CONTENTS

EXTENSION LEAFLETS

Series:

COVER CROP TREATMENT

Cover crops, to be most effective, like other crops, require proper care and attention. On all soil experiment fields in Kentucky, outside the Central Bluegrass region, and on hundreds of demonstrations conducted by farmers in cooperation with the College of Agriculture, the application of liming materials and superphosphate profitably increased the growth of cover crops. Even within the Bluegrass region, much of the land responds to lime and phosphate treatment. The application of these materials also benefits the crop which follows the cover crops.

When legumes are used for cover crops and these have not previously grown on the particular field, the seed should be properly inoculated. Directions for doing this may be obtained from the county agent.

Many farmers fail to sow sufficent seed of cover crops and do not sow them early enough to obtain sufficient growth before winter; therefore, the following seeding rates and dates are recommended:

Kind	Date	Rate
Rye	Aug. 20—Oct. 1	6- 8 pecks
Wheat	Oct. 5—Oct. 15	5- 6 pecks
Barley	Aug. 20—Sept. 20	6- 8 pecks
Crimson clover	July 20—Aug. 20	15-20 lbs.
Vetch	July 15—Oct. 15	30-40 lbs.

No treatment. Lime and phosphate.

PLANT COVER CROPS!

WHY?
- Reduce erosion
- Reduce leaching
- Provide feed
- Enrich the soil
- Increase profits

WHAT?
- Rye
- Wheat
- Barley
- Crimson clover
- Vetch
- and others

WHERE?
- Following:
- Corn
- Tobacco
- Soybeans and cowpeas
- All other cultivated crops
- Lespedeza seeded without a grass

WHEN?
- As soon as preceding crop is harvested

Cover crops will not do it all—

Other essentials of good soil management are:

Use of lime and fertilizers where needed.

Use of terraces where needed.

Maintaining large percent of farm in grass and legume mixtures.

Proper use of farm manure and crop residues.

Strip cropping and contour furrowing and cultivation where needed.

For further information consult your County Agent, or write to the Kentucky Agricultural Experiment Station, Lexington, Kentucky.

AGRONOMY LEAFLET
JULY, 1938

COVER CROPS

Cover Crops
Reduce Erosion and Leaching
Provide Cheap Feed
Improve Soils

EXTENSION DIVISION, COLLEGE OF AGRICULTURE
University of Kentucky, Lexington, Kentucky
THOMAS P. COOPER, Dean and Director

Published in connection with the agricultural extension work carried on by co-operation of the College of Agriculture, University of Kentucky, with the U. S. Department of Agriculture, and distributed in furtherance of the work provided for in the Act of Congress of May 8, 1914.

COVER CROPS

By WM. C. JOHNSTONE
Field Agent in Agronomy

COVER CROPS PROTECT THE SOIL

The term, cover crop, as used here, means a crop grown during fall and winter to provide a protective covering to land which otherwise would be bare. The crops commonly used for this purpose are wheat, rye and barley. Crimson clover, vetch and other winter crops are sometimes used.

The failure to use cover crops in Kentucky has been the major factor contributing to the loss of soil and plant food. It is estimated that this loss in Kentucky exceeds 35 million dollars annually. It is further estimated that over 1,000,000 acres of land in this State, or one fifth of the cultivated land, have been so badly eroded as to render them unfit for farming, and another million acres are rapidly reaching that point.

Cover crops not only prevent erosion but experiments conducted at the Kentucky Experiment Station show that they also reduce the loss of plant food by leaching. The loss of nitrogen, one of the most expensive plant foods, was over twenty-five times greater on unprotected soil than where a cover crop occupied the land during the winter.

It has been estimated that it requires hundreds of years for nature to produce one inch of soil from parent rock. This amount is sometimes lost in one year by leaving the land uncovered thru the winter. It is to prevent erosion that cover crops are of greatest importance. The slogan used by paint manufacturers, "When you save the surface, you save all" applies very forcibly to soil. Cover crops save the surface soil from being washed away.

From information furnished by over 100,000 farmers cooperating with the Agricultural Conservation program in 1936 it is evident that of 3,100,000 acres of land in Kentucky normally used for the cultivation of crops that leave the land bare during the winter, 2,400,000 acres, or 78 percent, are left unprotected thru the winter. It is clear, therefore, that the growing of cover crops is of prime importance in Kentucky's soil-building and soil-conserving program.

COVER CROPS FURNISH FEED

A very important value of cover crops which is often overlooked is the excellent pasturage which is furnished. All cover crops, when properly handled, furnish a large amount of early spring pasture; and the cereals, when seeded early, furnish excellent fall pasturage and often may be pastured thruout the winter. Kentucky sheep growers consider a good small grain for fall, winter and early spring pasture essential to profitable sheep production. Good fall, winter and spring pastures also lower the cost of production of hogs, beef, poultry and dairy products by decreasing the amount of concentrates and roughages required. In at least some cases, rye five inches high is slightly richer in nutrients than alfalfa of the same height.

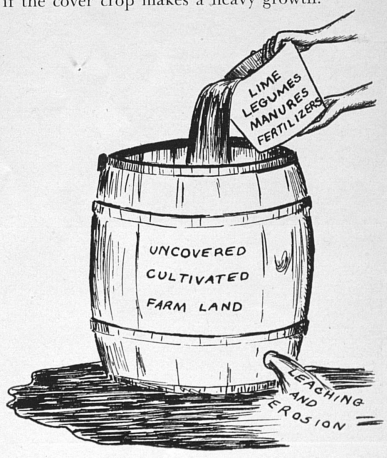
Winter cover crops should not, however, be the sole feed for livestock. They should be considered as valuable supplements to a suitable grain and roughage ration. Small grains may be pastured to a moderate extent and then harvested for grain with little or no lowering of yield, or they may be used as winter pasture and then allowed to mature for feeding down with livestock. Especially is the hogging down of wheat or barley considered an economical practice. Even if considered only for their feeding value, the planting of cover crops becomes an essential part of a good farm-management program.

Caused by the lack of protective covering.

COVER CROPS IMPROVE THE SOIL

Besides protecting the soil against leaching and erosion during the winter, cover crops, when turned under, add organic matter to the soil and thus increase the amount of water the soil can absorb, thereby further reducing erosion. Legume cover crops, such as vetch and crimson clover, add considerable nitrogen to the soil when used for green manure. Cover crops turned under before 15 inches high usually greatly increase the yields of crops which follow them. It may be said that trying to increase the fertility of cropped land with fertilizers without the use of cover crops is like trying to fill a barrel with the bung left out.

One of the principal uses of a winter-grain cover crop is as a nurse crop for grasses and legumes in changing a field from cultivated to sod crops. In this case, the grasses, except, perhaps, orchard grass, should be sowed in the fall, on the cover crop, and the legumes in the early spring. The cover crop may be left for harvest or may be grazed off; the latter practice is frequently better for the young grass and clover, especially if the cover crop makes a heavy growth.



Plug the hole with cover crops.

amounts representing equal money values produced slightly smaller yields when used with limestone, and slightly larger yields when used without limestone than has superphosphate.

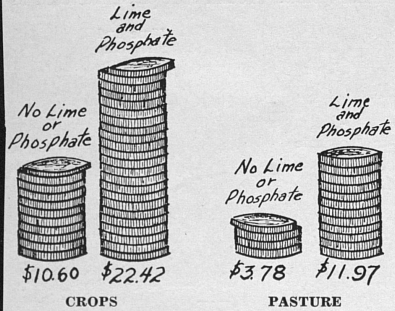
The last illustration also shows the average annual value of gains per acre for pasture grazed with steers on the Princeton farm, valuing beef at 8 cents per pound. The average annual value of the gain per acre on the check, or untreated field, was only $3.78, while on the limed and phosphated land the average annual value of the gain was $11.97 per acre.

LIME AND PHOSPHATE IMPROVE QUALITY AND AID IN SOIL CONSERVATION

Results of experimental work show that lime and phosphate treatment improves the quality of the various crops. It lessens the proportion of inferior corn ears and wheat heads, resulting in more plump grains of both corn and wheat. It increases materially the growth of both clovers and grasses in hay and pasture fields, thus holding in check the growth of wild grasses, weeds and bushes. Finally, lime and phosphate treatment increases the content of minerals and protein in crops, especially legume crops, thereby increasing their feeding value.

Another effect is that there is a large accumulation of lime and phosphate in the treated land

ANNUAL VALUE OF CROPS AND PASTURE PER ACRE



and, on the basis of earning capacity, it is worth two or three times as much per acre as the untreated land. Again, these materials not only increase the vegetative growth above the ground but they develop in proportion the root systems of plants, thus aiding in preventing soil erosion by producing a good ground cover and increasing organic matter.

HOW TO USE LIME AND PHOSPHATE

The best time to spread liming materials and phosphate is when land is being prepared for planting crops, as they can then be more thoroly mixed with the soil. However, they may be profitably used as a top dressing on small grain, hay and pasture crops. Especially is this true of phosphate. Phosphate can be very conveniently spread thru the fertilizer attachment on the grain drill when seeding small grain.

Many farmers in Kentucky are using heavier applications of limestone than is necessary. Two tons per acre is sufficient on most soils unless the land is being prepared for alfalfa. Then 3 or 4 tons per acre may be used. Many farmers, on the other hand, do not use as liberal applications of phosphate as they should.

LIME AND PHOSPHATE WILL NOT DO IT ALL

Other essentials of good soil management are:

- Use of cover crops.
- Use of terraces where needed.
- Maintaining large percent of farm in grass and legume mixtures.
- Proper use of farm manure and crop residues. Potash also may be needed for some crops on some soils.
- Strip cropping and contour furrowing and cultivation where needed.

For further information, consult your County Agent, or write to the Kentucky Agricultural Experiment Station, Lexington, Kentucky.

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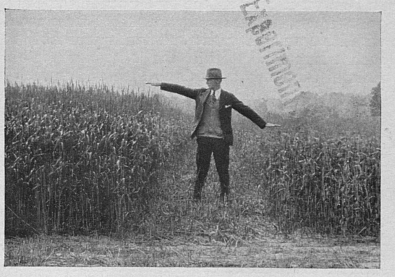
LIME AND PHOSPHATE FOR KENTUCKY SOILS



Limestone and phosphate — No limestone or phosphate

WHEAT

LIME AND PHOSPHATE—

Increase Crop Yields
Ensure Greater Profits
Improve Quality of Crops
Aid In Soil Conservation

EXTENSION DIVISION, COLLEGE OF AGRICULTURE
University of Kentucky, Lexington, Kentucky
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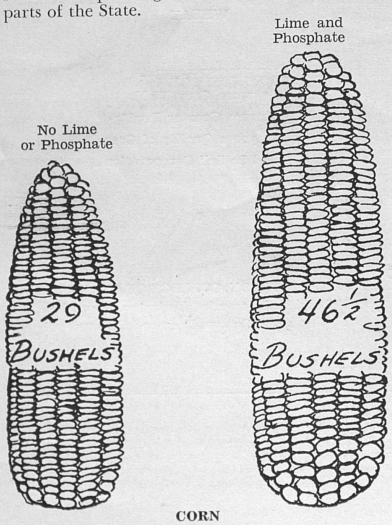
KENTUCKY SOILS NEED LIME AND PHOSPHATE

By S. C. JONES

More than three-fourths of the land in Kentucky is deficient in both lime and phosphate. In fact, practically all the land outside the Bluegrass region, if it has not previously been treated with lime and phosphate, responds profitably to such treatment. Within the Bluegrass region, most of the land responds to lime and much of it to phosphate. Probably half of it needs both for profitable yields. Proof that Kentucky soils are lacking in both lime and phosphate is furnished not only by the chemical analyses of thousands of samples, made by the Kentucky Experiment Station, but also by 10 to 25 years' results from ten experiment fields in different parts of the State, (the basis for the illustrations in this leaflet) and by the results of hundreds of lime and phosphate demonstrations conducted by farmers cooperating with county agents in all parts of the State.

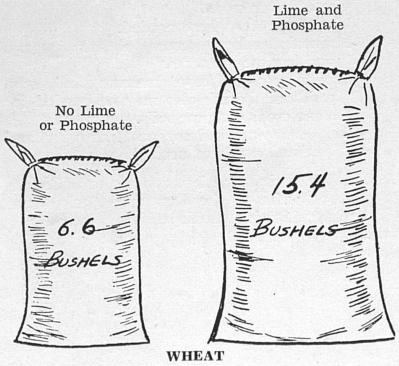


CORN

LIME AND PHOSPHATE INCREASE CROP AND PASTURE YIELDS

Many years' results from ten outlying experiment fields show marked crop increases from limestone alone and from phosphate alone, but the increases on land treated with both limestone and phosphate are much greater. For example, limestone alone increasd the yield of corn 6.9 bushels and phosphate alone 9.5 bushels per acre, while the increase on land treated with both limestone and phosphate was 17.5 bushels per acre, or 1.1 bushels more than the sum of 6.9 bushels with limestone alone and 9.5 bushels with phosphate alone. Comparisons for the wheat and hay crops were even more marked. The increases for the land treated with both limestone and phosphate over the land having no limestone or phosphate were: for corn, 17.5 bushels; for wheat, 8.8 bushels; for mixed clover and grass hay, 2,115 pounds; and for soybean hay, 1,405 pounds. Obviously, on most Kentucky soil it is more profitable to use both limestone and phosphate.

Eight years of pasture experiments in grazing steers on the Western Kentucky Substation at Princeton show only 47.2 pounds annual gain per acre on untreated land, while the annual gain on limed and phosphated land was 149.6 pounds, an increase of 102.4 pounds, or 217 percent. The use of lime and phosphate promotes the growth of a greater variety of grasses and legumes and therefore permits mixtures which otherwise could not be used. Thus, not only is the yield increased but the grazing season is lengthened and a higher quality pasture produced. Over most of Kentucky, lime and phosphate are essential to the successful production of alfalfa.



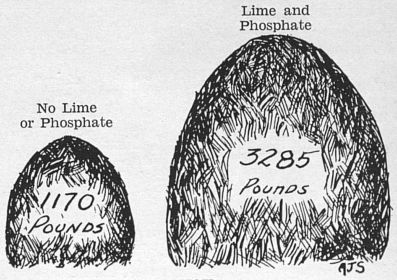
WHEAT

Comparison of results on the older experiment fields for the last eight years shows more than 25 percent higher yields of crops than for the first eight years. This is due not only to an accumulation of lime and phosphate but also to an accumulation of organic matter and nitrogen supplied by the legumes grown in the rotation, and to the larger amount of manure that was returned because of the larger yields produced.

LIME AND PHOSPHATE ENSURE GREATER PROFITS

The illustrations show the average annual yield and value of crops per acre for ear corn, wheat grain, and mixed clover and grass hay grown on ten outlying soil experiment fields (1) on land having no lime or phosphate, and (2) on land treated with limestone and superphosphate. Corn is valued at 75 cents per bushel; wheat, $1.00 per bushel; hay, $12.00 per ton; limestone, $2.50 per ton; and 20-percent superphosphate, $1.25 per 100 pounds.

Other forms of soluble phosphate show very similar results. Ground rock phosphate used in



HAY

CHEWING AND SMOKING WHILE WORKING IN TOBACCO

Barn-cured chewing and smoking tobaccos are a common source of mosaic and should not be used by those who handle tobacco plants in the plant bed or field. If a person who chews or smokes barn-cured tobacco is to weed a bed or pull or set plants, his pockets should be brushed out and his hands washed very thoroly with soap and water before he begins the work. Manufactured tobaccos are much safer to use than barn-cured tobacco but it is desirable to use no tobacco of any kind while weeding or pulling, especially if the beds must be pulled over more than once. Tobacco plants from a neighbor's bed should not be used unless one is certain that men who chew or smoke barn-cured tobacco have not worked in the bed.

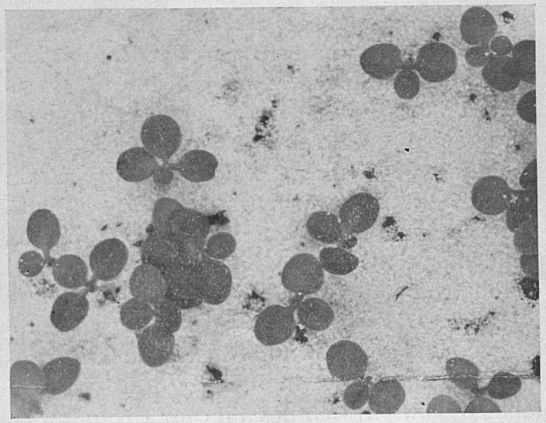
USE OF TOBACCO REFUSE AS FERTILIZER

Tobacco refuse should not be used on the tobacco plant bed as a fertilizer in any form and stalks and barn sweepings should not be applied to a field which is to be planted with tobacco the same season.

ROGUING

If, in spite of these precautions, a few mosaic, french, or walloon plants appear in the field they should be pulled and carried out early in the season. No healthy plants should then be touched until the hands have been thoroly washed with soap and water.

Recommendations for the Control of Leaf Diseases Of Tobacco



Time for application of first bluestone-lime treatment.

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University of Kentucky, Lexington, Kentucky
Thomas P. Cooper, Dean and Director

March, 1939

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RECOMMENDATIONS FOR THE CONTROL OF LEAF DISEASES OF TOBACCO

By W. D. VALLEAU and E. M. JOHNSON

The diseases which can be controlled by preventive measures are angular leafspot or rust in the plant bed, a disease common and injurious in White Burley beds; wildfire in the plant bed, a disease which is becoming increasingly destructive in the dark tobacco and White Burley plant beds in western Kentucky; angular leafspot and wildfire in the field, diseases which are particularly destructive to dark tobacco; and mosaic (also known as walloon and dry-weather french), including the burning which results from certain strains of mosaic which ruins the upper, most valuable leaves of dark tobacco. These diseases both impair the quality and decrease the yield of tobacco.

The practices recommended have been thoroly tested and are known to be effective in increasing yield and improving quality of all types of tobacco grown in Kentucky, if carefully followed. They are cheap and easily carried out. They are designed to prevent infection of the plants in the bed and avoid the spread of infection in the field.

BLUESTONE-LIME PLANT-BED TREATMENT

When to Apply. When the plants are just established in the bed and are producing the first leaf, or just before they are in the "square," apply the bluestone-lime mixture. Make a second application about 10 days later. Delay in applying the first treatment increases the likelihood of disease entering the bed. Early application of bluestone-lime mixture does not injure the plants, even when applied before they are up.

How to Apply. The mixture is applied to the bed with an ordinary 10-quart sprinkling can without removing the cotton cover from the bed. Logs or boards used to frame the bed should also be sprinkled. A 50-gallon container of the mixture will treat 200 square yards, or 66 linear yards of bed 9 feet wide, or 50 linear yards of bed 12 feet wide. This is at the rate of 1 quart per square yard.

HOW TO PREPARE BLUESTONE-LIME MIXTURE

1. Fill a clean 50-gallon barrel or oil drum three-fourths full of water strained thru a cloth.

2. Thoroly mix 4 pounds of commercial hydrated lime in 3 or 4 gallons of strained water. Hydrated lime is the powdered lime in paper sacks commonly sold by lumber yards.

3. Dissolve 3 pounds of powdered bluestone in about 4 gallons of water in a wooden bucket or crock. If powdered bluestone, which dissolves readily, is not available, beat the crystals into a fine powder before trying to dissolve them. Your hardware dealer can get powdered bluestone for you.

4. Pour the lime paste into the barrel of water and stir. While stirring vigorously, add the bluestone solution slowly.

5. Add enough water to make 50 gallons.

6. Stir the mixture each time the sprinkling can is filled. CAUTION. The water, barrel, and other containers should be free from bits of material which will clog the rose of the sprinkler. The rose should be easily removable for cleaning.

Cost of Bluestone-lime Mixture. The cost of materials for treating 200 square yards of bed twice should not be over 80 cents. The protection of plants in the bed, resulting in healthier, more vigorous plants and greater freedom from leafspot diseases in the field, will pay for the trouble and cost many times.

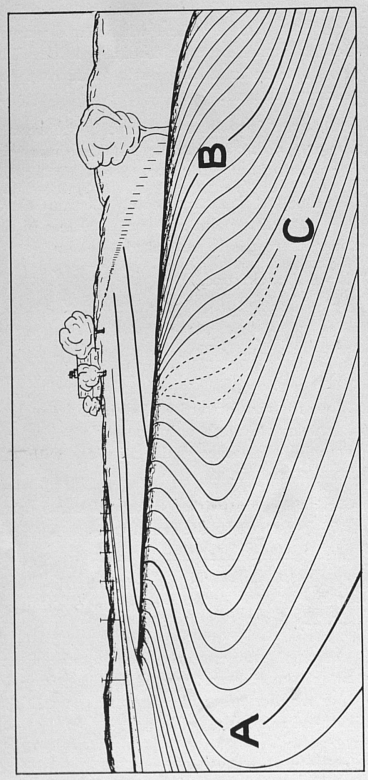
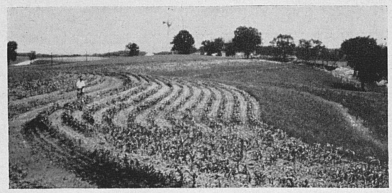


FIG. 1. Method of laying out rows on contour.

that part of the field not yet planted, and continue planting above this row until the first planting is reached. Fill in vacant space between the two plantings with short rows. Continue planting below B until the rows cease to be level. Locate other guide rows in the same manner and continue the procedure until the entire field is planted.

If guide rows are established for the preparation of a seed bed, a permanent contour line may be established by back-furrowing to the line of stakes, thus establishing a permanent line which may be used as a guide when the field is planted.

For further information, consult your county agent, or write the Department of Agricultural Engineering, Experiment Station, Lexington, Ky.



Corn planted on the contour.

CONTOUR CULTIVATION

Gullies in corn middles.

Do Your Plowed Fields Look Like This?

•

CONTOUR CULTIVATION

Reduces Erosion

Conserves Moisture

Requires Less Power

in Plowing, Cultivating and Seeding

•

EXTENSION DIVISION, COLLEGE OF AGRICULTURE

University of Kentucky, Lexington, Kentucky

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Contour Cultivation

By EARL G. WELCH and JOHN L. McKITRICK

WHY CONTROL EROSION?

To Conserve Agricultural Land. Erosion depletes the fertility of uplands by the removal of soil which is deposited in stream channels and thus causes poor drainage of otherwise fertile bottom land.

To Conserve Plant Food. Erosion removes more plant food than do harvested crops and, unless controlled, makes impossible the economical maintenance of soil fertility.

To Save the Soil Itself. Centuries are required for nature to produce a fertile top soil. Plant food removed by crops or by leaching may be returned to the soil by man thru soil-building practices, but he cannot return the soil itself to an eroded slope by any practical measure.

WHY PRACTICE CONTOUR CULTIVATION?

To Reduce Erosion. In any crop rotation which includes intertilled crops such as corn and tobacco, by far the greatest soil losses occur between the time the ground is plowed and the time when an adequate vegetative cover has been established following the cultivated crop. Erosion experiments have shown that about 80 percent of the annual amount of erosion takes place during the planting and cultivating season.[1] Data from soil erosion experiment stations indicate that during this period soil losses frequently are as great as 60 tons per acre and seldom less than 6 to 10 tons per acre. On an average of all slopes ranging from 5 percent to 15 percent, about one-half as much soil was lost from slopes planted on the contour as from those planted with rows running directly with the slope.[2]

1 Missouri Research Bulletin No. 63.
2 North Carolina Soil Erosion Experiment Station Report.

The combination of terracing and contour cultivation is the most effective means of controlling erosion during a period of cultivation; but, if terracing is not practiced, contour cultivation aids greatly in reducing erosion during the period of a rotation when land is not occupied by a vegetative cover.

To Save Time and Power. Rows laid out on the contour not only conserve soil but also time in turning, because the average length of rows is usually greater than it would be if the rows were straight. Likewise, less power is required in cultivating around the hill than when the rows are laid out up and down the slope. Thus it is easier on both team and driver. The same is true in plowing, preparation of the seed bed, seeding and harvesting small grains.

HOW TO PRACTICE CONTOUR CULTIVATION

Surveying Equipment. In order that contour cultivation may be most effective in controlling erosion, guide rows should be established which are true contour lines. An inexpensive farm level with a telescope or a surveyor's level, and target rod are most convenient for establishing a guide row. Other leveling devices may be used but are less accurate and require more time.

Small grain on lespedeza sod. Planted on contour.

To Stake Out a Guide Row. In a small field with a uniform slope, one guide row usually is sufficient. In fields of less uniform slope, more than one guide row will be required. One guide row will serve all that part of a field where rows planted parallel to it will be approximately level. The steps to be taken in staking out a guide row with a level are as follows:

1. Select a point where the slope is the average for that part of the field and set a stake to mark the starting point of the guide row. See A, Figure 1.

2. Set the level at approximately the same elevation as the starting point and some 300 feet in the direction the row is to be staked.

3. Level the telescope.

4. With the rod at the starting point, adjust the target on the rod so that the center of the target coincides with the horizontal cross hair of the telescope.

5. Move the rod forward 50 feet in the direction of the row and locate a point on the slope where the center of the target again coincides with the horizontal cross hair.

6. Mark this point with a stake and locate other points 50 feet apart in the same way.

7. If it becomes necessary to move the instrument, hold the rod at the last point that has been located and move the level into a new position on the key row.

8. Adjust the target on the rod the same as was done when the line was started and continue in the same manner as at the beginning until the row is staked across the field.

Planting with a Guide Row. The first row, or guide row, is laid out on the line staked. Other rows are made parallel to it on both sides until they cease to be level, as at C, Figure 1. Locate a second guide row where the slope is average for

If several samples are taken in a field, draw a map of the field in the space below showing the different areas and the location of the samples. Also state differences in the productivity and soil characteristics of the different areas.

- - - - - - - - - - - - - - - - - - -

DO NOT FILL IN BELOW

Acidity test .....

Available phosphorus test .....

Recommendations .....

.....

.....

terial was obtained; specific problem, if there is one.

DIRECTIONS FOR TAKING SOIL SAMPLES

Soil samples should be taken very carefully. The tests are useless and erroneous advice may be given if the sample does not fairly represent the soil. Areas differing materially in soil characteristics or productivity, or which have been cropped or fertilized quite differently in the recent past, should be sampled separately. Frequently several samples should be taken in the same field. Samples should represent the plow layer. A uniform amount of soil should be taken from top to bottom of the furrow slice. This can be done with a spade or shovel.* Make an opening to the plow depth with one straight side, from which remove a slice of uniform thickness from top to bottom. Grass and weeds should be removed before the soil is taken. Take an equal amount of soil from ten places distributed over the area. Avoid places which may be different from the rest of the area such as near a row if fertilizer was applied in the row last year, or near a highway where the soil may be affected by limestone dust blown from the highway. Put the soil from the different places together, mix well, and remove about one-half pint for the sample. Spread this out in a place where it will not be contaminated and allow to air-dry but avoid high temperature from a stove or furnace. Place in a clean container and label properly. Do not fail to fill out the part of this leaflet giving information about the soil and why the test is wanted, and to send it with the sample.

ESSENTIALS OF GOOD SOIL MANAGEMENT

The essentials of good soil management in the State, in addition to the proper use of lime and phosphate where needed, are:

Keeping a large part of the land in grass-legume mixtures to maintain the supply of nitrogen and organic matter and to prevent erosion.

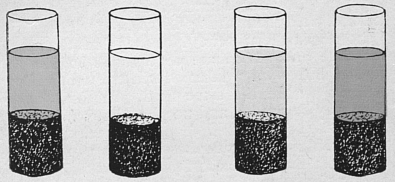
Reducing the acreage of corn and tobacco on sloping land to the smallest possible acreage; and when these crops are grown tilling this land on the contour to diminish erosion.

Using cover crops to prevent erosion and leaching during the winter.

Potash fertilizers also may be needed where soil is well supplied with the other nutrients, particularly when crop residues and farm manure are not returned to the soil, and for crops with a high potash requirement such as alfalfa, and high acre-value crops such as tobacco.

* A soil auger, if available, is the most satisfactory tool for sampling soil.

Soil Tests for Need of Lime and Phosphate



SOIL TESTS HELP TO KNOW—

Whether lime and phosphate are needed

How much should be used

When land should be relimed

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Soil Tests for Need of Lime and Phosphate

By P. E. KARRAKER

Most Kentucky soils need lime and phosphate, but they differ considerably in this respect. Some are strongly acid, many moderately acid, while still others are neutral or "sweet" and do not need liming. Most soils in the State are deficient in phosphorus but certain soils in the Bluegrass region and fertile bottom soils are high in phosphorus and give little or no increased yield from the application of phosphate (phosphorus) fertilizers. Not only does the need for lime and phosphate differ from region to region, but it may differ within the same farm or even within the same field. In some cases lime may be needed and no phosphate; in others phosphate may be needed and no lime. Past applications of lime and phosphate, also, more or less affect present needs for these materials. If applications have been sufficiently heavy, the lime and phosphate content may have been built up so that further applications will be unprofitable for some time. Liming, also, when not needed, not only is a useless expenditure of time and money but may injure some crops, in particular tobacco, by favoring certain diseases. Lime, however, leaches out of soil and some phosphate is removed from soil in crops so that eventually need for these materials will arise again. Even for soils where it is almost certain, from general knowledge, that lime and phosphate are needed, tests to verfiy this fact may be desirable.

The application of lime and phosphate to soil which is deficient in these materials is basic to soil improvement and good yields. Their use makes possible the growth of such legumes as red clover and alfalfa, improves pastures and meadows, and increases the yield of almost all other crops. On 10 outlying soil experiment fields operated by the Experiment Station, in a three or four year rotation including a mixed legume-grass sod crop and in which manure or crop residues were returned to the land in practical amounts, applications of limestone and phosphate increased the average yield as follows: corn, from 29 to 47 bus.; wheat, from 7 to 16 bus.; soybean hay, from 2215 to 3620 lbs.; and mixed legume-grass hay from 1185 to 3353 lbs.

SOIL TESTS SHOW LIME AND PHOSPHATE NEEDS

Because lime and phosphate are so important to fertility and because soil requirements differ in different parts of the State, perhaps on the same farm, the farmer who wishes to improve his land needs to know its lime and phosphate requirements; that is, whether one or both are needed, how much of each to apply, which fields need them most, and when to make succeeding applications.

The need for lime and phosphate can be determined most accurately by comparing crop growth and yields on adjacent plots which have and have not been treated with these materials, but there are also rapid chemical tests which indicate the need for these materials. These tests are of most value in planning long-time systems of soil improvement but they assist somewhat in fertilizing particular crops. Rapid chemical tests, however, do not enable one to prescribe the amount and anaylsis of the fertilizer needed within narrow limits; as, for example, whether 300 or 400 pounds of superphosphate should be used, or whether a 3-8-6 is better than a 4-10-5 analysis for a particular soil and crop. However, the effect of seasonal and other conditions makes such small differences relatively unimportant.

In making inquiries of the Experiment Station or County Agent as to fertilizing tobacco on a particular piece of land, it is more important, usually, to tell how the land has been fertilized, limed, manured and cropped, for the past four or five years and to give an estimate of how much tobacco or corn the land will produce, in an average season, without the use of fertilizers, than to send a soil sample for analysis. Frequently analysis is not needed if the information suggested is given.

Most county agents are prepared to make the tests for need of lime and phosphate; if not, the samples may be sent to the Experiment Station for testing. In either case the testing is done free of charge on properly taken samples. The Experiment Station also tests samples of marl and lime materials (one-half pint is sufficient) for their value in liming land. These should be taken in such a way as to fairly represent the material sampled. The following information should accompany samples: Name of farmer; location of farm on which the material is to be used; kind of material – burned lime, hydrated lime, ground limestone, or marl; where the ma-

(Tear off here)

SOIL SAMPLE RECORD

Name ..... Date .....

Address ..... County .....

Farm is on ..... road, ... miles,

..... direction, from .....
(church, school, village, etc.)

Sample No. ..... from .....
(designate field)

Sample taken from ridge top, fairly steep slope, gently rolling to level upland, poorly drained bottom, well drained bottom, second bottom (underscore the one that applies).

Crop grown this year ....., 1 year ago ....., 2 years ago .....,

3 years ago ....., 4 years ago .....

Has field ever been limed? ....., when .....,

kind of material ....., tons per acre .....?

What kind of fertilizer and how much per acre was used this year ....., 1 year ago ....., 2 years ago .....,

3 years ago ....., 4 years ago .....

Tons of manure applied per acre this year.....,

1 year ago ....., 2 years ago .....,

3 years ago ....., 4 years ago .....

Estimated bushels of corn per acre the land would produce in an average year .....

Why is test wanted? .....

.....

Is there a special problem with the soil; if so, what? .....

.....

(Continued on Back Side of this Page)

Directions for making the test. Pulverize the soil sample and mix as for the acidity test. The soil need not be air-dry but should not be saturated with water. Fill a glass tube, one-half inch in diameter, with soil to a depth of one inch. Add sufficient test solution so that, after shaking, the depth of soil and solution is three inches. Place corks in the tubes and shake thoroly for about one minute. Allow to stand until the solution above the soil is fairly clear. Stir gently with the tin rod until the maximum blue color appears. Read the test at once. The color fades on standing; it is renewed by stirring with the tin rod but may not be the same intensity as before.

The procedure just given is to be used for most soils. However, it may not give accurate tests on soils which are very high in phosphate as are many in the Central Bluegrass region, testing too low in these soils. The test may be medium or below when it should be very high. Too much soluble phosphorus appears to interfere with the reducing action that produces the color. The proportion of soil to test solution should be very much reduced for these soils — perhaps to one-fifth the usual amount. To ensure accuracy in testing soils in the Bluegrass region, particularly in the central part, make the test first with one-fifth the usual amount of soil. Then, if this test is medium to low, repeat it with the usual procedure.

The test is not accurate in soils containing considerable lime such as those which contain marly materials and effervesce vigorously when the test solution is added. The amount of lime ordinarily applied does not affect the test materially. Tests of several soils may be made at once as directed in the acidity test.

Tubes used for the phosphate test should not be used for the acidity test unless thoroly cleaned to remove acid from the phosphate test. Stoppers used in the phosphate test should not be used in the acidity test because of the difficulty of removing the acid.

DESIRABLE TO KEEP RECORDS OF THE TESTS

If a careful record is kept of the places where the samples are taken and of the results of the tests, the information when assembled will be valuable in showing the lime and phosphate needs of soils in the counties and in the State as a whole. In many counties wide differences will be found in these respects between different soils within the county.

OTHER RAPID SOIL TESTS

Rapid soil tests for available potassium and nitrate-nitrogen are used to a greater or less extent in some states. Fairly satisfactory procedures are available, but these tests are of less value in Kentucky than the acidity and available phosphorus tests. Potassium fertilizers are less needed in the State than are phosphates and lime. However, where the soil contains sufficient available nitrogen and phosphorus for large crops, potassium may become a deficient nutrient for certain crops, particularly tobacco and alfalfa. Under these conditions, the potassium test should be of value.

Nitrate nitrogen is the main form of nitrogen taken up by crops. There is no need of testing for this form early in the spring or at any time under crops which feed closely on the supply, such as the small grain and hay crops, because very little or none will be present. However, in growing high-acre-value crops, such as tobacco, if the test is made at setting time and occasionally during the first half of the growing season, the information obtained as to the amount of soluble nitrogen present will help to determine whether a nitrogen fertilizer should be applied, particularly top dressings for tobacco.

HOW TO OBTAIN MATERIALS FOR TESTING SOIL

The Experiment Station furnishes the materials for the acidity and available phosphorus tests described in this circular, to county agents for their use in testing soil in their counties. County agents may obtain these by calling at the Agronomy laboratories, or on request they will be sent by express collect. Extension specialists in Agronomy also may have the materials for these tests and be able to furnish them to county agents when visiting their counties. The Experiment Station does not furnish the materials to county agents for the available potassium and nitrate tests.

Materials for testing soil for acidity and available nutrients are for sale by several companies. Materials for acidity and available phosphorus tests which are very similar to the tests described in this circular, may be purchased commercially.

HOW THE TEST SOLUTIONS ARE MADE

The potassium thiocyanate test solution. Dissolve chemically pure potassium thiocyanate in synthetic absolute methyl alcohol and acetone U. S. P. in the proportion of 4 grams of the salt and 50 cubic centimeters of each of the solvents. If the solution is alkaline to sensitive red litmus paper, carefully add glacial acetic acid to make it slightly acid, or just so that sensitive blue litmus paper turns red. The solution is inflammable and poisonous.

Bray's available phosphorus test solution. Dissolve ten grams of chemically pure ammonium molybdate in 85cc. of distilled water. Filter this, allow it to cool and add it slowly to a cold mixture of 170 cc. of concentrated hydrochloric acid, 36%, and 70 cc. of distilled water. This is the stock solution. Dilute 12 cc. to 100 cc. with distilled water for use. The stock solution deteriorates only very slowly on standing.

Rapid Soil Tests

Rapid tests have been devised for soil acidity and for the readily available or active portion of the more important soil constituents. This leaflet tells how to make and interpret the more useful of these tests.

