre-cooking process. The attractive color of frozen vegetables is retained largely because the vegetables receive the short scalding treatment followed by plunging them into cold water. Off-flavors and off-colors develop when folks try freezing vegetables without first scalding them.

It usually is not necessary to keep vegetables in the cooling water as long as in the scalding. As soon as they are cool, remove them. You can determine whether they are cool by biting into one of the peas or beans or whatever vegetable you are working with. It has been found that over-scalding or over-cooking results in loss of vitamin C and sugar, so the time needs to be watched carefully.

Folks often raise the question as to whether they should dry the vegetables after they are cooled and before they are packed. The answer is no. You can place them in a collander to drain off, but that’s sufficient.

Now what to pack them in. There is no ideal container for frozen locker food that we know of. But several kinds give satisfactory results. They should be liquid-tight, rigid enough to support the product from crushing and as nearly water-vapor proof as possible to prevent the product drying out. Heavily waxed fiber board containers and those having an inner liner of parchment or cellophane are usually satisfactory. Glass jars sealed with rubber and tin cans

sealed with a sealing machine and those sealed with friction covers all have been used successfully.

Glass jars and tin cans have the advantages of being air-tight, can be used several times and are easily sterilized. But glass jars don’t stack in a locker well and must be handled carefully. One runs risk of disappointing flavors if he attempts to use paper containers more than once, because they can’t be adequately cleaned or heat sterilized. Plain tin cans can be used for vegetables, but for fruits and rhubarb, cans should be lacquered on the inside.

We advise a brine pack for vegetables, although for spinach, corn and lima beans, a dry or straight pack seems about as satisfactory. When containers are not air-tight, brine packing will reduce drying out. If the locker room temperature runs above 0° F, brine packing probably is an aid to preservation.

The brine solution we recommend is very weak, usually a 2-percent solution made by dissolving 2 teaspoonfuls of salt in a pint of water. For those who prefer an even weaker solution, a 1 or 1 1/2-percent solution can be used. The brine is added after packing the container. A space of 3/8 inch should be left in pint containers and 5/8 inch in quart for expansion during freezing. Enough brine should be added to just cover the product. If the brine added is cold, it will help keep the product cool while it is being delivered to the locker plant and the sharp freezer.

One of the common errors which folks make is to delay too long after vegetables are processed and packed before getting them frozen and in the locker. The sooner you can get them to the freezer after they are ready the better. If you pick peas, beans or other vegetables at night for the locker and don’t plan to take them to the plant until the next day, keep them in a refrigerator and don’t scald them until the next day. After they have been scalded and packed, then get them to the locker as soon as you can.

With a blanket or something of the sort cover up the basket or box in which you are going to take the containers to the locker plant so as to keep them cool.

Though one should scald only about a pint of beans, peas and the like at a time in 4 to 5 gallons of water, you can use two kettles at a time. Cooling the vegetable quickly after scalding is very essential. A string on the bail of the wire basket containing the vegetables helps avoid danger of burning hands.
Cooking for a Crowd

By CAROLYN CASON

WHEN IT'S your turn to have threshers or corn shellers—or to have club at your house—do you get out your favorite serves-6 recipes and multiply them by anything from 2 to 10?

It would seem that the only thing needed to cook gallons of macaroni and bake dozens of cookies is such a simple knowledge of the multiplication tables and a little addition. But when the macaroni turns out to be very dry and unpalatable, or the cookies too rich, you'll suspect—and rightly so—that doubling and quadrupling recipes doesn't always work.

A perfect recipe would have to call for ounces of salt and pounds of flour, because cups and teaspoons are not accurate. In a small-quantity recipe the slight variation makes little or no difference, but when the “error” is multiplied by 10 or 12 it produces a product that often is not like the original recipe's result at all.

