**The Authors**

C. H. Van Vlack, who is co-author of the article on drainage, would have graduated with the Iowa State College class of 1916, but he dropped out of school to give full time to building contracting, a sideline during college. He then farmed for a number of years in Cass County, near Atlantic. During that time he served as secretary and as president of the Cass County Farm Bureau. He came back to Iowa State College after this period of farming and graduated in 1929. He then taught vocational agriculture at Audubon High School and from that position came to head up the extension agricultural engineering staff of Iowa State College. Van received an M. S. degree from Colorado State College in 1936.

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Harold Gunderson (he’s called “Tiny” by his friends because of his stature — the dimensions: 6’ 6” hails from the plains of Montana. He has a Ph. D. degree from Iowa State College, but did his undergraduate work at Montana State College. He has been working for Iowa State College since 1936 and has been extension entomologist since 1939. It’s his job to know all about the bugs, the worms, the rodents that bother in the house and anywhere else about the farm, or anywhere in Iowa.

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**More Coming About Drainage, Lime**

The article in this issue about drainage of Iowa farm land will be followed in the January issue with another which will deal more specifically with the problems of laying out and putting in drainage systems on the farm. At least that’s the plan now. The present article deals mostly with repair and maintenance of drainage systems. More will be said, too, about liming in the near future. The one big problem now, it seems, is to get enough limestone and to make sure that it is ground fine enough to give quick action.

With the pressure which we have during this wartime period for greater food production, adequate drainage and the liming of acid soils are two of the primary essentials for crop production that we must not overlook.

**The Man in the “Brome”—Page 9**

The man in the bromegrass on page 9 is Chris H. Jensen, Audubon, Iowa. Mr. Jensen, a farmer near Audubon, is an enthusiast for bromegrass and is producing certified seed. This 4-acre field in which he stands is the Fischer strain, which originated in Iowa.

This field was seeded at the rate of 12 pounds of bromegrass to the acre on an old alfalfa field which had been plowed previous to the plowing and seeding of the bromegrass to give about the desired amount of alfalfa to provide the necessary nitrogen to the bromegrass to get good growth.

This year Jensen seeded another field to alfalfa and bromegrass for seed. He used about 12 pounds of bromegrass and 3 pounds of alfalfa to the acre. Iowa needs more farmers like Chris Jensen producing high quality bromegrass seed. Until a plentiful supply of bromegrass seed is available at reasonable prices, it will tend to hold back seeding of bromegrass on many Iowa farms.

Besides his job of farming, Jensen serves as chairman of the State Soil Conservation Committee.

**FARM SCIENCE REPORTER**

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On the Cover

We are indebted to J. M. Heizer, information agent, Farm Credit Administration, Louisville, Ky., for the photograph used on the cover. This kind of cooperative work between “Dad” and the “Boys” is one of the ways in which part of the labor problem is being handled on many an Iowa farm.

http://lib.dr.iastate.edu/farmsciencereporter/vol4/iss4/1
DRAINAGE Is Still a Problem

In our war effort to produce more food, let's work our level and low soils harder and take the crop producing load off the farms that are rolling, rough and liable to erode.

The level and low land in Iowa has highly productive soil which is able to stand heavy cropping over a long period of years without hurting it. But it is also low and flat land which presents a drainage problem.

During the first World War we plowed up and cultivated many hilly fields that should never have been used for that purpose. The result has been many farms cut with deep ditches — gullies. We do not want to make the same mistake again, and one of the ways we can avoid it is to press into "hard work" for crop production our level lands that do not wash. The farms that are steeply rolling can serve in the food program in another very important manner by producing grass and roughage.

How can we press the level, productive soils into carrying more of the crop production load? Of course the answer to that entails all of the good farming practices — the right kind of seedbed preparation, cultivation, the most productive varieties, the choice of the correct crops, etc. But here we are going to talk about a still more fundamental consideration than any of these — drainage.

Many of these highly productive soils in Iowa that are flat have become productive because they have had the excess water drained off so that they could be farmed and so that those precious helpers which the farmer has and never sees — the soil bacteria — can do better work. These tiny living organisms help turn the elements of the soil into a form that the plants can use. But they don't work well in wet soil.

But the drainage problem is far from entirely solved. Drive through central and northern Iowa in a rainy year and you will see many acres of potentially productive land with crops on them drowned out or discolored and stunted because of "wet feet." Or notice the countless seepy hillsides in the other parts of the state and the flooded river bottoms. All of these still present drainage problems which are holding back maximum crop production. Here are places that we can make telling efforts in our food production program for winning the war.

A poorly drained field which is fairly productive in some seasons and not productive in others may be more of a handicap to satisfactory crop production than swamp land, for when a field is plowed, planted and cultivated and...
Left: A drainage system survey party taking open ditch cross-sections in Webster County. The Soil Conservation Service and the county board of supervisors of Webster County are cooperating in making a survey of the public drainage system of the county to determine the maintenance needs. Near this cross-section station two covered-up tile outlets were located as shown in the pictures below and on the left at the bottom of the following page.