EXTENSION DIVISION, COLLEGE OF AGRICULTURE

University of Kentucky, Lexington, Kentucky

THOMAS P. COOPER, Dean and Director

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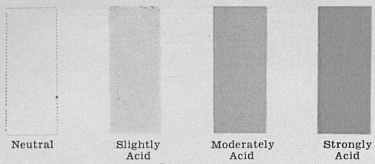
Rapid Soil Tests

By P. E. KARRAKER

The use of a potassium thiocyanate solution is a common test for soil acidity. The test was devised by N. M. Comber, an English investigator tho present day procedure usually differs somewhat from his.

How the solution shows soil acidity. This solution, when shaken with soil, remains colorless if the soil is neutral or alkaline, but turns red if the soil is acid, intensity of the color corresponding fairly closely to the degree of acidity. Degree of alkalinity is not shown because the solution remains colorless in both neutral and alkaline soil. The red color is due to ferric thiocyanate, a soluble, red compound. In acid soil, ferric iron from the soil becomes soluble in the test solution and acts chemically with the potassium thiocyanate to produce the red compound; the more acid the soil, the greater is the amount of iron thus becoming soluble.



Neutral | Slightly Acid | Moderately Acid | Strongly Acid

The color chart shows the range of color for nearly all acid soils in Kentucky. If previously unlimed, most Kentucky soils should test moderately to strongly acid; some, slightly to moderately acid; and others, neutral to slightly basic, especially in places where shaly limestone or marly materials are in the surface. Soil which has been limed sufficiently for general farming (so that red clover grows satisfactorily) should test slightly acid to neutral.

It is desirable to check the color chart by making the test occasionally with samples of soils, if such are available, which are known from the way legumes grow in the field to differ in acidity: for example, soils known to be strongly, moderately and slightly acid.

When the test is made on a representative sample of soil, the colors in the chart indicate need for liming as follows:

Test	Need for Liming
Neutral.	None for any crop.
Slightly acid.	Needed for alfalfa and sweet clover. Not necessary for red clover and perhaps some other legumes, but may increase their growth.
Moderately acid.	Needed for alfalfa, sweet clover, red clover, alsike clover, white clover. Beneficial for soybeans, the lespedezas and cowpeas; also beneficial for most non-legume general farm crops, mainly indirectly thru promoting growth of legumes. Tobacco not benefited directly.
Strongly acid.	Needed for all general farm crops.

The test also is of some value in deciding on rate of liming. A soil testing strongly acid needs more lime than one testing slightly to moderately acid, other soil conditions being about the same. However, when liming is needed, it is good general practice to apply as an initial application, 2 tons of ground limestone per acre or equivalent neutralizing amount of other lime materials irrespective of degree of acidity shown by the test. Applications thereafter can be made as found necessary; perhaps 1 to 2 tons every 6 to 10 years. In parts of the State where liming materials are relatively expensive or where, for any other reason, it seems desirable to lime lightly and frequently, the size of application can well be varied somewhat, depending on the test. The rate of liming for alfalfa generally should be heavier than mentioned above and may be varied somewhat according to the test.

The color chart applies to tests made according to the directions given below. If the test is made differently, the color chart will not fully apply.

Directions for making the test. The soil should be air-dry or almost so. The color appears more slowly and is less intense in moist than in dry soil. (Tests may be made in the field if the soil is dry enough for tillage, allowing somewhat for the retarding effect of the moisture on development of the color.) Pulverize the soil so that no lumps are larger than ⅛ of an inch in diameter and mix well. Into a glass tube one-half inch in diameter, put soil to a depth of one inch. Add sufficient test solution so that the depth of soil and solution after shaking is two inches. Place corks in the tubes and shake vigorously for about 2 minutes. Read the test at the end of 10 minutes.

When several soils are to be tested, time will be saved by preparing the tubes for the test and shaking all at the same time. This can be done by placing the tubes in a homemade rack and holding a board across the top during shaking.

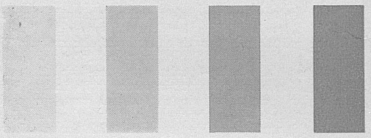
Test for carbonates. Soil that tests neutral with the potassium thiocyanate solution may contain carbonate, usually calcium carbonate, less frequently magnesium carbonate. The presence of carbonate is shown by a simple test. Add weak hydrochloric acid (one part of concentrated acid and two to three parts of water) to a small amount of the soil. If carbonate is present, bubbles of carbon dioxide gas are liberated; that is, the soil effervesces. (The action is very slow with magnesium carbonate, however, unless heat is applied.) The phosphorus test solution (described later in this leaflet) may be used for this purpose. The presence of carbonate confirms the finding of the acidity test that the soil is neutral or basic. Soil, however, may be neutral and not contain carbonates.

The weak acid solution, also, may be used as a test for marl, considerable effervescence indicating that the material is a marl. Many marls in Kentucky are high in magnesium carbonate and, hence, do not effervesce vigorously. A laboratory test is required to tell the exact value of a marl for use in liming land.

TESTING SOIL FOR AVAILABLE PHOSPHORUS

The test for available phosphorus described in this leaflet was devised by R. H. Bray, of the Illinois Experiment Station (Ill. Bul. 337). The test solution is a weak solution of hydrochloric acid, about four-fifths normal, containing ammonium molybdate. A tin rod, also, is required for the test. The test solution deteriorates on standing. It should be tested from time to time by stirring a small amount in a glass tube with the tin rod, and discarded if more than a trace of blue color appears.

How the solution shows available phosphorus. When the solution is shaken with soil, the more readily acid-soluble phosphates (those from which immediate crops mainly obtain their phosphorus) are made soluble by the acid in the solution. The phosphate reacts with the ammonium molybdate in the solution, forming ammonium phosphomolybdate. This is reduced by the stannous chloride formed when the tin rod is stirred in the test solution, with the formation of a greenish-blue to blue color. The amount of color thus depends on the amount of ammonium phosphomolybdate present which, in turn, depends on the amount of phosphorus going into solution from the more readily soluble or available phosphate in the soil.



Very Low | Low | Medium | High

The color chart shows the range of color for most soils in Kentucky. The majority of the soils in Kentucky should test low or very low. Many soils in the Bluegrass region, however, particularly the central part, should test high or above because of their high phosphate content. Soils previously deficient in phosphorus, which have received liberal applications of phosphate fertilizers for some time also may test medium to high.

It is desirable to check the color chart by making the test occasionally with samples of soils, if such are available, which are known from the way crops grow in the field to differ in need for phosphate fertilizers.

When the test is properly made on a representative sample of soil, the colors in the chart indicate need for phosphate fertilizers as shown below. The directions for making the test given later, should be followed, otherwise the chart will not fully apply.

Test	Need for Phosphate Fertilizer
Very low.	Very great need for all general farm crops. Liberal applications of phosphate fertilizers will be profitable; for example, 400 to 600 pounds per acre or more of ordinary superphosphate every 3 to 4 years rotation until an effective reserve of phosphorus is built up in the soil.
Low.	Same as above, except the need is not so great and the rate of application may be reduced somewhat.
Medium.	Doubtful whether general farm crops will respond profitably. Phosphate fertilizers, probably, will be profitable for many legumes, tobacco, and crops of high money value per acre.
High.	No need.

When feeding is done on pasture, as is practiced in the Bluegrass region, the manure increases the growth of grass without much loss of nutrients. Manure that accumulates on pastures during the summer and early fall is more effective when scattered by some means before the fall and winter rains begin.

If stalls do not have to be cleaned frequently it is good practice to allow manure to accumulate in them where it will be kept moist and packed, thus excluding air and preventing heating. When manure must be removed from stalls frequently, and stored, it should either be stored under a shed and kept compacted or, if kept outside, it should be piled in deep ricks with straight sides and a concave top and kept compacted. Supplying water helps to prevent heating but water should not run thru the pile as it will carry away nitrogen and potassium. Manure in loose piles so commonly seen in barnyards, often under the eaves of a barn, or in piles in the field, loses a great deal of its value.

Manure Increases Farm Income. The returns from farm manure depend not only upon how it is conserved but also upon how it is used. Manure returns the greatest profit when used on crops of high value, such as truck crops and tobacco.

At the Greenville Experiment Field, manure on limed and phosphated plots preceding dark tobacco increased the yield 510 lbs. per acre over similar unmanured plots. The value of the tobacco per pound was increased 42 percent and the acre value was increased 105 percent. The manure was used at an average rate per acre of 8 tons per tobacco crop in a six-year rotation of tobacco, tobacco, wheat, and meadow mixture. There was a similar increase in the wheat and hay crops following tobacco, due to the effect of the manure.

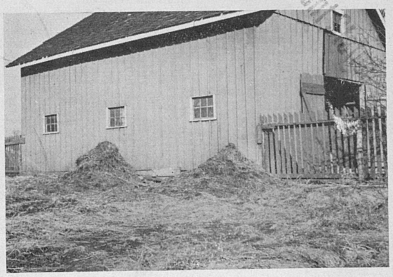
Light applications of manure give greater returns per ton, as a rule, than heavy applications. That is, 10 tons spread on two acres produces a greater yield and profit per ton, than 10 tons spread on one acre. Light applications of manure, ranging from four to six tons per acre, used for corn on the Kentucky Experiment fields, showed increases in yield of corn varying from 5 to 24 bushels; wheat from 1.5 to 4.5 bushels; soybean hay from 300 lbs. to 1200 lbs.; and clover hay from 200 lbs. to 800 lbs. per acre, comparing manured land with that having no treatment. These results were obtained on land low in lime and phosphate. The returns from manure were even greater when these materials were supplied, as well as manure. On the other hand, when limestone and phosphate were used over a sufficient period, without manure or potash fertilizers, potash deficiency resulted. This is very strikingly shown on the Mayfield Experiment Field where a plot having limestone and phosphate was compared with a plot having limestone, phosphate, and manure during the last 24 years. During the last 8 years of this period the manured plot gave an average increase of 16 bushels corn, 3 bushels wheat and 1400 lbs. hay per acre, over the unmanured plot. The corn showed symptoms of serious potash deficiency, which was corrected by applying potash fertilizer.

Finally, returns per ton for manure are greater when used on poor land or the poorer parts of a field and with uniform spreading such as may be done with a manure spreader, rather than careless spreading with forks.

If the millions of dollars worth of manure that goes to waste annually on Kentucky farms was scrupulously conserved and judiciously utilized it would go a long way in supplementing a soil-building and soil-conserving program.

Farm Manure

Its Value, Conservation And Use



Manure going to waste.

MANURE—

Is a valuable farm by-product.

Adds fertility to the soil.

Requires care in conserving and applying.

Increases farm income.

EXTENSION DIVISION, COLLEGE OF AGRICULTURE
University of Kentucky, Lexington, Ky.
Thomas P. Cooper, Dean and Director
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Farm Manure
Its Value, Conservation and Use

S. C. JONES

Manure Is a Valuable Farm By-Product. Farm manure is the most valuable by-product on Kentucky farms. Conservative estimates show that there is produced annually in Kentucky not less than 16 million tons of manure. At commercial prices for the plant food elements contained in this amount of manure, its value would approach 40 million dollars, or about $150 per farm for each of the 270,000 farms in the state. This is only $2.50 per ton. The average production of manure (solid and liquid) is about 10 tons annually for 1000 pounds of live weight of stock.

About 450,000 acres of tobacco is grown annually in Kentucky. No crop responds more profitably to manure than tobacco in both quantity and quality. If manure was properly conserved and utilized by all farmers, on tobacco and other crops, it would return millions of dollars more than the commercial value of its plant food. When tobacco sells high the returns per ton for manure used on tobacco may be worth $5.00 to $10.00 or more per ton. However, as conserved and utilized by the average Kentucky farmer probably 40 percent of its value, or some 16 million dollars worth, is wasted. Before the advent of the soil conservation program in 1936, this wastage represented more than eight times the expenditures made by Kentucky farmers for commercial fertilizers. Manure is the farmers' cheapest and best fertilizer but like most soils it is low in phosphate and should be supplemented with phosphate.

Manure Supplies Fertility to the Soil. The value of manure for improving and maintaining the productivity of the soil has been recognized from the earliest times. Its value in increasing crop yields is due primarily to the plant food elements, nitrogen, potassium and phosphorus it contains. It is valuable also because of the organic matter or humus it supplies. Fresh manure or manure that has been properly preserved is comparatively rich in nitrogen and potassium but low in phosphorus.

Manure improves the tilth or physical condition of the soil. It increases water-holding capacity, improves aeration and temperature relations and promotes the activities of bacteria and other soil organisms that make plant nutrients available. The physical properties of both heavy and sandy soils are improved by the organic matter or humus supplied by manure.

The amount of plant nutrients in manure varies with the kind, age and condition of the animal. Young animals retain more minerals and nitrogen for growth, and milk producing animals also retain more because milk is rich in minerals and nitrogen. Mature animals not giving milk or producing young void most of the plant food contained in the feed consumed. Richer feeds such as tankage, cottonseed meal, alfalfa, clover, pea or bean hay produce richer manure than poorer feeds such as cane, corn fodder, straw, timothy or redtop hay. Animals fed products grown on rich land or land that has been limed and fertilized properly, produce richer manure than animals fed products grown on land deficient in plant food. About half the value of manure is in the urine. Much of the nitrogen is lost when manure heats.

Manure Requires Care in Conserving and Applying. Manure, including both solid and liquid excrements, is about 80 percent water and if not properly conserved much of its fertility value is soon wasted. The proper care and handling of manure is highly important. Losses come in storage, in handling and spreading unless great care is used. About three-fourths of the nitrogen and phosphorus and nine-tenths of the potassium in the feed of animals is voided in the solid and liquid manure. More than one-third of the nitrogen and about two-thirds of the potassium are in the liquid manure. The production of high-quality manure requires sheltering, adequate bedding, and firm tramping or packing if in storage. Where the liquid, solid and bedding are stored together the least loss of nitrogen occurs if manure is tightly packed and contains all the water it will hold without drainage. Bedding with high absorptive capacity is essential in saving the urine. Straw is the most common beddng. It has a considerably greater absorptive capacity when chopped. Thousands of tons of lespedeza, straw and chaff are produced in Kentucky from the saving of Korean and other lespedeza seed, which should be used for bedding. It is rich in nitrogen and potassium and would add to the value of manure when used as bedding.

Corn is grown on practically every farm in Kentucky and corn stover, if properly saved and utilized, is good bedding. It is good practice to cut corn and feed the stover in the stalls to absorb the liquid manure. Using the corn crop as ensilage for livestock is the most practical way of utilizing both its feed and manure values. Shredding corn fodder makes it a more effective bedding. Cornstalks are more valuable for the soil when used with the manure. It is cheaper to buy bedding than to buy fertilizer to replace the loss of manure.

Fresh manure may be very efficiently utilized as it is produced by spreading it on grass fields or small grain. If spread on land where there is no growth the nitrogen leaches from the soil during heavy rains. Manure spread in warm weather loses nitrogen by volatilization unless it is at once plowed under or disked into the soil.

ing two or more pure breeding lines of corn, and when pollination takes place uncontrolled, as it does under ordinary field conditions, a certain amount of inbreeding takes place and there is a rapid reversion to inbred types

In developing inbred lines, by using the pollen of certain plants to fertilize the silks on the same plants, selection is carried on for such desirable characters as strong stalks, large root systems, resistance to diseases, insects, drouths, and other adverse conditions. Even tho these desirable characters may exist in inbred lines, the inbreeding process lowers the vigor of the plants and they often yield less than one-third the production of normal corn. The crossing of inbred lines, under controlled pollination, intensifies the desirable qualities and, at the same time, brings about hybrid vigor which results in larger yields of high-quality corn.

PLANT HYBRID CORN ON GOOD SOIL

The yield of hybrid corn, like that of all other crops, depends to a large extent upon the fertility of the soil as well as upon seasonal conditions. Altho the percentage increase due to the use of hybrid seed may be as large, or even larger, on soil of low or medium fertility, the maximum return from hybrid seed is obtained on soil of high productivity. The essentials of good soil management must not be overlooked in the production of corn if the corn requirements are to be produced on the least possible acreage in keeping with good farm management. These essentials are:

1. Use of lime and phosphate where needed.
2. Maintenance of a large proportion of the land in a good grass and legume sod.
3. Proper care and utilization of manure and plant residues.
4. Contour tillage where needed to prevent erosion.
5. Use of cover crops following all clean-tilled crops.

Hybrid Corn In Kentucky

EXTENSION DIVISION, COLLEGE OF AGRICULTURE
University of Kentucky, Lexington, Kentucky
Thomas P. Cooper, Dean and Director
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Hybrid Corn In Kentucky

Wm. C. JOHNSTONE

Corn occupies five times as much land in Kentucky as all other clean-tilled crops; it is grown by more people than any other crop and, on account of the method of cultivation it contributes more to erosion and plant food loss than any other crop. Any improvement in corn production which makes possible higher yields, improved quality and smaller acreage should be of interest to Kentucky farmers.

The production of hybrid seed corn is a relatively recent development in corn breeding and it has resulted in larger yields and improved quality. Many corn hybrids are also superior to ordinary varieties in strength of stalk (or lodge resistance) and in root development which permits better utilization of plant food and moisture.

Not all corn hybrids are adapted to Kentucky conditions; in fact, most hybrids have been bred for the main corn belt and are too early to produce maximum yields in this state. Results from many tests conducted at the Experiment Station and by farmers cooperating with county agents thruout the state indicate that the largest yields of high-quality corn may be expected from the white hybrids developed at the Kentucky Experiment Station. These are sold as Ky. 69, Ky. 72, Ky. 76 and so on but are commonly known as Kentucky White hybrids, there being little difference in their productiveness and quality of grain. The best yellow hybrids have consistently produced more than ordinary yellow varieties and are far superior to them in quality and strength of stalk. Among the yellow hybrids apparently giving excellent results in Kentucky and which are being produced for seed by Kentucky growers are U. S. 13, U. S. 44, Ind. 820, Ind. 845, and Ill. 960.

A Crossing Plot for Producing Corn Hybrids. The rows of light color have tassels and are the male rows. The other rows which have been detasseled are the female, or seed-producing rows.

The superiority of hybrid corn, which is not readily apparent in the field, is due to fewer barren stalks, higher shelling percentage, better quality, stronger stalk, and lower moisture content at harvest.

CERTIFIED SEED IMPORTANT

The production of hybrid corn seed is highly specialized work. Expensive foundation seed stock must be planted; the seed plot must be properly isolated from other corn to prevent undesirable crossing; special planting methods must be followed; tassels must be removed from certain rows thruout the tasseling period, and the seed, which is saved only from the detasseled or female rows, must be carefully cured and graded. If any of these steps are not strictly followed the product may be inferior to good local varieties. It is unsafe to buy hybrid corn seed unless certified by the Seed Improvement Association of the state in which the seed was produced.

HYBRID SEED MUST BE OBTAINED EACH YEAR

Corn produced from commercial hybrid seed should not be used for seed corn. Such corn, if planted, will produce from 15 to 25 percent lower yield than will true hybrid corn seed. This is because hybrid corn is the result of cross-

the corn rows follow the contour, but the breaking and preparation of the land for that crop and the seeding of cover crops which follow the corn should be on the contour. Contour cultivation also prevents the runoff of a large amount of rainfall often needed by the crop during the growing season. On terraced land contour cultivation is doubly necessary.

A simple practice which will prevent a large amount of soil loss in the culture of corn or other crops is the maintenance of sod strips in the natural draws of the field. About 10 feet of sod should be left on each side of depressions which carry considerable runoff water.

COVER CROPS TO FOLLOW CORN

In addition to the great loss of soil and plant food by erosion on unprotected land following corn, are the losses of plant food by leaching; that is, carried out by water going thru the soil. Many times as much plant food is lost by erosion and leaching from unprotected sloping land during the winter and spring as is removed by a corn crop. To reduce erosion and leaching as fully as possible, corn should be cut and shocked and the land seeded to a winter cover crop at once. The corn stover, which represents about 25 percent of the total feed value of the corn plant, may be stored under shelter for feed and bedding or fed on sod. Where corn is not cut from the land a cover crop should be sown between the rows of standing corn. However, there are more failures from dry weather with this practice than where the corn is cut and the soil prepared for the cover crop.

The best cover crop to follow corn depends upon the ultimate use of the cover crop, the date of seeding, and the fertility of the soil. If the cover crop is to be turned under the following spring for green manure, it should consist of a winter legume in combination with a small grain or rye grass. Excellent combinations are crimson clover or vetch with rye, wheat, barley or rye grass. Crimson clover should be seeded by early September, vetch may be seeded as late as October. If the cover crop is to be harvested, followed by a sod crop, then wheat, rye, barley or rye grass may be used. Grasses should be seeded at the same time as the small grains. Wheat and rye are the most dependable cover crops for late seeding and for use on medium to poor soil. Barley and rye may be seeded during late August, but the former should be seeded by October 1. Kentucky No. 1 and No. 2 barley and Missouri Early Beardless barley are winter resistant varieties recommended for Kentucky. Rye grass is a rather promising grass which has given excellent results in many parts of the state. It is a rapid-growing annual, good both for pasture and for soil protection. Winter, or Turf, oats are grown in the southern part of the state as a cover crop. However, it is the least resistant of any of the small grains mentioned and should be seeded in early September.

The recommendations contained herein with respect to soil management, tillage practices and use of cover crops for corn are equally important for tobacco and other clean-cultivated crops.

A more complete discussion on soil management may be found in Kentucky Experiment Station Bulletin 272 "Soil Management for Kentucky." Leaflets are available on "Cover Crops," "Contour Cultivation," "Lime and Phosphate for Kentucky Soils," "Hybrid Corn in Kentucky" and "Farm Manure, Its Value, Conservation and use." These may be obtained from the county agent or from the Experiment Station at Lexington.

Better Corn Culture

To Reduce Soil And Plant-food Losses

Corn planted on the contour.

Soil Losses from Corn Culture

May be Reduced by

Increasing Yield and Reducing Acreage.

Contour Cultivation.

Using Cover Crops.

EXTENSION DIVISION, COLLEGE OF AGRICULTURE
University of Kentucky, Lexington, Kentucky
Thomas P. Cooper, Dean and Director
January, 1939

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Better Corn Culture To Reduce Soil And Plant-food Losses

Wm. C. JOHNSTONE

The culture of corn in Kentucky causes the loss of more soil by erosion than does the culture of any other crop: (1) because almost five times as much land is used for the corn crop as for all other clean-tilled crops combined; (2) because a large part of the corn crop is planted in straight rows, irrespective of the slope of the land; and (3) because a very large part of the corn land is left unprotected during the winter.

This serious loss of soil and plant food in connection with the culture of corn may be effectively reduced by:

1. Increasing corn yield and reducing corn acreage.
2. Further reducing the corn acreage by displacing a part of it thru the greater use of pasture, hay and small-grain crops, which are less soil depleting.
3. Using the more level land for corn, leaving steeper slopes for sod crops.
4. Planting and cultivating on contour where erosion is likely to occur.
5. Following corn crops with cover crops.

A Scene Too Common in Kentucky.

A large corn acreage cultivated in straight rows on rolling land and left unprotected during the winter is the greatest factor contributing to the loss of soil and plant food in Kentucky.

PRACTICES WHICH INCREASE CORN YIELD

Use of Lime and Phosphate. The average yield of corn over much of Kentucky is too low. Much of the crop is grown on land already so impoverished that it produces other crops even less successfully than corn. The basic requirement for increasing corn yield on practically all soils of Kentucky is the application of limestone and phosphate. This must be followed by sowing grasses and legumes in the rotation and proper utilization of manure and crop residues. This system of soil management has given large increases in corn on all important soil types of the state. Typical of these increases are the following results at five Soil Experiment Fields:

Location	Bushels yield for		Bushels Increase
	No Treatment	Manure, Limestone, Phosphate	
Mayfield (Purchase Region) Ave. 24 crops	25.1	49.2	24.1
Greenville (Western coal field) Ave. 24 crops	16.2	46.2	30.0
Campbellsville (Waverly limestone and shale) Ave. 18 crops	14.2	57.9	43.7
Berea (Devonian shales) Ave. 25 crops	13.3	45.3	32.0
Fariston (Eastern coal field) Ave. 20 crops	7.2	45.4	38.2

Use of Hybrid Seed Corn. Most of the ordinary corn varieties used in the state are of poor quality and are not capable of producing maximum yields. At the Experiment Station and in many cooperative tests conducted thruout the state the use of adapted hybrid seed has increased the yield of corn above that of local varieties approximately 17½ percent. The Kentucky White hybrids were the highest producing varieties in these tests. Adapted yellow hybrids consistently produced higher yields than local varieties. Besides making higher yields of better quality corn, adapted hybrids are more resistant to adverse weather conditions and have stronger stalks. This last characteristic is a decided advantage, especially for those who wish to sow cover crops, grass or legumes in the standing corn.

SUBSTITUTING OTHER CROPS FOR CORN

Practically all corn grown in Kentucky is fed within the state. The need for such a large corn acreage may be lessened by the improvement and more efficient use of pasture and meadow crops and by using barley and other winter small grains to displace a part of the corn

Swine will produce gains with considerably less grain when fed on alfalfa pasture than when fed in dry lots.

Experiments with dairy cattle in other states indicate that where adequate supplies of high-grade pasture and silage are available the amount of grain required for the economical production of milk may be lowered as much as one-half to two-thirds of the normal allowance.

It is practical in many instances to replace part of the corn with a small grain as feed for livestock, especially winter barley. Barley yields well on good soil and the grain is practically equivalent in feed value, pound for pound, to corn. In addition, winter barley provides a large amount of fall, winter and spring pasturage, and protects the soil from erosion and leaching. Wheat may be grown as a substitute for corn. The grain is often used as a feed to replace part of the corn requirements with various kinds of livestock.

TILLAGE PRACTICES TO REDUCE EROSION

A reduction in the corn acreage will make it possible to restrict the crop to the more level land, permitting also the use of shorter rotations and more intensive soil-building practices. This will result in much higher yields than at present. Where level land is not available for the entire corn crop, contour tillage should be used on land where erosion is likely to occur. Not only should

tice. Greater attention should be given to thoro curing of stems before baling. Leaves must not be buried in the swath. Light, airy windrows must be made and the side-delivery rake becomes a necessity for such quick baling. Bales should be stored on edge and 3 or 4 inches between vertical sides to prevent heating. Partly cured weeds are more troublesome when baling from the windrow than when baling from the stack.

Too many small hay stacks result in greater loss from weather.

STACKING

A bottom of poles or dry trash is advisable and a well-tramped center built high and covered with a foot or more of grass hay to shed water. A few wires with weights on the ends may be arranged to hold down the top against wind. Stacked hay is subject to loss from weathering on the surface; therefore stacks should not be too small.

Cutting, Curing and Storing Hay

GOOD HAY IS

Clean
Fragrant
Green
Soft and pliable
Leafy
Weedless

EXTENSION DIVISION, COLLEGE OF AGRICULTURE
University of Kentucky, Lexington, Kentucky
Thomas P. Cooper, Dean and Director

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CUTTING, CURING AND STORING HAY

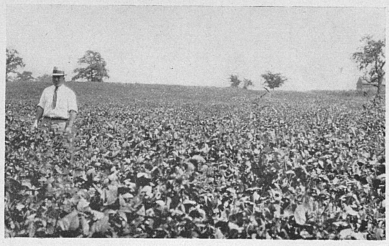
RALPH KENNEY

The feed value of sound, sweet hay increases with the leafiness and greenness of the legumes while foreign material decreases the feeding value of all kinds of hay, tho stubble of small grain harvested the same season is not so objectionable as weeds. Leafiness is the most important quality factor in legumes because the leaves are much richer in protein than the stems. The green color of leaves is an index to carotene content and vitamin activity. Carotene is directly concerned with growth and reproduction, while vitamins directly promote the health of animals. Natural green color usually indicates good curing, aroma, palatability, freedom from damage and relatively high carotene content. Foreign material, such as weeds or stubble, is so much waste. Weeds often cure more slowly than hay plants so that when the hay is cured properly the weeds are not dry enough, but when the weeds are cured the hay is too dry and the leaves will shatter.

The leading hay plants in Kentucky are lespedeza, various grasses, mainly redtop and timothy, alfalfa and red clover. More than a million tons of lespedeza hay are harvested for home use annually. Most of it is harvested too late and is handled in such a manner as to make it brown. Most of the grass hay crops and clover with timothy are cut too late. Alfalfa, especially the first cutting, is handled in a season subject to frequent rains and consequent damage

TIME OF CUTTING

On bottom land, lespedeza should be cut for hay when it begins to lodge or fall down, or when the lower leaves begin to drop in great volume. On upland the early bloom on Korean lespedeza usually coincides with dropping of lower leaves even tho lodging does not occur; it should be cut before this stage is reached. The first cutting of alfalfa hay is often delayed too long; it should be cut when the crop begins to lose the lower leaves and, on fertile ground, to lodge. The later cuttings should be made when about one-tenth in bloom. Weather, of course, may cause harvest to be delayed beyond the time for making the best hay. Timothy, redtop, and orchard grass hays are far better when cut at the beginning of bloom than at any later stage. Green-colored grass hay cannot be had from crops ripe enough for seed to be threshed out. Clover should be cut when not more than half of the heads are brown. Soybeans, in Kentucky, usually drop their leaves rapidly after the first pods are about half filled, and stemmy, slow-curing hay usually is the product of late cutting.



A good field of soybeans.

WEEDS

Weeds are more apt to be present in lespedeza hay than any other hay crop in Kentucky, because lespedeza is an annual plant and the field is not mowed for hay until near the end of the growing season. Weeds in a lespedeza field intended for hay should be mowed as late as can be done without topping the lespedeza. More damage is done by mowing weeds in midsummer than earlier. On the other hand, lespedeza is stunted by clipping the tops and for that reason the sickle bar must frequently be raised by means of a wheel, or cutting should be done before the crop is so tall that it will be clipped. Lespedeza is nearly always free from weeds when it follows a small grain harvested the same season.

CURING

No more hay should be mowed at one time than can be handled readily without too long exposure to drying after the first is ready to stack or bale. Lespedeza is perhaps the most easily damaged by overcuring. One hour too long in the swath before raking may result in great loss of leaves, that could have been prevented by raking a little sooner. Windrows should be loose, hence a side-delivery rake should be used. Dump rakes usually drag the hay into compact piles before dumping, which results in overdrying the outside before the inside is cured.

Moisture goes out of hay most rapidly while the leaves are wilting but not dry enough to break. If the leaves are buried in the swath or a tight windrow, the stems give up moisture slowly and may be damp enough to cause spoiling in the bale or stack even tho part of the hay may be dry enough to rattle. When the stems can be taken in a small bundle about an inch in diameter and easily broken by twisting, the hay is well cured and ready to put up. Experience is necessary to interpret this or any other test farmers may use. Rain on newly cut hay may cause little damage, but after wilting is well on the way the damage from rain may be serious.

BALING

Baling has usually been done on small farms after the hay had been stacked at least long enough to go thru a sweat. There should be no spoiled bales from this practice. Baling from the windrow is growing in favor on the larger hay-producing farms. There is greater danger of loss from heating in the bale with this prac-

If one wishes to compare fertilizers in the hill or row for crops like corn and tobacco, care must be taken to prevent the fertilizer from coming in contact with the seed or plants. The best placement is in bands on each side of the hill or row, about 3 inches from the seed or plant and just below the level of the seed or the crown of the plant. If machinery is not available for so placing it, the fertilizer should be thoroly mixed with the soil before planting the crop.

There are tests besides lime and fertilizer tests that can be made by use of small plots. If one prefers to use larger plots than indicated, they will be satisfactory if kept on land that is fairly uniform. Under some conditions smaller plots might be desirable.

All plot tests should be located on soil as nearly representative of the field as can be judged. Repetitions of the tests some distance apart add to their reliability.

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AGRONOMY LEAFLET

Revised, April, 1941

Field Crop Tests For Need Of Lime And Fertilizers

No limestone or phosphate

Limestone and superphosphate

Farmers can make reliable field tests to determine some of the needs of the soil for lime and fertilizers. This leaflet gives directions for such tests, with the hope that they will be used by many farmers. Other information also may be obtained by plot tests.

EXTENSION DIVISION, COLLEGE OF AGRICULTURE
University of Kentucky, Lexington, Kentucky
Thomas P. Cooper, Dean and Director

Field Crop Tests for Need of Lime and Fertilizers

GEORGE ROBERTS

THE VALUE OF FIELD TESTS

While chemical tests are valuable indications of the need of soils for lime and fertilizers, the response of crops to the various materials applied must finally determine whether their use is profitable. For this reason it is desirable that farmers make field crop tests to determine the need for lime and fertilizers. Information from these tests is the safest guide for liming and fertilizing practices.

Too much emphasis often is placed on the exact analysis and exact amount of fertilizer to be used for a particular crop and soil. There is no chemical test that measures accurately the amount of a plant food element in the soil at a given time available to plants. Variations in seasonal conditions affect the availability of soil plant nutrients so much that small differences in the analysis and the amount of fertilizer used are relatively unimportant. The important thing is to find out what mineral nutrient materials, such as lime, phosphate, and potash, are needed to start the process of soil building, and then to supply the deficient materials in liberal quantities as a basis for increasing the nitrogen and humus content of the soil thru the proper use of legumes, manure, and soil conserving crops. Extension circular 272 gives instructions on these practices.

HOW TO MAKE PLOT TESTS

A farmer can easily make field tests that will be of much value in determining the need for lime and phosphate, the two most common deficiencies in Kentucky soils. The following diagram shows how such a test may be made on 1/10-acre plots.

Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
No treatment (Check plot)	Limestone 400 lb.	Superphosphate 40 lb.	Limestone 400 lb. superphosphate 40 lb.	No treatment (Check plot)

A plot 42 by 103 feet is about 1/10 of an acre. An untreated strip 4 or 5 feet wide should be left between plots.

Legumes or a mixture of grass and legumes are the best crops to use for the foregoing test. Often only observation is necessary to show that the effect of a treatment is large enough to be profitable. However, it is best to weigh the crops.

It is seldom that the yields of any two untreated plots are the same. Therefore, to be of significance, the increased yield for any treated plot should be considerably greater than the difference between the two check plots.

If one wishes to know when to relime, this is best determined by reliming small plots just before seeding each legume crop as it appears on the field after it was first limed. When the relimed plots first show an appreciable beneficial effect, then the field should be relimed for the next legume crop.

By the use of plot tests the need for top-dressing pastures and alfalfa can be determined. Top-dressings should be applied when plants are dry. The pasture test plots, including checks, should be enclosed to prevent grazing from obscuring the effect of the treatment. Small plots of alfalfa or pasture fertilized at double the field rate at seeding time would indicate when there is a shortage of fertilizer for the crop.

Whether to use potash for alfalfa or other crops can be determined by applying 20 to 30 pounds of muriate of potash on a 1/10-acre plot and watching the effects. The test should be used on soil known to have sufficient lime and phosphate.

than removed for hay and pastured as lightly as possible, especially the year preceding tobacco. It should never be pastured closely enough to injure it.

FERTILIZATION

The use of 6 to 10 tons of manure together with the use of a high grade commercial fertilizer will increase yield and quality and greatly increase the resistance of dark tobacco to blackfire following topping. A 4-10-6 fertilizer or a similar analysis is satisfactory for tobacco. The amount used should vary with the fertility of the soil and the amount of manure used. About 300 pounds on the fertile and more heavily manured soils to 600 or 700 pounds on the less fertile soils is the range that will likely be profitable. On the phosphate-deficient soils that have not been liberally fertilized with phosphate in producing the sod for tobacco a broadcast application of 300 to 400 pounds of 20-percent superphosphate or its equivalent will also likely prove profitable on the tobacco and will greatly benefit the grain and grass crops that follow.

The method commonly followed in the dark tobacco districts, of mixing the fertilizers with the soil in making hills, is quite satisfactory for small amounts of fertilizer. The fertilizer should be thoroly mixed with the soil. Where larger amounts are used, it is suggested that most of it be applied in continuous bands on both sides of the row. A hundred pounds an acre may be applied in the hills in addition when the practice of making hills is followed. It is highly important to so place fertilizer that the roots of the plants will not come in contact with it or many of the plants may be killed. The danger of injury is greatest in dry seasons.

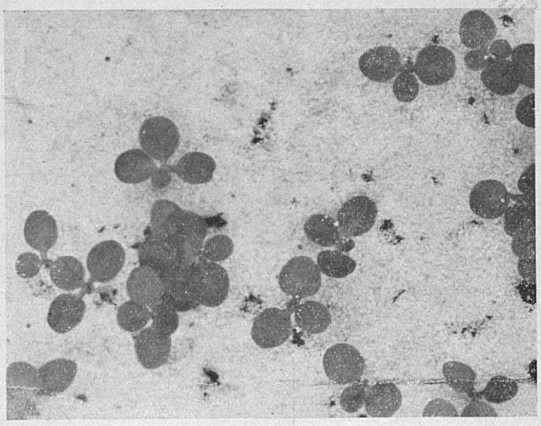
CULTIVATION

Deep cultivation, especially late in the growing season, destroys many of the fine feeding roots and thus tends to defeat the purpose of soil building and fertilization in the prevention of leaf spotting.

TOPPING

It is a common observation that low-topped early plants are more severely damaged by blackfire than higher-topped, later-maturing plants. With heavy manuring and fertilization the height of topping can be increased over that now commonly practiced, with resultant higher yields and greater freedom from leaf spot. High-quality tobacco can be produced following higher topping if a liberal supply of nutrients is available.