Besides changes that come with increasing quantities of ingredients, there is another reason for adjusting recipes to large quantity cooking—economy. If you're entertaining, the food bill goes up with the number of persons you're serving. And if it's a church or community supper, serving as inex-

There are no hard and fast rules that can be followed in changing or increasing recipes, but the Institution Management Department at Iowa State College has discovered a few general facts through experimentation. However, the “rules” need to be mixed with common sense and judgment because of the variation in ingredients and measurements.

1. The number of eggs used may be cut down if economy is necessary. This reduction may necessitate the addition of flour or cornstarch if the egg is used as a thickening agent, or baking powder or cream of tartar if the egg is used principally as a leavening agent. One tablespoon of flour or cornstarch or one teaspoon of baking powder is usually considered the equivalent of one medium-sized egg in such a case.

2. Fat may be substituted for part or all of the butter in a recipe. Care should be taken that the fat substituted is not too strong in flavor. For this reason it is better to use a hydrogenated rather than a non-hydrogenated lard in cakes or delicate puddings.

3. There usually is less evaporation of liquid in large recipes because proportionately less surface area is exposed; liquid, therefore, should be reduced in the large quantity recipe. Compare the following recipes for baking powder biscuits, as an example:

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>15 Biscuits</th>
<th>120 Biscuits</th>
<th>500 Biscuits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread flour</td>
<td>2 c.</td>
<td>4 qt. (16 c.)</td>
<td>15 lb. (60 c.)</td>
</tr>
<tr>
<td>Baking powder</td>
<td>4 t.</td>
<td>2/3 c.</td>
<td>12 oz. (2 c.)</td>
</tr>
<tr>
<td>Salt</td>
<td>1 t.</td>
<td>2 T.</td>
<td>8 oz. (16 T.)</td>
</tr>
<tr>
<td>Shortening</td>
<td>2 T.</td>
<td>2 1/2 c.</td>
<td>3 lb. 12 oz. (9 3/4 c.)</td>
</tr>
<tr>
<td>Milk</td>
<td>3/4-c.</td>
<td>5 c.</td>
<td>5 qt. or less (20 c. or less)</td>
</tr>
</tbody>
</table>
The small recipe yielding 12 to 15 biscuits requires \( \frac{3}{4} \) to 1 cup of milk, while the largest recipe requiring 3 quarts (20 cups) of milk yields 500 biscuits. In other words, 40 times as many biscuits are made by the large recipe as the small, but only 20 times as much milk was used. This would indicate that the milk was reduced 50 percent. This decided reduction in liquid would not hold true in all recipes.

4. The amount of flavoring used in cakes, cookies or other batters need not be increased the full amount when recipes are enlarged. For example, a recipe calling for 1 teaspoon of vanilla or other extract when increased as much as four times would require only 3 teaspoons or 1 tablespoon of extract instead of 4 teaspoons.

5. Raisins, nuts or candied fruits need not be increased in direct proportion. This is especially true when economy is a factor.

6. An increased recipe usually will require more manipulation and a longer baking time.

7. If a food is cooked in or served with a sauce, proportionately less sauce is needed for the increased recipe. For example, in Swedish ham balls, the small recipe when increased 12 times requires only 4 times the sauce used in the small recipe. (This same principle would hold true with scalloped dishes although the white sauce would not be decreased as much as the sauce in the Swedish ham balls.)

---

**MACARONI MOUSSE**

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>8 Servings</th>
<th>112 Servings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macaroni</td>
<td>1 c.</td>
<td>3 1/2 qts.</td>
</tr>
<tr>
<td>Soft bread cubes</td>
<td>1 c.</td>
<td>3 1/2 qts.</td>
</tr>
<tr>
<td>Cheese</td>
<td>1 t.</td>
<td>3 T.</td>
</tr>
<tr>
<td>Parsley</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Pimentos</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Eggs</td>
<td>3 separated</td>
<td>30 eggs</td>
</tr>
<tr>
<td>Thin cream</td>
<td>1 c.</td>
<td>3 1/4 qts.</td>
</tr>
<tr>
<td>Melted butter</td>
<td>1 c.</td>
<td>3 T.</td>
</tr>
<tr>
<td>Grated onion</td>
<td>1/4 c.</td>
<td>3 c.</td>
</tr>
<tr>
<td>Salt</td>
<td>1/2 t.</td>
<td>2 T.</td>
</tr>
</tbody>
</table>