Controlled grazing of open ditch banks by cattle and sheep — never hogs — is one way to prevent the growth of young trees. If young trees start and are not cleared away, they will slow down the flow of water and allow the ditch to fill up, thus ruining the outlet for the farmers' tile systems. Cleaning out these filled ditches is costly and can easily be avoided by some care. The ditch at the left is in good condition because it has had the proper kind of care and treatment. It will not fill up as will those with heavy growth of trees and weeds along them.

Below: Seepy soil discovered by the above surveying crew on the south bank of the open drainage ditch indicated to the surveyors that a clogged tile outlet might be found in the bank and on digging this was found to be true. In one such ditch a big roll of wire was unearthed which the farmer had put in trying to protect the end of a tile.

Below: Looking upstream from the east side of an open ditch showing a section of ditch on which the spoilbank has recently been leveled by a local contractor. Note how high the point of the leveled bank is near the ditch so that rain falling on the banks drains away from the ditch and enters the ditch through surface inlets. This is to prevent the washing of surface soil into the ditch itself. Bromegrass is the best crop for seeding down and holding ditch banks. Cattle and sheep pasturing it will help check the growth of young trees and weeds.
Right: A broken or misplaced tile has caused this sunken area or "hole" over a 12-inch tile-line. Unless the broken tile is replaced at once, the entire drain line above the damaged section may become filled with dirt. Then the only remedy would be to re-lay that portion of the system, which is costly. Farmers can do much to keep the drainage systems working by keeping watch for such needs of repair as this one. It's not costly to make such a repair.

Right: A 12-inch tile outlet is submerged 3 feet below the water at the white stake. Filling of the open drainage ditch owing to excessive tree growth has reduced the carrying capacity of the ditch to such an extent that lateral tile lines no longer have free outlet. The result is gradual silting and filling of the tile and poorly drained land. The open ditch needs to be cleaned and put in shape, then maintained so that it will offer rapid and free outlet for the land which it was "built" to serve.

Below: A stream of clear water bubbles up from the end of the 8-inch tile submerged almost a foot below the foot of the man. Outlets for tile drains and the lower ends of tile lines should be inspected frequently. All weeds, grass, trash and debris which check the free flow of water should be removed. Only by such procedure can the benefit of tile drainage systems be obtained and the tile kept working as it was intended.

Below: Here's the sort of condition that one often finds when the tile outlet is not protected or the bulkhead fails. Water flowing out of the end of the tile washes back under it until the first tile drops, then the next one, and so the process continues, cutting back far into the field. The remedy here is to re-lay this line, using bell-end sewer tile, cemented, and then put in a bulkhead.
then no crop is harvested, not only is
the land wasted, but the labor, power
and machinery costs and seed are
totally lost.

No Priorities for Tile

The old swamps and low spots of
Iowa which have been drained have
mostly been taken care of by clay tile
or non-reinforced concrete tile systems.
There are no priorities on tile up to 12
inches in diameter, so where drainage
is needed and the labor can be obtained
do it, we can make a big push now in
crop production by installing the
tile needed.

(This article will deal mostly with
putting into shape and maintaining
drainage systems. The problems of
laying out and properly installing
drainage systems will be discussed in
an article in the Farm Science Reporter
in the next issue — January, 1944.)

Essentials for Tile Drains

Not all drainage systems have been
satisfactory. If any one of a number
of essentials for an adequate tile drain-
age system is lacking or faulty, the
whole system is certain to be unsatis-
factory and cease to function as it was
planned. Experience and study indicate
that the essentials of a satisfactory
tile drainage system are as follows:

1. A suitable outlet.
2. Tile drains properly located.
3. Adequate depth and spacing of the
tile drains.
4. Greatest obtainable fall for tile.
5. Quality and size of tile properly
chosen.
6. Correct laying of the tile.
7. Watchful and careful mainten-
ance of the drainage system.

Of these essentials the most important
is to have a good outlet. Unless you
can get a satisfactory outlet, the drain-
age system, no matter how small or
large, will fail. The outlet may be a
natural waterway, an open ditch or an-
other tile line. Whichever is used
should be adequate to handle the full
flow being emptied without submerging
the tile for any appreciable time during
heavy rainfalls.

The outlet of a tile is where most
trouble occurs. Washing away of the
fill over the tile may result unless the
last few tile at the outlet are filled
around with stone. It is advisable when
possible to use a length of galvanized
iron culvert pipe instead of the last
few tile.

Webster County Reports

To bring the big problem of what
needs now to be done about drainage
down to a specific case, we are going to
take a look at a report made by the
County Agricultural Planning Commis-
tee of Webster County concerning the
drainage problem there. What was
found is common in many other coun-
ties and the recommendations for solv-
ing the drainage problem will work as
well in other counties. The committee
found that over 65 percent of all county
tile outlets were submerged or partly
submerged, which resulted in ineffective
use of the tile drainage system. This
also meant that this percent of the open
drainage ditches was filled with sludge
and was in poor to bad condition.