Recommendations for the Control of Wildfire and Blackfire of Dark Tobacco



The first application of bluestone-lime should be made when the largest plants are this size.

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Recommendations for the Control of Wildfire And Blackfire of Dark Tobacco

W. D. VALLEAU, E. M. JOHNSON, and E. J. KINNEY

During the past few years wildfire has been very destructive in plant beds in certain areas in Western Kentucky and, following topping and suckering, blackfire, caused by the wildfire and angular leafspot organisms, has destroyed much tobacco. In 1938, a wet season, fully 60 percent of the dark tobacco crop in large areas in Western Kentucky was thus destroyed in the field.

CONTROL IN THE PLANT BED

These bacterial diseases may be completely controlled in the plant bed by two applications of bluestone-lime mixture applied (1) when the plants are just established in the bed and producing the first true leaves and (2) ten days later. *Caution.* Apply early or the treatment will be of little benefit after the crop is set in the field. In a wet season apply at the recommended time when it is not raining.

HOW TO PREPARE BLUESTONE-LIME MIXTURE

1. Fill a clean 50-gallon barrel or oil drum three-fourths full of water strained thru a cloth.
2. In one container thoroly mix 4 pounds of commercial hydrated lime in 3 or 4 gallons of strained water. Hydrated lime is the powdered lime in paper sacks commonly sold by lumber dealers.
3. In a separate container, preferably a wooden bucket or crock, dissolve 3 pounds of powdered bluestone in about 4 gallons of water. If powdered bluestone, which dissolves readily, is not available, beat the crystals into a fine powder before trying to dissolve them. Hardware dealers can get powdered bluestone for you.
4. Pour the lime paste into the barrel of water and stir vigorously, at the same time adding the bluestone solution slowly.
5. Add enough water to make 50 gallons.
6. Stir the mixture each time the sprinkling can is filled. *Caution.* The water, barrel, and other containers should be free from bits of material which will clog the nozzle of the sprinkler. The nozzle should be easily removable for cleaning.
7. Dry Bordeaux mixture is not recommended.

HOW TO APPLY

The mixture is applied to the bed without removing the cotton cover. An ordinary 10-quart sprinkling can is used. Logs or boards used to frame the bed should also be sprinkled. A 50-gallon container of the mixture will treat 200 square yards, or 66 linear yards of bed 9 feet wide, or 50 linear yards of bed 12 feet wide. This is at the rate of 1 quart per square yard.

Caution. Bluestone-lime does not injure plants so do not attempt to wash it off after applying. Do not mix nitrate of soda with the bluestone-lime.

CONTROL IN THE FIELD

Selection of Plants

In an average year plants from a bluestone-lime treated bed will remain free or nearly free from blackfire until cutting time. Therefore use plants only from treated beds. Crops set with clean plants from a treated bed have been ruined by resetting from an untreated one.

CHOICE AND MANAGEMENT OF SOIL FOR TOBACCO

Select land with good under drainage, which is indicated by well-granulated, reddish, brownish-red or bright yellow subsoil. A light-colored compact subsoil and the presence of dark-colored concretions (buckshot) are evidence of poor drainage.

Soil for tobacco should be in a high state of productivity, at least sufficiently fertile to yield 1000 pounds of tobacco an acre in a good season, without fertilization beyond that used in improving the soil. Land which is in good grass and legumes and not heavily pastured is desired. The longer in sod the better. Poor results have usually followed lespedeza and other legumes if they have been removed for hay year after year preceding tobacco. In improving land for tobacco 300 to 400 pounds per acre of 20-percent superphosphate or its equivalent should be broadcast ahead of seeding the grass and legume mixture. If the soil has not been limed, only sufficient lime should be added for the legumes. A good pasture mixture to precede dark tobacco consists of 3 pounds of redtop, 8 to 10 pounds of orchard grass, 3 or 4 pounds of Kentucky bluegrass, 3 or 4 pounds of Canada bluegrass, 5 pounds of native red clover, not over 5 pounds of Korean lespedeza, and 2 pounds of white clover per acre. Sow grasses in the fall with small grain and add the lespedeza and white clover in early spring. It is desirable that the grass-legume mixture be pastured rather

is set heavy infection may result. Horse nettle and ground cherry are two common weeds which are subject to mosaic. If a bed is located where these weeds are present and they are handled while weeding the beds, or pulling plants, the disease may be spread from them to tobacco.

DAMAGE CAUSED BY MOSAIC

Infection at setting time causes stunting of plants which reduces their value over 60 percent. The later the infection occurs the less damage there is to the crop. Burley tobacco infected at topping time is not seriously damaged; but the upper, most valuable leaves of dark tobacco may be ruined if the mosaic is of the burning type as illustrated on page 2 to this leaflet.

RECOMMENDATIONS FOR CONTROL

1. Place the plant bed where there are no infected ground cherries or horse (bull) nettles.
2. Tobacco stalks, barn sweepings, or water in which tobacco has been soaked should not be used as fertilizers on the plant bed.
3. During the periods when men are working in the plant bed they should not use or otherwise handle barn-cured tobacco either day or night. Most brands of manufactured tobacco are safe. But the pockets must first be thoroughly brushed, and barn-cured tobacco must not be handled when away from the bed.
4. If barn-cured tobacco has been handled the hands should be thoroly washed in soap and water or dipped in a saturated solution of trisodium phosphate before plants are handled.
5. Do not put barn sweepings, tobacco trash or stalks on land to be planted with tobacco unless it is done several months before planting.
6. If a low percentage of mosaic develops within three weeks after setting these plants may be removed, but healthy plants must not be touched during the operation.
7. Hand worming should be done only when the plants are dry.
8. If seed of a mosaic resistant variety is available raise resistant tobacco for personal chewing or smoking until a satisfactory resistant variety is available for the whole crop.
9. In topping dark tobacco mosaic plants should be left absolutely alone until the healthy plants have been topped. If mosaic plants are handled accidentally the virus can be destroyed by dipping the hands in a concentrated solution of trisodium phosphate.

Control of Tobacco Mosaic

Mosaic mottling and distortion in young leaves.

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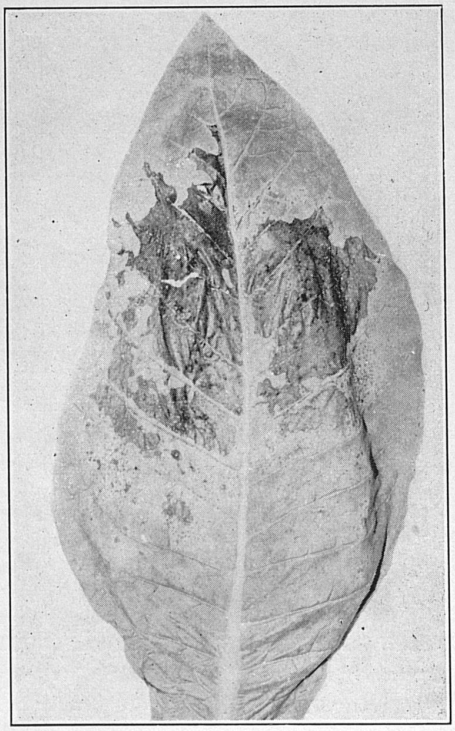
CONTROL OF TOBACCO MOSAIC

W. D. VALLEAU and E. M. JOHNSON

Fifteen years ago the writers discovered that the principal source of mosaic of tobacco in Kentucky was infected barn-cured tobacco used for chewing or smoking by those who weeded beds and pulled and set plants. For the past thirteen years Kentucky growers have been instructed in methods of controlling this destructive disease so that at present prevention of mosaic is a routine practice on many farms in the state.



Mosaic burn on an upper leaf of a tobacco plant infected with mosaic at topping time.

NATURE OF THE DISEASE

Tobacco mosaic (walloon or dry-weather french) is caused by a minute organism which is characterized by its ability to infect healthy plants even after it has remained in dried tobacco for fifty years or more. The virus multiplies around the point of infection and is then carried thru the veins to the young leaves where typical mosaic patterns soon appear. An infected plant cannot be cured. All new leaves will show signs of the disease.

PROOF OF INFECTIVITY

To transmit the disease it is only necessary to moisten dry tobacco from an infected crop and rub it on healthy plants, or crush a bit of leaf from a diseased plant and lightly rub healthy ones. The following experiment illustrates how chewing tobacco may be a source of infection to tobacco in the field. Three twists of tobacco, each infected with a different strain of mosaic virus were given, one to each of three men. Each man broke a piece from his twist, crushed it with his fingers, and then dusted off his hands until they appeared clean. Each man then pulled 400 plants which were tied in bundles of 100 plants each in the order of pulling. A fourth man with hands free of virus pulled 200 plants. The plants were set, in the order of pulling, by men with clean hands. The kind of mosaic infection on the hands of the pullers and the kind and extent of mosaic which developed on the plants after setting are shown in the following table.

Kind of mosaic on hands of pullers	Percent mosaic in successive pullings		Kind of mosaic which developed
Yellow mosaic	first	60	Yellow mosaic
	second	45	" "
	third	16	" "
	fourth	7	" "
Burning mosaic	first	64	Burning mosaic
	second	31	" "
	third	8	" "
	fourth	5	" "
Green mosaic	first	69	Green mosaic
	second	31	" "
	third	23	" "
	fourth	7	" "
Clean hands	first	none	None
	second	"	"

This experiment proves that a man who has handled infected tobacco only once can infect more than 100 plants of the first 400 pulled.

OTHER SOURCES OF MOSAIC INFECTION

Tobacco may be grown on land which grew a crop of infected tobacco the previous year, with little danger of infection from the soil. If barn sweepings, tobacco stalks, or other tobacco trash are scattered over a field and disked in shortly before the tobacco crop

case more than 10 to 12 hours. Neither is it harmful for the cured leaves to dry sufficiently to shatter, provided they come back in case. It is the average condition that counts, not the extremes for a few hours. Study the table, page 2, in connection with the relative humidity table. It is an abbreviated story of curing. The relative humidity table is divided into zones by black lines to show the approximate effect of different conditions, if maintained thruout the cure, on the final color and quality of the cured tobacco. The color to be expected is shown at the right side.

If the tobacco is drying too rapidly, the barn should be closed tight to retain the moisture given off by the tobacco. In extreme cases, it is helpful to sprinkle the floor of the barn at night, to bring the tobacco in case.

If the tobacco remains in case with all the ventilators open, start fires if the condition continues for as much as eighteen to twenty-four hours. Hoping for better weather and delay in starting fires have resulted in much damaged tobacco.

Tobacco which has cured green or shows papaw, may be improved by alternately bringing it in case and drying it out again. Tobacco cured too red or houseburned by excessive moisture in the barn *cannot be improved* by using heat after damage has occurred.

The temperature goes up during the day and the relative humidity goes down, while at night the temperature goes down and the relative humidity goes up, especially in fair weather. The average condition of tobacco in the barn will be somewhat wetter at night than in the daytime.

Do not depend upon the condition of the tobacco near the driveway or outside walls or upon readings of the hygrometer in a convenient location, to determine if the tobacco is safe. The greatest danger exists in the second or third tier of tobacco in the sheds, especially if coke stoves are being used. Since this is a difficult place in which to feel the tobacco during curing, it is very helpful to use a hygrometer hung at this place by means of a strong cord and pulley. *Do not use binder twine.* Care should be taken to see that the tobacco is as close together around and below the hygrometer as at other places or a reading may be obtained which does not represent the condition of the tobacco which is in greatest danger.

The type of hygrometer which has generally proved to be most satisfactory for Burley tobacco curing is the wet-and-dry-bulb thermometer. It consists of two thermometers matched at the factory so they read alike. One of the thermometers has a wick tied around the bulb, the other end of which is placed in a water container. This container must be refilled frequently and the wick kept clean and wet if accurate results are to be obtained. If the air is saturated, no water evaporates from the wick and so the wet bulb reads the same temperature as the dry bulb. If the air is not saturated, evaporation from the wick lowers the temperature of the wet bulb below that of the dry bulb. The drier the air, the more rapid the evaporation and consequently the greater the wet bulb depression. This relationship is shown in the Relative Humidity Table from which the relative humidity corresponding to different temperatures and wet-bulb depressions can be determined.

Another type of hygrometer, based upon the swelling of a piece of wood when damp, has been widely sold for tobacco curing. It is simpler to read than the wet-and-dry-bulb thermometer, since the relative humidity is read directly from a dial, but it is not accurate unless it is adjusted frequently to read 100 percent when wrapped in a wet towel overnight and unless it has been held at constant relative humidity at least four hours, as compared with 10-15 minutes for the other type.

If heat is used, fires should be distributed as uniformly as possible. Stoves located in the driveway may drive moisture out of the tobacco over them but allow this moisture to settle on the tobacco in the sheds, making that tobacco wetter than it would be if no heat were used. Remember the heat is used primarily to reduce the relative humidity in the barn and thus dry the tobacco; consequently, the ridge ventilator should be open, and sometimes side ventilators on the side away from the wind, also, to let the moisture out. If fewer than three coke stoves are used to the bent, they should be moved every day to keep the cure uniform. At least two should be used per bent if the weather is such as to require much fire. Do not attempt to cure tobacco with one large stove per bent.

After Curing. If the tobacco comes in case even after it is completely cured but before it is stripped, the fires should be relighted to dry it out, especially if the weather is warm. Except when fires are used, the barn should be kept closed tight from the time the tobacco is thoroly cured until it is to be put in case for stripping.

Recommendations for Curing Burley Tobacco

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The following recommendations for curing Burley tobacco are based on the experience of successful farmers, the results obtained in curing demonstrations and on curing tests conducted at the Kentucky Agricultural Experiment Station.

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EXTENSION DIVISION, COLLEGE OF AGRICULTURE
University of Kentucky, Lexington, Kentucky
Thomas P. Cooper, Dean and Director
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RECOMMENDATIONS FOR CURING BURLEY TOBACCO

By RUSSELL A. HUNT and R. N. JEFFREY

Cutting and Housing. Harvest only fully ripe tobacco. Green or partially ripe tobacco will not cure into a satisfactory product. If the lower flying and trash leaves are burning and wasting in the field, with the upper leaves partially ripe or wholly immature, it may be very profitable to "prime," or pull off, these lower leaves and cure them separately rather than cut the entire plant at this time. Remove only those leaves which are likely to be injured if left in the field. Fasten them together by the tips, with rubber bands, into groups of 8 to 10 leaves and hang over tobacco sticks. When the stems are dry, grade and tie into the usual hands. In any case it is important to decide when the tobacco starts to lose value at the bottom more rapidly than it is gaining at the top.

In cutting, drive the sticks into the ground and place the cut tobacco on the sticks as soon as cut. There is danger of sunburn and bruising if the cut plants are thrown on the ground to wilt. Scaffolding for one to two days before housing is advantageous.

Tobacco may be harvested by splitting the stalk or by spearing. Splitting is usually more desirable, however. Tobacco cures more rapidly and generally is less likely to damage when split. Spearing should not be practiced unless the grower is prepared to use heat in curing. Even if heat is used in curing, September 1 should be the deadline for spearing.

Tobacco-curing table

Average relative humidity	Wet-bulb depression	Feel of cured tobacco	Color of lug leaves after curing
percent	degrees F.		
Below 50	10 or more	Very brittle	Green if temperature low. Mottled with green cast if medium temperatures. Green if temperature very high (over stoves).
50–60	8–15	Brittle	Green if temperature low. Mottled tan and yellow at medium temperature. Mottled red and yellow at high temperature.
65–70	6–10	Can be handled without much breakage	Tan or light brown.
75–80	4–6	Satisfactory case for stripping	Red-brown, considerably darker than desirable.
80–85	3–5	High case	Houseburn starting on leaves which are stuck together.
85–100	0–3	Wet and soggy	Houseburned

Fill the barn to capacity, but do not overfill. Fifteen to twenty sticks fill a 12-foot rail. In filling the barn, fill the top tier rail a little fuller than the lower rails. In the top of the barn, with 12-foot rails, twenty sticks may be hung; on the next tier, nineteen sticks; on the next, eighteen, and so on until the lowest rail carries only fifteen sticks. If possible, leave a clearance of at least 4 feet under the lowest tobacco. Do not hang fresh-cut tobacco under tobacco partially cured. This may be avoided by completely filling one bent before starting to hang in another. Shake out each plant when hanging.

Curing. Keep the average relative humidity in the barn at about 65 to 70 percent. At 65-70 percent relative humidity the cured portions of flyings and trash will be dry enough to be springy and rattle when the hand is placed on the leaf. Leaf curing in too high case feels cool and clammy or sticky. Leaf curing safely feels warm and dry to the touch. It is not injurious for tobacco to be in case while curing—in fact, it may be beneficial provided it does not stay in

RELATIVE HUMIDITY TABLE

Lowering of wet bulb	92°	90°	88°	86°	84°	82°	80°	78°	76°	74°	72°	70°	68°	66°	64°	62°	60°	Color of lug leaves after curing
degrees F.																		
1	96	96	96	96	96	96	96	96	96	95	95	95	95	95	95	94	94	Houseburn
2	92	92	92	92	92	92	91	91	91	91	91	90	90	90	90	89	89	
3	89	89	89	88	88	88	87	87	86	86	86	86	85	85	84	84	83	
4	85	85	85	84	84	84	83	83	82	82	82	81	80	80	79	79	78	Red or brown
5	82	81	81	81	80	80	79	79	78	78	77	77	76	75	74	74	73	
6	78	78	77	77	76	76	75	75	74	74	73	72	71	71	70	69	68	Tan or buff
7	75	74	73	73	72	72	72	71	70	69	69	68	67	66	65	64	63	
8	72	71	70	70	69	69	68	67	66	65	65	64	62	61	60	59	58	Papawed, piebald or green cast
9	69	68	67	66	65	65	64	63	62	61	61	59	58	57	56	54	53	
10	65	65	64	63	62	61	61	60	59	58	57	55	54	53	51	50	48	
11	62	61	61	60	59	58	57	56	55	54	53	51	50	48	47	45	43	
12	59	58	57	57	56	55	54	53	51	50	49	48	46	44	43	41	39	
13	56	55	54	53	52	52	50	49	48	47	45	44	42	40	38	36	34	Green
14	53	52	51	50	49	48	47	46	44	43	42	40	38	36	34	32	30	
15	51	50	49	47	46	45	44	43	41	39	38	36	34	32	30	28	26	
16	48	47	46	44	43	42	41	39	38	36	34	33	31	29	26	24	21	

How to use the table. Subtract the reading of the wet-bulb thermometer from that of the dry-bulb thermometer. Locate this difference in the first column and follow the same line to the right until the column is reached which is headed by the reading of the dry-bulb thermometer. The figure at this place is the percent of relative humidity. For example, suppose the thermometers read 80° and 71°, respectively. The difference is 9. Following the 9 line to the column headed 80° the figure found is 64, the percent of relative humidity. This figure is in the zone of "papawed," "piebald," or greenish color. It is just a little too low to give the best cure.

lar leafspot and wildfire in the plant bed. In the field a severe outbreak of angular leafspot, and less frequently of wildfire, may occur after a protracted rainy period if numerous spots of the lower leaves of rapidly growing plants have become water-soaked. The bacteria, which appear to be present in some field soils, enter the water-soaked areas of the leaves. While conditions for this type of field infection are rather rare, it must be recognized that plant-bed treatment will not always prevent the disease in the field.

Set Only Clean Plants

In an average year plants from a bed treated with bluestone-lime will remain free or nearly free from leaf spots until cutting time. Therefore use plants only from treated beds. Crops set with clean plants from a treated bed have been ruined by resetting from an untreated one.

Build Up Soil Fertility

It is a common observation that the most severe outbreaks of angular leafspot and wildfire in the field occur where the soil is not very fertile. In very fertile soils neither of these diseases is destructive, as a rule. Consequently, selection of a fertile piece of land for the tobacco field will help prevent field injury and increase the yield and quality of the tobacco. If the land is not fertile, a moderately heavy application of manure or of a high-grade fertilizer, or both, will help.

Topping and Cutting

If the leafspot diseases are well established in a field of tobacco at topping time, it is well to top the plants rather late and high, as this tends to increase resistance to the diseases. Also, if such diseases are well established, and if the cutting season is rainy or heavy dews are common, cutting should be done immediately after final suckering. Suckered tobacco under such conditions should not be left in the field over night.

A 15 30M—2-41

Recommendations for the Control of Wildfire and Angular Leafspot of Burley Tobacco

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EXTENSION DIVISION, COLLEGE OF AGRICULTURE
University of Kentucky, Lexington, Kentucky
Thomas P. Cooper, Dean and Director

March, 1941

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Recommendations for the Control of Wildfire and Angular Leafspot of Burley Tobacco

W. D. Valleau and E. M. Johnson

ANGULAR LEAFSPOT, or rust, is a common disease each year in Burley plant beds in all parts of Kentucky. Wildfire likewise has occurred in certain areas of the state, where it is likely to persist for several years. In very wet seasons wildfire may appear in neighborhoods where it had not been observed before. Rust may injure plants in the bed considerably, and may therefore delay setting a few days; but a severe outbreak of wildfire may destroy most of the plants in a bed, especially if infection occurs early. There is no way of predicting whether one or both of these diseases will occur in a plant bed. Wildfire is often mistakenly thought to be blue mold.

CONTROL IN THE PLANT BED

These bacterial diseases may be completely controlled in the plant bed by two applications of bluestone-lime mixture applied (1) when the plants are just established in the bed and producing the first true leaf, and (2) ten days later. *Caution*: These treatments must be made early, for they will otherwise be of little benefit after the crop is set in the field. In a wet season apply at the recommended time, but choose a time when it is not actually raining.

Treating the beds with dry Bordeaux mixture is not recommended.

HOW TO PREPARE BLUESTONE-LIME MIXTURE

1. Fill a clean 50-gallon barrel or oil drum three-fourths full of water strained thru a cloth.
2. In one container thoroly mix 4 pounds of commercial hydrated lime in 3 or 4 gallons of strained water. Hydrated lime is the powdered lime in paper sacks commonly sold by lumber dealers.
3. In a separate container, preferably a wooden bucket or crock, dissolve 3 pounds of powdered bluestone in about 4 gallons of water. If powdered bluestone, which dissolves readily, is not available, beat the crystals into a fine powder before trying to dissolve them. Hardware dealers can get powdered bluestone for you.
4. Pour the lime paste into the barrel of water and stir vigorously, at the same time adding the bluestone solution slowly.
5. Add enough water to make 50 gallons.
6. Stir the mixture each time the sprinkling can is filled. *Caution.* The water, barrel, and other containers should be free from bits of material which will clog the nozzle of the sprinkler. The nozzle should be easily removable for cleaning.

HOW TO APPLY

The mixture is applied to the bed without removing the cotton cover. An ordinary 10-quart sprinkling can is used. Logs or boards used to frame the bed should also be sprinkled. A 50-gallon container of the mixture will treat 200 square yards, or 66 linear yards of bed 9 feet wide, or 50 linear yards of bed 12 feet wide. This is at the rate of 1 quart per square yard.

Caution. Bluestone-lime does not injure plants, so do not attempt to wash it off after applying. Do not mix nitrate of soda with bluestone-lime.

COST OF BLUESTONE-LIME MIXTURE

The cost of materials for treating 200 square yards of bed twice should not be over 80 cents. The protection of plants in the bed, resulting in healthier, more vigorous plants and greater freedom from leafspot diseases in the field, will pay for the trouble and cost many times.

CONTROL IN THE FIELD

In Kentucky the bluestone-lime treatment has been found to give complete control of angu-

"Sow and Save" for National Defense

As part of our national defense effort an increase must be brought about in production of eggs, meat, and dairy products. One way for Kentucky farmers to help is to sow cover crops for winter pasture.

SOW . . . . . **Small grain** — rye, winter oats, barley, wheat, alone or in mixtures

Winter legumes — vetch and crimson clover

Ryegrass — alone, or in mixture with small grain and legumes

SAVE . . . . **Feed** — hay, grain, and commercial feed

Money — lower cost of production means money saved

Soil — cover crops protect soil from winter erosion

Plant food — much plant food is leached out of soil unprotected by cover crops

Seed — for next year's needs

Luxuriant cover crops provide excellent pasture in fall, winter, and spring—at the times when permanent pastures are not especially productive. Such pastures reduce feed costs, improve the health and production of the animals, and protect the soil from erosion and leaching.

Cover crops may be harvested for hay, for seed or grain; or they may be left on the land or turned under for green manure.

Lexington, Kentucky August, 1941

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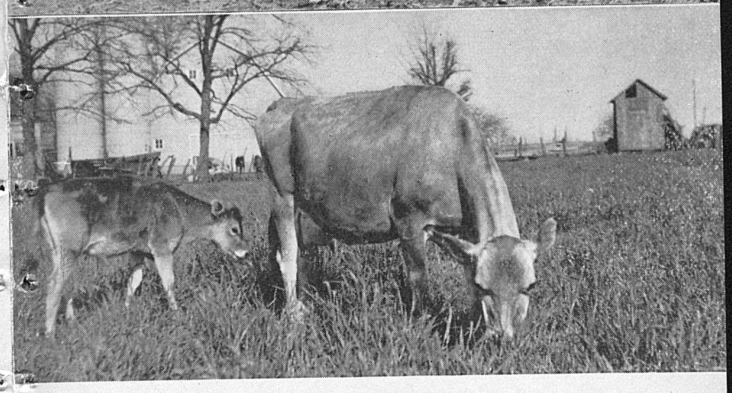
A-16 100,000—8-41
50,000—9-41

Winter Pastures

Save feed
Increase production
Lower feed cost

Protect the soil
Save plant food
Increase profits



Which should be more profitable?

UNIVERSITY OF KENTUCKY..COLLEGE OF AGRICULTURE AND HOME ECONOMICS
EXTENSION SERVICE

Early Seeding Is Essential

The earlier cover crops are seeded the more winter pasture they produce. The following are recommended dates for seeding:

	Optimum date	*Latest safe date*
Crimson clover	Late August	September 15
Vetch	Late August	October 1 to 10
Winter oats	Early September	October 1 to 10
Barley	Early September	October 1 to 10
Rye	Early September	November 1 to 15
Ryegrass	August	October 1
Wheat	September	November 1

Early sown wheat or barley may be damaged by hessian fly. Consult your county agent for fly-free date.

Heavy Seeding Improves Stand

Rates of seeding vary according to use and purpose of the crop. More pasture and better protection results from the heavier seedings. Lighter seedings are satisfactory where grazing is not possible, and are desirable where grasses and legumes are to be established.

	Recommended seeding rates	
	Minimum	*Optimum*
Crimson clover*	12 pounds	20 pounds
Vetch*	15 pounds	30-40 pounds
Winter oats	1½ bushels	3 bushels
Barley	1¼ bushels	2 bushels
Rye	1 bushel	2 bushels or more
Ryegrass	15 pounds	20-30 pounds
Wheat	1 bushel	1¼ to 2 bushels

* To produce more pasture and better protection small grain or ryegrass should be seeded with crimson clover or vetch.

Limestone and Phosphate May Be Needed

Lack of fertility often accounts for the failure of cover crops or reduces the amount of pasture provided. On such land the use of limestone and phosphate in connection with cover crops is practical and economical.

Well-Prepared Seedbed Helps

Sowing seed on unprepared or poorly prepared seedbeds is wasteful and expensive. Thoro disking is advisable after corn, tobacco, soybeans, and other such crops.

Cover Well and Conserve Moisture

Small grain and vetch should be covered about 2 inches. Crimson clover and ryegrass require lighter covering. The use of a cultipacker either before or after seeding helps conserve moisture and leaves a firm seedbed.

Inoculate Vetch and Crimson Clover

Inoculation needed by vetch is different from that of any other common farm crop, and special inoculation therefore is required. Crimson clover, however, is inoculated by the same bacteria as other common clovers. Therefore no inoculation of the crimson clover seed is likely to be needed if other clovers have been grown successfully on the land to be seeded.

Caution

Wheat acreage is limited by AAA regulations. Before increasing wheat acreage for winter pasture, therefore, consult your Agricultural Conservation Association office.

12. Control mosaic. Plants are usually infected with mosaic from the hands of workers who chew or smoke barn-cured or "homespun" tobacco. To prevent mosaic the pockets of the workers should be brushed clean and the hands thoroly scrubbed before going to the plant bed, and the workers should not smoke or chew while working at the plant bed. Take this precaution when—

(a) Applying bluestone-lime mixture
(b) Weeding plant beds
(c) Watering beds
(d) Applying poison dusts, sprays, or poison baits
(e) Pulling plants
(f) Setting plants

13. To control wildfire and angular leafspot apply with a sprinkling can, thru the canvas, 3-4-50 bluestone-lime mixture (3 pounds copper sulfate, 4 pounds lime, and 50 gallons of water). This should be applied at the rate of 1 quart per square yard, *first* when the first true leaf appears; *and then again* from 8 to 10 days later.

14. To destroy cutworms, use 1 part of paris green and 50 parts wheat bran mixed with enough water to make a fairly thick mash. Scatter thinly over the bed late in the afternoon. This treatment should be repeated at least twice, at intervals of 3 days, for complete control.

15. To control flea beetles, dust the plants with a mixture of 1 part paris green, 5 parts of lead arsenate, and 4 parts hydrated lime. Apply at the rate of ¾ pound per 100 square yards. Or use dust containing 1 percent rotenone applied with a rotary hand-operated duster at the rate of ½ pound per 100 square yards.

16. When setting and resetting is finished, destroy the remaining plants in the bed to help prevent diseases from spreading, and to help control insects.

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A—17 30M-1-42

Tobacco PLANT-BED Management

How to select the site, prepare the plant bed, and care for it so as to get vigorous, stocky plants for early setting.

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University of Kentucky
College of Agriculture and Home Economics
Extension Service

Tobacco Plant-Bed Management

By Russell A. Hunt

An abundance of healthy, vigorous, stocky plants ready for transplanting at an early date is essential to the production of high-quality tobacco. Sufficient plant-bed area should be prepared to provide the plants needed for the entire crop at the first and second pullings. The first plants pulled from beds are generally quite free from disease, but at each successive pulling the plants are likely to carry more disease, particularly mosaic, which of course contributes to the amount of disease in the field. Vigorous, stocky plants aid materially in obtaining a good stand. They recover quickly from the effects of transplanting, are not easily killed by bad weather and often survive attacks of insects.

Having the plants ready for early transplanting has a number of advantages. The field soil then is usually in better shape than later, for obtaining good stands, and the early-set crop is more likely to escape injury from drouth, more likely to have favorable weather for harvesting and curing, and less likely to be affected seriously by wildfire, rust, and other leafspot diseases.

Some Points to Remember

1. Select fertile, well-drained land for the bed, preferably with a slight southern or eastern slope.

2. Select a site free from shade, especially in the forenoon. (This is helpful in preventing blue mold.)

3. Use a new site for the plant bed each year, a great help in avoiding black root-rot and blue mold.

4. Where a burley tobacco crop is to be grown on land which has grown tobacco in recent years, choose a variety resistant to black root-rot, such as Kentucky Experiment Station No. 16. On virgin land, or in very long rotations, a variety not resistant to this disease may be as satisfactory, if one can be found which gives a yield comparable to that of Kentucky Experiment Station No. 16. Where Fusarium wilt is prevalent, Kentucky Experiment Station No. 33 should be grown.

5. Before sterilizing, prepare the seedbed thoroly, so that only a very light raking will be necessary before sowing the seed. Deep stirring after sterilization results in weedy beds.

6. Fertilize a steamed bed with a complete fertilizer such as 6-8-6 or 4-8-4, at the rate of 4 to 5 pounds per 100 square feet, and rake in very lightly. A low-potash fertilizer is preferable for a heavily burned bed. *Caution*: Heavy fertilizing of plant beds may put too much soluble salts in the soil, which in dry weather causes the plants to yellow and die.

7. Provide 400 to 450 square feet of bed for each acre of burley tobacco to be grown, and 250 square feet for each acre of dark tobacco.

8. Sow 1 level teaspoon of seed to 400 to 450 square feet of bed. Seeding may be done as soon as weather permits, which is usually the last half of February, or the first half of March. Perhaps the most favorable time for seeding is from the first to the middle of March in southern and western Kentucky, and from March 10 to March 20 in central and northern Kentucky. It is a mistake to work the ground when it is wet in order to sow early.

9. To distribute the seed evenly, mix the seed with screened wood ashes, fine sand, or commercial fertilizer. Going over the bed several times, sowing part of the seed each time assures even distribution.

10. Box the bed tight, using 1″x6″ material. Use a good grade of tobacco cotton. Draw it over the tops of the boxing boards and fasten to the sides of the board. This will keep out flea beetles, cutworms, and grasshoppers, and will double the life of the tobacco cotton. Since a shortage of cotton is likely this season, it is essential to conserve supplies.

11. In dry weather, water the bed thoroly every 4 to 6 days. Use 50 to 60 gallons for each 100 square feet. Watering a large bed is laborious, but in many seasons is necessary if strong, thrifty plants are to be produced. Tobacco growers can well afford to provide equipment for watering plant beds rapidly. Seldom are there seasons when watering is not needed.

yields produced on TVA demonstration farms in Grayson county. In 1940 the average yields (pounds per acre) from the treated and the untreated portions of the demonstration fields were as follows:

	Untreated	*Limestone and phosphate*
Lespedeza, 33 fields	641	2,875
Red clover, 5 fields	428	2,680
Redtop, 5 fields	80	2,179

Further evidence of the value of fertilizer treatments is furnished by experiments with permanent pastures at the Western Kentucky Agricultural Experiment Substation. In these experiments a 30-acre field was divided into three 10-acre fields, one of which received no fertilizer or limestone treatment, and the other two of which had fertilizer and limestone worked into the soil prior to seeding, and later top dressings of rock phosphate or of limestone and superphosphate. The results, in terms of pounds gain of steers and cost per pound of such gains, indicate what may in general be expected from suitable soil treatments on pasture land. Cost of the soil treatments was of course figured in the costs per pound of gain. The average gains and costs over a period of 13 years (1929-1941) were as follows:

*Treatment**	*Average number of steers carried per 10 acres*	*Average yearly gain per 10 acres (pounds)*	*Average cost per pound of gain (cents)*
None	2.5	460	10.3
Rock phosphate	6.4	1,635	3.3
Limestone and superphosphate	6.6	1,614	3.3

* Rock phosphate—1,200 pounds applied per acre in 1927 and worked into the soil; 800 pounds applied in 1934, 300 pounds in 1939, and 327 pounds in 1941 as top-dressings. Limestone and superphosphate—1½ tons of limestone and 600 pounds of 16-percent superphosphate applied per acre in 1927 and worked into the soil; 400 pounds of 16-percent superphosphate applied in 1935, 1 ton of limestone in 1935, 200 pounds of 20-percent superphosphate in 1939 and again in 1941, as top-dressings.

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A—18 50M—2—42

OLD PASTURES and MEADOWS

Patching . . Reseeding

IMPROVE OLD GRASSLANDS BY—

- patching bare spots
- reseeding thin stands
- fertilizing poor soil
- liming acid land
- sowing plenty of seed
- sowing dependable kinds of plants

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Extension Service . . . Thomas P. Cooper, *Dean and Director*

Patching Old Pastures and Meadows

By Ralph Kenney and E. N. Fergus

It is estimated that Kentucky farmers, in order to meet the demand for more meat and more milk in 1942, must reseed or otherwise improve a million acres of grassland in 1942, and about 2 or 3 million acres in 1943. Most Kentucky meadows and pastures now have poor stands. Fall weather for the past three years has been unusually dry, with the result that stands on some 6 million acres of pasture and hay land seeded during those years are very thin. By patching with suitable seeds, however, and by liming and fertilizing, most of these newer meadows and pastures and many of the older ones can be made to double their present production of good pasture and hay. Where drouth was the cause of poor stands, most patching will be done by sowing seed either on thin spots or over the entire fields, but where other causes have contributed, these must be corrected before reseeding will be very effective. Where the soil is unproductive, treatment with limestone, fertilizer, and manure will be profitable before reseeding. Construction of diversion terraces, diversion ditches, and hillside ditches are distinct aids in patching pastures on rolling land.

In the past much patching has consisted in spreading a few loads of manure on the thin spots, putting brush and other material in gullies, and other treatments of small areas in a relatively few fields. The job to be done now, in order to produce notable increases in pasture and hay, requires sowing seed on roughly three-fourths of the grassland of the state.

Lespedeza and Ryegrass Most Widely Adapted for Patching

The cost of patching grassland in Kentucky probably should not be unduly high. Korean lespedeza and Italian ryegrass are widely adapted and suitable for extensive use. Both are among the cheapest seeds sown, and both are produced extensively in Kentucky. Each is the most reliable in its class in making stands on unprepared seedbeds; each produces heavy seed crops; and each grows well under continuous grazing from the time of seeding. Among other plants used may be sweet clover, other lespedezas, timothy, Canada bluegrass, and Kentucky bluegrass. They are less widely adapted and less easily established where they are best adapted than the two first mentioned.

Time and Rate of Seeding

Most seedings will be made in spring or fall. Fall-sown seeds should be almost entirely grasses. They can be sown at any time from September 1 thru November, but the September sowings give best results. Spring seedings may be both grasses and legumes, and may be made from February 1 to as late as May 1 in northern Kentucky. Again, best results can be expected, on the average, by sowing in February and March. However, it may not be possible to decide the needs of many fields until late in the season, because expected volunteer stands of korean lespedeza and Italian ryegrass do not always materialize. When they do not, there is still time to sow seed.