**SAUCE**

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Small Quantity</th>
<th>Increased Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown sugar</td>
<td>1 c.</td>
<td>1 qt.</td>
</tr>
<tr>
<td>Vinegar</td>
<td>1/2 c.</td>
<td>2 c.</td>
</tr>
<tr>
<td>Mustard</td>
<td>1 t.</td>
<td>3 T.</td>
</tr>
<tr>
<td>Water</td>
<td>1/2 c.</td>
<td>1 c.</td>
</tr>
</tbody>
</table>

It must be kept in mind that nothing can take the place of butter, eggs and cream in a recipe and that beyond a certain point these ingredients cannot be reduced.

When deciding on what changes you will make in the increased recipe, consider the role of the ingredient and be governed by that. In angel food cake or baked custard, for example, you cannot substitute for eggs because they are the chief ingredient in these products.

Because of less evaporation, a change in surface tension and proportionately less adhering to the sides of the pan, a recipe need not be increased as many times as would be necessary by direct multiplication, even from a quantity standpoint. For example, if a recipe is sufficient to serve 6, 15 times that recipe would, as a rule, serve 100 people, though by direct multiplication it would be sufficient to serve only 90. For instance, a recipe for 3 chiffon pies when tripled usually will make 11 instead of 9 pies. Of course there are variables, such as the size of the eggs used and the method of combination, which influence the bulk. Therefore the steps in increasing the recipe should be:

1. Multiply the small quantity recipe, as it stands, the number of times you think would be necessary to serve the large group.

2. Change all the measurements to the largest practical medium. For an example, express teaspoons as tablespoons, tablespoons as cups or fractions of a cup, and cups as pints, quarts or as pounds.

3. Study the recipe and decide which ingredients you can reduce with safety.

In the Quantity Cookery Class in the Institution Management Department, the above recipe for macaroni mousse was increased from a small recipe of 8 servings to one for 112.

The eggs were slightly reduced, a sharp cheese was substituted for a mild cheese and the amount considerably reduced. The butter also was reduced, but the cream, bread crumbs and macaroni were not reduced because they were less expensive and added bulk. The pimento and the parsley in the small recipe, used for seasoning, were reduced and grated onion, less expensive, was added to give a tasty product.
SORGHUM

Sweet Varieties Prove Superior to Grain Types for Fodder and Silage

IOWA FARMERS have been taking an increased interest in sorghum the last few years. There were 177,000 acres of sweet sorghum in Iowa in 1940, four times as much as during the average year from 1929 to 1938.

The two main reasons for increased interest in sorghum in Iowa are: (1) Sorghum withstands drought well and (2) makes good silage or fodder. A lot of the sorghum grown in Iowa has been cut and put into silos that once were filled with corn silage. (This has resulted in part from the AAA programs which have limited corn acreage.)

Because sorghum is a relatively new crop in Iowa, many farmers want information about it. They raise many questions about varieties and how to grow and handle the crop.

Since sorghum in Iowa is used as a forage crop and largely as a silage crop, the sweet varieties are preferred. Sorgos fall into two main types: Grain sorgums and sweet sorgums. The grain sorgums have been bred to produce grain; their stalks are inclined to be short, the pith dry and low in sugar content. The sweet sorgums are best for forage because of their sweet, juicy stalks and high total tonnage of fodder. Our tests indicate that grain sorgums cannot compete successfully with corn in producing grain in Iowa. We do not recommend growing sorgums for grain in Iowa, particularly because the better yielding varieties are too late in maturity for Iowa conditions.