The causes for the above situation
were sized up as follows:

1. Excessive tree and brush growth
has been allowed to develop in the open
ditches.
2. Ditches consequently were filled
with silt and organic matter which had
accumulated over a period of years.
3. The spoilbanks have never re-
ceived any care and were left to con-
tribute to weed and tree growth.
4. Improper pasturing of the open
drainage ditches and undesirable fenc-
ing has led to the development of dams
in the ditches and the sloughing off of
the ditch banks.
5. In some areas surface soil has
eroded into the drainage ditch, causing
it to be partly filled with silt.
6. The county and private outlets in
many cases were improperly construct-
ed, have broken down and have contrib-
uted to erosion and silting. Often the
entire outlet has been destroyed.
7. It was found that the surface
pipes were often improperly located,
while not enough pipes were supplied
in other instances.

How to Recondition

After sizing up the situation about
drainage in this northwestern Iowa
county, the Webster County men made
the following recommendations for im-
proving and reconditioning open
ditches.

First, clean and grub all trees and
brush in ditches and on all ditch banks.
Then clean the main ditch thoroughly.
If the laterals to the main ditch need
it, clean them. Repair the county tile
outlets and encourage the repair of
private tile outlets.

They recommended that surface
drain pipes be installed where needed,
and properly located. All spoilbanks
should be leveled so that they can be
properly seeded. They urged proper
maintenance of private drainage sys-
tems by inspection and an educational
program.

Maintaining Ditches

To maintain the ditches after they
have once been put in order, they
recommended:

1. Keep hogs out of the drainage
ditches. They contribute to the dam-
mimg process and the sloughing off of
ditch banks.
2. Seed all drainage ditch banks and
slopes to bromegrass.
3. Do not cultivate and farm closer
to the open ditch than 10 to 12 feet.
4. Install suitable fencing across the
ditch and use water gates.
5. Inspect the ditch periodically un-
der the supervision of a county engi-
neer's office for the following: To see
that no tree growth is allowed on the
ditch banks or in the channel; to pre-
vent overpasturing with livestock, espe-
cially hogs; to encourage seeding ditch
banks to bromegrass; to locate broken
tile outlets (these should be repaired or
replaced at once); to find evidence of
broken tile back in a drainage system so
that it can be repaired.

Final Suggestions

Other possibilities of improving the
drainage systems to protect the crops
are pointed out. The throwing of old
car bodies, rolls of wire, discarded farm
machinery, etc., into drainage ditches
was condemned. These serve as ob-
structions and hurry the filling up of the
ditches — the outlets for the farm-
ers' tile systems.

Dynamite to remove silt from open
ditches and to straighten natural ditches
was suggested. In the use of dynamite,
competent persons should be consulted.

There are times and situations when
a plow or V-drag or grader can be used
to construct small, short, open tempor-
ary ditches and to close those which
were opened by the dynamite.

(Continued on page 16)
Feed Them Strychnine on Vegetable Bait

Such As Potatoes, Carrots, or Parsnips

By HAROLD GUNDERSON

IF YOU happen to be one of the Iowa farmers who has just broken a sickle on your mower by running into a pocket gopher mound, perhaps you would like to know some simple way of getting rid of these pests.

How can you get rid of the pocket gophers easily? Poison them. It's really not hard to do, and it is very effective if done properly. It is a much more efficient way to get rid of these pests than trapping, although where a bounty is paid, a boy can keep himself in pocket money trapping gophers. He will soon become very skillful at the job, but he will never actually eradicate all the gophers in any one field.

Poisoning is a rapid, easy way to kill pocket gophers. If the poison and bait are mixed and applied properly, one baiting will kill from 75 to 90 percent of the gophers — and another dose of poisoned bait will get the rest of them.

Bait can be made from Irish potatoes, carrots, turnips, parsnips, rutabagas or sweet potatoes. Cut the vegetable into pieces 1 1/2 inches long and 1/4 inch square. While the cut pieces are fresh, place them in a paper sack and sprinkle them with 1/16 ounce of powdered strychnine per quart (by measure) of cut bait.

While strychnine is very poisonous to all animals, it makes an excellent pocket gopher poison if mixed and properly applied with the bait. If the mixing vessels and hands are washed as soon as the job is done, there is no danger to pets or children because the bait is buried.

Pocket gophers can be poisoned almost any time, but the most efficient job can be done in April, May and October when vegetation is short and mounds are easy to see.

Take the poisoned baits and a sharpened broomstick out to the infested field. Find a pocket gopher mound which looks fresh, and examine it. As seen from above, the mound will be round in outline on one side, flat on the other. The flat side of the mound indicates the position of the main runway where you want to put the poison.

The main runway is usually 8 to 12 inches away from the mound, so use the sharpened broomstick as a probe to locate the runway where you want to put the poison. When it is found, drop two or three pieces of poisoned bait into the probe hole, and then close the hole with the heel to exclude light. The pocket gopher, in his travels along the runway, will find and eat the bait — and die.

Poison at two mounds in each system and remember there is only one pocket gopher per system. When the field has been poisoned completely, take a harrow and drag down the mounds. There are two reasons for this: First, the mounds are hard on mowers and are easy to drag down when fresh; second, you can’t expect to kill all of the gophers with one baiting.