Rates of seeding korean lespedeza and Italian ryegrass on old grassland range from 5 to 25 pounds per acre, whether seeded alone or (in the spring) in combination. The lighter rates are used over entire fields, anticipating heavy volunteer stands the second year. The heavier rate is used on vacant spots and in gullies, or over entire fields when maximum production the first summer must be had.

Prepared or Unprepared Seedbed

Hitherto most of the lespedeza and grass seed used on old grasslands has been sown on unprepared seedbeds. Whether or not it would be better to disk or harrow the ground to be patched or reseeded cannot be definitely stated until more farm trials of seeding on disked or harrowed seedbeds as compared with seeding on unprepared seedbeds have been made.

Value of Soil Treatment for Grassland

Limestone has been used on approximately 3 million acres of Kentucky crop land in the past 17 years, and phosphate in the past 5 years on about the same amount of land, most of it limed. A considerable portion of this acreage is now in grass, and it may be patched more or less successfully without further soil treatment.

The value of treating less productive soil before seeding grass and legume crops is indicated by hay

Legumes Necessary for Good Grass

It is not possible to have a continous vigorous stand of highly nutritious grass without a continuous supply of nitrogen. The most economical way to provide the nitrogen is by having legumes continously with the grass.

More high-quality pasture and hay are necessary in Kentucky for a profitable live-stock industry and for effective soil improvement and conservation. There are prosperous farmers in Kentucky who maintain cattle and sheep on pasture and hay with very little use of grain or concentrates; but this can be done only with high-quality pasture and hay.

KEEP KENTUCKY GREEN

and

THE PASTURES CLEAN

Lexington, Kentucky March 1942

Published in connection with the agricultural extension work carried on by cooperation of the College of Agriculture and Home Economics. University of Kentucky, with the U. S. Department of Agriculture, and distributed in furtherance of the work provided for in the Acts of Congress of May 8 and June 30, 1914.

A—19 25M—3-42

Alfalfa and bluegrass ready for pasture

SOW ALFALFA AND GRASS TOGETHER

- for high-quality hay
- for high-quality pasture 3 or 4 years after the hay
- to prevent erosion
- to fix and conserve nitrogen
- to reduce acreage of tilled crops

UNIVERSITY OF KENTUCKY

College of Agriculture and Home Economics

Agricultural Extension Service

Thomas P. Cooper, *Dean* and *Director*

Sow Alfalfa and Grass Together

By George Roberts

It has been the experience of many farmers that one of the surest means of producing a good bluegrass sod is to sow bluegrass with alfalfa. This is true not only in the older alfalfa areas of the Outer Bluegrass region, but also in the parts of the Bluegrass region where alfalfa has more recently come into use. Farmers have had the same experience in many other parts of the state.

The acreage of alfalfa has increased considerably thruout the state. In 1929 there were 98,355 acres, and in 1939, 154,767 acres. Warren County had 6,000 acres in 1939, which shows the possibilities of extending the crop in that area. The acreage should be largely increased thruout the state because alfalfa is a reliable hay crop of high quality. There is seldom a season so unfavorable that one or more cuttings are not obtained, and in normal seasons three to four cuttings.

Preparing the Soil

Alfalfa can be grown any place in the state where the soil has good underdrainage, as is true of most Kentucky soils. Liming is necessary on all soils that do not naturally contain lime. Some soils that do not need liming are those that contain limestone fragments and those on slopes below marl outcrops. Practically all soils in the state, except the high-phosphorus soils of the Bluegrass region, need to be treated with phosphate. About 3 tons of ground limestone and 500 pounds of 20-percent superphosphate per acre are reasonable first applications for alfalfa. Some soils may also need potash for alfalfa, for this crop is a very heavy feeder on potash. However, a preliminary test should be made by applying potash at the rate of 200 or 300 pounds per acre on three or four small plots over the patch and watching its effect. If the alfalfa shows a good response, the patch may be top-dressed.

This test should be made on soil that contains sufficient lime and phosphate.

Alfalfa may be grown on "run-down" land by growing a crop of sweet clover ahead of it and turning it under. Sweet clover grows much better on run-down land than alfalfa and leaves the soil inoculated for alfalfa. The sweet-clover seed should be inoculated when sown, and the soil should be limed and phosphated as outlined above.

Seeding the Crop

It is important to grow grass with alfalfa to prevent erosion, for sloping land will erode if it has alfalfa only on it. Alfalfa does not make a dense sod, and the soil washes from between the crowns. More grass is needed for pasture in Kentucky, and seeding it with alfalfa is one of the surest ways of getting a good sod. Bluegrass or orchard grass is good for this purpose. A mixture may be used. It is good practice to cut the alfalfa for hay for not more than three or four years and then use the field for pasture. The picture on the front page, showing a field handled in this way, was taken in McCracken County.

If a farmer has had no experience in growing alfalfa, it is advised that he first try it on a small scale. With this trial seeding of alfalfa, seed a strip of bluegrass, a strip of orchard grass, and a strip of a mixture of the two. Seed at the following rates per acre:

Alfalfa	15 pounds
Bluegrass	6-8 pounds
Orchard grass	8 pounds
Mixture of grasses	5 pounds of each

Where alfalfa is seeded for the first time, it is advisable to sow it on a well-prepared seedbed, between August 5 and early September, depending on the latitude. The alfalfa seed should be well inoculated.

Grasses may be sown on established stands of alfalfa on a "honeycomb" freeze in January or February. (Extension Circular 312 gives detailed information on growing alfalfa.)

plies of imported seed have been cut off or seriously reduced, transportation means are jammed, and bagging material is scarce. In addition, our allies need large amounts of American-grown seed.

Seed saving is an important part of the Live-at-Home Program. A dollar saved on seed is a dollar available for winning the war!

Kentucky farmers need to produce more seed of orchard grass, bluegrass, fescue (Ky. No. 31), ryegrass, vetch, clover (red, crimson, and sweet), Balbo rye, and improved varieties of barley, oats, wheat and ryegrass.

Steps in a Seed-Saving Program

1. Start with high-quality seed known to be adapted to your locality. Use recommended varieties.
2. Sow on fertile soil because it not only produces more seed, but better seed. Limestone, phosphate, and humus are important in making soil productive.
3. Control the weeds by proper cultivation before seeding crops, and by pulling, cutting, and mowing at proper times.
4. Harvest the seed at the proper stage after maturity is reached but before the seed shatters badly.
5. Make plans well in advance for all labor and machinery needed.
6. Clean the seed properly before sowing or selling it.

If you produce seed for sale consult your county agent about state and national seed laws!

Lexington, Kentucky May, 1942
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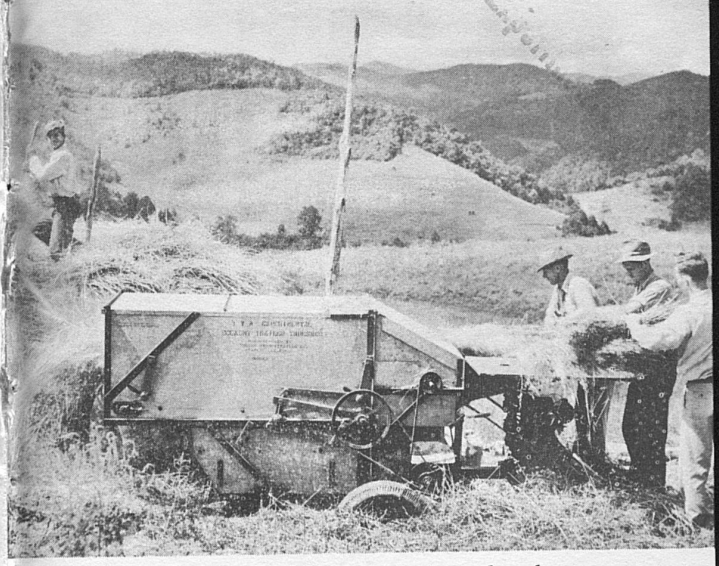
SAVE SEED
on Kentucky Farms



Trailer thresher for small crops of seed

Unless far more seed than usual is saved on Kentucky farms this year, our quotas for war production of foods and feeds will not be met. We may not be able to buy, transport, or pay for seed from outside sources.

UNIVERSITY OF KENTUCKY

College of Agriculture and Home Economics
Agricultural Extension Service

Thomas P. Cooper, *Dean* and *Director*

Save Seed on Kentucky Farms

By WM. C. JOHNSTONE and RALPH KENNEY

ON many Kentucky farms the lack of seed, or of money with which to buy seed for sowing pastures, meadows, and cover crops, limits the acreage of cropland seeded, reduces the rate of seeding, and results in the use of less desirable and cheaper kinds of seeds instead of the better species of grasses and legumes.

Proper seeding of pastures, meadows, and cover crops in Kentucky would require many times more seed than is now being used. Not only should the acreage of cover crops be trebled but the rates of seeding should be increased. Many thousands of acres of pastures and meadows are seeded to lespedeza alone, because neither the seed nor cash to buy seed is available for other crops. Local production of seed is the answer to this seed scarcity.

More Liberal Seeding Is Practical Where Seed Is Saved at Home

Thruout Kentucky, farmers who save seed sow more than those who buy their seed. Farmers who save vetch seed sow 30 to 40 pounds per acre; others sow half that amount. Farmers in the orchard-grass area sow that seed more liberally than those in areas where the seed is shipped in. Where rye seed is abundant, 3 bushels per acre are often used for increasing pasture production and affording better soil protection. The same tendency is seen in all other crops.

Better Varieties May Be Obtained

Farmers who depend upon shipped-in seed often get seed of unadapted varieties. This is especially true of red clover, barley, rye, and oats. The development by plant breeders of especially well adapted varieties of practically all grasses, legumes, and other farm crops may be expected in the future. Many farmers will find not only interesting but profitable work in the production of high-

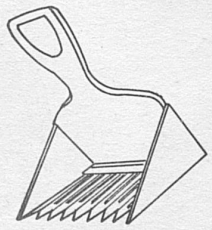
quality seeds of these superior varieties. They may find interest in gathering and planting seeds of local strains of grasses which may prove valuable in future years.

Local Dealers Prefer Local Seed

Many merchants prefer to purchase seed from local farmers. In doing so, they serve their community well and keep the "seed money" at home. In addition, they are more likely to obtain adapted varieties and less likely to bring in new weeds which may prove troublesome. Commissions and freight bills are saved. Surplus seed produced in the community may be handled by local dealers. Where quantity justifies, buying, cleaning, and handling may become a valuable side line for the local dealers or cooperatives.

Seed-Saving Is Simple

Seed may be saved in many ways. Almost 2,000 combine harvesters are now in use in Kentucky for harvesting seed. Most of them do custom work. A small trailer thresher designed particularly for small farms, is now being successfully used in Kentucky, especially in the eastern part of the state. Small grain, clovers, and some grasses may be threshed with ordinary grain threshers. Hand strippers are available at low cost for harvesting bluegrass seed, and many Kentucky farmers are profitably harvesting and threshing small lots of seed by hand. Directions for harvesting the various seed crops are available from the county agents or from the College of Agriculture and Home Economics, University of Kentucky.



With a seed stripper like this, several bushels of bluegrass seed can be collected in a few hours.

Seed-Saving in the War Emergency

Local production of seed is a vital part of the country's war effort. Some of our sup-

15 to 20 sticks to the tier rail. If only a few sticks are housed, they should be hung high in the barn where good curing conditions prevail. If several rails are filled at a time the housing should be done in such a manner as to facilitate the use of heat.

A common practice with many farmers is to keep the primed leaves in piles for one or two days and then spread them on the barn floor, or on hay or straw, to cure. This practice is not recommended as the leaves quickly heat when piled, and when spread on the ground, or on other materials such as hay or straw, one side of the leaf dries and the other remains in case. It is practically impossible to have satisfactory curing under such conditions.

Method of Curing

Curing primed leaves is easier than curing the entire plant. The important thing is to keep the leaves dry most of the time. Since primed leaves are well yellowed, or even partially cured, when harvested, there is practically no danger of setting a green color, or of too rapid curing. Ample ventilation should be provided and heat may be used to advantage if the leaves stay in case longer than one day. Usually curing is finished in ten days to two weeks. The tobacco should then be taken down, tied loosely in hands of 20-25 leaves, placed on sticks the same as other tobacco and bulked in hollow bulks, covered but not weighted. If the leaves are permitted to hang indefinitely in the barn they fade, losing the bright, flashy color that characterizes high-quality smoker leaf. If fresh-harvested tobacco is hung under cured primed leaves the moisture soon causes the primed leaves to discolor or even to houseburn.

Primed leaves may be mingled with comparable grades from the crop or marketed separately. Either way is satisfactory, according to reports of farmers, as well-handled leaves saved by priming are equal in value to leaves harvested in the regular way.

Lexington, Kentucky July, 1942
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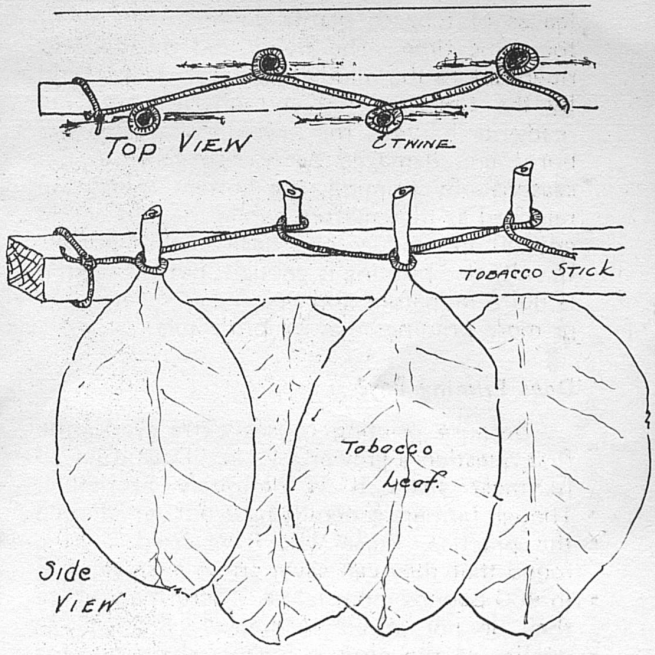
A-21

PRIMING BURLEY TOBACCO

- **Saves lower leaves**
- **Permits upper leaves to ripen**
- **Saves more leaves**
- **Increases yield of smoker grades**
- **Increases total yield**
- **Brings highest returns**



UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service
Thomas P. Cooper, *Dean* and *Director*

PRIMING BURLEY TOBACCO

By RUSSELL A. HUNT

Priming, if done the right way, is the answer to the question growers often ask, "What can be done if the bottom leaves are burning badly while the rest of the plant is still immature?" Most growers faced with such a condition cut the tobacco—all of it. By so doing they get 6 to 8 excellent leaves per plant, 4 to 6 leaves of passable quality, and 6 or 8 immature leaves hardly worth marketing. If instead of cutting at this time they would go through the field and pick off 2 to 5 bottom leaves per plant, and wait to cut until the middle and upper leaves were mature, they would get a total of 16 to 20 good-to-choice leaves per plant.

The reason for such priming (removing leaves from the standing stalk) is that the leaves of tobacco plants do not ripen all at the same time. The flying and trash leaves ripen before the middle and upper leaves, and by the time the lug and bright leaves are ready for harvest, the lower leaves often are burnt and damaged badly, especially in dry seasons. By priming, the bottom leaves are removed as they mature, while they are sound enough to produce the best smoker grades. Usually one priming is enough; but if the crop is quite immature and burning is severe, two or more primings may be profitable.

Does Priming Pay?

Because priming causes extra work, the first question a grower asks is, "Does it pay?" In most years it is definitely profitable. Though farmers generally have not yet adopted the practice, those who have tried it have found that they can save, on an average, 300 to 400 pounds more leaf per acre than where they do not prime. Moreover, the average quality of the crop is higher where priming is done, and it therefore brings a higher price. In 1940 and 1941 primed leaves of burley have averaged about 25 percent above the season's average market price. Returns of $50 to $100 more per acre where priming is used have been common. The amount a farmer can earn per hour for time spent in priming

of course depends on how fast and skilfully he works, on the amount of tobacco needing priming, and on the price of tobacco. It has not been unusual, however, to make $1 to $1.50 an hour in this way.

Especially Important to Growers with Small Tobacco Acreage

Tho priming is practical for all tobacco producers, it is especially useful to those growers who have only 2 or 3 acres, or even less. It enables them, by putting in a little more work on harvesting, to definitely increase their income from tobacco. Of the 120 farms in Kentucky producing burley tobacco, some 81,000 grow less than 2 acres per farm, and only about 14,500 produce more than 4 acres per farm.

When to Prime

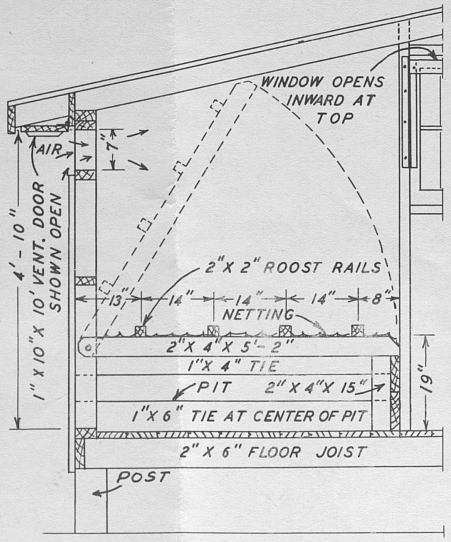
Priming may be done at any time after the bottom leaves or flyings mature and begin to yellow thoroly or burn at the tips. To get the greatest number of leaves in the best possible condition, they should be primed before they are badly burnt. Many growers wait until the bottom leaves are practically cured or until the plants are harvested, then go thru the field and pick up leaves. In a dry season this may prove satisfactory, but in a damp season it may result in serious loss of leaves and in impaired quality. Cured or partially cured leaves attached to the growing plant or lying on the ground, darken rapidly and may be entirely lost in three or four days, if the weather is warm and rainy.

Method of Housing

Priming should be done when the bottom leaves are in case, to prevent shattering. Experience indicates this may best be accomplished in the early morning or on a cloudy day. The leaves are pulled from the plant and removed to the barn where they are sorted according to soundness and quality and tied to tobacco sticks with light twine, 2 to 6 at a place. The tie shown in the drawing is satisfactory for fastening leaves to the stick. After the sticks are filled, they are housed at the rate of

Dropping Pits

Dropping pits are very popular with farmers in Kentucky because of their convenience. A plan of an approved type dropping pit is shown below.



It is not necessary to clean dropping pits as often as dropping boards; in fact, two or three cleanings a year may be enough. This depends entirely upon the condition of the pit.

For more information refer to Kentucky Extension Circular 351 "Housing Farm Poultry." See your county agent.

Lexington, Kentucky. June, 1942

Better Poultry Houses Mean More Eggs and Larger Profits

To the Reader:

This leaflet gives a few practical suggestions for improving poultry houses. In these days when maximum production of eggs is an essential part of our wartime food drive, we should give the hens every opportunity to do their part. If your hen house needs improvement, let me recommend that you give this leaflet careful attention.

Cordially yours,

County Agent

For:

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating.

U. S. Department of Agriculture
Extension Service
Washington, D. C.
OFFICIAL BUSINESS

Penalty for private use to avoid payment of postage, $300

Hints on Remodeling Poultry Houses

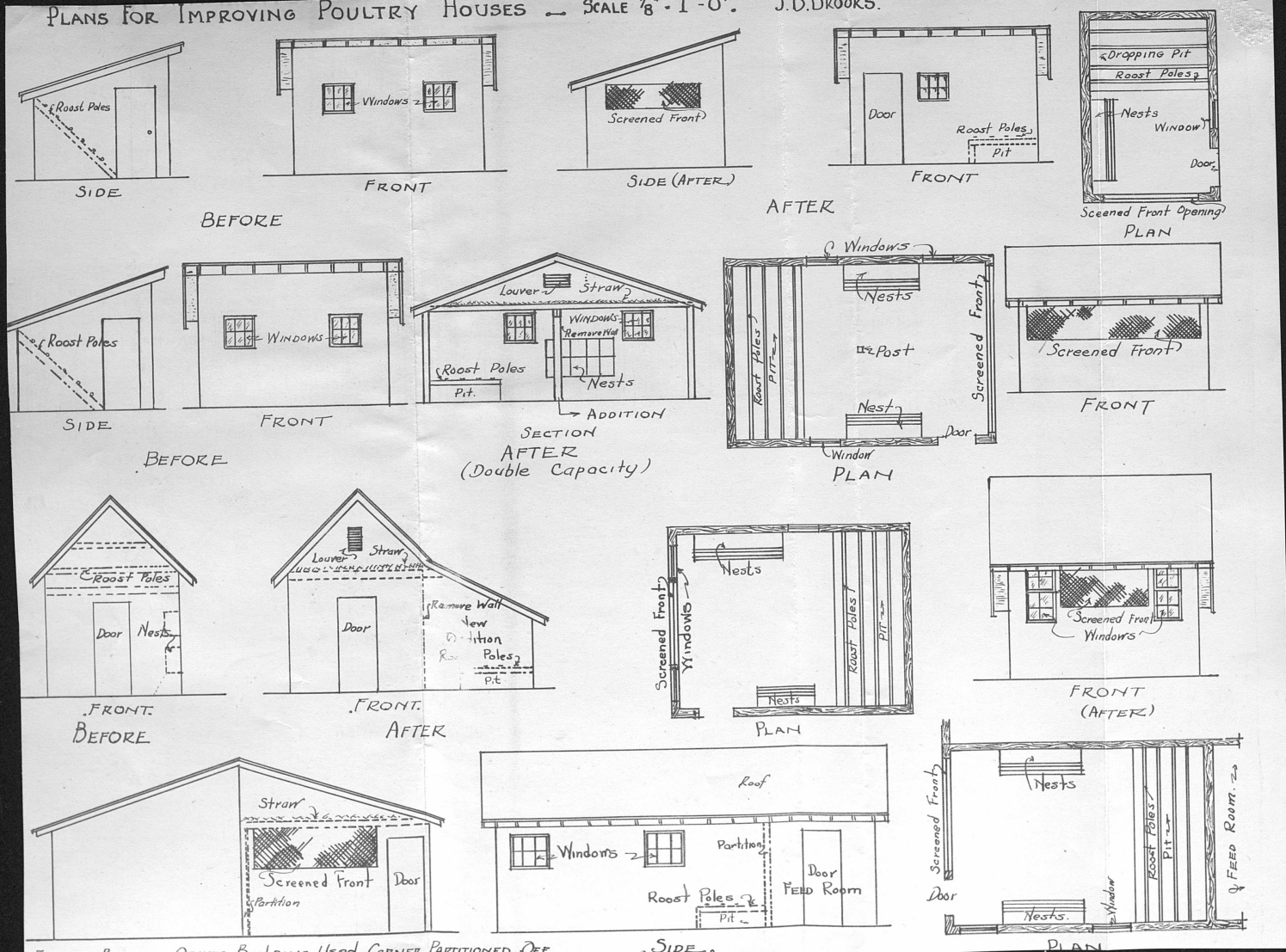
By Jesse B. Brooks

1. Be sure the house is on well-drained soil.
2. Allow 3½ to 4 sq. ft. of floor area per bird.
3. Provide 8 to 10 inches roosting space per bird.
4. Have 1 sq. ft. of open screened front per 10 sq. ft. of floor area for ventilation.
5. Add windows to admit sunlight (See plan).
6. Wooden or concrete floors improve sanitation and add warmth in house.
7. Build a dropping pit 19 inches deep and screen in under roost poles.
8. Strip all cracks. Fodder may be stacked around house during winter.
9. Provide at least 24 nests for each 100 hens. Build nests so that they can be easily removed and cleaned.
10. Provide adequate feeding equipment and watering stands. Have 3 reel-type mash hoppers for each 100 birds.
11. When increasing size of house make the house deep from front to rear and place the roost poles in the back of the building.
12. If the roof is high, a straw loft about 6½ to 7 ft. above the floor will make the house warmer (See plans).

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service

A-22

Plans For Improving Poultry Houses — Scale 1/8" - 1'-0". By J.B.Brooks.



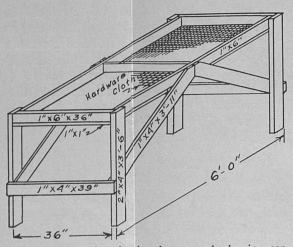


Fig. 2—Screen for cleaning hemp seed, showing construction and sizes of materials

screen. The seed is then ready to be cleaned in a fanning mill. The best practice is to clean seed each morning while waiting for shocks to dry sufficiently for threshing.

Using a fanning mill.— Farmers not having the necessary cleaning equipment may hire an operator doing custom work who owns a combine, a threshing machine, or a fanning mill. In some counties, it may be advisable for some local farm organization to provide a fanning mill where farmers can have hemp seed cleaned at a reasonable charge.

Much skill is involved in efficient use of a fanning mill or of cleaning equipment on a thresher. Conditions vary so widely that adjustments that will meet one situation may not be satisfactory for another. The operator must use considerable judgment in adjusting the cleaner.

The purpose of cleaning seed is to remove impurities such as leaves, twigs, chaff, dirt, inert material, weed seeds, and any small, shrunken, immature seeds.

A good fanning mill or thresher-cleaner should be provided with adjustments for varying the air blast, the rate of feed, the pitch of

screens and speed of shaking the screens.

The air blast can be varied by the speed of the fan and the adjustment of the blinds on the air inlets. The air blast should be sufficient to remove the lighter materials without blowing the seed over.

The feed-hopper opening, the pitch of the screens, and the speed of the shaker should be regulated by trial to do a good job of cleaning.

The openings in the upper screen should be just large enough to let the seed thru and hold back the larger impurities. The size of hole to use in this screen depends upon the size of the hemp seed. A 10/64″, 11/64″, 12/64″, 13/64″, or 14/64″ round hole may be needed. In most cases, the 12/64″ will be satisfactory. This is known as a No. 12 screen.

The purpose of the lower screen is to separate the good seed from the undesired weed seed, and other small particles. The good seed should pass over this screen and the undesired seeds and small particles pass thru it. The openings on the lower screen for hemp should be about 1/12″x¾″ in the oblong hole and 5/64″ in the round.

10M—8-42
SM—10-42

TO THE READER:

This folder describes the most practical methods now in use for harvesting hemp seed. If you are raising hemp for seed for the first time, you will, I am sure, find it most helpful.

Cordially yours,

County Extension Service

For:

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating.

U. S. Department of Agriculture
EXTENSION SERVICE
WASHINGTON, D. C.

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How to Harvest HEMP SEED

Practical methods used by experienced growers.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service
Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky

A-23

July, 1942

How to Harvest Hemp Seed

By J. B. Kelley

Farmers growing hemp for seed this year for the first time want to know what are the best practices in harvesting the crop, how to get along with the least labor and least loss of seed. The information given in this folder is based on interviews with experienced growers, who described their methods of handling the crop.

When to Cut the Plants

Cut the hemp plants when the seed starts to shatter easily from the middle branches. If cut later, many seeds will shatter and be lost. If cut earlier, many seeds on the upper branches will be too immature for sowing. Cut the plants by hand, using a corn knife; and be sure the knife is sharp so that there will be very little shattering of the seed. Cut the stalk about 6 inches below the lower branches. Put 50 to 60 hills in a shock to cure for threshing.

Where to Locate the Shocks

Follow a systematic plan in locating the shocks. They should be arranged so that it will be convenient to thresh 4 shocks at only one setting of the threshing canvas. Such an arrangement is illustrated in Fig. 1. A, B, C, and D show the location of the shocks; the square a-b-c-d shows the location of the canvas; and the square e-f-g-h, bounded by broken lines, represents an area 8 hills square from which the plants are taken to form one shock.

How to Set the Shocks

As in shocking corn, provide a support for a hemp shock by bending 3 or 4 strong plants, one from each of 3 or 4 hills, toward each other and tying them together. Against this support, place the plants from the other hills and bind the shock tight above the center with two hemp stalks having the branches left on. Then reach

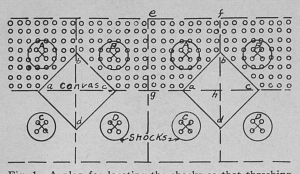


Fig. 1—A plan for locating the shocks so that threshing will be convenient

under the shock with a sharp knife and cut off, near the ground, the plants which form the support. Some growers, however, prefer to leave these plants uncut until the day the shocks are threshed, in which case the branches of the uncut plants should be removed before the shock is made, and should be fastened in a bundle and placed in the shock. If left on uncut stalks, the seed will not cure.

Prepare for Threshing While the Hemp Cures

Hemp in the shock will cure in 7 to 10 days if the weather is favorable. During this period, clear the stubble from the areas between each set of 4 shocks where the threshing canvas will be spread (Fig. 1). Cut the stubble with a sharp ax or grubbing hoe below the surface of the ground and rake the stubble away so that the threshing canvas will not be torn.

Also during this time, prepare a place at a convenient central location in the field, for the cleaning to be done. A canvas will be needed on which to pile the seed and chaff to be cleaned. Where this canvas is to be placed, level the ground and rake it smooth so that the seed can be readily shoveled from the canvas. Then, in this leveled area, at the place where the cleaning screen is to be set, dig out a slight depression so that the canvas will settle into it and form a container for the cleaned seed.

How to Thresh the Seed

Until the shocks are on the threshing canvas, handle them as little as possible, for the seed shatters easily. The most practical method so far known for threshing hemp is to put one shock at a time on a canvas 24 to 30 feet square, and beat the seeds out by striking the branches with strong clubs about 1½ inches in diameter and 6 feet long.

The following procedure is used by experienced growers in threshing hemp seed:

1. Provide a crew of 3 to 4 men for each canvas. The number of crews depends on the acreage to be threshed.

2. Start threshing when the shocks are free from dampness caused by rain or dew.

3. Spread the threshing cloth on the area from which the stubble has been removed, placing it as illustrated in Fig. 1. This cloth may be canvas or heavy unbleached muslin.

4. If the stalks used for supporting the shocks were left uncut, reach under the shock and cut them with a sharp knife.

5. Lift or tip the bound shock over on the canvas before removing the tie. In order not to shatter the seed over the bare ground, do not disturb the branches.

6. Thresh out the seed by beating the branches with clubs. When the branches on one side of the plants have been beaten, turn the plants over with the aid of the clubs and continue beating until all the branches are free of seed. Then remove the twigs from the canvas and repeat the process on each of the other three shocks of the setting.

7. Move the canvas to the next setting of four shocks. After several settings have been beaten out, place the canvas loaded with the chaff and seed on a slide having smooth plank runners and haul it to the central place in the field where the seed is to be cleaned. Place the load from the slide in a conical pile on the canvas, and beat it down so that it is compact and the surface is smooth.

Farmers who raise only an acre or two of seed will probably adjust this plan of threshing so as to use fewer men and a smaller canvas or other cloth made from a carpet or sheeting already available on the farm. If the canvas is smaller than 24 feet by 24 feet, be careful that the seeds do not fly off the canvas in beating the plants. Tramping the plants causes the seed to fly less than beating.

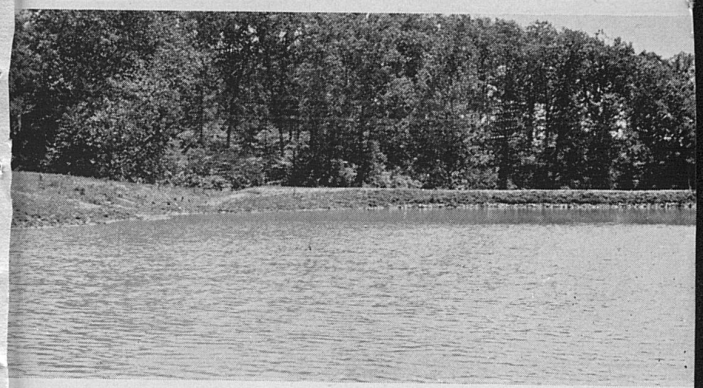
Cleaning the Seed

For home use the seed after it is beaten out can be winnowed in a light breeze, or rubbed thru a screen and then winnowed. Some dealers, however, will not accept seed in this condition. It must be run through a fanning mill or thru a combine or other threshing machine to remove the chaff, before they will buy it. A homemade cleaning screen may be used in conjunction with a fanning mill where a combine or a threshing machine adjusted with the proper screens is not available.

Making and using the cleaning screen.—A cleaning screen is easily made, as shown in Fig. 2, to provide working space for 4 men. It consists of a light frame 3 feet wide and 6 feet long made of 1″x6″ or 8″ boards with a ½″ or 1/3″ mesh galvanized hardware cloth across the bottom and held in place by 1″x1″ strips securely nailed to the bottom edge of the frame.

The frame is mounted on four 2″x4″ legs 3′ 6″ long, to place the screen at such height that the threshing crew, without bending their backs, can work with the least effort. The size and number of screens to make will depend on the number of men doing the cleaning. The hardware cloth should be held taut by inserting 1″x4″ spreader boards between the sides, spaced about 3 feet apart.

When in use, this screen is placed over a part of the canvas or a large box. The partly threshed seed is shoveled onto the screen and rubbed against the wire by men wearing heavy gloves. The seed and small chaff drop through and the twigs remaining on top are removed from the



FARM RESERVOIRS

Suggestions on Planning and Construction

By Earl G. Welch

GOOD WATER for livestock, at low cost, is the main reason for building farm reservoirs. Lack of a good water supply during drouth is a great handicap to livestock production. If the drainage area is free from pollution and if livestock are fenced away from the pond, a farm reservoir will provide good water. Also, a properly built farm reservoir is the cheapest source of water for livestock where there is no ample natural supply. Protected from silting, it lasts for many years without expense for pumping and without needing much attention from the farmer.

Aside from this main benefit of good water at low cost, a good farm reservoir provides other values. Stocked with fish, it gives both recreation and meat for the table. It is a place also for swimming and boating. If it is well constructed and well maintained, it definitely increases the sale price of the farm.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service
Thomas P. Cooper, *Dean* and *Director*
Lexington, Kentucky August, 1942
A-24

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating

TO THE READER:

If your farm lacks a dependable supply of good water for livestock, the year round, this folder will offer some valuable suggestions to you.

Cordially yours,

County Extension Agent

15M—8-42

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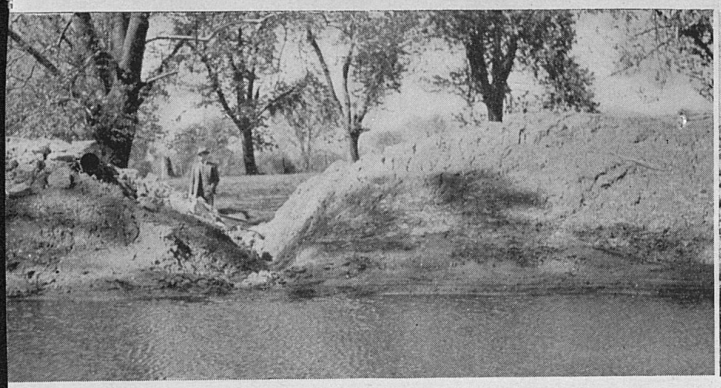

Both these dams failed because of faulty construction. That at the left settled too much at one point and then washed out; that at the right was destroyed by overflow when the spillway, built too small, failed to carry off the surplus water.

Where to Locate the Dam

1. Select a site with enough drainage area to supply water to the reservoir during normal rainfall.

2. Avoid a site with sinkholes, gravel beds, or layers of rock outcropping on it. Use a soil auger or post-hole digger to determine the character of materials under the surface of the ground.

3. Serve more than one field with the same body of water, if possible.

4. Avoid a location near barnyards and other areas where manure accumulates.

5. Choose a location with a comparatively level area above the dam to increase storage capacity per foot of height.

6. Choose a site where it is easy to provide an open spillway at one end of the dam.

Plan the Spillway First

1. Determine size of spillway from the tables in Extension Circular 317, "Earth Dams for Farm Reservoirs." Do not guess at size of spillway.

2. Protect the spillway from erosion by a good sod, or by concrete or masonry.

3. Use concrete or masonry if water is likely to flow over the spillway for one week continuously.

4. Provide at least 1½ feet of height of dam (freeboard) above maximum water level in the spillway.

Constructing the Dam

1. Remove all vegetation, including trees and their roots, from the site of the dam.

2. Dig a core trench to impervious soil before starting the fill for the dam. Porous soil, logs, sand, and gravel, if not removed, are quite apt to cause a leak under the dam. Refill the core trench with tight soil.

3. Make the top of the dam at least 6 feet wide, and at least 1½ feet above the high-water level in the spillway.

4. Build slopes 2 to 1 on the dry side and 3 to 1 on the wet side of the dam to prevent excessive settling when the earth becomes wet.

5. Add 10 percent to the height of the fill to offset settling of earth.

6. Level and pack the earth frequently while making the fill, to prevent uneven settling.

7. Seed slopes of the fill to grass to stop erosion.

8. Use rock, or a raft of logs, on the wet side of the dam to keep waves from cutting the dam away.

Protection During Use

1. Fence in the area covered by the water to keep out livestock. Place a tank with an automatic float valve below the dam to provide a place for the livestock to drink.