Last year (1940) we compared six sorgos (sweet sorgum varieties are commonly referred to as sorgos), six grain sorgums and one variety of corn at the Iowa Station. The plots were harvested for silage when the seeds were in the medium to hard dough stage. Representative plots were left to mature and harvested for seed when completely ripe. Yields of green forage and of mature dry seed and the average height of plots are given in table 1.

In comparing varieties of sorghum with each other and with corn for silage the tonnage of green forage is not the only thing to consider. The time of maturity, the comparative protein and carbohydrate content, the percentage of grain and the digestibility of the stalks and grain, as well as the ease of handling the fodder, are all important.

The Honey variety, which produced the highest yield of green forage, is popular for sirup in Texas but is not considered as good for silage or fodder even in Texas because it is relatively high in moisture content and somewhat difficult to harvest. The Atlas sorgo produced 25 tons of forage and three times as much seed as Honey. Atlas is considered the best variety for silage where it will mature sufficiently.

In this experiment, corn, which yielded 19 tons of forage and 5,550 pounds of grain per acre, was nearly equal to any of the sorgums in the test and was definitely better than most of them. The highest yielding grain sorghum variety, New Grain (Grohoma), which matured 3 weeks later than corn, yielded less forage than Atlas or Honey and less grain than corn. The Waconia Orange, which produced 21 tons of green forage, was ready for the silo 3 weeks earlier than either Atlas or Honey.

All varieties of sorghum represented in the variety test at Ames were grown in demonstration plots in 17 counties in the state in 1940. Observations on the plant height, percent lodging, date ready for silage, relative yield as compared with corn and order of choice for use as a silage crop were made by the county extension agents in the counties in which the tests were located. A summary of these observations is given in table 2.

Averaging the results of the 17 county tests (grouping them according to location into northern and southern Iowa tests), the Waconia Orange and Leoti Red ranked first and second choice in northern Iowa. Atlas and Honey outyielded Waconia Orange, but we believe Atlas and Honey are too late in maturity to be safe for northern Iowa. For southern Iowa, Atlas ranked first, Honey second and New Grain (Grohoma) third, with Waconia Orange and Leoti Red as fourth and fifth choices. These sorghum varieties appeared to have a considerably greater relative yield advantage over corn in southern Iowa than in the northern half of the state.

Varieties Recommended

From the data available, and from the accumulated experiences of many Iowa farmers, we consider Atlas sorgo the best variety for silage in central and southern Iowa. While it is too late in maturity to ripen seed dependably, it has produced high yields of forage year after year. Atlas is resistant to lodging and has white seed which is considered more palatable to livestock than the colored seed of many of the other varieties. The Honey and Leoti Red varieties gave excellent results in the 1940 trials, but these varieties should be tested further before we can be sure about recommending them.

For northern Iowa the Waconia Orange is our first choice. It produces high yields of forage and matures satisfactorily. It also has sweet stalks, and has proved extremely desirable for sirup manufacture. The Early Sumac and various strains of Black Amber also are acceptable for the northern half of Iowa. In 1940 the Leoti Red and Atlas also produced good results in this area, but in most years these two varieties probably would be too late in maturity, especially in the two northern tiers of counties.
By C. P. WILSIE, 
E. S. DYAS, C. Y. CANNON

Description of Varieties

**ATLAS**

Atlas sorgo was developed by selection from a cross between Sourless sorgo and Blackhull Kafir. It is a popular variety in Kansas, Nebraska, Oklahoma, Missouri and Iowa. Atlas is tall and late in maturity, too late to produce dependable seed yields in Iowa in most years. It has the sweet, juicy stalk of the sorgo parent and the strong stalk and white seed characteristic of the kafir parent. Atlas is resistant to lodging, somewhat resistant to chinch bugs—as are most of the sweet sorghums—and produces high yields of forage.