Any fresh mounds that appear in 24 to 48 hours are thrown up by gophers that missed the bait. Re-poison those mounds and drag them down. Usually two poisonings will clean up a field.

Since pocket gophers move from farm to farm in the spring and fall, baited fields usually become re-infested from unbaited fields nearby. But don’t use this fact as an excuse to delay poisoning.

Yearly baiting will pay big dividends in increased yields of alfalfa, fewer broken sickles and less soil erosion. Pocket gopher control is an ideal community project. If all farmers in a community will poison their own gopher-infested fields thoroughly the same season, they can all rest for sev-
One of the common damages of pocket gophers is to cut off the roots of young trees for storage in their winter food supply. These are young cherry trees. After several years before the population builds up again.

Pocket gophers in Iowa do a great deal of damage to crops and soils by their underground and underground work. They feed on the roots of many crops, but seem to prefer legumes like alfalfa and the clovers.

One pocket gopher may cut off and store more than a bushel of roots during the summer. In addition, pocket gophers sometimes cut off the roots of young trees during the fall and winter, and, if they are allowed to work unmolested in the garden, they can destroy whole rows of many root crops.

Pocket gophers are very industrious, and one gopher may dig out as much as a mile of runway during a season. These runways, particularly on slopes, may be the cause of serious erosion later.

The mounds thrown up in alfalfa and clover fields are the cause of many broken sickles every year. This year, with the machinery shortage, we can’t afford to have broken parts and we can’t afford the loss of time these broken parts cause.

Here is indicated the correct place in the runway of a pocket gopher to place the poisoned vegetable bait.

Bees in the War

Uncle Sam is asking the beekeepers to “ask” their bees to help win the war. Because of the rationing of sugar, honey has gained a new spotlight in the food picture. In addition, the government wants all of the beeswax that can be obtained. This is being used for coating machinery that goes into climates so warm that oil and grease won’t stay on the machinery. The wax is used, too, for dental work in the services and for making models of machinery in war production plants.

Bees have another important contribution to make besides the honey and wax which they furnish — they are a great aid to the pollination of fruit and field crops such as the clovers and alfalfa. This better pollination increases the crop of seed of the legumes and the fruit production of orchards.

The Iowa Agricultural Experiment Station, in cooperation with beekeepers and other experiment stations, has made a gigantic contribution to successful beekeeping through the development of strains of bees that are resistant to American foulbrood, the worst of the bee diseases. Use of queens of these disease-resistant strains will reduce the loss of bees and by eliminating bee losses will help bring about the much needed increased production of legume seed and fruit.

Queens of the disease-resistant stock are now available commercially. The resistant strain was developed by the Iowa Station and the distribution of the queens is being done through the Iowa Beekeepers’ Association. About 15,000 queens were distributed this year.
Use More BROMEGRASS

It Does Best Seeded With a Legume and Alfalfa Seems to Be the Most Desirable

BROMEGRASS may not sound like a war emergency crop, but it can make a real contribution toward our effort for maximum food production. Providing feed for livestock is one of our problems now and an acre of good bromegrass pasture will feed as much livestock as 1 1/2 to 2 acres of bluegrass, say some Iowa farmers who have tried it. So in this period, when we are trying to make every acre of land produce to capacity, we need to look into the possibilities of providing more productive pastures.

With Alfalfa

Bromegrass (Bromus inermis) can probably make its greatest contribution in Iowa as either a pasture or hay crop if used in combination with alfalfa. Bromegrass-alfalfa is highly nutritious and palatable to all classes of livestock when used as a rotation pasture. Alfalfa used alone for pasture is a bloat hazard, but when bromegrass makes up from one-third to one-half of the forage mixture, bloat is practically if not completely eliminated.1

In 1942, Iowa passed its first million-acre mark of alfalfa, or an average of about 5 acres per farm. We believe this acreage should be doubled or increased to an average of 10 acres per farm to help meet the present livestock feed requirements. Much of this acreage should be seeded in combination with bromegrass on the more rolling fields where longer rotations are necessary to build fertility and prevent serious soil losses. The bromegrass-alfalfa combination provides for a longer period of grazing than other pasture grasses and legumes and not only furnishes an abundance of forage but is an economical source of protein.

It is best to pasture the bromegrass-alfalfa judiciously, not closer than 5 to 8 inches, so as to prevent injury to the alfalfa stand. Bromegrass is a heavy user of nitrogen and therefore should always be grown with a legume, preferably alfalfa. Unless considerable alfalfa can be maintained with the bromegrass, it soon becomes less productive. A stand of bromegrass when grown alone for 3 or more years without a legume often becomes unproductive. This condition is commonly referred to as being “sod-bound.” Bromegrass can be grown with alfalfa on any soil properly treated and suited to the growing of alfalfa. The meadow should be allowed to recover sufficiently in the fall to furnish adequate winter protection.