2. Reduce silting by keeping most of the area draining to the pond in grass. When cultivated crops are planted in the area, plant them on the contour and use cover crops in winter.

For more detailed information, read Kentucky Extension Circular 317, "Earth Dams for Farm Reservoirs"

varieties on land free from root-rot, but outyield the old varieties on black-root-rot soil. The seed supply for 1943 is limited, but as seed becomes available these varieties should be widely tested.

Suggestions on Changing Varieties

Any grower who is satisfied with his present variety but who wishes to test a resistant variety or some new variety, should sow a small bed of the resistant or new variety and set a stick row of it here and there through his own variety for comparison. If this variety seems to be better than his own, he should not yet make a complete change to the new variety, but should make a larger planting the next year and repeat the process until he has determined to his own satisfaction that he has found something better for his own farm.

Those who have had losses from root-rot in the past should grow either Ky. 16, Ky. 41A or one of the other root-rot resistant varieties, but should not change to a susceptible variety.

The practice of changing seed, because some crop on the market has appeared to be better than his own, has cost many a tobacco grower heavily in the past. Remember that a poor variety grown on highly fertile soil, free from disease, and properly cured and handled, may produce a crop higher in quality and yield than a good variety poorly handled or grown on poor soil.

To avoid slow-starting, late-maturing tobacco, grow a root-rot resistant variety.

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating.

TOBACCO VARIETIES THAT HAVE PROVED THEIR WORTH

TOBACCO VARIETIES

that have Proved Their Worth

Ky. 16 is a black root-rot resistant variety of burley that, in 1942, yielded 15 to 35 percent more than common varieties on fertile soil.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service
Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky A-25 January, 1943

Tobacco Varieties That Have Proved Their Worth

By W. D. Valleau and Russell A. Hunt

Heavy Losses from Black Root-Rot in 1942

In the cool, wet summer of 1942, Kentucky farmers lost millions of pounds of tobacco from black root-rot. They had this loss in spite of the fact that satisfactory root-rot resistant varieties were available and had been grown with profit by Kentucky growers for many years. Such waste of time and effort now, when labor is so scarce, is doubly harmful. It takes nearly as much labor to raise an acre of tobacco that yields 400 to 800 pounds as it does to raise an acre yielding 1700 pounds or more. The past season (1942) was one of the worst years for black root-rot in the past quarter of a century.

Many of the farmers whose tobacco was seriously injured in 1942 had grown root-rot resistant varieties successfully for several years and therefore had largely forgotten the losses which the disease can cause. When they saw a "flashy" crop of tobacco on the market, they purchased seed of it without knowing anything about it except its quality. In some counties most of the growers changed from a resistant variety to a susceptible variety, with disastrous results to many of the crops.

Unfortunately many growers do not recognize the symptoms of black root-rot even in fields where the loss is extremely heavy. On land known to be highly fertile, tobacco affected with black root-rot starts slowly and unevenly, wilts on hot days, in some cases turns yellow, and may not begin normal rapid growth until late July or early August. Many growers thought this poor growth was due to wire-worm injury, because most of the plants pulled for examination showed some wire-worm damage. Thoughtful growers realize, however, that wire worms cause only slight delay in growth if stalky plants are set in fertile soil.

Many of the cases of slow growth examined in 1942 were caused by black root-rot. Resistant varieties, such as Ky. 16, make normal rapid growth in infested fields where the ordinary varieties start slowly and unevenly.

All the Old Varieties Subject to Black Root-Rot

All the old standard varieties of burley and dark tobacco grown in Kentucky are highly susceptible to black root-rot, and in cool, wet years fail to make good growth in about one-third of the fields in which they are planted. The disease is especially injurious if the soil has been manured or is highly productive. Loss from such varieties is therefore likely to be especially heavy where a high-quality crop was expected.

Burley Varieties Resistant to Black Root-Rot

Ky. 16 has been thoroughly tested in all parts of Kentucky where burley is grown, as well as in burley-growing areas in all neighboring states. On fertile soil, in 1942, it yielded 15 to 35 percent more than common varieties. Yields of more than 2,000 pounds per acre are not unusual. In tests on disease-free land it has given greater returns per acre than any of the susceptible varieties with which it has been compared the past 7 years. It is at least equal in quality to the best of these varieties. On black-root-rot land Ky. 16 has often returned 2 or 3 times as much per acre as the ordinary varieties. It is a standup burley averaging about 2 leaves per plant more than most other varieties. It is now recognized as one of the easiest varieties to sucker because of the few, relatively small suckers produced. Certified seed of this variety is available.

Ky. 41A is as resistant to black root-rot as Ky. 16, and also produces few suckers. It is not a typical standup variety. It yields about the same as Ky. 16 on disease-free and on black root-rot soil. In tests over several years it has returned about the same money per acre as Ky. 16 but produces about 3.5 per-

cent more smoker tobacco than Ky. 16. Growers who are not entirely satisfied with Ky. 16 would profit by testing Ky. 41A before turning to a susceptible variety, as they will be assured of good tobacco and will not risk loss from black root-rot. Seed of Ky. 41A is being grown by a few seedsmen in Kentucky and is therefore available for trial on a large scale.

Ky. 48 is nearly identical with Ky. 16 except that it blooms slightly lower and yields about the same as the common varieties. It is resistant to black root-rot and also to mosaic (walloon, or black french), and is of good quality. Where losses have been heavy from mosaic it will pay to grow it. It has been extensively tested by farmers in many parts of Kentucky so that local sources of seed may be available.

Ky. 52 is a vigorous-growing tobacco resistant to both black root-rot and mosaic. It is a standup burley, lighter green in the field than Ky. 16, and like Ky. 16 it produces smaller suckers than most other varieties. It yields about the same as the common varieties, but its quality was higher the past season (1942) than that of any other of the 12 varieties with which it was compared. A limited supply of seed is available for trial in 1943. It should be tested by all burley growers who have had difficulty in controlling mosaic.

Ky. 33 is a standup variety resistant to black root-rot and fusarium wilt, and it seems to have rather high resistance to brown root-rot. It is capable of yielding as much as Ky. 16, and in some sections of Kentucky has been exceptional in quality. It is a desirable variety in sandy soil along the Ohio river and in a few other parts of the state where fusarium wilt causes heavy loss. It is the only safe burley variety to use in wilt-sick fields and, as it matures a week to 10 days ahead of other varieties with which it has been tested, it may prove valuable where an early-maturing variety is desired.

Dark Fire-Cured Varieties Resistant to Black Root-Rot

Ky. 120 and Ky. 134 are resistant to black root-rot, yield about the same as the ordinary dark-fired

substitute for a part of the oats, either corn or ground barley. Sheaf oats is relished by jacks and answers not only for grain but also for a part of the necessary roughage. Care in feeding grain to jacks must be exercised as they are inclined to over eat. The average sized jack should not have a daily feed of grain of over 10 lbs. He should have, with his grass or hay, just enough to keep him in good condition. The best hay for jacks is a mixture of timothy and clover. Any grass hay should be supplemented with alfalfa or other legume—clover or lespedeza. He should not be fed quite all the hay he can clean up; this amount has to be determined by the feeder.

Breeding. Jacks should be broken to serve when two-year-old but should not have over 10 mares in that year. If yearling jacks are allowed to run with fillies there will be but little trouble to teach them to serve.

Three-year-old jacks may be given as many as thirty mares a season while older animals may be mated to as many as sixty in any one breeding season. Mature jacks may have as many as two services per day. Whether there be but one service or two the jack should be bred at a certain time in the day. Usually, when two services are permitted, the first is at eight o'clock in the mornng and the other at four o'clock in the afternoon. Care should be taken to space the services not closer than seven hours, and an eight hour interval is still better.

The mare should be teased carefully by a stallion before she is hobbled. As a rule the jack is not fit to use for teasing as mares are liable to be frightened by him. Often mares known to be in heat will show no signs when teased by a jack. It is desirable to have, on the same farm, a stallion and a jack both standing for service.

Either a pit or hobbles should be used for mating. Most breeders prefer hobbles. A pair of good, strong hobbles will prevent the mare kicking the jack or injuring the attendants. Sometimes a twitch should also be used. There is no danger to the mare, or coming foal, from the use of a twitch nor will it interfere with the mare conceiving. Her tail should be wrapped and she should be washed with warm water, and should not be bred if there be a discharge. The jack should be washed after service with warm water containing a mild disinfectant. The mare should not be retried until the 18th to the 21st day after mating.

Jack Sores. When slight abrasions are found on jacks they should be promptly treated by cleaning them carefully, applying a disinfectant, and binding the wounds to prevent flies reaching them. Jacks are prone to develop, from slight wounds, injurious sores that are difficult to heal. Prevention is very much better than to have to treat them after they have developed. A good disinfectant for wounds or sores is made of two teaspoonfuls of methylene blue mixed with one teaspoonful of tannic acid to be dusted on.

The Feet. The feet of the jack must be kept trimmed to the right shape. They are liable, if allowed, to grow in an irregular form and to cause lameness.

Care and Management Of Purebred Stallions and Jacks

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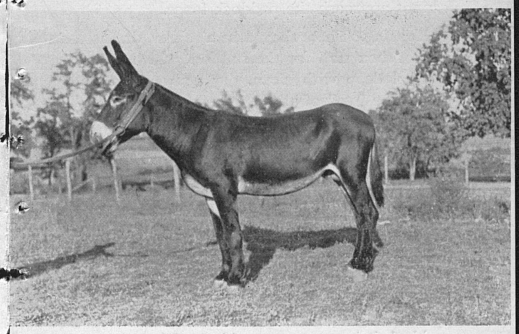
Care
Feeding
Breeding



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Thomas P. Cooper, Dean and Director

May, 1939

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CARE AND MANAGEMENT OF PURE-BRED STALLIONS AND JACKS

THE STALLION

The Lot. The stallion as well as the jack should have a lot large enough for exercise and for pasture. The fence of the paddock, whether plank or wire, must be strong enough to prevent the animal from breaking thru, and high enough to prevent him from jumping over or riding it down. If other horses are to be pastured in adjoining fields a guard fence should be erected about ten feet away so farm horses or mules cannot approach the paddock fence.

Housing. There should be a roomy, dry, well-lighted box stall for the stallion, which is kept bedded deep with clean, dry straw. The stall should be freed of all droppings and damp bedding each day. There should be a built-in manger for grain, a rack for hay, a box for salt, and a place for a large bucket kept filled at each feeding with water.

Exercise. If possible, the stallion's paddock should be large enough for exercise and for grass enough to satisfy his appetite for green stuff. He must have exercise each day, winter and summer. The most natural method is to roam in a paddock. In the absence of a suitable paddock it is necessary to ride or drive him several miles each day, or work him on the farm.

He should be curried or rubbed down once a day. His feet must be watched carefully and kept pared to proper shape. He should be shod when necessary to keep the feet from breaking from rough treatment. The groom should handle the horse gently but firmly, requiring him to develop good, quiet habits. Kind treatment is usually better than harsh methods in cultivating a good disposition.

Feeding. The stallion should have one pound of grain per day for each 100 pounds of live weight, one-half fed in the morning and the other at night. Salt should be kept in a box in the stall and a large bucket should be kept filled with clean, fresh water. Oats is the standard grain for stallions. Ground barley may be used as a part of the grain. Corn may replace part or all of the oats if need be. Bran and a half pound of linseed oil meal may be used for variety for part of the grain occasionally. Any clean, well cured hay like mixed timothy and clover or timothy with alfalfa or lespedeza may be fed. Fodder and cured sorghum may be used as part of the roughage provided it is not mouldy. No mouldy or musty grain or roughage should ever be given to horses. It is always advisable to make use of as much pasture as possible in caring for the stallion during the pasture season. It is cheaper than hay and has a beneficial effect on the digestive system of the horse and less grain is required than when hay is fed.

Breeding. A mature stallion can be mated once a day during the usual breeding season. During the height of the season he may be allowed nine or ten services per week. There should be stated hours for breeding; if once a day, set a morning hour or an afternoon hour and do not vary from it. If two services a day, they should be at 8:00 a. m. and 4:00 p. m. Mature, vigorous stallions can, with proper care, be bred to 50 or 60 mares during the breeding season, from March 15 to July 1. The heavier the returns the fewer mares can be bred. It is not well to permit more than two matings per day and not over 9 or 10 per week with Sunday reserved for rest.

The mare to be mated should be tried to determine if she is ready for mating. She should be hobbled, tail bound and washed. If she is nervous a twitch should be used.

The stallion should be washed after the service with tepid water and any mild soap. Some operators prefer a mild disinfectant like zonite or B. K., an ounce of either to a gallon of water. Other operators prefer to purchase chlorinated lime and dissolve it in water as needed, following the directions on the package for the strength of the solution.

No mares should be bred unless healthy and free from discharge. Mares with foals if fully recovered should be bred on the ninth day after foaling and barren mares on the third day in heat, not on the first day. After breeding, mares should not be tried again until the 18th to 21st day. If a mare fails to conceive from the first or second service, it is well at next heat period to mate her every other day during the heat period.

It is fairly well established that the one service that results most frequently in conception is the one given on the ninth day after a mare has foaled. Not all mares, even if entirely recovered from foaling and fully in heat, conceive on that day; but of all the days of the heat cycle it is the one on which service is the most likely to result in pregnancy.

THE JACK

Paddock. A grass paddock of about an acre should be given to the jack so he may have ample grazing and room for exercise. The paddock fence must be high and strong—high enough that the jack cannot get his head over it to ride it down, and strong enough to prevent him from breaking thru. It is well to have a guard fence to prevent the farm animals from approaching the paddock fence.

Housing. A box stall in one corner of the paddock is necessary for protection from severe weather conditions and for a dry place where the jack may be fed his grain and hay. In addition to the manger, there should be a box always filled with salt. Fresh, clean water at all times is necessary.

Feeding. Oats and bran are standard feeds for jacks. It is well at times, especially in winter, to

to feed hay thru the late spring and summer if an abundance of good pasture is available. A mixture of 3 parts of oats and 1 of bran is a satisfactory feed. Begin the feeding on pasture with one-half pound of grain daily and increase it to about a pound daily. The ram should be pulled from the flock once daily and given a feed of

grain. The ram should be in a vigorous and active condition and not too fat at breeding time. If the wool is heavy he should be sheared a few days before being turned with the ewes. Each ewe should be inspected and if there is an accumulation of tags to interfere with the mating, they should be clipped off. The yearling ram should be allowed only 25 or 30 ewes; the mature ram may have 35 to 40.

When two or more small flocks are put together to be bred it is advisable to paint the brisket well back under the body with a mixture of lampblack and linseed oil applied every other day. Thus each day a record of the matings can be made.

Note. All sires as well as domestic animals should have free access to barrel salt kept protected from the weather in a self-feeder, and water always available.

Care and Management Of Purebred Bulls, Boars, and Rams

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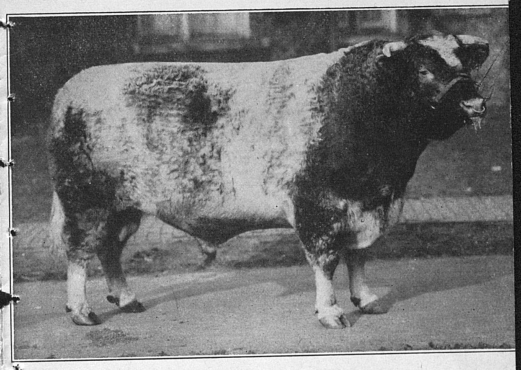
Care
Feeding
Breeding



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A. I. 2

CARE AND MANAGEMENT OF PUREBRED BULLS, BOARS, AND RAMS

THE BULL

Where two or three cows are kept on a farm, it is economically unsound for a farmer to purchase a purebred bull for private use. Therefore, in order to get the use of a purebred bull in a community, custom services must be made available.

Care. The bull is best kept in a shed open away from the prevailing winds, in a lot of one or more acres fenced with a bull-proof fence. This allows space for the bull to exercise and to graze, and the shed gives protection in bad weather. A small pen well fenced or a roomy stall is satisfactory as a place for serving. The bull should remain in the pen several minutes after the cow is turned out. The bull should be handled in such a way that he will recognize man as his master. He should be treated with kindness yet with firmness and not allowed to learn his strength.

Feeding. When on good grass, a bull needs little or no grain. In winter and on sparse pasture he should be fed mixed or legume hay and two to four pounds of grain per day. The grain may be corn, ground barley or oats. A little bran, cottonseed meal or soybean meal added to the other feeds is good during the breeding season. The bull should have access to salt at all times, kept in a container sheltered from wind and rain. In another container should be steamed bone meal. Water should be always available.

Breeding. Sanitation cannot be overemphasized, especially while the bull is serving cows from other farms. Care should be exercised in selecting only healthy cows.

A mature bull may safely have as many as seventy-five cows a year, provided the rush breeding does not last longer than sixty days. Owners of good bulls should use extreme care not to allow the bull to have more than two cows a day, at least six to eight hours apart, one service to each cow.

THE BOAR

Housing and Care. During the summer the boar should run in a lot affording ample water, pasture, and sufficient shade for protection during the hot days. For protection during the winter a movable hog house may be placed in the lot. It is not advisable to let a valuable purebred boar run with the farm hogs, especially if he is used for custom breeding. The coming and going of females excites the boar. He should be treated kindly but firmly and never allowed to leave his paddock to roam at will over the farm. Since purebred boars are costly, they should be so cared for that they can be used for several years. His feet should be watched and trimmed when needed.

Feeding. The boar should be fed so that he is kept in a thrifty condition but not fat. If he is allowed to get fat like a market hog he will become sluggish and soon attain a weight unfit for service. Just enough grain should be fed to keep him vigorous but not fat; the lot should supply grass and legumes during the growing season. With these, sweet or sour milk may be fed and some grain, as corn, ground barley or ground wheat. As the green material is exhausted he should have more grain and during the breeding season the protein supplement should be increased to one-fifth of the total grain. If enough milk is not available, tankage may be used.

Breeding. The boar should not be allowed to mate before about eight months of age. The number of services should be limited to two or three a week until the boar is near one year old. After he has reached maturity, he may be allowed to mate with one or two sows a day during the breeding season. As a rule, one service to each female is sufficient and this should, if possible, be given toward the end of the second day of heat. Mating should not be given the first day of the heat period. If early in heat the litter is liable to be small. Practice proves that the last of the second day is the best time. Farm females as well as those brought from other farms should be turned in to the boars, one at a time, and after mating immediately taken out.

Service fees should be collected at time of mating.

THE RAM

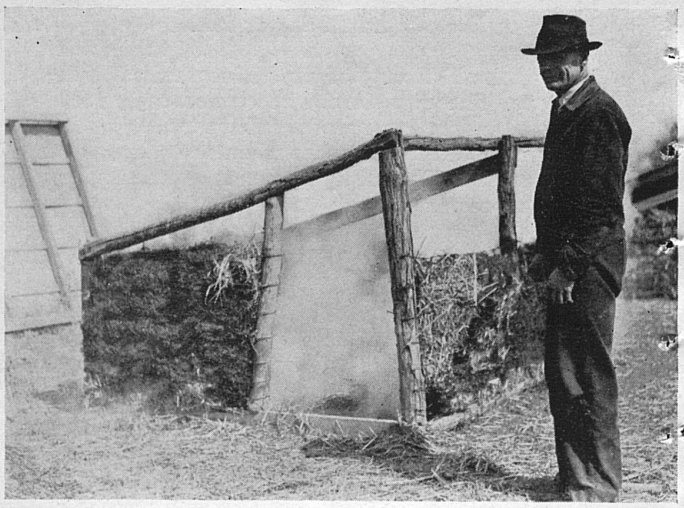
Care. The ram, if possible, should be kept in a lot or field where other livestock is pastured so that he may be contented until time to put him with the ewes. He may remain with the ewes after the breeding season until close to lambing time. He may become rough with ewes far advanced in pregnancy and should then be separated from them.

Feeding. The ram should have access to good pasture or legume hay, and to fresh water and salt each day in winter. Very little grain, if any, is needed except during the breeding season and during severe weather. It may not be necessary

Several litters of practically the same size are run together, in which case a colony house should be provided for each sow and litter.

The size of the straw house may easily be modified to suit almost any need for hog house or shelter.

In hog lot sanitation one of the important steps is the thoro cleaning of the farrowing house or shelter. This usually is accomplished by a thoro application of scalding water to each 5 gallons of which has been added a thirteen-ounce can of lye. Cleaning a straw house, on the other hand, is simpler, requires much less labor, and is apt to be more thoro. In cleaning a straw house the movable roof is taken off and the straw burnt completely, thus destroying worm eggs and disease germs.

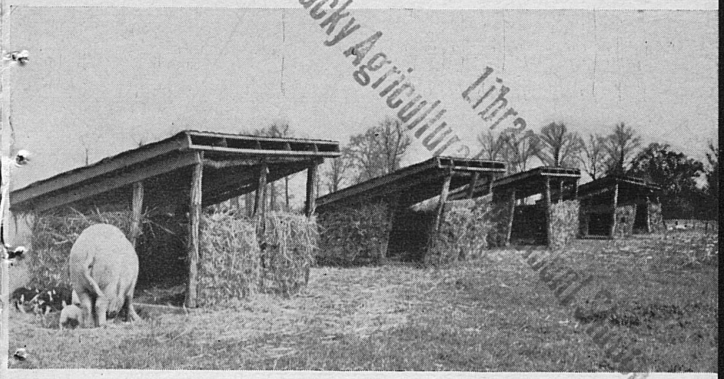


Burning the straw destroys worm eggs and disease germs

The framework can readily be moved to a new location before the house is rebuilt with new straw.

If used as farrowing quarters, the straw house should be at least 8 feet by 8 feet in size, so as to provide ample room for the sow and litter after guard rails have been put in. Two-by-fours nailed to stakes 8 inches high and 8 to 10 inches from the wall are satisfactory for guard rails.

A Straw Hog House



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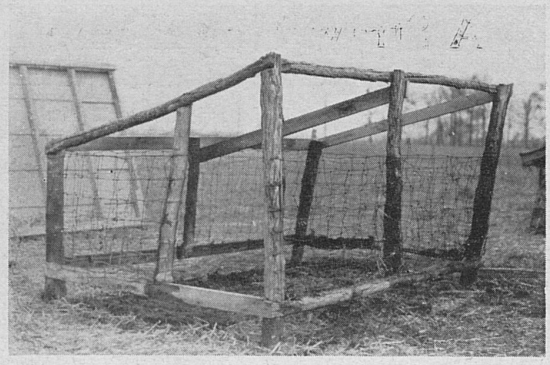
A STRAW HOG HOUSE

By GRADY SELLARDS

Failure to provide adequate housing may cause much loss in hog production. A good hog house need not be expensive but it should be accessible, dry, warm, and free from drafts. In other words, the house should provide a maximum of comfort and protection and should be so constructed as to enable the caretaker properly to care for the hogs with a minimum of labor.

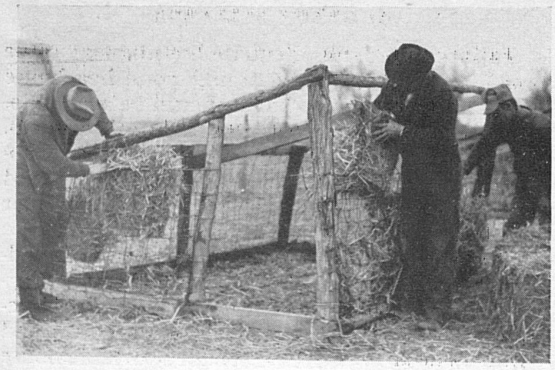
Portable houses fit well in the systems of modern hog production, which prescribe that pig-farrowing quarters and ranges be shifted frequently as a control measure against worms and filth-borne ailments. A satisfactory portable house usually costs twenty dollars or more, which is more than some producers care to invest in housing a sow and litter. To these, a straw house should appeal. A good straw house was designed by a Daviess-county producer and the county agent*.

* W. J. Foster and County Agent J. E. McClure



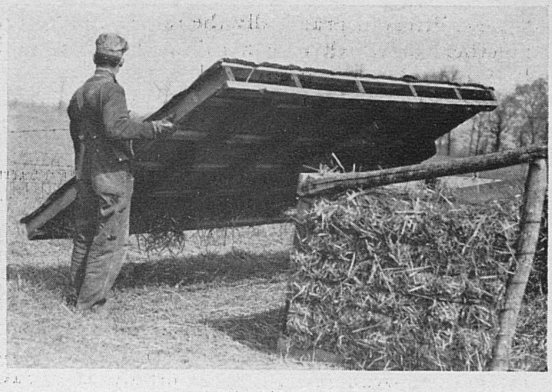
Framework of straw hog house

The Daviess-county straw hog house is six by eight feet in size and of very simple construction. The framework consists of seven medium-sized posts, or saplings, and 1-by-4 inch boards nailed together. The corner posts are so designed that they can be set 9 inches in the ground thus providing anchorage for the house against strong wind. The walls consist of straw stuffed between strips of woven fencing wire stapled about the inside and outside of the posts.



Constructing walls of straw

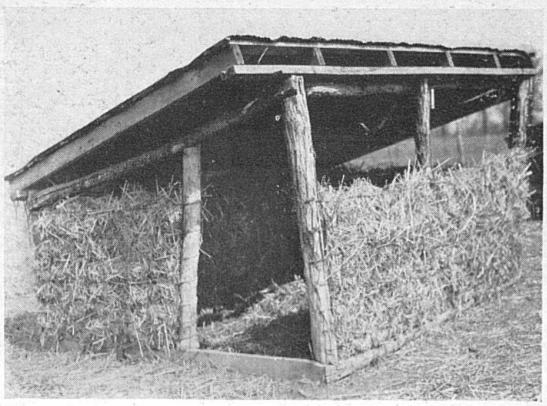
The roof is metal nailed to a movable frame. It is held in place by bailing wire wrapped securely about the frame of the roof and house. Composition or other kinds of roofing can satisfactorily be used.



Attaching roof

The straw hog house can be built for $8.50, or less, depending upon the value of the materials. It can be built in a half-day or less.

On farms where pigs are farrowed in central houses, the difficulty of practicing sanitation is obvious. The pigs should be carried or hauled to pasture free from worm infestation. Pigs on pasture should have shelter when the weather is unfavorable. The straw house is excellent for this purpose.



The finished house

Some hog-raisers convert their tobacco barns into temporary farrowing quarters, and use the straw or other individual colony houses for shelter after the pigs have been turned to pasture.

Grain during the winter. — For economical winter feeding give the cows all the roughage they will clean up with a minimum of waste. In addition, feed them grain according to their production, at the rate of approximately 1 pound of grain to 3 to 6 pounds of milk daily. Take into consideration (a) the ability of the cow to respond, (b) the cost of the grain and its relation to the price received for the milk or butterfat, (c) the condition of the cow, (d) the quality of the roughage being fed, and (e) the breed of cattle as it affects the richness of the milk. The poorer the roughage the more grain should be fed; and Jerseys and Guernseys should have more grain, per pound of milk produced, than cows of other breeds.

Prices Will Probably Continue Attractive

In view of increased foreign demand and governmental support of the market, no substantial lowering of the price of milk would be expected to result from the desired increase in milk production. The Surplus Marketing Administration is authorized by the Secretary of Agriculture to buy butter on leading markets until June 30, 1943, whenever there is a tendency for the price of 92-score butter in Chicago to drop below the seasonally adjusted price based on an average annual price of 31 cents per pound. Furthermore the Secretary of Agriculture has recently announced a policy supporting prices received by farmers for "defense agricultural products," including milk, up to 85 percent of "parity." That is to say, support will be given to prices of such products to keep them in line with prices farmers must pay for the equipment and supplies used in producing them.

Caution

Do not rob the family table of the milk needed at home, in order to meet the appeal for more

dairy products for export. It is an *increase* in the nation's milk supply, *over and above our present needs at home,* that the Secretary of Agriculture is urging as an emergency defense measure. A well-nourished people at home constitutes our first line of defense. A strong nation is a healthy nation; good health is a reflection of good food habits — and good food habits include the liberal use of milk and other dairy products on the farm. No one is urged to sell the milk which should be used on the farm where it is produced — no matter how attractive the price may be.

For more detailed information on feeding for higher milk production, see Kentucky Extension Circular 364, "Feeding Dairy Cows," which will be sent free on request from the College of Agriculture and Home Economics, Lexington, Kentucky.

Lexington, Kentucky June, 1941

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AI-4

20M—6-41
30M—10-41

More Milk for National Defense

What Kentucky farmers can do to meet the need for increased dairy production . . .

(*Revised, October,* 1941)

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Extension Service

Thomas P. Cooper, Dean and Director

More Milk for National Defense

FORDYCE ELY

Kentucky farmers during 1941 responded in a most substantial manner to the call for increased production of dairy products. For 1942, however, the Secretary of Agriculture is asking for a still further increase to meet the needs for export to Britain and her allies. It has become increasingly evident during the past few months that adequate food supplies to Britain are as vital to her war efforts as the flow of guns, ammunition, and planes.

Kentucky's quota in the "food for defense" program calls for a 12-percent increase in milk production over 1941, or about a quarter of a billion pounds more milk this coming year than last. For the nation as a whole, the Secretary is asking for some 8 billion pounds more milk than in 1941 — a very valuable contribution to the nation's larder for the warring democracies. Plans call for concentrating the extra milk into forms most convenient for shipping — cheese, evaporated or condensed milk, dried or powdered milk.

Dairy Industry Ready for Further Expansion

Farmers who milk cows find themselves in a position to respond to the demand for still more milk. For the past two years the prices of cows and of dairy products have been high in relation to the general level of other agricultural products, and as a result farmers have been building up their herds. There are about 25 million cows of milking age on farms in the United States, which is a peak number for all time. There are also more yearlings and calves being raised for herd replacements than ever before in history. The total production of milk for 1941 will be considerably greater than in any other year. As to any danger of overproduction, however, the Secretary of Agriculture has indicated that because of a supported market and an unprecedented foreign demand, dairy farmers need not be concerned regarding over-production during the next year.

To Meet This Situation —

It is estimated that there will be about 3 percent more milk cows in Kentucky in 1942 than in 1941, but this increase will not of itself bring about the desired 12-percent increase in milk production. Farmers are urged, therefore, to meet the greater demand by better feeding and management practices. Kentucky farmers are in general well equipped to meet this emergency expansion of dairying. The tremendous seasonal increase in Kentucky's milk production which occurs when cows go on pasture is evidence that there is room for improvement in feeding and management practices.

Better pastures and more hay. — Efficient use of pastures in season, and hay and silage the remainder of the time, affords an excellent opportunity to produce milk or butterfat at a low cost. During the past five years much of Kentucky's pasture and hay land has been improved and the yield increased by the application of lime and phosphate. Many dairymen are making grass-molasses silage (see Circular 361) as a means of conserving crops which, because of untimely rain, are often spoiled in curing for hay.

Grain supplements. — The feeding of grain to supplement pastures and hay will accomplish the desired increase in production of milk. There is no rule of thumb to follow in recommending the kind or quantity of grain to feed. Each cow should be fed as an individual and no rule can replace common sense. There are, however, certain general principles of good feeding to serve as guides.

When to Feed Grain

Consider the price. — When the value of one pound of butterfat on the farm will buy twelve or more pounds of grain, it will be profitable to feed grain regardless of the quality of roughage.

Do not waste grain. — Feed grain only to the fresh or high-producing cows that are capable of responding to the increased feed allowance, or to dry cows known to be high producers.

Grain for dry cows. — The allowance of grain to dry cows may be fairly accurately determined by their condition and their ability to produce milk during the previous milking period. Good producers in poor or medium flesh should have plenty of grain. It is important that enough grain be fed to insure vigorous condition at time of freshening in order to withstand a heavy milking period.

Grain on pasture. — Pastures vary greatly in amount of actual feed produced; and it is therefore important that the amount of grain supplement should likewise vary — more grain being fed of course, when the pastures are poor. In this connection it is worth pointing out that most farmers, unless they give special attention to their pastures, are inclined to overestimate the amount and quality of feed produced, especially after the grasses begin to mature.

The following table offers suggestions for feeding grain to cows on pasture:

Feed 1 pound of grain daily for each 2 pounds of milk produced over and above —	
20 lb. milk, Jerseys or Guernseys 25 lb. milk, other breeds	On excellent pasture
15 lb. milk, Jerseys or Guernseys 20 lb. milk, other breeds	On good pasture
10 lb. milk, Jerseys or Guernseys 15 lb. milk, other breeds	On fair pasture
5 lb. milk, Jersey or Guernseys 10 lb. milk, other breeds	On poor pasture

or on a piece of cheesecloth spread on a rack or colander. Draining may be hastened by changing the position of the cheese in the bag or on the cheesecloth.

Working and Seasoning the Cheese

After nearly all the water has been drained away, or at least has stopped running in a steady stream, the cheese should be removed to a clean dish and worked to an even texture with a spoon. Salt may be added to suit the taste either when the cheese is worked or when it is eaten. Usually about one level teaspoonful of salt per pound of cheese is enough. If some cream is available, a little of it will improve the taste of the cheese a great deal, altho it is not absolutely necessary.

Best When Fresh

Cottage cheese is rather perishable, and therefore should be made often and eaten while fresh. If it is desired to keep it for a short while, place it in a clean, scalded glass or earthenware vessel, cover, and keep in as cool a place as possible without freezing.

Lexington, Kentucky October, 1941

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20M—10-41

Making Cottage Cheese at Home

By Henry B. Morrison

UNIVERSITY OF KENTUCKY . . . COLLEGE OF AGRICULTURE AND HOME ECONOMICS

EXTENSION SERVICE

AI-5

Making Cottage Cheese at Home

By Henry B. Morrison

Cottage cheese is a concentration of the protein or curd portion of milk, and is very high in nutritive value. It can easily be made in the farm home from surplus skimmilk that might not otherwise be used for human food. Especially where there are family cows, skimmilk is often available in such large amounts that it cannot all be used for drinking or cooking, and at least part of it can well be used in the form of cottage cheese.

When properly made from skimmilk of good quality, cottage cheese is not only a most desirable food alone, but forms delicious combinations with many other foods.

Equipment Necessary

Cottage cheese can be made at home in small amounts by using ordinary equipment found in every kitchen. The necessary equipment includes—

- Kettle or pail of at least 8-quart capacity
- Long-bladed knife to cut the curd
- Large spoon with which to stir the curd
- Dishpan or large kettle to be used as a double boiler in cooking the curd
- Dairy thermometer to assure the proper temperature necessary in making the cheese
- Cheesecloth or draining bag
- Rack or some device for draining the whey from the curd

Setting the Milk

In order to make cottage cheese of good quality, the skimmilk must be of good quality, because any undesirable flavors that may be present in the skimmilk will probably be present in the cheese. The skimmilk should be kept at a temperature between 70° and 75° F. until it sours or clabbers. Sometimes this process may take as long as thirty hours. If desired, it may be speeded up by the addition of a small amount of clean-flavored sour skimmilk or natural starter.

Another and probably a better method is to pasteurize or heat the milk to 145° F. and hold it at that temperature for 30 minutes. It should then be cooled to 70° or 75° F. and inoculated with a small amount of commercial starter or clean-flavored sour milk. About ¼ pint of starter will be enough for 2 gallons of milk.

It is usually most convenient to add the starter in the afternoon and then the milk will be clabbered and ready to be cut by the following morning.

Cutting the Curd

One may tell when the proper time for cutting has been reached by the condition of the curd. If the curd breaks away from the sides of the vessel cleanly when depressed slightly with a spoon, the proper stage has been reached. The curd should then be cut (not broken) into pieces approximately one-half to one inch in each dimension. If the pieces are very small more moisture will be forced from them and a very dry cheese will result, while if they are very irregular the cheese will not be uniform in moisture content.

Heating the Curd

Heating or cooking the curd is accomplished by placing the vessel containing the clabbered milk in a larger vessel containing water at a temperature of 120° to 130° F. The curd should be stirred gently with a large spoon so as not to break up the pieces of curd too much. It should be heated to 100° to 110° F. and held at this temperature for about a half hour, stirring gently from time to time. One of the common mistakes in making home-made cottage cheese is heating to too high a temperature and for too long a time. High temperature causes the pieces of curd to contract, squeezing out too much whey and making the cheese too dry. After 30 minutes at 100° to 110° F. nearly all of the curd will have settled to the bottom of the vessel.

If much of the curd is floating, undesirable gas-producing organisms are very likely present, and these are apt to produce off flavor as well as gas.

Draining the Whey

When the cooking is done the whey may be poured or drained off and the curd washed with about the same amount of cold water as there was whey. This will wash a good deal of the acid from the cheese so that it will not taste so sour, and at the same time it will cool the cheese.

The water may be drained away either by placing the cheese in a small cheesecloth bag

temperature is one which causes the butter to come in about half an hour, in small flaky granules. Usually a lower temperature is required for churning in summer than in winter—52° to 56° F. in summer and 56° to 62° F. in winter. If the cream is churned at too low a temperature it may whip and take a long time to churn. If churned at too high a temperature the butter will be soft and greasy. Churning should be stopped when the butter grains reach the size of wheat kernels. If the butter is overchurned and forms in large lumps, it carries too much buttermilk, which often results in the development of off flavor in the butter.

Wash Butter Thoroly

After churning is completed, the buttermilk should be drawn off and the butter washed with water at about the same temperature as the butter. However if the butter is soft it would be well to use water a few degrees colder than the butter. It is a good idea to wash the butter twice to remove all the buttermilk which was not drained off. This helps to prevent off flavor, especially in butter made from poor-flavored cream.