**WACONIA ORANGE**

Several strains of the Orange variety are grown extensively for forage and sirup, including Kansas Orange, Sourless sorgo and Waconia Orange. Waconia Orange is earlier in maturity than Kansas Orange and is well adapted to conditions in northern and central Iowa. Under favorable conditions Waconia Orange grows to a height of 8 feet, and is noted particularly for its sweet stalk, desirable for sirup manufacture as well as for forage purposes. This variety is characterised by having yellowish-brown seed and bright red chaff.

It is very similar to, if not identical with, Rox Orange, a strain released by the Wisconsin Station a number of years ago.

**HONEY SORGO**

Honey sorgo is a popular sirup variety in Texas and is grown only to a limited extent in the northern states. It is late in maturity, extremely tall, with large, open, bushy heads. Although seed yield is low, under conditions favorable for full-season growth, Honey produces high yields of green forage.

**EARLY SUMAC**

An early maturing strain of the popular Sumac variety, the Early Sumac, matures successfully in Iowa. It has short, compact heads with small reddish-brown seeds.

### Table 1. Sorghum Variety Trials, Ames, 1940.

<table>
<thead>
<tr>
<th>Variety and type</th>
<th>Production for silage</th>
<th>Seed production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Date cut for silage</td>
<td>Green weight</td>
</tr>
<tr>
<td>Honey (sweet)</td>
<td>Sept. 26</td>
<td>33.07</td>
</tr>
<tr>
<td>Atlas (sweet)</td>
<td>Sept. 26</td>
<td>25.08</td>
</tr>
<tr>
<td>Lodii Red (sweet)</td>
<td>Sept. 29</td>
<td>21.75</td>
</tr>
<tr>
<td>Early Sumac (sweet)</td>
<td>Sept. 12</td>
<td>21.09</td>
</tr>
<tr>
<td>Waconia Orange (sweet)</td>
<td>Sept. 4</td>
<td>21.15</td>
</tr>
<tr>
<td>New Grain (Grohoma) (grain)</td>
<td>Sept. 26</td>
<td>20.03</td>
</tr>
<tr>
<td>Corn, U.S. 44</td>
<td>Sept. 12</td>
<td>18.98</td>
</tr>
<tr>
<td>Grohoma (grain)</td>
<td>Sept. 26</td>
<td>18.48</td>
</tr>
<tr>
<td>Black Amber (sweet)</td>
<td>Aug. 21</td>
<td>15.74</td>
</tr>
<tr>
<td>Western Blackhull Kafir (grain)</td>
<td>Sept. 12</td>
<td>15.41</td>
</tr>
<tr>
<td>Hegari (grain)</td>
<td>Aug. 21</td>
<td>13.79</td>
</tr>
<tr>
<td>Sooner Milo (grain)</td>
<td>Aug. 21</td>
<td>13.62</td>
</tr>
<tr>
<td>Early Kalo (grain)</td>
<td>Aug. 21</td>
<td>11.78</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variety and type</th>
<th>Height in feet</th>
<th>Lodging in percent</th>
<th>Date ready for silage—September</th>
<th>Yield estimate in percent of corn—Northern Iowa</th>
<th>Yield estimate in percent of corn—Southern Iowa</th>
<th>Order of choice for silage—Northern Iowa</th>
<th>Order of choice for silage—Southern Iowa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honey (sweet)</td>
<td>8.3</td>
<td>0.5</td>
<td>27</td>
<td>119</td>
<td>144</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Atlas (sweet)</td>
<td>7.5</td>
<td>0.8</td>
<td>23</td>
<td>108</td>
<td>129</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Lodii Red (sweet)</td>
<td>8.2</td>
<td>1.0</td>
<td>24</td>
<td>114</td>
<td>133</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Early Sumac (sweet)</td>
<td>6.2</td>
<td>1.8</td>
<td>23</td>
<td>90</td>
<td>128</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Grohoma (grain)</td>
<td>6.4</td>
<td>4.7</td>
<td>26</td>
<td>103</td>
<td>122</td>
<td>3</td>
<td>6</td>
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<tr>
<td>Hegari (grain)</td>
<td>5.6</td>
<td>1.8</td>
<td>23</td>
<td>80</td>
<td>128</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Black Amber (sweet)</td>
<td>6.0</td>
<td>3.3</td>
<td>18</td>
<td>73</td>
<td>106</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Western Blackhull Kafir (grain)</td>
<td>5.5</td>
<td>2.5</td>
<td>18</td>
<td>73</td>
<td>115</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Sooner Milo (grain)</td>
<td>6.1</td>
<td>0.2</td>
<td>27</td>
<td>88</td>
<td>113</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Early Kalo (grain)</td>
<td>4.5</td>
<td>1.0</td>
<td>18</td>
<td>33</td>
<td>75</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Honey (sweet)</td>
<td>4.5</td>
<td>1.0</td>
<td>18</td>
<td>49</td>
<td>63</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