In Rotations

A mixture of bromegrass-alfalfa is especially useful on the more rolling to steeply rolling cropland fields which are subject to serious sheet erosion. On such land, rotations may vary from 4 to 8 years in length. These rotations usually provide 1 to 2 years of corn and 2 to 4 years of bromegrass-alfalfa. The seeding rate of alfalfa can be reduced from one-third to one-half when sown with bromegrass. Greater yields of clean-tilled crops can be expected following bromegrass-alfalfa if plowed before the alfalfa disappears or becomes too thin.

In the Knox-Marshall soil area in western Iowa, where alfalfa grows very vigorously, 4 to 6 pounds of alfalfa and 12 to 15 pounds of bromegrass seed per acre has been a desirable mixture for rotation pasture. If it is to be cut for hay, it may be desirable to use a little less grass and more alfalfa seed.2 In other areas of the state where bromegrass grows more vigorously, the seeding rate may range from 5 to 10 pounds with 6 to 10 pounds of alfalfa seed per acre. Where the land is more gently rolling, greater use should be made of the shorter rotations which provide not less than 2 years of bromegrass-alfalfa. If such a combination is desired for a longer period, wilt resistant strains of...
as bromegrass when used with alfalfa produces very effective protection against sheet erosion. When a good bromegrass-alfalfa sod is plowed, the effect of the bromegrass roots is immediately apparent—they hold the plowed soil together. This binding effect also carries over to a considerable extent the second year when the field is in clean-tilled crops.

Waterways, Terrace Outlets

The spreading root system of bromegrass together with the surface protection it produces make it an excellent grass for use in terrace outlets and grassed waterways. Where the soil is low in fertility, especially nitrogen, an application of barnyard manure following seeding is highly recommended. Care should be taken during the seeding year to prevent the concentration of water in the waterway or terrace outlet channel. A good time to seed bromegrass in waterways is when the field is going to small grain in the spring. Oats have considerable seedling vigor and furnish field and waterway protection while the bromegrass is becoming established.

For Special Uses

Field borders of bromegrass sufficiently wide on which to turn with ordinary farm equipment are recommended where contour farming is practiced. This will eliminate end rows of clean-tilled crops. The bromegrass may be cut for hay or used for early spring and late fall pasture. Such areas may also be a source of bromegrass seed.

Bromegrass is well adapted for use on spoilbanks along drainage ditches, and should be included in all the mixtures seeded for such purposes. It not only furnishes bank protection but it stops spreading at the waterline. The Iowa Highway Commission is using bromegrass extensively in all its grass and legume mixtures in the re-vegetation of sloping right-of-ways on state and federal roads. When establishing vegetation on slopes from 3 to 1 to as steep as \( \frac{1}{2} \) to 1, an application of mulch such as straw or strawy manure has many times been the difference between success and failure. The mulch increases infiltration, reduces run-off, decreases sheet erosion, and assures better stand and growth of vegetation.

In fence rows where there is little or no grass, the weeds may be practically eliminated by establishing such areas to
brome grass. Fence rows in bromegrass not only reduce the labor of cutting weeds, but such areas are a source of grazing in late fall and early spring.

**Of Adapted Strains**

In an attempt to determine why many farmers in western and southern Iowa have been unable to obtain bromegrass stands, we obtained bromegrass seed from many sources as far south as Kansas and north to Canada. We compared this seed in a test in southern Iowa at the Albia Pasture Farm, in southwest Iowa at the Clarinda Experiment Station, in western Iowa on the George Lee Farm, in Monona County, and in central Iowa on the Agronomy Farm, Ames.

Observations from these plantings showed the western Iowa area was the most difficult in which to establish a stand. Bromegrass from northern sources such as Canada and northern commercial firms were much inferior in forage yield and stand establishment to the so-called southern strains from Kansas and Nebraska. The northern strains produced very weak seedlings which showed more susceptibility to injury from hot weather. The bromegrass strains from northern sources were highly susceptible to disease. The observations of the different bromegrass strains in western Iowa are similar to the results obtained in eastern Nebraska.

At Ames, the southern strains were somewhat superior in forage yields to those from northern sources, with satisfactory stands resulting from all strains. In southern Iowa, on the Albia Pasture Farm, the variation in yields and stand establishment was intermediate between that of western Iowa and the results obtained at Ames.

Until more seed of the southern strains of bromegrass is available, north-central and north-eastern Iowa farmers can well continue to use commercial seed of northern origin. Farmers in southern and western Iowa can expect to increase their chances of obtaining stands and expect greater production from the use of the southern strains of bromegrass. (Southern strains of adapted bromegrass being certified in Iowa at the present time by the Iowa Agricultural Improvement Association are Lincoln, Fischer and Achenbach.)
This is a close-up of bromegrass and alfalfa, one of the best combinations for use either for pasture or for hay.

But there are other factors besides unadapted strains which may contribute to a seeding failure or a thin stand of bromegrass. These include lack of a firm seedbed, prolonged drought in the seedling stage, honey-combing and drying out of seedbed in the spring following a fall seeding, insect damage (grasshoppers and chinch bugs), covering the seed too deep (over 3/4 inch), too late seeding in the spring, and excessive competition from weeds or small grain.