Salting and Working the Butter

Butter should be salted to suit the taste, usually about one-half to one ounce of salt per pound of butter. In power churns the butter can be salted and worked in the churn, but in hand churns it may be necessary to remove the butter to work the salt into it evenly. The butter should be worked just enough to distribute the salt evenly; too much working makes it weak-bodied, sticky and greasy. If it is not worked enough it may be gritty and uneven in color.

Keeping the Butter Fresh

Until the finished butter is used it should be kept cool and in a tight container in order to preserve the flavor and prevent absorption of foreign flavors, which are readily taken up by butter.

Lexington, Kentucky October, 1941

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20M—10-41

Farm Butter Making

By
Henry B. Morrison

UNIVERSITY OF KENTUCKY . . . COLLEGE OF AGRICULTURE AND HOME ECONOMICS
EXTENSION SERVICE

Thomas P. Cooper, *Dean* and *Director*

AI-6

Farm Butter Making

By Henry B. Morrison

Making butter at home is a good way to provide the farm family with an excellent food at a low cost. Butter made from fresh cream is a superior food. It is not difficult to make butter on the farm, but constant attention must be paid to details if butter of good quality is to be made. The most important of these details have to do with cleanliness and accurate control of the temperature of milk and cream.

Cleanliness Is Important

Cleanliness should be practiced from the time the cow is milked until the butter is finished. In keeping dirt out, one also keeps out bacteria which may cause bad flavors to develop and may even cause disease. The cow's flank and udder should be cleaned thoroly just before milking. Utensils should be scalded well before using. If a separator is used, it should be taken apart and cleaned thoroly and scalded after each time it is used. If the separator is not thoroly cleaned each time, bacteria will develop and cause undesirable flavors in the cream and butter.

Cool as Quickly as Possible

If a separator is not used, cool the milk immediately to as close to 50° F. as is practical, both to prevent the growth of bacteria and to aid the creaming, which is more complete at low temperature. Cream from the separator should also be cooled to 50° F. and held until enough is on hand to make a churning. Warm cream should not be mixed with the cooled cream. It should be cooled first and then placed with the cream already cooled. Ice water gives the best results in cooling cream, altho cold well or spring water is often used satisfactorily. If running water is available, cream may be readily cooled in a small tank made from a half barrel placed in the line between the well or spring and the stock watering trough.

Richness of Cream

The richness of the cream is an important factor in churning. For best results it should contain 30 to 35 percent of fat. If the cream is too thin it does not churn readily, while if it is too rich it tends to stick to the sides of the churn and prolong churning.

Sweet or Sour Cream

Many persons think that cream must be sour in order to churn, but this is not true. Cream may be churned either sweet or sour, according to the taste of those who are to eat the butter. While butter made from sweet cream does not have quite so high a flavor, most persons like it better than sour-cream butter after they have become used to it. In addition, where sweet cream is churned there is less chance that off flavor may develop in the cream and be carried into the butter. If it is desired to make butter from sour cream, the cream should be kept sweet until enough is collected for a churning and should then be kept at 70° F. until it is sour, before churning. The fact must be emphasized that the longer the cream is held prior to churning the more opportunity there is for deterioration, due to the action of microorganisms, and the quality of the resulting butter is likely to be lowered.

Preparation of Churn

Before churning, the churn should be thoroly cleaned and rinsed with scalding water; then it should be chilled by rinsing with cold water. If this is not done the temperature of the cream will be raised during churning and a soft, greasy butter will result. Paddles and other utensils coming in contact with the butter should be treated in the same way to prevent butter from sticking to them. The cream should be strained into the churn to break up lumps and to remove particles of curd or foreign material. To get the best results the churn should be filled one-third to one-half full. If the churn is too full the cream will not be agitated properly, while if it is not full enough, the butter will not gather readily.

Control Temperature Accurately

The temperature at which the cream is churned is very important in making good butter. Temperature cannot be guessed accurately by dipping a finger in the cream or feeling the can, but should be determined with a thermometer. A thermometer costs little. The right

lice. Used engine oil or kerosene, painted on the roost poles and put into other places where mites are found, is effective for killing these pests.

CULLING

A non-producing hen can eat up the profit of a good layer. After the flock has been properly housed and a good feeding program is under way, remove all under-sized, crow-headed pullets, and overfat hens. Any time such hens are seen in the flock, take them out and eat or sell them. Sick birds should be killed and burned.

FEED-EGG RATIO

The relationship between prices of feed and of eggs is more favorable to producers now than either a year earlier or for the 10-year average, 1930-1939. The number of dozens of eggs required to buy 100 pounds of feed may be figured by adding the cost of 50 pounds of mash to the cost of 50 pounds of grain and dividing the total by the price of a dozen eggs. *Example*: If 50 pounds of mash costs $1.25; 50 pounds of grain costs $0.75; and eggs are 30c a dozen, it will take 6.67 dozen eggs to buy 100 pounds of feed ($1.25 + $0.75 = $2.00 ÷ .30 = 6.67).

PERCENT PRODUCTION TO PAY FEED BILL

The percentage of production required to pay the feed bill may be determined by multiplying the number of dozens of eggs required to purchase one hundred pounds of feed by 3. Continuing the preceding example, 6.7 dozen eggs × 3 equals 20 percent of production. Hence, high egg production assures greater profit.

Lexington, Kentucky December, 1941

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AI—7 30M—12-41

MORE — Poultry and Eggs from Kentucky Farms

"Food for Freedom"

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Extension Service

More Poultry and Eggs from Kentucky Farms

By J. E. Humphrey and Stanley Caton

Since eggs and poultry are health-promoting foods needed for national defense at home and abroad, the Secretary of Agriculture has asked for increases in production of both these products in 1942. Kentucky farmers are asked to produce 15 percent more eggs (about 10,212,000 dozen more) and 15 percent more poultry meat in 1942 than in 1941. Undoubtedly this goal will be reached without difficulty, as a "government-supported price" of not less than 85 percent of parity during the period ending December 31, 1942, should assure a profit on egg production.

To maintain maximum economical egg production farmers will need to pay special attention to flock management. The following are the most important points to watch:

1. Feeding a balanced ration including green feed.
2. Providing ample room, 3.5 to 4 sq. ft. per bird.
3. Controlling diseases and parasites by range rotation.
4. Culling.

FEEDING

Many hens do not lay at a maximum rate because of inadequate feeding. This is especially true of farm flocks, and it is from such flocks that the bulk of our eggs are gathered. Any one of the following rations will meet the requirements of the farm flock of 50 hens for 1 day. Decide upon one ration and follow it. *Do not change from one ration to another.*

RATION 1: Two gallons of skimmilk or buttermilk; 10 medium-sized ears of corn (shelled); ground limestone or oystershell always accessible; and fresh water always available.

RATION 2 (if milk is not available): One pound or 1 pint of meat scrap; 10 medium-sized ears of corn (shelled); ground limestone or oystershell and fresh water always available. A pinch of salt should be mixed in the meat scrap.

RATION 3: Ground corn 4 pounds; mill feed or ground wheat or barley or oats 4 pounds; meat scrap 2 pounds (½ pound of meat scrap may be replaced by ½ pound soybean oilmeal); and salt 3 level tablespoonfuls. This mash should be thoroly mixed by shoveling four or five times. A commercially prepared mash may be used instead of it. Oystershell or ground limestone and fresh water must be kept available to the hens at all times.

RATION 4: A commercial or home-made supplement mash containing 26 to 32 percent protein may be fed. The mash or supplement should be kept before the hens in mash hoppers, giving the hens all they will consume. Grain feed consisting of corn or corn and wheat must be fed with the mash. Do not limit the amount of grain, but keep it in self-feeders where the hens can eat as much as they want. Keep fresh water and oystershell or ground limestone available to the hens at all times.

Green feed should be a part of all rations. Alfalfa and bluegrass are the most valuable green feeds, but when these are not available a patch of rye, wheat, barley, or oats should be provided. During the winter alfalfa or leafy green Korean lespedeza hay should be fed to the hens.

HOUSING

It is believed that by filling Kentucky hen houses to capacity with good hens, the desired increase in egg production will be more than met. Some farmers will need to build new hen houses; others will remodel the old ones. Unused sheds or portions of barns may be converted into usable laying quarters for hens. Remember to allow at least 3.5 square feet for each hen.

DISEASE AND PARASITE CONTROL

Range rotation to prevent parasites should be practiced wherever possible rather than depending on treatment with worm capsules. Get the pullets and hens out on alfalfa or other pasture. It will cut down the feed bill too.

Lice and mites reduce egg production. Sodium fluoride dusted on the hens, or nicotine sulfate put on the roost poles will control the

a feeding program often results in overfeeding the low-producing cows and underfeeding the higher producers. Grain feeding according to individual cow production is essential to efficient and economical feed utilization and to maximum profits.

For directions on amounts of grain to feed to cows on pasture during the summer and in barns during the winter, see Kentucky Extension Circular 364, "Feeding Dairy Cows," or Kentucky Extension Leaflet, "More Milk for National Defense."

Grain Mixtures

(About 16 percent protein)

On Kentucky farms where at least a portion of the roughage is made up of legumes, and where some home-grown grains are available, the following grain mixtures should in general prove adequate for dairy cows. Many other satisfactory combinations might, of course, be worked out. It should be remembered that if the quality of roughage available should warrant feeding a grain mixture carrying a higher or lower protein content, the necessary adjustment can be made by simply increasing or decreasing the proportion of high-protein feed in the grain mixture.

	Parts (wt.)
No. 1	
Corn-and-cob meal	4
Oilmeal*	1
No. 2	
Corn-and-cob meal	3
Ground oats	2
Oilmeal*	1
No. 3	
Corn-and-cob meal	3
Ground barley	2
Oilmeal*	1
No. 4	
Corn-and-cob meal	4
Wheat bran	2
Oilmeal*	1
No. 5	
Corn-and-cob meal	6
Distillers' dried grains	2
Oilmeal*	1
No. 6	
Corn-and-cob meal	1
24% protein dairy feed	1
No. 7	
Corn-and-cob meal	2
32% protein dairy feed	1
No. 8	
Corn-and-cob meal	2
Ground oats	2
Wheat bran	2
Oilmeal*	1
No. 9	
Corn-and-cob meal	2
Ground barley	2
Wheat bran	2
Oilmeal*	1
No. 10	
Corn-and-cob meal	5
Ground oats	3
Distillers' dried grains	2
Oilmeal*	1
No. 11	
Corn-and-cob meal	5
Ground barley	2
Distillers' dried grains	2
Oilmeal*	1
No. 12	
Corn-and-cob meal	5
Ground oats	3
Wheat bran	2
Distillers' dried grains	2
Oilmeal*	1
No. 13	
Corn-and-cob meal	4
Ground barley	2
Ground oats	2
Wheat bran	2
Distillers' dried grains	2
Oilmeal*	1
No. 14	
Corn-and-cob meal	8
Ground barley	4
Ground oats	4
Wheat bran	4
Distillers' dried grains	4
Soybean oilmeal*	1
Cottonseed meal*	1

* The oilmeal may be soybean oilmeal, cottonseed meal, or linseed meal, depending on price.

GRAIN MIXTURES *for* DAIRY COWS

Mixtures to use, and points to consider in a grain-feeding program

University of Kentucky . . College of Agriculture and Home Economics . . Extension Service

Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky February, 1942

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AI—8 25M—2-42

Grain Mixtures for Dairy Cows

GEORGE M. HARRIS

IT IS HARD to estimate the extent to which dairy cows over the state as a whole are underfed, but most authorities agree that the low average production of milk per cow is due chiefly to poor feeds and poor feeding methods. The vast majority of Kentucky herds would produce more milk more economically if they were better fed.

Grain Is a Supplement to Roughage

Dairy cows are built to eat and digest large amounts of roughage, and for that reason the most economical dairy rations are usually those that contain all the good-quality home-grown roughage the cows will clean up. Usually that means legume hay with or without silage, with enough concentrate feed to supply the extra nutrients needed. For *heavy* production of milk the nutrient requirements are so high that a cow cannot eat enough roughage to support the production, and she must have grain in addition to good-quality roughage. Only high-quality, palatable roughages will be consumed in large quantities. It is important, therefore, that every effort be made to cut roughages early and to cure them carefully and store them in such a way as to assure highest quality.

Points to Consider in a Grain-Feeding Program

1. Does it *pay* to feed grain to dairy cows? Yes; if the cows respond to the grain feeding by increasing their milk flow enough to more than pay for the cost of the grain. In general, it pays to feed grain to good cows when a pound of butterfat in milk or cream at the farm is worth the cost of 12 pounds of grain. Because it is not merely the immediate effect but also the holdover effect of grain feeding that determines its profitableness, it is best to take into account the feeding program and the production of milk for the year as a whole.

2. On farms adapted to grain production, the dairy herd can be kept well nourished, the volume of milk large, and production as a rule most economical by feeding ample amounts of home-grown grain.

3. Home-grown grains such as corn, barley, and oats are relatively rich in energy but are not rich sources of protein, which must be adequately supplied if milk is to be produced economically.

4. Cottonseed meal, soybean oilmeal, and linseed meal are rich in protein, and should for the most part be used to increase the protein content of the grain mixture to the extent desired. Protein-rich commercial feeds (24 and 32 percent protein) may also be considered for this purpose if the price is not too high.

5. Wheat bran, distillers' dried grains, brewers' dried grains, and hominy meal, are commonly fed in Kentucky. To include one or more of these in the grain mixture will often improve its feeding value. Cost should be carefully considered, however, for there are times when the addition of such feeds to the ration does not pay.

6. Grain mixtures are, as a rule, more palatable than most dry roughages, and contain more digestible nutrients per pound.

7. Grain mixtures serve several purposes in feeding dairy cattle: they permit a greater nutrient intake than roughages alone; they are the chief source of protein when low-protein roughages are fed; and they are relatively rich in phosphorus as compared with roughages. Roughages are rich in calcium, the other important mineral to consider.

8. Less grain is needed to meet the cow's requirement for total nutrient intake if legume hay of good quality, rich in protein, is fed. Cows consume more of such palatable, nutritious roughage than of average- to poor-quality roughage. Also, the amount of protein supplement needed in the grain mixture is less when good legume roughages are fed. Thus the use of legume hay provides an opportunity for greater economy in feeding.

9. More grain, of a higher protein content, must be fed to meet the needs of the cow when the roughage is of poor quality and low in protein. Less of such roughage will be consumed and that which is eaten is not so nutritious as better roughage. This usually means that a more expensive grain mixture is necessary for supplementing poor-quality roughage.

10. Grain and roughages in a dairy ration seem to supplement each other in some other manner than the mere supplying of nutrients. Recent experiments have shown that small quantities of grain added to a roughage ration increases milk production out of proportion to the added nutrients.

Rate Of Feeding Grain

The rate of feeding grain depends on the cows' ability to convert it profitably into milk. Thus the rate of grain feeding must be governed by the amount of milk the individual cow produces. A cow's producing ability over a season as a whole, as well as her production from day to day or week to week, must be taken into consideration. Too often all cows in the herd are fed the same amount of grain regardless of the stage of lactation or the level of production. Such

with materials that would better be used for bedding. This is not to say that molasses itself is not good feed for dairy cows if the price is right. It is not only a good feed, but it also is valuable in remedying or preventing acetonemia in cows. In terms of its "total digestible nutrients" 100 pounds of molasses is about equal to 70 pounds of shelled corn. When, on this basis, molasses costs about the same as corn, it will be practical to feed molasses mixed with the grain—up to about 4 pounds molasses per cow per day.

Chopping Roughages Sometimes Pays

Whether it is desirable to chop coarse hay or fodder depends largely on the price and the relative scarcity of hay. Cows will eat much of the coarser stems of chopped hay, cornstalks, and sorghum fodder that would otherwise usually be left in the manger or feed rack. These coarse stems are of little feeding value, however, and unless hay is scarce it seldom pays to force the cows to eat them.

Another reason for chopping roughage is to put more of it into a given storage space, for chopped hay occupies only half to a third as much space as long hay. Care must be taken, however, not to overload the joists of a barn where chopped hay is stored.

Hay or other roughage to be chopped must be drier than is necessary for unchopped hay. Because chopped roughage will pack more in the mow, there is greater danger from spontaneous combustion unless it is well dried.

Great care must be taken in chopping or grinding feed, especially baled hay, to see that no baling wire or other metal goes into the machine. If chopped pieces of wire or nails get into the feed they are likely to penetrate the stomach wall of the animal that eats them.

Lexington, Kentucky April, 1942
Published in connection with the agricultural extension work carried on by cooperation of the College of Agriculture and Home Economics, University of Kentucky, with the U. S. Department of Agriculture, and distributed in furtherance of the work provided for in the Acts of Congress of May 8 and June 30, 1914.
AI-9

PREPARING FEEDS *for* DAIRY COWS

This leaflet is designed to answer the questions: Does it pay to grind or chop feeds for dairy cows? Which feeds should be ground or chopped and which should not?

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service
Thomas P. Cooper, *Dean* and *Director*

Preparing Feeds for Dairy Cows

By A. A. SPIELMAN

USE of portable feed grinders in recent years has led to recommendations that farmers grind almost all kinds of feed for milk cows. Farmers will do well, however, to question such advice, for grinding or chopping certain feeds does no good at all, and may even be harmful.

Cost of Grinding

Tho cost of custom grinding varies considerably, a usual charge for grinding grain is 10 to 15 cents a hundred pounds, and for grinding hay, 15 to 20 cents a hundred. Farmers who have their own equipment may figure a lower cost.

Grind the Grain for Cows

Cows need their grain ground because they do not chew their feed thoroly when they eat it. Later they rechew it in the cud, but only the roughage and such grain as may get caught in the roughage is brought up in this way and rechewed. As much as 30 percent of unground grain fed to mature dairy cows may thus be lost unless these cows are followed by hogs or poultry.

The grain should be ground "medium to coarse," using a 7/16-inch screen in a hammer mill or proper adjustment of a burr mill. The most practical way to prepare corn for milk cows is to grind or crush the corn and cob, or the corn, cob, and shuck together. Wheat for milk cows should be ground medium or coarse. Fine-ground wheat will form a pasty mass, difficult to digest. Ground wheat should not make up more than 1/3 the grain feed for cows.

Grinding Not Needed for Calves

Dairy calves up to six months of age chew whole grain more thoroly than older animals, so very little passes thru them undigested. It

is therefore not necessary to grind grain for young dairy animals.

Roughage Not Made More Digestible by Grinding

Grinding hay does not increase its feeding value. It is, in fact, slightly less digestible than unground roughage because cows do not readily bring up the cuds of ground hay to rechew them.

No Advantage in Grinding Grain and Roughage Together

Ground hay cannot take the place of grain in the grain mixture. It is still a roughage with a large amount of crude fiber. In fact good cows fed on such a mixture may not get enough concentrate feeds to produce as much milk as they are capable of producing.

Grinding soybean hay, however, is practical if the hay is of reasonably good quality and the pods are filled with well-ripened beans. Coarse, blackened, stemmy soybean hay that has been damaged by rain in curing cannot be made into a good feed by grinding, and had better be used for bedding.

In general, money spent for grinding hay for milk cows would bring greater returns if it were spent instead in producing hay of better quality.

Does Not Pay To Mix Molasses With Ground Roughage

Cows will eat almost anything with molasses on it. For this reason farmers are often tempted to grind poor-quality roughage and mix molasses with it. Such practice, however, is neither economical nor practical for best milk production.

Cows will grind their own roughage. Adding molasses may cause cows to eat more of a roughage than they otherwise would, but it does not increase its feeding value or digestibility. If the roughage is of poor quality in the first place, it merely serves to fill up the cows

dairy farms could well use a small area of sudan grass. It will provide plenty of pasture, and help to avoid overgrazing the permanent pasture.

CAUTION: When sudan grass and related crops are making rapid growth after a rain following a summer drouth there is some danger of prussic-acid poisoning of animals grazing on it. At such times it is good practice to keep the animals off the pasture for a few days.

FOR MORE INFORMATION about pastures and dairy feeding, see the following Kentucky Extension circulars and leaflets:

Preparing Feeds for Dairy Cows—*Leaflet*
Grain Mixtures for Dairy Cows—*Leaflet*
Selection and Purchase of Feeds for Dairy Cows—*Leaflet*
Feeding Dairy Cows—*Circular* 364
Sow Alfalfa and Grass Together—*Leaflet*
Old Pastures and Meadows—Patching and Reseeding—*Leaflet*
Winter Pastures—*Leaflet*

These publications may be obtained free of charge from the College of Agriculture and Home Economics, Lexington, or from your county agricultural agent.

Lexington, Kentucky August, 1942

25M—8-42
25M—9-42

TO THE READER:

This is one of a series of folders on dairying published by the Cooperative Extension Service as an aid toward more economical milk production.

Cordially yours,

County Agent.

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating.

U. S. Department of Agriculture
EXTENSION SERVICE
WASHINGTON, D. C.

OFFICIAL BUSINESS

Penalty for Private Use to Avoid Payment of Postage, $300

For:

Summer Feeding of DAIRY COWS

THE PASTURE SEASON offers an opportunity for low-cost dairying. How well a dairyman takes advantage of it depends on his skill in pasture management and the extent to which he supplies the feeds needed to supplement the pasturage.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service

Thomas P. Cooper, *Dean* and *Director*

AI-10

Summer Feeding of Dairy Cows

By A. A. Spielman

Proper use of pasture is an effective way to reduce the cost of milk production because the cost of nutrients from pasture is about one-third their cost in other feeds. Also, cows can get nearly half their yearly feed requirement from good pasture.

Cows on Pasture Often Underfed

Many farmers turn their cows out to pasture with little thought as to the supply of feed actually available. Young pasture grass stimulates cows to make more milk than when on winter feed; yet it is impossible for heavy-milking cows to eat enough pasture forage to furnish the nutrients needed for heavy production. Cows, therefore, lose flesh on pasture and when the pasture becomes dry and scanty in midsummer they fall off greatly in milk yield.

Economy of Feeding Grain to Cows on Pasture

The economy of feeding grain to a cow on pasture depends upon her milk production. A cow can eat enough good pasture to produce 2 to 2.5 gallons of milk a day without loss of flesh. Cows giving less than that on pasture without grain usually will not give enough more milk when fed grain to pay for the extra feed. However, it is a serious mistake not to feed some grain to high-producing cows. Even tho such cows may not show a great increase in milk production, the extra grain fed helps maintain their heavy milk flow during the usual midsummer slump and prevents them from losing flesh. Also, they will milk more the following winter.

Feeding Value of Pasture

Young pasture grass is about 85 percent water, while average grain feed is about 10 to 12 percent water. If a pasture has been well limed

and phosphated however, the young grasses and legumes supply enough protein, vitamins (especially vitamin A) and minerals for high milk production.

As the season advances, a cow gets from the average pasture only enough feed for 1 to 1½ gallons of milk a day. The grass is less palatable and has less feeding value as it becomes older, and the pasture produces less forage because of slower growth. In a mixed pasture, crude fiber increases from about 7 percent in March to about 15 percent in July, and digestible protein decreases from about 4 percent to about 1.5 percent. Mature grass is therefore too low in protein and too high in fiber to meet the needs of milking cows. Milk production from cows on pasture therefore falls off considerably in midsummer unless the cows get extra feed.

Pasture grass is generally high in protein as long as it is growing actively and is prevented from heading out. Keeping the pastures fertile and clipping them when they begin to head out helps to keep them rich in protein thruout the season.

How Much Grain to Feed

The following general rules are helpful in determining the amount of grain to feed.

Feed 1 pound of grain daily for each 2 pounds of milk (4 pounds of grain for each gallon of milk) produced over and above the amounts given in the following list:

	Gallons milk	*Pounds milk*
JERSEYS OR GUERNSEYS		
On excellent pastures	2¼	20
On good pasture	1¾	15
On fair pasture	1¼	10
On poor pasture	¾	5
OTHER BREEDS		
On excellent pastures	3	25
On good pasture	2¼	20
On fair pasture	1¾	15
On poor pasture	1¼	10

How Much Protein is Needed in Grain Mixture

As protein is usually the most expensive part of the feed for cows, dairymen should take full advantage of the cheap protein furnished by

pasture. Too often they feed a grain mixture containing much more protein than is needed for cows on pasture. The percentages needed with pastures of different quality are given in the following list:

	Percent needed
On excellent pasture	10 to 12
On good pasture	12 to 14
On fair pasture	14 to 16
On poor pasture	16 to 18

Corn, barley, and wheat are usually the cheapest supplements for spring pasture. As pasture becomes poorer and older, a high-protein feed such as distillers dried grains, or soybean or cottonseed oilmeal should be added to supply the needed protein.

Hay as a Supplement to Pasture

When pasture grows old, tough, and less palatable the cows should be given all the hay they will clean up. They will eat no more than they need. The best time to feed hay is after the evening milking, before the cows return to pasture. Remember, however, that hay cannot take the place of grain for heavy-producing cows on pasture.

Summer Silage

Some dairymen feed grass or alfalfa silage as a pasture supplement. When grass is most abundant in the spring, dairymen often have more pasturage than their herds can use. By ensiling the excess grass, or the first crop of alfalfa, and feeding it when pastures become short, they have a more uniform and dependable supply of feed. However, silage costs more than hay, and a fairly deep layer (about 4 inches) must be removed daily to prevent spoiling.

Supplementary Pasture

One of the most satisfactory ways of providing cheap feed during summer when regular pastures are not actively growing is supplementary pasture. Sudan grass, lespedeza and millet are among the best crops for this purpose. Most

calcium are the only minerals, besides salt, likely to be needed. Cheapest sources of them are steamed bonemeal and ground limestone.

A wide variety of feeds is not necessary in the grain mixture. Many feeds in a mixture may make it more palatable, but often more expensive.

4. Consider the quality as well as the price in buying feeds.

Some commercial mixed feeds contain large amounts of "filler" such as oat hulls, weed seeds, chaff, and screenings. Because cows will not eat such poor-quality feeds readily, and therefore farmers would not buy them, some manufacturers mix appetizers (chiefly molasses) with such feeds. Farmers should beware of such disguised feeds, and should examine the tags carefully to see whether such "fillers" are included. Kentucky law requires that every sack of feed must carry an official tag giving information about the contents. Low-grade feeds must carry a YELLOW TAG, printed in bold-faced type, warning the farmer that he is buying a feed adulterated with filler. These "yellow tag" feeds cost less per 100 pounds, but are actually more expensive than the better feeds.

Manufacturers are not required to state the amount of "total digestible nutrients" in their feeds. This can be estimated, however, from the percentages of fat and fiber on the tag. As fiber increases, digestibility decreases. In general, mixed feeds containing not more than 12 percent fiber and not less than 4 percent fat are most economical and satisfactory.

To compare the feeding value of a mixed feed with that of a straight product, compare the percentages of protein, fat, and fiber on the tag with those in the following list:

	Protein	*Fat*	*Fiber*
	%	%	%
Corn	9.6	3.9	2.4
Wheat bran	16.0	4.9	9.7
Wheat mixed feed	15.5	4.0	8.5
Brewers' dried grains	23.1	6.5	14.9
Distillers' dried grains	28.0	9.0	12.2
Soybean oilmeal	43.0	5.4	6.4

25M—8-42
25M—9-42

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County Agent.

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U. S. Department of Agriculture
EXTENSION SERVICE
WASHINGTON, D. C.

OFFICIAL BUSINESS

Penalty for Private Use to Avoid Payment of Postage, $300

For:

Selection and Purchase of Feeds for Milk Cows

DURING THE WAR, changing prices of feed, milk, and butterfat, and the scarcity or lack of some feeds, make careful selection of feeds more important than ever and at the same time more difficult. This folder tells what should guide farmers in making a choice.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service

Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky AI-11 August, 1942

Selection and Purchase of Feeds for Milk Cows

By A. A. Spielman

1. Feed grown on the farm is generally cheaper than feed that is bought.

Dairy farmers who grow all or most of their feed have a better chance for profit than those who depend more on purchased feeds. Every dairy farmer should study the suitability of his farm for growing the various feed crops. If the farm is not adapted to growing certain feeds it may be more economical to buy such of those as are needed, than to try to raise them.

In general, it is economical to grow all needed roughage, both pasture and hay, and to buy some grain if need be. Acre for acre, good pasture yields more nutrients than most feed grains, and produces them at about one-fourth to one-third the cost of the same nutrients in grain. Moreover, rapid-growing pasture and legume hay are rich in protein, and usually the protein part of the ration costs the most. Profitable dairy feeding must therefore be built on a program of growing good pasture and legume hay.

2. Feed more hay and less grain when grain prices are high in relation to price of milk and butterfat.

On the basis of nutrients contained and their digestibility, good legume hay is worth, pound for pound, about two-thirds as much as a good grain mixture. If a grain mixture sells at $36 a ton, good leafy legume hay is therefore worth about $24 a ton.

In making such substitution of hay for grain, however, remember that cows giving a heavy flow of milk cannot eat enough hay, because of its bulk, to supply all the nutrients they need. They should be fed some grain also.

3. Buy only those feeds that are the best supplements to the home-grown feeds.

Corn, barley, oats, and wheat, the grains usually grown on Kentucky farms, are high in carbohydrates or starch, but low in protein.

These grains may need protein added to make satisfactory grain mixtures. Oilmeal or 32-percent mixed feed is usually a more economical source of protein than bran or a 16-percent mixed feed.

The amount of protein to add depends on several things, but mainly on the kind of roughage fed. The better the pasture and legume hay fed, the less protein is needed in the grain mixture. For a detailed discussion of grain feeding, see Circular 364, "Feeding Dairy Cows," and the leaflet, "Grain Mixtures for Dairy Cows".

The only vitamins likely to be lacking in a dairy cow's feed are A and D. The practical sources of them are sunshine, pasture grass, silage, and leafy sun-cured hay. Phosphorus and

HOW TO FIND WHICH FEED WILL FURNISH PROTEIN AND "TOTAL DIGESTIBLE NUTRIENTS" AT THE LOWEST COST

In the following table insert the local price per 100 pounds and divide by the number of pounds of protein or of digestible nutrients.

To change cost per bushel to cost per 100 pounds, multiply the cost per bushel by the number indicated: shelled corn, 1.8; ear corn, 1.4; wheat, 1.7; barley, 2.1; rye, 1.8; oats, 3.1.

Kind of feed	Local price of feed per 100 lb.*		Pounds of digestible protein per 100 pounds		Cost per pound of protein	Local price of feed per 100 lb.*		Pounds of total digestible nutrients per 100 lb.		Cost per pound of total digestible nutrients
Alfalfa hay		÷	11	=			÷	52	=	
Soybean hay		÷	12	=			÷	54	=	
Lespedeza hay		÷	9	=			÷	52	=	
Red clover hay		÷	8	=			÷	51	=	
Clover-and-timothy hay		÷	4	=			÷	46	=	
Corn silage		÷	1	=			÷	18	=	
Corn No. 2		÷	7	=			÷	82	=	
Corn-and-cob meal		÷	6	=			÷	78	=	
Hominy feed		÷	7	=			÷	85	=	
Oats		÷	10	=			÷	70	=	
Barley		÷	9	=			÷	79	=	
Wheat		÷	9	=			÷	84	=	
Molasses		÷	1	=			÷	59	=	
Wheat bran		÷	12	=			÷	61	=	
Wheat feed		÷	11	=			÷	60	=	
Corn gluten feed		÷	22	=			÷	81	=	
Brewers' dried grains		÷	21	=			÷	66	=	
Distillers' dried grains										
From corn		÷	22	=			÷	89	=	
From rye		÷	12	=			÷	55	=	
Cottonseed meal		÷	33	=			÷	75	=	
Linseed oilmeal		÷	30	=			÷	78	=	
Soybean oilmeal		÷	40	=			÷	84	=	
Soybeans ground		÷	33	=			÷	94	=	
16% dairy feed										
Yellow tag		÷	8	=			÷	50	=	
Manila tag		÷	12	=			÷	70	=	
24% dairy feed		÷	18	=			÷	75	=	
32% dairy feed		÷	24	=			÷	80	=	

* Include cost of grinding for grains.

Range shelter

Summer Management of PULLETS

By J. E. Humphrey

Many farmers make the mistake of letting their pullets hustle for themselves during the summer after the cockerels have been sold, canned, or eaten. Consequently when winter approaches and the price of poultry products is highest, these birds are not laying eggs. Pullets, properly managed through the growth period should begin laying by the time they are about 6 months old.

Put pullets on clean ground away from the old flock

Keeping the pullets on clean range with plenty of room is a safeguard for their health, because certain parasites and the germs of some

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service
Thomas P. Cooper, *Dean* and *Director*
Lexington, Kentucky
August, 1942
AI-12

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating

POULTRYMEN:

This leaflet tells how to get pullets ready this summer to lay eggs this fall and winter.

Cordially yours,

County Extension Agent

For:

15M—8-42

diseases survive a year or more on poultry ranges. Moreover, when the pullets are by themselves it is easier to feed them properly. Ground is considered clean for chickens if neither chickens nor turkeys have been on it during the last 2 years.

Build a shelter or summer home for the pullets on their clean range. The one shown on the front page was built at little cost. Poles cut from the woods make an inexpensive shelter.

Give pullets all they will eat of the right feeds for rapid growth

Adapt the feeding program to the feeds available on the farm. Corn, grown on most farms or easy to get, is usually the basis of the feed mixture. Wheat, barley, and oats may be used to advantage along with corn. But unless the pullets get more than these common grains they will make only slow growth. They must have plenty of protein also. Meat scrap, dried milk, and soybean oilmeal are good sources of protein for summer feeding. Skimmilk for summer feeding is not recommended, because it attracts flies which the pullets eat in large numbers. Flies are intermediate hosts of poultry tapeworms.

The following feeding plans have proved successful.

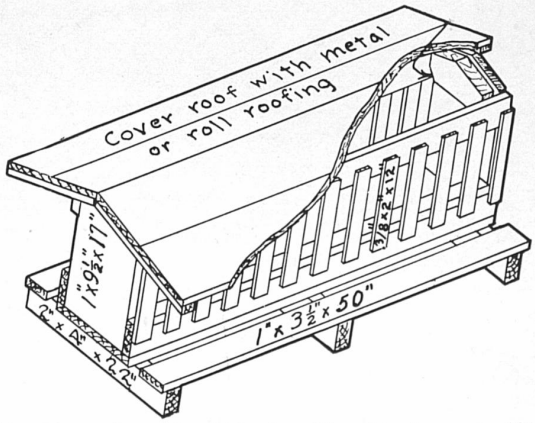
Cafeteria plan.— Put shelled yellow corn (or wheat, barley, or oats) in one hopper. Put 50 lb. meat scrap and 1 lb. salt, well mixed together, in another hopper; and 50 lb. soybean oilmeal with 1 lb. salt, well mixed together, in a third hopper. Pullets will make their own choice of these feeds and eat all they want of them. If desired, the grains can be mixed and fed from one hopper—for example, corn 30 lb.; wheat, 30 lb.; barley, 30 lb.; and oats, 10 lb. Because these grains are practically equal in feeding value they can be mixed in any other proportions desired. If the protein feeds are mixed together, use 3 parts by weight of meat scrap to 1 part of soybean oilmeal. Plenty of water and green range should of course be available.

Mash and grain.— Make a mixture composed of 40 lb. ground wheat or mixed feed; 40 lb. ground yellow corn; 20 lb. meat scrap, and 1 lb. salt. Put these materials into a box or on the ground and mix by turning them 3 or 4 times with a shovel. Put the mash in one hopper, and the grain in another, giving the pullets all they will eat of both. Green feed and water should be accessible at all times. If barley and oats are available they may be ground and used in the mixture. Use equal parts by weight of corn, wheat, barley, oats, and meat scrap plus 1 percent salt.

Commercial protein supplement and grain.— Feed with grain a commercially prepared protein supplement running 26 to 32 percent protein. Put the supplement in one hopper and the grain or grains in another. Keep the feed before the pullets all the time. Allow them to balance their rations. This plan of feeding provides a well-balanced ration from homegrown grains without the labor of grinding and mixing.

Green feed should be a part of all rations

When pullets run on a good range such as alfalfa, clover, korean lespedeza, bluegrass, or sudan grass, the feed cost will be reduced 20 to 30 percent. For chicken pasture sow twice as much seed as is usually recommended. Green feed not only reduces feed cost, it also furnishes important vitamins and minerals which promote the general health of pullets.



Provide at least 2 self-feeders like this for each 100 pullets.

KEEP FOWL POX out of your flock

The best way to keep fowl pox out of a healthy flock is to vaccinate before the disease makes its appearance. Consult your county agricultural agent for more information on buying and using vaccine.

UNIVERSITY OF KENTUCKY

College of Agriculture and Home Economics
Agricultural Extension Service

Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky AI-13 August, 1942

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating.

POULTRYMEN:

Sick chicks fail to make normal growth; sick hens drop off in egg production. Such chickens are of course unprofitable. This leaflet tells how to keep your chickens free from a disease that each year takes a heavy toll from profits of Kentucky poultrymen.