1Cut for silage when seed was in the medium to hard dough stage.

Varieties maturing much later than Oct. 1 are not dependable for seed production.

### Table 2. Summary of Reports from 17 Counties on Sorghum Variety Demonstration Plots, 1940.

<table>
<thead>
<tr>
<th>Variety and type</th>
<th>Height in feet</th>
<th>Lodging in percent</th>
<th>Date ready for silage—September</th>
<th>Yield estimate in percent of corn—Northern Iowa</th>
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<td>119</td>
<td>144</td>
<td>4</td>
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</tr>
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<td>7.5</td>
<td>0.8</td>
<td>23</td>
<td>108</td>
<td>129</td>
<td>1</td>
<td>4</td>
</tr>
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<td>Lodii Red (sweet)</td>
<td>8.2</td>
<td>1.0</td>
<td>24</td>
<td>114</td>
<td>133</td>
<td>2</td>
<td>2</td>
</tr>
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<td>6.2</td>
<td>1.8</td>
<td>23</td>
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<td>Grohoma (grain)</td>
<td>6.4</td>
<td>4.7</td>
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<td>122</td>
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<td>128</td>
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<td>7</td>
</tr>
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<td>6.0</td>
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<td>73</td>
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</tr>
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<td>5.5</td>
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<td>18</td>
<td>49</td>
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<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

Atlas Sorgo, shown below, has proven to be well adapted for fodder and silage in central and southern Iowa, but matures too late to be considered safe for the northern part of Iowa.

Waconia Orange is the variety shown below. It is especially desirable in northern Iowa for fodder and silage. It also has been proven an excellent variety for sirup.
While it does not grow as tall as Waconia Orange, it has been a dependable forage producer.

**Black Amber**

This variety includes a number of strains, Minnesota Amber, Waconia Amber, Dakota Amber, Ames Amber and Early Amber. A mid-season variety for Iowa, Black Amber has slender stalks with few leaves. The heads are loose and open, with the light brown seeds enclosed in a black, shiny, bearded chaff. The various strains of Amber have been popular for sirup as well as for forage.

**Leoti Red**

This variety, of unknown origin, has been tested by the Kansas Agricultural Experiment Station and is known for its good forage quality and resistance to red spot diseases. It is grown extensively in Kansas and Nebraska but has been grown in Iowa only to a very limited extent.