To Produce Seed

We need more farmers producing more high quality seed of adapted bromegrass strains. Until an adequate seed supply is available at a reasonable price, bromegrass will not spread in Iowa as rapidly as it should. When a bromegrass stand is established for seed production, we recommend that it be sown with a light seeding of alfalfa. The stand should show a predominance of bromegrass. Alfalfa seeded at the rate of 3 to 5 pounds, depending on the location, and 10 to 12 pounds of bromegrass seed per acre, has been found a satisfactory mixture for bromegrass seed production. When grown in this manner, it is not unusual to obtain yields of 400 to 700 pounds of bromegrass seed per acre, which is worth $60 to $100 an acre at present prices. Old alfalfa stands that are becoming too thin for hay production may be disked or spring-toothed in the fall and seeded to bromegrass for seed production, pasture, or both.

It is very important that fields selected for the production of bromegrass seed be free of noxious weeds as well as any other weeds that may prove troublesome, such as the annual bromes. Much of the commercial bromegrass from parts of Iowa, Nebraska and Kansas contains weed seed of the annual bromes such as downy bromegrass, chess, Japanese chess and others. If there is a considerable quantity of annual bromes in the field of bromegrass you are planning to save for seed, it may be necessary to pasture and mow such fields for hay until the annual bromes disappear.

Bromegrass may be harvested for seed with a binder and threshed. Probably the simplest and most convenient way to harvest bromegrass for seed is with a combine. Those with a rubber-faced bar type cylinder and concaves are preferred because they do not break the stem or straw in so many pieces as do the spike-toothed type of cylinder and concave.

The combine should be set to head the brome above the alfalfa, thus leaving all the stems and leaves for hay or pasture following the seed harvest. Be sure to reduce the wind in the combine to prevent loss of seed, since the seed is almost as light as the straw. Where the yield of bromegrass seed is heavy it may be necessary to reduce the width of the cut to prevent overloading the combine.

Combined bromegrass seed should be spread on a suitable floor space to dry. The seed should be stirred daily the first 3 or 4 days to prevent heating. When thoroughly dry, the seed can be cleaned if necessary by re-running it through the combine or by the use of a small fanning mill.

Certified seed production programs of adapted bromegrass strains have been started in a number of counties which have organized Soil Conservation Districts. This program is cooperative between the District Commissioners of a Soil Conservation District, the Iowa Agricultural Experiment Station and the Soil Conservation Service. The main objective is to produce a sufficient quantity of adapted bromegrass seed in the shortest possible time to meet the local needs of the soil conservation program of the District.

Bromegrass fills a badly needed place in holding the soil on waterways in the more hilly lands of Iowa. It is also used along highway cuts and on ditch banks.
SAVE THOSE VEGETABLES

By L. C. GROVE and
S. W. EDGECOMBE

IN OUR EFFORT to conserve food at home this year, the storage of vegetables is exceedingly important. Potatoes, carrots, beets, parsnips, cabbage, onions, squash, pumpkins and other vegetables can be stored successfully over winter so that they remain fresh and firm. The more vegetables that can be stored fresh, the less the family need draw upon canned, frozen and other conserved foods.

One of the first essentials in successfully storing vegetables is to make sure that only sound ones are placed in storage. Any vegetables which have injuries from insects, diseases or mechanical causes should not be stored.

Unfortunately the right storage conditions for one vegetable may be just the wrong kind for another. Cabbage, beets, carrots, parsnips, turnips and other root crops require cold, moist storage; onions, on the other hand, need a cold, dry place; sweet potatoes, squash and pumpkins keep best in a dry, relatively warm place.

There are ordinarily three choices of places to store vegetables on the farm: 1. The house basement; 2. the cave; 3. outdoors in a pit. Of course closed porches and outside buildings may sometimes be used at least into late fall, but basements, caves and pits are places in which vegetables may be left until spring.

The house basement is likely to be the poorest of the three places for most vegetables. This is especially true if it contains a furnace. But a cold, well ventilated basement can be an excellent place for storing vegetables.

Basement Storage

The two factors so necessary in successful basement storage are good insulation and ventilation.

In order to have suitable storage, it is generally best to partition off a room either in one end or one corner of the basement. There should be no heating pipe from a furnace in this room. The floor area of this room need not be larger than 8' x 12'. The walls in this special room should be of good insulating material. Cork, mica and redwood bark are among the best insulating materials. Other good ones are insulating boards made of sugar cane, wood, cornstalk, straw and the like; mineral or rock wool; 8-inch and 12-inch hollow tile (insulating value depends on number and direction of spaces); 12-inch interlocking tile. Concrete, stone walls, brick walls, plaster, stucco, cement mortar, concrete block are poor insulating materials. Wood lath and plaster, dry sawdust, lumber, dry shavings and cinders are about a third as effective insulators as the best ones listed.

It is best to spend a little extra for insulation when the room is being built because the vegetables will keep better and in the long run pay for the additional cost of insulation. It is a good plan to have double doors into a basement storage room.

Supposing your basement already is equipped with a small room with a window. Likely all that will be needed will be rock wool batts to nail on the ceiling and sides (not the foundation.