Cordially yours,

County Extension Agent

15M—8-42

U. S. Department of Agriculture
EXTENSION SERVICE
WASHINGTON, D. C.

OFFICIAL BUSINESS

Penalty for Private Use to Avoid Payment of Postage, $300

For:

Keep Fowl Pox Out of Your Flock

THIS DISEASE is also called chicken pox, avian diphtheria, canker mouth, and contagious epithelioma or sore head. It is caused by a living infectious agent known as fowl pox virus. Until a way is found to kill this virus poultrymen must seek to prevent its appearance in their flock.

By T. P. Polk

How to Recognize the Disease

Sores on the unfeathered parts of chickens and turkeys usually are symptoms of fowl pox. These sores (pox scabs) are little inflammatory bumps that develop on the comb, wattle, and skin of the birds. Sometimes pus accumulates in the eyes and in the cavities of the head; and matter, having the appearance of cheese, forms in the mouth and throat. In the former case blindness may result; in the latter, death by suffocation.

When fowl pox appears in a mild form the general health of the birds is not seriously affected and the egg production of the hens is only slightly decreased. But in severe cases the birds become droopy, rapidly lose flesh, and may quit laying eggs. Birds affected with colds have some of the symptoms of fowl pox. Unless they have the pox scabs or sores, however, such fowls do not have this disease.

How the Disease is Spread

Fowl pox is a highly contagious germ disease. Its virus is spread from bird to bird by contact, though mosquitoes, flies, and other insects may be carriers of it. Persons who go from one flock to another may spread the disease by carrying the virus on the hands, clothing, shoes, or any material contaminated by an infected bird. The time from exposure to the development of visible lesions (scabs) varies from 3 days to 2 weeks.

Fowl pox is most likely to occur in late summer, fall, or winter. The virus is very resistant to drying and disinfectants, and may remain alive in poultry houses and protected places from one season to another.

Vaccination is Only Control Method

When symptoms of fowl pox are present in a flock or when it is known that the flock was infected the previous year, vaccinate every bird. For healthy, young fowls 3 to 4 months old, use Fowl Pox Vaccine after the surplus cockerels are sold. For infected flocks and flocks in egg production, use Pigeon Pox Vaccine. This vaccine is milder than Fowl Pox Vaccine; therefore, it causes less severe reaction and is safer to use on laying hens in infected flocks. The "mixed avian bacterin vaccines" are not recommended.

When vaccinating against fowl pox use either the stab or feather follicle method but use only the feather follicle method when Pigeon Pox Vaccine is applied. The person applying the vaccine should not handle the birds because his hands, contaminated by the virus, might spread the disease.

Protect Your Poultry from COCCIDIOSIS

Suggestions on prevention and control

UNIVERSITY OF KENTUCKY

College of Agriculture and Home Economics

Agricultural Extension Service

Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky   AI-14   September, 1942

15M—9-42

PROTECT YOUR POULTRY FROM COCCIDIOSIS

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating

U. S. Department of Agriculture
EXTENSION SERVICE
WASHINGTON, D. C.

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For:

Protect Your Poultry from Coccidiosis

By T. P. Polk

Coccidiosis is a very widespread disease of poultry that causes death losses, unthrifty birds, and lowered egg production. It is caused by very small parasites called "coccidia." When eaten by poultry, these parasites live in the intestine walls and multiply rapidly. In a few days they develop into egg-like form and leave the intestines in the droppings. In the presence of air, warmth and moisture they develop in 18 to 48 hours into the harmful stage and will cause coccidiosis if eaten by poultry. There are at least six kinds of coccidia but only two of these cause blood to appear in the droppings. Coccidia may live in soil or poultry droppings for one year or more.

How to Recognize this Disease

Chicks do not have coccidiosis when they are hatched. They are most likely to have it when they are one to four months old and during May, June, and July. The symptoms are paleness of beak, shanks, and visible membranes; drowsiness and ruffled feathers; drooping wings and diarrhea. In two forms of coccidiosis blood appears in the droppings of the infected birds. The death rate may be high.

When chickens show symptoms of coccidiosis, start control measures at once.

Control

Coccidiosis cannot be cured by any known remedy. Disinfectants usually destructive to germs do not kill coccidia. In fact moisture of any kind aids the development of this disease. Control therefore depends on intensified preventive measures.

1. As soon as coccidiosis appears confine the chicks to the brooder house and sunporch.
2. Dry clean the brooder house each morning by scraping and sweeping. Do not use water or disinfectants. Cleaning can be done more quickly if a small amount of litter is used.
3. Keep feed and water containers clean.
4. Daily cleaning should continue until symptoms of coccidiosis disappear, usually 5 to 10 days.
5. If the chicks appear cold supply more heat.
6. The use of milk in any form is of value as an addition to the regular feed. Keep liquid milk before the chicks instead of water for 5 to 10 days. Sweet or sour milk may be used. Do not change from one to the other. Dried milk may be used at the rate of 4 pounds to each 6 pounds of mash. Feed for two days, skip two days, and feed for two days. A commercial flushing mash may be used. No other changes in feeding are recommended.

Prevention

Coccidiosis can be prevented by raising the chicks in clean brooder houses on clean ground away from other poultry. Preventive measures that are effective for coccidiosis will also aid in the prevention of other diseases and parasites of poultry.

1. Do not depend on medicines or any particular kind of feed to prevent coccidiosis.
2. Clean the brooder houses in the fall or winter before moving them to clean ground. Scrape and sweep the ceiling, walls and floor until all litter and droppings have been removed. Scrub the house and all equipment with hot lye water (one can of lye to five gallons of water). Wait one hour and rinse with hot water. Spray with a 5-percent solution of cresol compound. The house is now ready to move to clean ground. **Clean ground is ground that has not been used for any kind of poultry for at least two years.**
3. Provide a sunporch and range shelter for each brooder house. See Extension Circular No. 157 for details on their construction.
4. Avoid carrying infection into the brooder house. Keep overshoes to wear only in the brooder house.
5. Construct the feed hoppers and drinking vessels so that the feed and water will not become contaminated with droppings.
6. Clean the brooder house when it needs cleaning. Keep a deep litter on the floor.
7. Until the droppings can be removed to a place remote from the poultry houses and ranges, keep them in containers that protect from insects and poultry.
8. Coccidiosis may be carried from house to house or from flock to flock by the poultryman, visitors, feed sacks, water pails, poultry crates, animals, birds, insects and especially flies. Don't encourage visitors to enter your brooder house or poultry lot. Anything that will draw flies should be removed from the poultry houses and yards. Fly traps help to control flies. Ask your county agricultural agent how to make them.

Other Poultry

This information deals with coccidiosis in chickens. The control and preventive measures outlined, however, are also effective for this disease in other farm poultry and for trichomoniasis or hexamitiasis in turkeys.

cases on slatted platforms so that air can circulate underneath.

5. **Avoid rough handling of eggs** and all unnecessary jarring of them. Aside from danger of breakage, such jarring breaks down the egg whites and makes the air cell move out of place. Eggs so treated deteriorate rapidly.

6. **Market eggs as frequently as possible.** Keep them moving to the larger market centers or cold-storage plants.

7. **Don't store eggs near kerosene, nor in the same room with raw furs, onions, cabbage, potatoes.** Even through the wooden cases, eggs rapidly absorb the odors of such products and are made unfit for table use.

8. **Encourage the grading of eggs and marketing on a graded basis.** Grading of eggs, when a satisfactory market outlet has been established, means better prices and more income for both producers and dealers.

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating.

15M—2-43
9M—6-43
15M—7-44

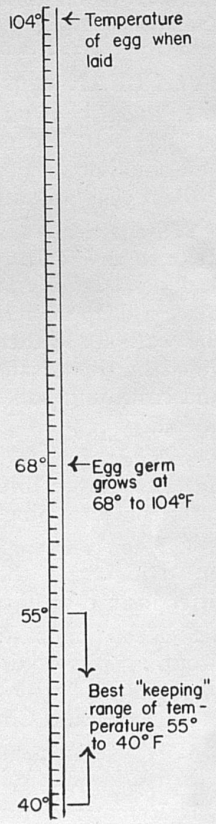
For:

U. S. Department of Agriculture
EXTENSION SERVICE
WASHINGTON, D. C.

OFFICIAL BUSINESS

Fresh, Clean EGGS for Market

BY KEEPING EGGS CLEAN AND FRESH, Kentucky farmers and dealers would gain at least a million dollars annually. That is the amount now lost from spoiled eggs and price deductions for inferior quality. Better management by farmers and better handling methods by truckers and dealers would prevent much of this loss. Dirty eggs spoil quicker than clean ones, and are less attractive to buyers; and spoiled eggs can neither be eaten nor hatched. Keep them clean, and keep them cool!



Leaflet 15

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Division
Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky February, 1943

Fresh, Clean Eggs for Market

By C. E. Harris

Getting eggs to the consumers fresh and clean is a job that must have the cooperation of all who handle eggs. To improve the general quality of eggs in a broad market area, so that buyers for consumer markets will pay a premium price for eggs from that area, requires the most widespread adoption of good methods of handling eggs.

WHAT THE FARMERS CAN DO

For CLEAN eggs —

1. **Provide at least 1 nest for each 4 hens.** Unless enough nests are provided, hens are likely to crowd one another when laying. Crowding breaks eggs; broken eggs soil nests; soiled nests smear clean eggs.

2. **Face nests so that the hens will enter on side next to the wall.** Leave a passageway between wall and nests large enough for the hens to get in, and place a drop door on the side of the nests away from the wall, for gathering eggs. In the dark nests provided by this arrangement there will be less fighting and crowding than in lighter nests, and fewer broken and dirty eggs.

3. **Keep plenty of hay, straw, or shavings in nests** to prevent breaking of eggs and to absorb moisture from droppings and broken eggs.

4. **Keep a deep litter on the floor.** Mud or manure, clinging to the feet of hens, will lodge in the litter instead of in the nests to soil the eggs.

5. **Keep hens away from droppings** by using dropping pits or dropping boards. How to equip a poultry house with these devices is explained in Kentucky Extension Circular 351.

6. **House hens until noon on rainy days.** Hens with muddy feet soil nests and eggs.

7. **Remove dirt spots** with very fine sandpaper, an egg-cleaning brush, or a cloth dampened with vinegar and water. Do not wash eggs; they deteriorate more readily than unwashed eggs.

For FRESH eggs —

1. **Produce infertile eggs;** sell or confine all roosters. A high percentage of fertile eggs are thrown away in hot weather as rots; and the rest may not reach consumers in good condition in summer. At temperatures above 68° F. incubation takes place. Blood rings, the result of beginning incubation, occur only in fertile eggs.

2. **Sell broody hens.** By sitting on nests they keep eggs laid by other hens warm, and if the eggs are fertile incubation may start.

3. **Gather eggs in wire baskets at least twice a day.** Eggs, when laid, register 104° F. Unless gathered frequently they will be kept too warm by hens using the nests. Warm eggs deteriorate badly even though they are infertile.

4. **Put the eggs at once in a cool place,** such as a cellar or basement, and leave them in the wire baskets over night to cool. These baskets allow air to circulate around the eggs so that all are cooled.

5. **Case the eggs small end down** to keep the yolk well centered and to prevent breaking the air-cell membrane usually found at the large end of the egg. Eggs spoil when this membrane is broken.

6. **Keep the cased eggs in a cool, moderately humid place until marketed.** Such a temporary storage room prevents evaporation of water from the egg white and enlargement of the air cell. A large air cell means a low-quality egg. When eggs are stored in a basement, keep the baskets or cases off the floor by placing them on wooden strips.

7. **Keep eggs away from onions, cabbage, potatoes, and kerosene.** Eggs absorb such odors.

8. **Market eggs 2 or 3 times a week, if practical.**

9. **Sell to dealers properly equipped to handle eggs.** By so doing, you will help build up the reputation of your market area for good-quality eggs, and therefore strengthen the local price of eggs.

WHAT TRUCKERS AND DEALERS CAN DO

1. **Protect eggs from sun.** Truckers who pick up eggs at the farms should make provision for shading the cases, to prevent their being unduly heated by the sun. Covered trucks are best; a tarpaulin or similar covering over the cases is next best.

2. **After candling the eggs, case them small end down,** to keep the yolk well centered and prevent breaking the air-cell membrane.

3. **While holding the cased eggs for shipment, store them in a cool, moderately humid place.** A temperature between 40° and 55° F. is best.

4. **In stacking the cases of eggs for storage, leave space between the cases** for air to circulate around them and cool them more readily. Stack the

FOWL PARALYSIS

. . . a poultry disease

This disease is also called "paralysis," "range paralysis," "lymphomatosis," and "big liver disease." Because no medicine controls this disease, poultrymen should use the most rigid measures of cleanliness and careful poultry management to prevent or control it.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
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Thomas P. Cooper, *Dean* and *Director*

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For:

FOWL PARALYSIS

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating

15M—9-42

Fowl Paralysis

Avian Leukosis Complex

By F. E. Hull

"Fowl paralysis" is the general name given to a disease which causes a variety of closely related conditions, such as paralysis, lameness, blindness, big liver, and tumor-like growths in various parts of the body. All breeds of fowls contract this disease. Younger birds are more susceptible to it than older ones. Fowl paralysis develops slowly; symptoms are not usually observed before chickens are about 4 months old. Many poultrymen fail to recognize it because of its slow development and also because its symptoms resemble similar conditions caused by poor feeding, parasites, and other infectious diseases.

Symptoms of This Disease

Paralysis of the legs or wings is a symptom of the disease. Usually this condition starts with lameness in a leg or drooping of a wing. Next the head and neck twist to one side or fall backward. Finally the bird becomes completely prostrate and lies on its side with its legs outstretched, probably one leg extended forward and the other backward.

Gray eyes, another symptom of this disease, does not occur in all affected chickens but when it does the change in eye color takes place slowly, a gray color replacing the normal reddish-bay color, and the chickens become blind. Gray eyes appear when birds are 6 to 8 months old; one or both eyes may be affected. Blindness often hastens the death of the victim of this disease for, altho the appetite of the bird may be good, it is unable to find feed.

Tumors on the skin and internal organs of chickens frequently appear with fowl paralysis. Examination of a dead chicken may show swelling of the nerves and, very frequently, the enlargement of the spleen, kidneys, and liver, the latter often twice its normal size.

Control and Prevention

Despite much investigation the cause of fowl paralysis is not definitely known. Probably a virus causes it. Increased susceptibility and increased resistance may be inherited. Some evidence shows that the virus is transmitted thru the egg to the chick and that the disease is spread by contact with infected birds and contaminated surroundings. On account of the uncertainty about the cause and transmission of fowl paralysis no remedy for it is known. At present poultrymen should use the following approved sanitary measures and flock management procedure for its control and prevention.

1. Remove from the flock all birds showing visible symptoms of the disease.

2. Clean the laying quarters, runways, and containers for feed and water. Remove all dirt and caked material from the floor, roost poles, dropping boards, side walls and ledges. If necessary soak the floor and dropping boards to loosen this material. Disinfect with a spray made of one can of lye to 5 gallons of water or with a 4 percent cresol compound.

3. Break up and reseed old yards and ranges.

4. Separate young stock from old, and rear the young birds on ground on which neither chickens nor turkeys have been kept for at least 2 years. Let different attendants look after the chicks and the old birds. Provide pullets with laying quarters separated from the old flock. Clean the laying quarters before putting the pullets in, and then keep them clean.

5. Breed for increased resistance by retaining healthy survivors of an outbreak of this disease. Hatch eggs from hens 2 or more years old in your own incubator.

6. Dispose of the entire flock and replace it with new stock. This procedure may not bring the desired end because no assurance can be given that the new flock will be free of fowl paralysis. A proved resistant flock is hard to find.

7. Support the preventive measures for fowl paralysis by feeding the flock properly, by taking due precautions to prevent worms, and by observing the control measures for coccidiosis and other poultry diseases.

enough protein to balance the ration, it pays to feed low-protein roughages, usually cheaper than legume hay or legume silage. The percentages of "total digestible nutrients" in low-protein roughages are accurate measures of the relative value of the different roughages for this purpose;

	Percent T. D. N.		*Percent T. D. N.*
Corn silage	21	Oat straw	44
Corn fodder	55	Barley straw	45
Corn stover	45	Wheat straw	36
Bluegrass hay	53	Rye straw	41
Mixed grass hay	53	Cottonseed hulls	44

Oat straw is especially desirable because it is a short pliable straw relished by cattle. Wheat and rye straws are coarse, stiffer than oat straw and consequently less nutritious and less palatable. Barley straw, if smooth, is very desirable; but bearded straw may cause sore mouths. Cottonseed hulls are well adapted to slop feeding because they mix well with the slop and therefore require no additional racks and are not wasted.

Don't grind the roughage.— As slop-fed steers seem to crave a certain amount of coarse material, the expense of grinding roughage for them is entirely unjustified. Also, cattle seem to bloat less on unground than on ground roughage.

Best pasture not needed.— Slop-fed cattle are sometimes put on pasture. Although pasture is inexpensive roughage, it is also rather bulky, laxative, and high in protein. These three characteristics make an abundance of pasturage not too desirable for slop-fed steers. Usually it pays better to use high-quality pasture for other livestock to which it is better adapted, and to feed cheaper, low protein roughages in balancing the ration of slop-fed steers.

Feeding Value of Slop in Relation to Corn

When whole slop is fed according to the foregoing recommendations a gallon should have a feeding value equal to slightly less than one pound of corn. Settled slop has about ¾ the feeding value of whole slop and thin slop has about half the value of whole slop.

20M—9-42

DISTILLERY SLOP FOR BEEF CATTLE

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating.

For:

U. S. Department of Agriculture
EXTENSION SERVICE
WASHINGTON, D. C.

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Distillery Slop for BEEF CATTLE

- Feeding value
- How to use it in the ration

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service

Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky AI-17 September, 1942

Distillery Slop for Beef Cattle

By W. P. Garrigus and E. S. Good

DISTILLERY SLOP is the material remaining after fermented mash has been distilled for the production of whisky or alcohol from grain. From Kentucky's distilleries come millions of barrels of this byproduct, much of which is used as feed for hogs, beef cattle, sheep, and dairy cattle. With distilleries operating at utmost capacity making alcohol for war uses, the amount of slop available to feeders now is even greater than usual.

Many farmers who feed distillery slop, however, fail to use it to the best advantage. The two most common mistakes in its use are (1) failing to use other feeds with it so as to have an adequate and balanced ration, and (2) hauling the slop so great a distance that the cost (including cost of hauling) is too high for the slop to be an economical feed.

Feed Materials in Slop

In distilling the mash most of the starch is removed but practically all the protein, fat, and fiber of the original grain is left in the slop. Such slop is therefore relatively rich in protein and fat, but poor in starch. When it is produced from a mash containing principally corn it is higher in fat and lower in protein and fiber than when it is made from a mash in which rye or wheat is the chief grain.

Kinds of Slop

There are four kinds of slop: "Whole slop" or "thick slop" is the entire material remaining after distillation. "Thin slop" is that part remaining after the larger particles of whole slop have been strained out to make distillers' dried grains. Thin slop is a thin, whitish liquid. "Evaporated slop," made by evaporating most of the water from thin slop, is a semisolid material. A fourth slop, called "settled slop," and very rarely available at distilleries, is usually prepared on the farm from thin slop. After the

thin slop has settled for a few hours the upper third is skimmed off. The portion that remains is "settled slop."

AVERAGE ANALYSES OF 4 KINDS OF DISTILLERY SLOP FROM MASHES CONTAINING 65 TO 75 PERCENT CORN
(These analyses were made at the Kentucky Agricultural Experiment Station)

	Thin slop	*Settled slop*	*Whole slop*	*Evaporated slop*
Protein	1.3	1.5	2.4	4.8
Fat	0.6	0.6	0.8	2.3
Fiber	0.2	0.3	0.6	0.7
Nitrogen-free extract	1.6	2.0	4.0	7.2
Calcium	.01	.01	.02	.02
Phosphorus	.05	.05	.05	.18
Other ash	.24	.24	.23	.80
Total solids	4.0	4.7	8.1	16.0
Water	96.0	95.3	91.9	84.0
Number of analyses averaged	10	11	5	2

How Much Slop to Feed

A thin, growthy 1,000-pound steer will eat as much as 50 gallons of slop per day if very little other feed is given. Farmers who have fed slop to steers, however, have had best results by feeding no more than 3 or 4 gallons daily per 100 pounds live weight.

Rate of Gain of Steers on Slop

Gains of 3 to 5 pounds daily per steer have been recorded over short feeding periods up to one month. Much of this gain, however, is fill; and the rate of gain decreases during the rest of the feeding period. Average gains for a 4- or 5-month feeding period are 1.5 to 1.75 pounds per head per day. Slop-fed steers gain less during cold weather than during warm weather.

Other Feeds Needed With Slop

Ground limestone needed.— Because of the high phosphorus content of distillery slop, steers on this feed develop a great need and craving for calcium. In experiments at the Kentucky Experiment Station, steers fed distillers' corn dried grains to balance a ration of shelled corn and wheat straw ate nearly twice as much ground limestone per head as similar steers fed cottonseed meal to balance shelled corn and wheat

straw. Since ground limestone is very cheap and steers will eat what they need of it if allowed to do so, it is recommended that clean, dry, fine-ground limestone be made available to them at all times. Slop-fed steers will consume 2 to 3 ounces of it per head per day.

Dry concentrate needed.— Slop is so bulky that most cattle will not produce satisfactory gains on it over a long feeding period, or reach desirable market condition, unless some dry concentrates are added to the ration. When grain is not too high in relation to beef, it will pay to feed 3 to 6 pounds of grain per head daily, in addition to the slop.

Ground yellow ear corn is one of the best dry concentrates because of its high fattening value, its vitamin A content, and the slight binding and bloat-reducing effect of the cob. Don't feed white corn or small grains as the only dry concentrate for more than 2 or 3 months unless the steers have some green forage, for white corn and small grains contain very little vitamin A needed for satisfactory health and eyesight. Wheat for feeding purposes, now available at about 85 percent of the parity price of corn, is a very economical dry concentrate to feed with slop. Ground wheat, hominy feed, hominy meal, and ground rye (if free from ergot) are all about equal to shelled corn, pound for pound, in fattening value. For older steers the best ground barley is worth about 88 percent as much as shelled corn, pound for pound, and ground heavy oats about 80 percent as much.

No high-protein supplement needed.— As distillery slop is itself very high in protein, it is decidedly uneconomical to add protein-supplement feeds to the ration of slop-fed steers. Dry concentrates fed with the slop should be low in protein and high in carbohydrates, or fattening value.

Some roughage should be fed.— Steers fed whole slop should have at least ½ pound of roughage per day per 100 pounds of their weight. Those fed thin slop will need double this allowance. Since the slop provides more than

litter. It should not be allowed to become damp or packed down.

A dry, fluffy, deep litter may be better than one that is shallow but cleaned often, with the necessary disturbance of the chicks. A disease such as coccidiosis makes daily cleaning of the brooder house a necessity. At this time the use of a minimum amount of litter makes frequent cleaning less difficult.

Clean ground.— Put growing chickens on ground not used for any kind of poultry during the past two years. All the work of keeping a brooder house clean is lost by placing the chickens on a range infested with parasite eggs. Provide 3 or 4 ranges, at least 100 yards apart, and use a different one each year. Cultivate (in garden, for example) or mow frequently the ranges not in use. Do not allow weeds, brush, boards, or other trash to accumulate on any poultry range. Trash harbors insects that serve as intermediate hosts for parasites of poultry.

Disposal of dead fowls.— Burn immediately or bury deep the fowls that die. Dead baby chicks may be burned in the brooder stove. Killing and burning all sick chickens often stops a poultry epidemic.

Cleaning the laying house.— Breeding and laying flocks are a constant source of parasites and parasite eggs. Hens and pullets allowed free range void more than 50 percent of the droppings in the house. The house should be cleaned thoroughly and disinfected at intervals of 6 months. (See instructions for cleaning the brooder house.) Spray the house for mites and treat all poultry for lice at these times. More frequent cleaning may be necessary in damp weather.

Water containers and feed hoppers.— Feed hoppers and water containers should of course permit the poultry to get at the feed and water readily, but should prevent poultry from getting into or roosting on them. The water utensils should be set upon wire platforms to prevent litter and droppings from being thrown into the water. Feed and water may be the means of spreading disease. They should therefore be kept clean and free of poultry droppings.

20M—9-42

POULTRY PARASITES

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating.

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POULTRY PARASITES

Control • Prevention

Some points to remember---

- Chicks, when they hatch, are free from parasites.
- Chicks don't get parasites unless they come in contact with the parasites, parasite eggs, or "intermediate hosts."
- Intermediate hosts — flies, grasshoppers, and so on — spread no poultry parasites unless they have had access to droppings from birds having parasites.
- Chickens having parasites are sick chickens, and usually fail to make a complete recovery.
- Poor health, unthriftiness, and unproductiveness of poultry are often directly traceable to parasites or to improper feeding, or both.
- Prevention by proper care, feeding, and management is the best defense against parasites.
- Methods of prevention that are effective against the common parasites of poultry are also effective against other parasites, and are an important aid in controlling most poultry diseases.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service

Thomas P. Cooper, *Dean* and *Director*

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AI-18

Poultry Parasites

By F. E. Hull

Roundworms, tapeworms, lice, and mites cause a continuous loss to poultry raisers, especially among young birds. These parasites cause general unthriftiness, paleness of head and shanks, loss of flesh, diarrhea, or constipation, and loss of appetite in advanced cases. The modern practice of raising large numbers of fowls on small areas has increased the losses from parasites.

Examining Fowls for Worms

The presence of intestinal parasites in a flock can be discovered by examining the intestines of chickens killed for table use. All chickens that die should be examined. Remove the intestines from the dead bird and slit them open with a small knife or a pair of scissors. If the opened intestines are placed in a pan of warm water the smaller worms will be easier to see.

Common Parasites

Roundworms are yellowish-white worms 1 to 4 inches long, found in the intestines of fowls. The mature female worms produce eggs in large numbers which pass in the droppings. When the droppings get into the feed and water of chickens the roundworm eggs often enter the intestines of fowls and hatch worms which mature in 3 or 4 weeks.

Roundworm eggs are resistant to heat, cold, and disinfectants. They may remain on the ground or in the chicken house more than a year and still be capable of producing worms. For this reason, clean the chicken house frequently, and remove the droppings to ground not used by poultry. For chickens known to have roundworms give a tablet or capsule containing nicotine or tetrachlorethylene. These capsules or tablets can be obtained from local veterinarians or from dealers in poultry supplies.

Tapeworms are white, flat, segmented, ribbon-shaped parasites, some so small that it is impossible to see them without a microscope; others larger. The

head of the tapeworm fastens itself to the intestinal wall of the fowl. The last segments are oldest; when mature they contain numerous eggs, break off, and are passed in the droppings. Tapeworm eggs do not cause tapeworms in chickens if the eggs themselves are eaten by the chickens. The tapeworm eggs are eaten by flies, grasshoppers, earthworms, snails, slugs, or beetles, and when these in turn are eaten by chickens the tapeworms that are partly developed in these insects or worms continue their development in the chickens. The flies, grasshoppers, and so on, that eat the tapeworm eggs are called "intermediate hosts." It is not good poultry practice therefore to feed liquid milk, distillery slop, or wet mash in warm weather, because it attracts flies and other intermediate hosts and brings them in contact with poultry droppings.

No effective treatment for tapeworms in poultry is known. Control depends on prevention rather than treatment. This requires a longtime sanitation and poultry management program.

Lice.— Head lice infest baby chicks; body lice and feather lice appear when chickens begin to feather. Lice spend their entire life on the infested fowl and deposit their eggs singly or in clusters on the bases of the feathers. The heat of the chicken's body hatches the eggs in one week, and the lice mature in 10 days. They pass readily from one chicken to another, but they die very quickly when off the fowl.

A 40-percent solution of nicotine sulfate will kill lice. Apply it to the perches half an hour before the birds go to roost, or place a small amount on the feathers below the vent, under each wing, and at the back of the neck.

Sodium fluoride also may be used to kill lice. Apply it by the pinch method or in warm weather by dipping. Use 1 pound of sodium fluoride to 10 gallons of warm water to make the dip. For the pinch method apply a small amount under each wing, under the vent, at the base of the neck, and at the base of the tail. Rub thoroughly to the skin. One treatment will not destroy lice eggs; therefore repeat the treatment 3 times at intervals of 7 days.

Mites.— Poultry serve as hosts for several different kinds of mites. Red mites are found in most flocks. They are blood-sucking parasites that feed almost entirely at night and leave the chickens during the day to hide in the chicken house. They deposit their eggs in cracks and crevices on the perches, ceiling, walls, floor, and nests. Mite eggs hatch in 2 days, and the mites mature in 5 days.

Red mites as well as other poultry mites, are not hard to kill, but it is hard to reach them in their hiding places. The first step is to get rid of the hiding places. Remove loose boards and other unnecessary material from the chicken house.

After cleaning, spray with 1 part kerosene and 3 parts crankcase drainings or with creosote or carbolineum, driving the spray thoroughly into the cracks. Spray ceiling, walls, floor, perches, nests, and any other part of the poultry house that might furnish a hiding place for mites.

Prevention of Parasites

Prevention of parasites requires proper disposal of droppings, clean brooder and laying houses, clean ground, clean water containers and clean feed hoppers. Such a program must continue over a period of years.

Disposal of droppings.— Because the droppings of a fowl having roundworms or tapeworms contain parasite eggs, proper disposal of droppings is essential to good poultry management. Place the droppings in a container such that neither insects nor poultry can get to them. Empty the container in a place remote from the poultry house and yards.

Cleaning the brooder house.— Parasite prevention demands that chicks be kept away from the parasites and their eggs. Clean the brooder house before the chicks arrive and move it to clean ground. Do not use water, disinfectants, or sprays for cleaning the brooder house after the chicks have been placed in it. Dry cleaning by scraping and sweeping is better. Moisture of any kind aids the development of worms, as well as coccidiosis and other diseases. The frequency of cleaning depends upon the condition of the

BETTER FEEDING OF MILK COWS is probably the only hope we have of meeting the goal of *"more milk in 1943!"* Because of labor shortage many farmers will milk fewer cows this winter than last. Unless we have more milk per cow, we shall have less milk in 1943, rather than more. Fortunately, good feeding will not only contribute to our food-for-victory program, but will be profitable for the dairyman this year.

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating.

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For:

AI-19
40M—12-42

WINTER FEEDING GUIDE for Milk Cows

(Winter 1942-43)

Unfold this chart and tack it up over the feed bin, where you can refer to it regularly.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Division
Thomas P. Cooper, *Dean* and *Director*

Let your ROUGHAGE be your GUIDE!

With NON LEGUME roughage

SUCH AS corn silage, shock corn, oat hay, cane, timothy and other grasses, or soybean straw

Feed this GRAIN MIXTURE

Crushed corn and cob	300 lb.
Wheat bran	300
Cottonseed meal	300
Steamed bonemeal	20
Salt	10

Contains

20 percent crude protein
16 percent digestible protein

With MIXED roughage

SUCH AS poor quality legume hay, or nonlegumes mixed with alfalfa, clover, soybean hay, or lespedeza, with or without silage

Feed this GRAIN MIXTURE

Crushed corn and cob	400 lb.
Wheat bran	300
Cottonseed meal	200
Steamed bonemeal	20
Salt	10

Contains

18 percent crude protein
14 percent digestible protein

With LEGUME roughage

SUCH AS excellent alfalfa, clover, lespedeza, or soybean hay, with or without silage

Feed this GRAIN MIXTURE

Crushed corn and cob	500 lb.
Wheat bran	300
Cottonseed meal	200
Steamed bonemeal	20
Salt	10

Contains

16 percent crude protein
12 percent digestible protein

When to feed grain
When 1 pound of butterfat will buy 12 or more pounds of grain, it pays to feed grain regardless of the quality of roughage being fed.

Amount to feed
Feed Jersey or Guernsey cows 1 pound grain for each 3 pounds of milk, or 3 pounds grain for each gallon of milk.
Feed Holsteins, Brown Swiss, or Shorthorns 1 pound grain for each 4 pounds milk, or 2.5 pounds grain for each gallon of milk.

Substitutes for crushed corn and cob
Ground shelled corn can be substituted pound for pound. As much as half of the corn can be replaced pound for pound by barley, wheat, sorghum grain, or hominy feed.

Substitutes for cottonseed meal
Linseed meal, soybean oilmeal, or ground soybeans, pound for pound. Up to three-fourths of oilmeal or ground soybeans may be replaced by 2 pounds distillers' dried grains for each pound of oilmeal.

Prepared by
A. A. SPIELMAN, Extension Dairyman

Substitutes for wheat bran
Oats, alfalfa meal, wheat feed or wheat middlings, pound for pound. One pound of dried brewers' grains will replace 1½ pounds wheat bran.

Feed enough protein
Much grain is wasted by not feeding enough protein. Protein stimulates milk production.

Grind all grain medium fine or coarse. *Do not grind roughages; chopping is better.* Cows are themselves excellent grinders of roughage!

Feed all the roughage the cows will clean up. Use refused hay for bedding or feed it to the horses. One pound of hay equals three pounds of corn silage.

Green leafy hay or winter pasture is needed to supply vitamin A, necessary for normal reproduction and birth of healthy calves.

Water—
A cow needs 10 to 12 gallons of water every day.

Feed dry cows grain
Dry cows need little protein. Feed them enough low-protein grain mixture and bonemeal to have them in good condition when they freshen.

Lexington, Kentucky
December, 1942

vent accumulation of filth. Feed all feed from hoppers and not on the ground. Use water containers that chickens cannot get into. Don't feed milk to growing chickens in the summer, as it draws flies and they are spreaders of the chicken tapeworm.

Lice can be controlled by dusting the hens with sodium fluoride or treating the roost poles with nicotine sulphate. To kill mites use old crankcase oil and kerosene on the roost poles and in cracks and crevices around the roosting quarters.

Cull Hens That Don't Lay

Hens which quit laying in June, July, and August should be culled and either eaten, canned, or sold. Culling reduces the feed cost and increases the profit. The nonlayers of the yellow-skin breeds can be recognized by their yellow beaks and wilted combs.

How to Preserve Eggs

To preserve eggs when they are plentiful, for use in the fall or winter when production may be low—

1. Select a 5-gallon crock, wash thoroughly, and scald. (Half-gallon jars can be used instead.)
2. Boil water; when cool put 9 quarts in the crock.
3. Add 1 quart of water glass and stir thoroughly.
4. Place eggs in the crock and put in a cool place. Allow 2 inches of water glass solution to cover the eggs. If there are not enough eggs available at one time, they may be added from time to time.
5. As needed, to offset evaporation, add boiled water which has been allowed to cool.

Hatching and Brooding With Hens

There are many advantages in buying chicks and raising them with a brooder. However, the following suggestions are given for those who use hens:

1. Use a clean nest, free from mites and well bedded.
2. Dust the hen with sodium fluoride or a good louse powder before the eggs are placed under her and again about 10 days after she has been set.
3. Don't dust the chicks until they are full feathered.
4. Use a coop which is rat proof, clean, movable, and has a floor in it. One hen can brood 30 chicks.
5. Feed the chicks as suggested in this leaflet.

THIS FOLDER was prepared by the Poultry Department of the College of Agriculture and Home Economics, and is given to you by

who has voluntarily agreed to bring this and other important war information to families in your neighborhood.

500M—1-43

Chickens and Eggs for Home Use

EVERY FARM FAMILY and many village families will want to keep enough chickens to produce the eggs and some of the meat needed for the family. With good care a flock of 5 hens or pullets for each member of the family will produce enough eggs. To keep up a flock of this size and to provide poultry meat, start 15 chicks in the spring, for each member of the family. For both eggs and meat, such breeds as Barred Rocks, White Rocks, Rhode Island Reds, or New Hampshires are best. Suggestions for taking proper care of the growing chicks and the laying hens are given in this folder.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service
Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky AI-20 January, 1943

Buying and Starting the Chicks

Start chicks in March or early April. Buy them from a reliable hatchery close to home.

It is best to brood early chicks in a brooder. The homemade lamp or lantern brooder is excellent for 75 or fewer chicks. It is easy to build and operates at low cost. (Ask your county agent for a plan for building this brooder.) A brick brooder may be used if a house 10 x 12 feet is available.

Start the brooder 2 days before getting the chicks. A temperature of 90° to 95° is best. Watch the chicks to see that they are comfortable. Gradually reduce the temperature about 5° a week for 4 or 5 weeks.

Feeding the Chicks

Feed the chicks as soon as they are put in the brooder. Feed a good chick starter mash for at least four weeks. See that they have plenty of water. As soon as the chicks are allowed range and sunshine, use one of the following methods of feeding until the chicks are 12 weeks old. By "self-feeding" is meant to keep the feed before the chickens *all the time,* so that they can eat all they want whenever they want it.

1. Self-feed cracked corn or cracked corn and wheat, soybean meal (add 1 lb salt and 8 lb steamed bonemeal to each 50 lb), water, and green feed.
2. Self-feed commercially prepared supplement (26-32 percent protein), grain, water, and green feed.
3. Self-feed regular grower mash, grain, water, and green feed.

Feeding the Growing Stock

From the 12th week until the 26th week, feed the growing pullets one of the foregoing three rations, with whole corn instead of cracked corn.

Feeding the Laying Hens

If hens are to lay as many eggs as they should, they must be fed for egg production. The following methods are recommended, with green feed in addition.