**Grohoma, or “New Grain”**

First distributed to farmers in 1929, this grain sorghum has been grown but to a limited extent. While its origin is somewhat obscure, it is believed to have been developed from a cross between feterita and some sorgo. It has a dry but sweet stalk, grows to a height of from 4 to 6 feet, has broad, wrinkled leaves, large, loose, elongated heads, brown seeds and a rather high percentage of chaff. Grohoma is susceptible to covered kernel smut and to lodging. This variety is not uniform, off-type segregates appearing frequently. Seed ripens too late to make it a dependable crop for grain, but under favorable conditions yields of forage are fairly high. Recent interest in Grohoma developed through the planting of a variety sold as “New Grain.” Investigations have shown that this crop was originally sold into Iowa from Illinois as “a new grain and forage crop (Grohoma).” The term “new grain” appeared to have some appeal and many farmers are now growing Grohoma sorghum under the name “New Grain.”

**Growing the Crop**

The sorghum seedling isn’t as sturdy as the young corn plant; it is inclined to be spindling. The seedbed should be fitted well in advance of planting, the final fitting being delayed until just before planting in order to get rid of as many weeds as possible. Planting should be delayed until the soil is warm and all danger of frost is past. May 20 to 25 is about the best time to plant in central Iowa in most years. The crop is handled in all ways as corn would be grown. Sorghom or “cane” plates should be used in the planter for best results in getting a uniform stand, planting 6 to 8 pounds of seed per acre.

**Ensiling Sorghum**

The crop is ready to cut either for silage or fodder when the seeds are in the medium to hard dough stage. If silage is made of immature sorghum too much acid develops, giving the silage a strong flavor and odor. Such silage also usually has too much moisture, and cows do not like it. Thus care should be taken to select a variety that will mature.

If the sorghum does fail to mature, better silage can be made if the plants are wilted to get rid of part of the moisture before it is cut into the silo. One must use care not to allow the sorghum to get too dry, for silage needs enough moisture to pack properly and prevent mold.

As a general rule sorghum silage is less coarse than corn silage and therefore is easier to pack in the silo. If properly made it has a slightly greener appearance than corn silage and an aroma that is pleasing. Poorly made silage usually has a sharp, irritating smell. The sorghums are particularly good for refilling silos in the winter since they do not deteriorate in feeding value as much as many other crops when exposed to winter weather. Whenever the silo is filled with dry sorghum it is necessary to add ample water to the chopped crop (about 2 to 2½ times by weight as much water as dry sorghum), otherwise the silage is apt to be moldy.

The sorghums dry much more slowly than most of the forage crops because the stems are large and juicy. Rains do not greatly damage the leaves of sorghums while curing, and few are lost during this period. Care must be taken to cure thoroughly the sorghum fodder in shocks or windrows before it is stacked or stored in the barn or else it will mold and spoil.

**Feeding Sorghum**

The feeding value of sorghum fodder is similar to corn fodder. When properly prepared, sorghum silage ranks slightly below corn silage as a dairy feed. This is because it usually contains more moisture—though on a dry-matter basis the two feeds are nearly equal. There apparently is little difference in feeding value (dry-matter basis) between silages made from the different varieties of sorghum.

Supplemental grains, for feeding with sorghum fodder and sorghum silage to dairy cattle, should be approximately the same as those used for supplementing corn fodder and corn silage.

**Effect on Milk, Health**

Sorghums under certain conditions may cause the death of stock pastured on it from prussic or hydrocyanic acid poisoning. Green shoots and leaves of young, rapidly growing sorghum plants, and particularly the second-growth sprouts or suckers which come up following a dry or semi-dormant period, or after a frost, are likely to be dangerous.

Most deaths have occurred when cattle are pasturing the sorghum, though recent experiments indicate that the plant may retain the poisonous properties when dried or ensiled. Because only matured plants are usually used for fodder or silage they cause no losses when fed.

Sorghum silage may be troublesome in causing off-flavored milk because it often develops strong acid aromas. Milk flavors are intensified when large quantities of an offending feed are fed, or when the feed is fed shortly before milking.

To lessen such trouble feed sorghum silage right after milking and, if it is strongly acid, feed less than usual amounts. Since flavors can be absorbed directly by the milk, the silage odors should be kept away from it by feeding the silage in outside bunks or in well-ventilated barns.