Root crops, as well as any others that are to be stored, should be carefully examined to insure that only sound ones that will keep use the storage space.
walls). The cost of insulation is relatively small.

Ventilation is highly important in basement storage. One or two windows are desirable for this purpose. If there is but one window, one pane of glass may be removed to make an intake and another removed to permit an outlet of air near the ceiling. One square foot of outlet ventilator area is necessary for every 1,200 cubic feet of storage space. A shaft should be built down from the inlet ventilator so that the cool air from outside is released near the floor. False floors, together with false walls, are needed for ideal ventilation.

The air may be too dry in a basement storage room with concrete floor and good ventilation. When vegetables shrivel, the air has been too dry. A false or slat floor should be built, allowing about 3/4 inch spaces between the boards, so that water may be kept on the floor to keep the humidity at a high level. Vegetables stored in closed baskets and boxes may be kept out of the water by setting them on the false floor or on shelves. It is helpful to use peat or sphagnum moss underneath the false floor. An earthen floor makes it easier to handle the humidity problem.

The basement windows should be covered to exclude light as most vegetables store best in the dark. A thermometer should always be kept in the storage room to check the temperature. The temperature should not go below 32 degrees or above 40 degrees.

Pumpkins, squash and sweet potatoes need a warmer and drier storage room. These crops can be stored in the furnace room on shelves. A temperature of about 50 degrees is ideal. They just won't keep well in a place that is satisfactory for Irish potatoes and root crops. Pumpkins, squash and sweet potatoes before they are stored should be cured for about 2 weeks in a place where the temperature is between 80 and 90 degrees F. Onions, too, require similar treatment before storing in a cold, dry place. Such curing is essential for satisfactory storage of these few vegetables.

Cave "Tops" for Roots

Outdoor storage cellars or caves are excellent for the storage of vegetables such as potatoes, root crops and cabbage. Cellars and caves have all of the advantages of the basement storage room and are superior in some respects. Temperature and humidity can be maintained more evenly than in basement rooms.

Ventilation in caves is essential and should consist of an outlet which is flush and opens at the highest place in the ceiling. As with the basement room, 1 square foot of outlet ventilator area should be allowed for every 1,200 cubic feet inside the cave. A 4 or 5-inch drainage tile is entirely too small to be used as an outlet ventilator.

The door, however, will serve as the major intake ventilator during the cool, fall nights. The essential principle in ventilation of any storage room is to open the ventilators at night when the temperature of the outside air is lower than that within the storage room and to close the ventilators when the outside temperature is higher than that in the storage room. Vegetables in a properly insulated cave will not freeze even with large ventilators since the ventilators may be plugged with old sacks or straw during exceptionally cold weather. All ventilators must be screened to keep out rats and mice. Drainage should be provided in the cave by the use of tile properly placed.

Storage in Pits

Outdoor pits as storage places are valuable to those who do not have a cave or a basement and do not wish to construct one. The major advantage which they have over all other types of vegetable storage places is that they cost little or nothing. The only material necessary to build a pit storage consists of straw, old boards and earth. The use of pits requires considerable labor in storing and removing the vegetables. It is difficult to control the temperature and moisture in a pit. Still another disadvantage is that it is sometimes difficult to remove produce from a pit in severe weather and close it up again. Some of this difficulty can be overcome by having a series of small pits in each of which is placed a small supply of each kind of vegetable. The removal of all the material from such a pit will overcome losses due to freezing of the portion left in the pit after it is once opened.

Small pits may be constructed without provision for ventilation. For large ones, select a well drained location so that surface water runs away from the mound. In any kind of pit storage select a place on the north or east side of a building for shade. Avoid drip from roofs.

Barrels or boxes may be sunk in the ground in a well drained place and covered with straw and soil. Wooden dividers in the barrel or box will separate several kinds of vegetables and make it easier to remove them. Cabbage, turnips and salsify can be stored in barrels or boxes sunk in the ground. Once the vegetables have been frozen, they may be kept in this condition until March 1 if the barrel is covered with soil, straw and cornstalks to prevent alternate freezing and thawing.

Can Use Tile

A very good pit storage can be made by using large concrete or clay tiles. A good size is one 18 inches in diameter and 30 inches long. It will hold about 3 bushels of vegetables. Dig the hole about 8 inches deeper than the length of the tile. Place three building bricks in the bottom of the hole upon which to rest the tile. Then place about 4 inches of cinders, fine gravel or coarse sand in the bottom. Wet the tile and material in the bottom. Use hardware screen cloth to cover the tile after the vegetables are stored. A few inches of straw and a waterproof covering will complete the protection. When severe weather sets in, several feet of mulch must be added.

Select your method of storage now so that you are prepared to store your surplus vegetables this fall. Get your drain tile, boxes and other materials not on hand as soon as possible if pit storage is to be used. Be sure you have enough boxes, baskets and crocks or other containers with lids in which to store the vegetables if a cave or basement storage is to be used.

Pamphlet on Storage

Further details on storage of garden products will be found in Extension Pamphlet 70, entitled "Storing Victory Garden Vegetables," and Extension Circular 249, entitled "Home Storage of Vegetables." Copies of these can be secured at the office of the County Extension director or by writing to the Agricultural Extension Service, Ames, Iowa.

Iowa this year is producing about 1950 acres of waxy corn which will be processed commercially to replace the tapioca starch formerly imported from the East Indies. The Station also is producing approximately 7,500 bushels of waxy seed for next year's crop.
**Lime to Boost Yields**

WE CAN INCREASE food production by growing more acres of the necessary crops, but we are inclined to forget that high acre yields can often contribute more toward total production than shifts in crop acres. High acre yields also mean less labor and machinery costs per ton of hay or bushel of grain produced. And that's an important consideration during this war emergency.

How can we increase our yields? A basic consideration is the fertility of the soil, and the first step in improving fertility is to make sure the soil is not acid. If it is acid, the first step should be to lime the soil.

Briefly, here are the essentials for a liming program to increase crop production:

1. Increase the use of finely ground limestone immediately as a means of meeting our feed and food production goals.

2. At least 1 1/2 million tons of ground limestone should be used annually in Iowa.

3. Provisions should be made by the government agencies concerned to make possible the production and distribution of at least this amount of agricultural limestone annually.

4. Limestone in Iowa should be ground to a greater degree of fineness if we are to obtain as quick results as possible from the tonnage used and are to effect economies in labor and transportation costs.

5. All available lime should be used in the most effective manner possible to increase crop production. This means liming according to soil tests, spreading uniformly and working lime well into the soil.

**By W. H. PIERRE**

**Helps All Crops**

The average increase in corn yields in Iowa has been about 5 bushels an acre from lime alone in 51 field experiments by the Iowa Agricultural Experiment Station on the major acid soils of the state during about a 20-year period. Oats showed an increase of 3.7 bushels, wheat 3.4 bushels, mixed hay 0.3 ton and alfalfa 1.5 tons. (See accompanying table.)

Liming increased the yield of all crops in our experiments here in Iowa, but it proved especially beneficial in getting stands and increasing the yield of legume crops, particularly alfalfa.

About two-thirds of the soils of Iowa are estimated to be acid. The average lime need is between 2 and 3 tons to the acre. Over 3 million acres are seeded to legumes each year. If lime were used at an average rate of 2 tons to the acre on 60 percent of this acreage, over 3 1/2 million tons of limestone would be required. We feel that a minimum of at least 1 1/2 million tons should be used annually during this war period to assure higher crop yields.

Iowa has an abundance of limestone deposits. With the reduction in the demand for crushed limestone for road building, the production capacity of plants for agricultural limestone could be increased. Some of the "bottlenecks" to production and distribution of lime are shortages of labor, machinery repair parts and trucking and spreading facilities. Where these "bottlenecks" exist, action should be taken through the proper governmental agencies to remove them.

**Fine Lime Important**

One of the most important points now is to use lime that is finely ground so as to get quick benefit from its use. The finer the limestone is ground the better it reacts with the soil in correcting the acidity, making calcium available and increasing crop yields.

In the accompanying graph, the desirability of having the lime fine is shown. Note that the material finer than 60-mesh became entirely available within 6 months. Material coarser than this, however, became available much more slowly. For instance, only 20 percent of the material coarser than 20-mesh had become available in 2 years. This is the reason why the standard generally recommended is that ground limestone should be fine enough so that at least 90 percent will pass through an 8-mesh sieve (a wire sieve with eight openings per linear inch).

A study is now in progress of the fineness of the ground limestone used in Iowa. Of the 148 samples thus far analyzed we found that only about one-fourth were sufficiently fine so that 90 percent of the material passed through an 8-mesh sieve. The 110 samples which failed to meet the standard given above had an average of 22.2 percent of material too coarse to pass an 8-mesh sieve. On the basis of the data on the accompanying graph, only about 46 percent of these ground limestones would become effective in the soil during the first 6 months after application and only 55 percent during a period of 2 years. That's too slow for this war period when we want increased food production in the shortest possible time.

It costs just as much to quarry the rock and to handle, transport and spread ground limestone regardless of whether the material is coarse and very slowly available in the soil or is of good quality, has a large percentage of fine dust and becomes readily available. The slightly greater cost of grinding that would result from increasing the fineness of much of the ground limestone used would be a very small item in comparison to the benefits obtained.
Fertilizer Helps Hemp

In tests conducted by the Iowa Station this year to try to find out the needs and the response of hemp to commercial fertilizer, it was found that this crop shows considerable increase from fertilization. The increase was especially large from nitrogen.

Data have not been analyzed from the experiments, but it appeared that in some of the tests the yields were doubled by the use of fertilizer.

The tests consisted of the use of potash, phosphorus and nitrogen fertilizers applied separately and in combination to soils in eight tests. There were 24 plots in all of the principal soil types of the hemp-growing area.

In addition to the fertilizer tests, some study has been made of the effect of preceding crops on hemp and also of different rates, dates and methods of planting, seed treatment and soil adaptation.