1. Self-feed, in different hoppers, skimmilk or buttermilk and yellow corn.
2. Self-feed a mash made of 37 lb ground yellow corn, 40 lb soybean meal, 10 lb alfalfa leaf meal, 9 lb steamed bonemeal, 2 lb ground limestone and 1 lb salt. Self-feed this mash with yellow corn.
3. Self-feed a commercially prepared protein supplement (26-32 percent) with yellow corn.
4. Feed a commercial laying mash with corn.

Whatever the ration, see that the hens get green feed. Alfalfa and bluegrass are most reliable the year round. A patch of rye, wheat, barley, or oats will help. In winter, feed green leafy alfalfa or lespedeza hay.

Also, with all the above rations, self-feed oystershell, or coarse-ground limestone, and water. The ground limestone pieces should be about the size of a grain of corn.

Some further suggestions on feeding hens:

1. Provide plenty of feeder space — 1 inch for each chick; 2 inches for each growing bird, 4 to 24 weeks; and 3 inches for each hen.
2. Supply plenty of fresh clean water.
3. Don't change the hens from one ration to another, but choose a good one and stay with it.
4. Plenty of green feed aids greatly in growth, egg production, and economy in feeding.

Make the House Comfortable

A comfortable, well-arranged laying house keeps the flock in good condition and requires less labor to keep clean. Old houses may be remodeled or unused sheds may be used. The building should be tight on three sides, with ventilation provided by an opening in the south or east side. Some suggestions—

1. Don't overcrowd the house. Allow 3½ to 4 square feet of floor space per hen.
2. Provide 8 to 10 inches of roosting space per hen.
3. Place windows on the south side for light.
4. Have 1 square foot of open screen front for each 10 square feet of floor space, for ventilation.
5. Make a dropping pit — for less labor and a healthier flock.
6. Stop drafts by stripping the cracks. Stack fodder around the house in winter.
7. Provide 1 nest for each 4 hens. Orange crates are good.
8. When adding to the house, make it deep from front to back.
9. If the roof is high, add a straw loft 7 feet above the floor.
10. Use a deep litter of straw, planer shavings, or shredded fodder on the floor.

Keep the Flock Healthy

Careful management will help to keep death losses low. Wherever possible keep the young chickens and old hens away from each other. Don't feed young chickens in yards or runs where the old hens are. Cull and destroy any sick chickens as soon as noticed. A screened dropping pit or dropping board will keep the hens from working in the droppings. Clean the laying house and brooder house often enough to pre-

tankage or 16 percent of oilmeal should be added when the pigs are a month old.

Male pigs should be castrated when 4 to 6 weeks old. There is much less shock to the pig when the operation is done at this time.

Vaccinate against hog cholera 10 to 15 days after weaning. Immunity is more lasting then than later, the pigs are easier to handle, there is less danger of losses, and it is less expensive.

Pigs should be allowed to nurse the sow 8 weeks.

Balanced Feeding is Profitable

Even when supplements are scarce and high in price it is not economical to feed corn alone. Hogs fed corn alone in drylot need about 12 bushels of corn to make 100 pounds of gain, while 45 pounds of soybean oilmeal and about 7 bushels of corn produce an equal gain in one-third less time. This means that in drylot 100 pounds of soybean oilmeal replaces 625 pounds of corn. To hogs on pasture, 100 pounds of soybean oilmeal saves 350 pounds of corn.

Skimmilk is an excellent source of protein. Daily allowances of ½ gallon per pig on pasture and 1 gallon per pig in the drylot furnish enough protein to balance the deficiencies of farm grains.

All the oilmeals (plant proteins) are low in calcium and salt, and therefore a simple mineral should always be fed with them. Soybean oilmeal when fed free choice with corn or other grain should have 20 percent of mineral (see page 3, mineral recommended for sows) mixed with it to prevent the pigs eating too much. Linseed meal probably does the poorest job of balancing corn, but it is a good feed to use with other proteins. Cottonseed meal is poisonous to hogs when fed as the only protein, but it is safe when it is not over 9 percent of the total feed. More than 14 percent of soybeans in a ration produces soft pork. Fifteen to 16 percent of plant protein is necessary to balance corn. Generally two or more plant proteins in combination give better results than any one used alone.

Hogging-Off Corn Saves Labor

Fifteen shotes weighing 100 to 150 pounds harvest 50 bushels of corn in about 30 days. Protein supplement, minerals, water, and shade should not be overlooked when hogging-off corn.

Self-Feeding Saves Labor and Produces Faster, More Profitable Gains

Pigs can balance their own ration when allowed a choice of various feeds, better than any man can balance it for them. Also there are fewer runts among self-fed pigs because each pig has a better chance to get a full share of feed. Self-fed pigs usually gain faster and require less feed for 100 pounds of gain than hand-fed pigs.

Good Pasture Saves Grain and Supplement

One acre of alfalfa, clover, or lespedeza pastured to capacity takes the place of about 1000 pounds of grain and 500 pounds of protein supplement. Some protein supplement is needed with pasture, however, for full-fed pigs will not eat enough forage to balance their ration no matter how palatable it is. The addition of protein supplement to a ration of corn and good pasture not only saves corn but it puts the hogs on the market sooner.

Fresh Water and Shade are Important

Water is the cheapest raw material in pork production. A pig needs 1 to 2 gallons every day. Unless fresh water is available in the lot, an automatic waterer is recommended.

Pigs also need shade. Tree shade is best, but if there is none use old boards or woven wire over several posts and cover with weeds or straw.

Feed to 250 Pounds or More

As medium-type hogs make efficient gains up to 300 pounds it is profitable to feed to heavier weights so long as prices of feed and hogs are favorable. Feeding to heavier weights also reduces labor requirements for a given tonnage of pork.

For more details consult your County Agricultural Agent.

Lexington, Kentucky January, 1943

Cooperative Extension Work in Agriculture and Home Economics: College of Agriculture and Home Economics, University of Kentucky, and the United States Department of Agriculture, cooperating, Thomas P. Cooper, *Director*. Issued in furtherance of the Acts of May 8 and June 30, 1914.

200M—1-43

One-third

MORE PORK

with the SAME FEED and LABOR

- Keep the pigs healthy
- Self-feed balanced rations
- Provide water and shade
- Use good legume pasture
- Vaccinate against cholera
- Feed to heavier weights
- Use good breeding stock
- Raise 2 litters per sow

FOR 1944—The fundamental hog-raising practices described in this leaflet are even more important this year than last, because of shorter feed supplies. Feeding to weights above 220 pounds, however, is not recommended this year, because of feed shortage and the narrow feeding ratio.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service
Thomas P. Cooper, *Dean* and *Director*
AI-21

One-Third More Pork with the Same Feed and Labor

By R. W. Pifer

By better feeding and management, Kentucky farmers can raise 8 pigs to the litter instead of the usual six. By so doing they will furnish one-third more pork to feed our fighting men, civilians, and allies. They will also greatly increase their profits, for the cost of feed, labor, and equipment needed to raise the 8 pigs by following the proved methods in this leaflet would be little if any more than that needed to raise the six.

Good Breeding Stock Pays

Gilts and boars for seed stock should be selected on individuality, ancestry, and feeding ability. Both should be meaty, with good feeder-type head, smooth shoulders, strong back, deep, smooth sides of medium length, wide back and loin, deep bulging hams, straight legs of medium length, and strong pasterns. Sows should be gentle and should have 10 or more well-developed teats.

Only the most rapid-gaining animals from well-suckled litters of 8 or more pigs saved should be considered for breeding purposes. Too many times the best-doing pigs of the litter are sold for slaughter and the smaller, slower-gaining animals kept for the breeding herd. This is a mistake and results in a less productive strain of hogs.

Mature brood sows farrow more and heavier pigs, and grow their pigs slightly faster than gilts or yearling sows. Mating late the second day of the heat period results in larger litters than breeding the first day. Breed each sow for two litters a year.

Well-Kept Sows Produce Better Pigs

Pigs are larger and more vigorous at birth when the sows and gilts are kept in medium flesh and gain 80 to 100 pounds during pregnancy. Pregnant sows and gilts should receive 1/4 to 1/3 pound of protein supplement daily. Mix 5 pounds of tankage or 8 pounds of soybean oilmeal or soybeans or other plant protein with 1 bushel of ground barley or ground oats or 75 pounds of wheat middlings, and feed 2 to 2½ pounds per sow daily. In addition feed up to 6 ears

of yellow corn daily, depending on the condition of the sow. Feed a little more the last 6 weeks than the first 10 weeks of pregnancy. Keep water, salt and a simple mineral mixture where the sows can get it any time they want it. To make a good mineral mixture, mix 40 pounds fine-ground limestone, 40 pounds bonemeal, and 20 pounds salt, or 80 pounds limestone and 20 pounds salt, and keep it before the sows.

When there is no pasture or it is poor in quality, feed alfalfa or other legume hay in a rack.

Locate the sleeping quarters 35 rods or more from the place the sows are fed and watered, to make sure the sows get enough exercise.

Healthy Pigs Make Wealthy Farmers

Pigs raised the "healthy" way average 2 more pigs marketed per litter, use 20 percent less feed, and go to market 8 weeks younger, weighing about 20 pounds more than pigs raised the "wormy" way.

The greatest single cause of unhealthy pigs is the common roundworm. Sows kept in permanent hoglots carry millions of worm eggs on their udders. Unless the sow is thoroughly washed and put in clean quarters at farrowing time, the little pigs get hundreds of worm eggs along with their first mouthful of milk. These eggs soon hatch and the young worms first damage the liver and lungs. Soon the pig is coughing; he has rough, harsh hair, a straight tail, and a general lack of thriftiness. At the time the pig is coughing, which usually begins before weaning, the worms are crawling up the windpipe into the mouth. From the mouth they are swallowed and pass into the intestines where they quickly develop into mature roundworms slightly larger than a new lead pencil.

Worm damage can be prevented. To do so, four simple jobs must be done. FIRST, clean the farrowing quarters of litter and dirt, and scrub them with boiling water and lye (1 pound of lye to 30 gallons of water). If the house is movable, take it to a lot which has not been used for hogs for at least 2 years or has been plowed and seeded since last used for hogs. SECOND, wash the brood sow before putting her in the farrowing pen. Wash the udder and legs thoroughly with soap and warm water. THIRD, *don't drive* the sow and pigs from the clean farrowing quarters to pasture, but *haul* them to keep them from picking up worm eggs on the way. FOURTH,

keep the little pigs on clean ground away from permanent hoglots until they are at least 4 months old.

It Pays To Be Prepared for Farrowing

Make individual farrowing houses comfortable in cold weather by banking with fodder or strawy manure, or by hanging a lantern inside. Chaff is better than long straw for bedding. Pig hovers nailed across one corner 12 inches from the floor make a good place for pigs to get under to nest. Slope the floor slightly toward the hover so the pigs will find it at once.

Don't disturb a farrowing sow when everything is going well. Pigs weak at birth can often be saved by holding them to the teat until they get some warm milk. Chilled pigs may be saved by putting them in a barrel or basket in the center of which is placed a jug of hot water or a hot brick.

Cut the sow's grain ration in half 3 days before farrowing and add to it 2 double handfuls of wheat bran. The day the sow farrows, she should not have any grain but should have all the water she wants. The 2d and 3d days after farrowing, feed 1 double handful of either wheat middlings, ground wheat, ground oats or ground barley each feeding; the 4th and 5th days, feed 2 double handfuls each feeding; the 6th and 7th days, 3 double handfuls each feeding. Beginning on the 8th day, add an ear or so of corn and a single handful of good protein supplement or ½ gallon of skimmilk. Gradually increase the amount of feed until the sow is getting daily 1 gallon of ground feed, 1 pint of protein feed or 1½ gallons of skimmilk, all the corn she will eat, and salt.

Little Pigs Respond to Good Care

Little pigs need to get their noses into soil by the time they are 1 week old. If weather prevents turning pigs out at this early age, throw a piece of clean sod into the pen each day. This prevents anemia—a condition frequently called "thumps."

By the time the pigs are 2 weeks old they should have a grain mixture in a shallow trough or feeder placed inside a pig creep. For this purpose 70 pounds of coarse-ground yellow corn and 20 pounds of coarse-ground wheat or wheat middlings is very satisfactory. Protein supplement is not needed at this age; if they get it there is danger of scouring. Ten percent of

Other leaflets and circulars on insects and gardening

Further information on gardening and control of garden insects can be obtained from the following Kentucky extension circulars:

Control Measures for Common Garden Insects -- Cir. 359

The Vegetable Garden, Month by Month -- Cir. 376

The Mexican Bean Beetle -- Cir. 257

For these Circulars see the agricultural or home demonstration agent in your county, or write to the --

College of Agriculture and Home Economics, Lexington

Lexington, Kentucky May, 1942

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Ent. 1

Control of

STRIPED CUCUMBER BEETLE

on

Cucumbers
Squashes
Melons
Beans

UNIVERSITY OF KENTUCKY

College of Agriculture
and Home Economics
Extension Service

Thomas P. Cooper
Dean and Director

STRIPED CUCUMBER BEETLE

By W. A. Price

The striped cucumber beetle, sometimes called the striped bug, melon bug, or "cuke bug" is found thruout Kentucky. As the name implies, it is a striped, hard-shelled insect. The general color is yellow, and there are three black stripes on the back. The full-grown insect is about ¼ inch in length

Damage to crops

The adult beetles live thru the winter in trash or brush, and are among the first insects in spring to start feeding on green plants in the field. As soon as their favorite food plants (squashes, melons, beans, and cucumbers) appear above ground, they transfer their attacks to them. So eager are they to feed on these plants that they often burrow into the ground to meet the young plant coming thru the soil. Here they lay eggs from which hatch the larvae that feed on the underground parts of the plant. The larvae become full grown in 5 or 6 weeks. There are two or more generations each year, and the beetles of the last generation feed on the flowers and fruits of the crops mentioned above

Entire stands of melons, beans, squashes, or cucumbers are sometimes destroyed in a few days by these beetles or their larvae. In addition to feeding on the crops, the beetles spread plant diseases such as mosaic and wilt, that may be as destructive as the feeding habits of the beetles.

Method of control

Control must begin before the beetles enter the ground to lay their eggs and feed on the young plants pushing thru. Poison dust is the best control material for these beetles and their larvae.

When the soil begins to heave and form cracks where the seedlings are going to come thru, dust the hills with a well-mixed dust made of 1 part calcium arsenate and 9 parts of a neutral powder, such as gypsum, or "Gypsum hard-coat plaster." If the hair is screened out of building plaster, a gypsum powder remains which can be used for the purpose. Calcium arsenate is a POISON. The mixture should be labeled and kept out of the reach of livestock and children.

A handy way to apply the dust is to put it in a gunny sack and shake the sack lightly over the hill

Beginning before the plants can be seen, when they begin to heave the soil, dust the hills every 3 or 4 days, at least until the vines begin spreading over the ground. During rainy weather more applications are needed, as the dust is washed off by the rain. Often 15 or 20 applications are necessary.

How to Rid Fields of Broom Sedge

Feed the good grass. — Burning does not kill broom sedge. After burning it comes back stronger than ever and crowds out valuable grasses. When lime and phosphate are applied to most soils forage plants grow vigorously and drive out the sedge.

Mow before broom sedge seeds. — Mowing pastures before broom sedge has seeded helps get rid of this weed. Cut sedge is good for "galled spots" and for bedding.

Don't burn fields. — Burned pastures "green up" in the spring and temporarily fatten stock more quickly than pastures not burned off. However, during July and August cattle will usually be found grazing on pasture not burned because the soil contains more moisture and therefore more plant food in the grasses. Best farmers never "burn off" a meadow.

Plow under sedge. — Broom sedge can also be destroyed by turning it under with a heavy plow. Given sufficient time, it decays and improves the soil with organic matter. Plant decay is nature's way of building up soil.

How to Keep Fires Down

1. **Initiative.** — When fire is located be the first one to help in putting it out, even if it isn't on your land; the next one may be.

2. **Organization.** — Keep your community organized into a volunteer fire-fighting crew.

3. **Education.** — Talk the fire situation over with your neighbor. Do this until you are certain all your neighbors are informed about the damage done by fires and the methods of fire control. Agree how you will help each other in case of fire.

4. **Determination.** — Ninety-nine percent of our fires are caused by man. Few fires will start if a community is determined to prevent them. Those that start will be quickly extinguished.

Penalty for Private Use to Avoid Payment of Postage, $300

U. S. Department of Agriculture
EXTENSION SERVICE
WASHINGTON, D. C.

OFFICIAL BUSINESS

For:

STOP FIRES IN WOODS AND FIELDS

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating.

50M—1-43

STOP FIRES
in Woods and Fields

Suggestions on preventing and controlling fires

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service
Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky F-1 January, 1943

Stop Fires in Woods and Fields

By W. E. Jackson, Field Agent in Forestry

When Burning Brush

1. **Pile brush.**— Put brush in small piles at a safe distance from woods and fences.

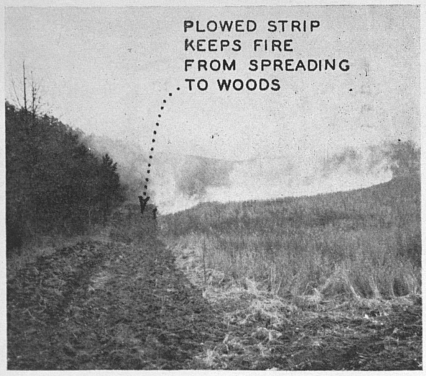
2. **Clear strips.**— Plow clean strip all around field wide enough to keep fire from getting out of control.

3. **Have tools and help.**— For an emergency have rakes, axes, shovels, and water ready. Call neighbors if needed.

4. **Burn into wind.**— Test wind by firing a small pile. Start brush pile on uphill side of field. Fire only as many piles at one time as you know you can control.

5. **Put fire out before leaving.**— Keep one man on job until every spark is out.

6. **Select a quiet, moist day.**— Burn after 4 p.m. when air moisture is increasing. Don't burn in a strong wind. Be particularly careful during the fire months—March, April, October, and November—when there are strong winds and much dry matter on the ground.



Forest Fires and Lumber

Destruction of lumber. — Wood is one of the chief materials in houses, barns, furniture, and farm implements. Trees supply this material. Fires in woodlands destroy many trees, stunt the growth of others, and prevent their normal development. When fires burn in the woods a potential home is in flames; it may be your home, your children's or your grandchildren's.

Poor grades of lumber. — Thousands of trees in Kentucky would have made valuable timber if they had not been stump-scorched while small. Many fire-scorched trees heal over if not continually burned but the inside of such trees never heals up. Diseased and inferior, they yield a reduced amount of sound wood.

High prices of lumber. — Except for the past two years homes were built and furnished at reasonable cost because of the moderate price of lumber. Today because of an actual shortage of timber, lumber prices are going up. Fires in wood and forest have been the one great cause of this shortage and therefore of the scarcity of lumber. As scarcity increases prices will advance.

Growing trees for lumber. — Never graze woodlands. Grasses among trees, due to the absence of sunlight, have little food value. Timber grows better when livestock are kept away from it. Burning woodlands increases soil erosion especially when the woodlands are on hillsides. Repeated burning and grazing causes sprout growth, destroys tree seedlings, and damages mature trees. Give the woodlands a chance to produce the best lumber.

What Fire Destroys in Woods and Fields

1. Destroys grass, tree seeds, and seedlings.
2. Destroys nature's mulch of decayed plant growth. Mulch prevents the sun from drying water out of the soil and protects roots of young plants from freezing out the first winter. It also slows the runoff of water and therefore helps to prevent erosion and the loss of rich top soil.
3. Destroys the home of wild life that scatter and plant many valuable seeds.
4. Destroys fences, crops, timber, and often farm buildings.
5. Destroys grass seed and allows the heavier, earlier maturing weed seed to become embedded in the soil, where safe from fire it eventually takes the pasture.

Plant adapted varieties.—The use of adapted hybrid seed corn; adapted frost-resistant barley; adapted native clover seed, and many other seed selections may be even better economy now than when labor costs are normal.

Labor-saving machinery.—Wherever practical, more machine work and less hand work should be done, especially in seeding, planting, cultivating, and harvesting. Farmers should be cautious, however, about purchasing more equipment. Power machinery and parts for repairs, as well as fuel and oil, are becoming more expensive and difficult to obtain. Difficulty of obtaining new power equipment and the higher prices of such equipment justify the hiring of machine work done and more repairing of the old machinery to keep it usable. Hiring custom power work tends to employ more fully the tractors and harvesters that are available, and also leaves more time for other jobs. To keep all machinery well oiled and cared for is important in avoiding delays. The outright purchase of some tools with an old one traded in or discarded will result in a net gain in some instances. Caution and judgment should rule all such adjustments.

4. Recruit additional labor from schoolboys, girls, women and others not now considered farm laborers; and work more days per month and more hours per day.

Many farmers can readily recall the shifts that were made to obtain farm workers during the last war. Both youths and adults gave up hours of leisure or days of vacation as part of the price to be paid for farm and national security. Keeping the children well employed, but not overworked, will save labor on many farms, and is at the same time better for the boys and girls than too much idleness or lack of responsibility.

The operator or landlord who has felt that his job was largely overseeing the other workers may well find that it is to his advantage, out of necessity, to "make a hand" more of the time. Many farmers can save time by going to the store or shop less frequently, by using the home shop rather than the one at a distance, and by making more of the necessary purchases at one trip.

By keeping in touch with the State Employment Service, extension workers, and other agencies, farmers can often find out where additional farm workers may be found.

Lexington, Kentucky December, 1941

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25M—12-41

POUNDS OF TOTAL DIGESTIBLE NUTRIENTS PRODUCED PER ACRE AND PER DAY OF MAN LABOR

Crop	Pounds of digestible nutrients per acre (with given yields)			Pounds of digestible nutrients per day of man labor		
	Low yield	Medium yield	High yield	Low yield	Medium yield	High yield
Alfalfa hay	1509 (1.5 T.)	2414 (2.4 T.)	4024 (4.0 T.)	943	1207	1677
Lespedeza hay	731 (.7 T.)	1253 (1.2 T.)	1879 (1.8 T.)	731	1139	1565
Clover hay	623 (.6 T.)	1246 (1.2 T.)	2284 (2.2 T.)	692	1132	1757
Grass hay	500 (.5 T.)	1000 (1.0 T.)	1500 (1.5 T.)	625	1000	1363
Corn (grain)	993 (22 bu.)	1580 (35 bu.)	2257 (50 bu.)	414	585	728
Barley	567 (15 bu.)	1058 (28 bu.)	1700 (45 bu.)	567	962	1417
Oats	392 (18 bu.)	696 (32 bu.)	1088 (50 bu.)	392	580	777
Wheat	351 (7 bu.)	552 (11 bu.)	903 (18 bu.)	439	613	903
Corn (stover and grain)	1639 (.7 T.) (22 bu.)	2689 (1.2 T.) (35 bu.)	3735 (1.6 T) (50 bu.)	482	708	869
Silage (corn)	1740 (5.0 T.)	2436 (7.0 T.)	3480 (10.0 T.)	544	696	870

These figures were computed from yields and labor requirements as shown by records of farmers and experiments made by the Kentucky Agricultural Experiment Station. The TDN units were computed from *Feeds and Feeding* by F. B. Morrison. Also see *Feeding Dairy Cows*, Kentucky Agricultural Extension Circular 364.

FE—1

FARM LABOR ADJUSTMENTS

Made Necessary by National Defense

Saving labor and costs

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Extension Service

Farm Labor Adjustments

By Roy E. Proctor

Shortage of labor is likely to be felt on many Kentucky farms in 1942, at the same time that the Food-for-Defense program will put heavier demands on farming for an increase in production of certain foods, especially milk, eggs, pork, and some vegetables. Unless suitable adjustments are made to offset the scarcity of labor, *total* farm production will very likely fall off as the supply of farm labor declines. Farmers who have less labor available can expect higher income as a result of the greater demand for their products, *only if all available labor is used efficiently and on the right crops and livestock enterprises.*

CHOICES OPEN

Farmers will do well to anticipate such labor shortage as they are likely to face, and to guard against the ill effects, so far as possible. One or more of the following courses may be taken:

1. Reduce the acreage of harvested crops and the number of livestock.

With the probability that prices of some farm products will go higher, and with calls for substantial increases in production of many items urgent for defense needs, it would seem very short-sighted of a farmer to make a uniform reduction in all his enterprises.

2. Reduce production or refrain from increasing production in less-important enterprises while maintaining or increasing production in those more important.

If reduction somewhere along the line seems necessary, the enterprises to be reduced should be carefully selected. Likewise those to be expanded should be selected with care. In reorganizing his farm to meet the defense needs, a farmer should consider (a) the products most urgently needed in the Food-for-Defense program, and (b) the enterprises that offer the greatest return for labor and other effort put into them. These two standards may oppose

each other at some points, but by careful management most of the conflicts that are likely to arise can be avoided.

Dairying.—Among the various farm enterprises, dairying is being pushed in the present emergency, and should therefore continue to be profitable. Accordingly, labor should not be taken from actual milking and caring for good dairy cows. Saving of labor should rather be made by better care and feeding of the best cows so as to increase production per cow and per worker; and by choice of the feeds to grow for the dairy herd and all other livestock. A table is presented on pages 5 and 6 of this leaflet to help farmers choose which feeds to produce. There should be no delay in selling unprofitable cows.

Feed crops.—Substitution of winter-resistant barley for corn on highly productive land will give a better distribution of labor over the year and produce more feed per day of labor. Wheat or other small-grain pasture in winter or spring saves much corn and commercial feed and requires very little labor per unit of feed. More clover and alfalfa can well be seeded to replace a larger acreage of less productive hay and thereby assure the production of more feed per day's labor and per acre of land. The acreage now in grass hays can be pastured with the least amount of labor. In all areas, hay provides more feed per day of work than any grain crop. Labor on livestock production can therefore be saved whenever more pasture and hay can be substituted for part of the grain in the ration. Caution is needed, however, so as not to carry this process of substitution so far as to reduce net income.

Where shortage of labor prevents expanding production on additional acres, a farmer can frequently increase returns from labor by adding fertilizer more liberally on the better crop land and leaving the less productive land in hay and pasture. Silage provides more feed *per acre* than most other crops, but hay or barley provides more feed *per day of man labor* than silage, as is shown in the table on pages 5 and 6. Silage made from corn, grasses, or legumes is such a succulent feed that its production for dairy cattle should be continued where sufficient labor is available.

Beef cattle and sheep.—Reducing a sheep flock or beef herd saves very little labor except in production of the grain they need. However, it would appear to be profitable at this time to cull the beef breeding herds more closely than usual. Some feed and labor will thus be saved for hogs and dairy cattle; and there is an immediate need to send more beef animals to market, some of them at younger ages than usual.

Hogs and poultry.—Total production of pork, eggs, and poultry can be increased by very little additional labor, by more liberal feeding, by better sanitation practices, and the use of self-feeders. Laying hens may be culled later than usual, and hogs fed to heavier weights.

Improvements and equipment. — Other places to save labor by retrenching here and expanding there, have to do with improvements and equipment. At the present time it may be wise, in many instances, to avoid the excessive costs of new improvements and equipment, keeping the old buildings, fences, and machinery in usable condition. Usually less labor is required to patch a roof than to put on a new one. After the present emergency both building material and wages will probably be cheaper. Temporarily some of the stone moving and brush cutting from low-valued fields may be delayed in order to devote the available labor to more productive work. The less important "jobs" may well be saved until farm laborers return to the farm.

3. Adopt improved methods; more machinery; improved varieties; and more timely and efficient practices so that production is maintained or increased in spite of labor shortage.

Plan the farm work.—Where getting the work done more efficiently is the answer to the labor-shortage problem, methods of production, varieties of crops, and kinds of equipment need to be evaluated. Perhaps the most effective way each farmer can solve his labor problems any year, whether labor is scarce or abundant, is to plan and systematize his farm work so that each worker can accomplish more in a day than he had been accomplishing.

As we have already said, some communities have interest groups (such as Parent-Teacher Associations, Homemakers clubs, 4-H clubs, service clubs, and the like) as well as neighborhoods. Then too there are institutions such as churches and schools; there are businesses such as stores; services such as those of doctors and lawyers; state and national agencies with paid workers or directors; various occupational groupings such as farm owners. renters, hired workers, storekeepers, teachers and the like.

For a rural community in the open country, it is sometimes best to organize only on the neighborhood basis. For nearly every community, it is well to begin an organization in this way.

If, as in a community with a town center, there are interest groups, institutions, special services and agencies, it may be well also to provide for their representation in the community organization. If so, care must be taken that representation is complete, and no groups are omitted.

If community organization is meant to spread knowledge widely among all people, or to get people to have more common opinions, or to pass along to people outside the community the word about how this community feels and believes, it may be that organization on the basis of neighborhoods will be sufficient. If community organization is meant to start or carry on action involving what other interest groups, businesses, agencies, and institutions are doing, it will be necessary to include them in the organization, along with neighborhood leaders. The choice will depend upon the kind of community and the purpose of the organization. A county-wide organization, being larger than the community organization, will need to be composed of both community leaders and special-group delegates.

Rural neighborhood and community mobilization is a duty in war and an effective aid in peace. In its success or failure rests much of the future of the American way of life.

There are an almost endless number of things to be done! Nutritional programs must be furthered, welfare needs must be met, crops must be harvested in the face of labor shortages, there must be campaigns to reduce waste, to sell defense stamps or bonds, to collect needed war material, funds must be raised for important causes, transportation facilities and manpower must be conserved and used wisely, neighbors must help each other to withstand the strain of increasing sacrifice, people must be helped to understand the nature of the war and our destiny in it, and above all there must be thinking and planning for the great peace to come. The need for community organization was never greater that it is now.

Lexington, Kentucky May, 1942

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FE-2

RURAL NEIGHBORHOOD AND COMMUNITY MOBILIZATION FOR HOME DEFENSE

UNIVERSITY OF KENTUCKY

College of Agriculture
and Home Economics
Extension Service

Thomas P. Cooper
Dean and Director

RURAL NEIGHBORHOOD AND COMMUNITY MOBILIZATION FOR HOME DEFENSE

By Howard W. Beers

In this time of national crisis skillful organization of our communities is necessary to get the many things done that must be done.

This leaflet tells how to go about the preliminary work of setting up an effective community organization: locating the neighborhoods and communities, finding who are the leaders, recognizing special problems that may determine the success or failure of the organization.

Finding the Neighborhood

Some people think a rural community is the same as a town, a voting precinct or a magisterial district, a mail route or a school district. This usually is not true. The boundary of a community is not a fence nor a legal line. A community exists only in the minds of the people. It represents their customary ways of associating with one another. Each community is different from every other one. A knowledge of relationships in any community is a prerequisite to its skillful organization.

To get this knowledge it is necessary to discover the neighborhoods and their leaders, for these two factors constitute the vital parts of the community. In the search for them one should guard against the feeling that they are so easily seen as to be generally recognized. Such an attitude shuts out any chance of discovering new knowledge. In each neighborhood inquire about its geographic extent. With a map in hand ask, for example, "Which family here on Ridge Road do you consider the last one before you reach the next neighborhood?" In this way you can discover and can indicate on your map the boundaries of each neighborhood.

The rural community is usually made up of more than one neighborhood. Ask the people in each one "With what other neighborhoods does your neighborhood have the most in common?" In this way you can discover what neighborhoods taken together form a community. Sometimes the community is a small town surrounded by country neighborhoods. In 14 Kentucky counties recently studied, 170 communities were found. There was an average of 4.8 neighborhoods per community.

Finding the Leaders

In each neighborhood ask several people, "What neighbors would you select to represent in public meetings your own situation and opinion about farm production, marketing, public policy, and such matters?" You may wish to specify other things. In this way you can discover the names of the actual leaders in each neighborhood.

Relation of Interest Groups to Neighborhoods

Some people think rural life no longer operates on a neighborhood basis. They say good roads and automobiles have destroyed neighborhoods because, with these opportunities for travel, people, instead of visiting their neighbors, go anywhere their interests lead them. They say interest groups (that is, clubs, special organizations, etc.) have replaced neighborhoods in rural social life. In some places this has happened, at least to some degree. But usually a rural community has both neighborhoods and interest groups. In a recent study of 14 counties in Kentucky, 830 neighborhoods were found. No county had fewer than 24; one county as many as 165. Some neighborhoods had only about 25 families; few had more than 75 families. During the war in which we are now engaged the use of the automobile will decline. People everywhere will rely more upon their own homes and neighborhoods. Even tho the appearance of interest groups has affected rural life greatly in some places, many neighborhoods will be doubly important during the war.

Special Problems

Communities are like people; no two are exactly alike. Hence any effort at community organization is likely to involve one or two special problems that may not be forseen. In some cases neighborhood boundaries may seem hard to find, families may divide their association among two or more neighborhoods, some neighborhoods will seem weak and some strong, good roads may tie some neighborhoods more closely than others to a community center. Leaders in an isolated neighborhood may attend community meetings only rarely. The building of a highway, the closing of a school, the establishment of a new church or a new village business -- all these may gradually modify neighborhood patterns from year to year. A community boundary is not fixed and final. It changes with the habits of association among people.

It may not be enough to locate only the neighborhoods, the neighborhood leaders and the community boundaries.

stock enterprises and change the cropping plan. Labor-saving methods in caring for the livestock will therefore be particularly important. Some suggestions for shortening the livestock chores are—

1. *Chopping corn by hand each day is seldom necessary.* Crushing or shelling in large quantities saves considerable time.
2. *Hand feeding and hauling feed considerable distances in small amounts each day is time-consuming.* Use of self-feeders and storing feed near the feeding place saves labor. However, self feeding is not adapted to either sheep or horses.
3. *The practice of hauling shock corn from the field to the livestock each day can be eliminated.* After the ears are removed from the stalk the stover can be hauled and stored near the feeding places. This can be done instead of setting the shock up again and then later hauling out a few shocks at a time.
4. *Avoid the practice of slopping livestock or soaking grain.* For a few farms this may be a good practice but for most of them it cannot be justified. If the water for soaking has to be hauled a considerable distance and the slop or soaked grain handled several times, then the cost of the labor will be far greater than the advantages gained.
5. *Do not shuck snapped corn that is already cribbed,* except for feeding to chickens and sheep.
6. *Driving livestock to distant pastures each day can usually be avoided.* Temporary lanes, replanned field arrangement, and gates leading to the barns will reduce this chore.
7. *Hauling water takes time from other work.* This problem differs on nearly every farm. Conveniences requiring less labor (such as ponds, automatic waterers, springs, cisterns, or wells) could be developed on most farms.

Shift the Production of Certain Crops

On some farms, certain crops can be substituted for others, in whole or in part, to save labor.

1. *Soybeans are needed in the war program and fit very well on level or bottom land.* They are planted a little after corn and harvested a little before corn. The labor requirements per acre are low if combines are available for harvesting.

2. *On uplands barley can be substituted for corn.* The weight of grain produced per acre is about two-thirds as much as that of corn, but the yield per day of work is about twice as much. On many farms where grain production is to be increased, barley could be used.
3. *Growing alfalfa or other legumes that usually have high yields per acre, reduces the amount of labor per unit of feed.* No other commonly grown feed crop yields more feed than alfalfa per day of work expended.
4. *Reduction of dark tobacco acreage leaves labor for feed crops and livestock.* Some farmers in the dark-tobacco areas will probably take this opportunity to discontinue production of this crop.

Use Improved Varieties and Increase Yields

Use of hybrid corn, improved varieties of barley, rye, and tobacco increases the yield and thus requires fewer crop acres for the same production. Hybrid corn, especially, saves labor because in most years the corn can be removed from the stalk early in the fall, permitting disking down stalks instead of cutting. The use of commercial fertilizers on most farms is strongly recommended as an important means of increasing yields.

Keep Jobs Done Ahead of Schedule

The man who is always ahead with his work accomplishes much more in a year than the one who is lagging. A well-developed plan and long hours of work help to get the work done on time.

TO THE READER: As more workers are drawn from farms to the army and to war industries, the farm-labor problem will become more and more difficult. This leaflet contains practical suggestions which should be helpful to farmers who are short of labor and I recommend that you read it.

Cordially yours,

County Agent.

20M—6-42

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating

U. S. Department of Agriculture
EXTENSION SERVICE
WASHINGTON, D. C.
OFFICIAL BUSINESS

For:

Penalty for Private Use to Avoid Payment of Postage, $300

DOING FARM WORK in WARTIME

Some suggestions for getting the job done with less labor

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service
Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky
PE-3
June, 1942

Doing Farm Work in Wartime

By Ernest J. Nesius and Max M. Tharp

The most effective help farmers will get to relieve the shortage in farm labor brought on by the war, will come about by their arranging to do the necessary jobs more simply and more systematically. In that way the farmer himself and the members of his family can get more done.

The first thing a farmer should do to prepare for a labor shortage is to study closely everything he is doing and how it is being done. Usually changes can be made in farming practices and even in the crop and livestock enterprises themselves, to reduce the number of days' work needed. Plans should be made in detail for the time when several jobs must be done at the same time. All the jobs, and the number of men needed for them, should be listed in the order in which they must be done. From such an outline of work, adjustments can usually be made that will partly eliminate rush periods.

Swap Work With Neighbors

Examples of opportunity for hiring less labor during rush periods:

1. A farmer producing clover hay can swap work with one producing alfalfa hay.
2. A farmer producing dark tobacco can swap with a neighbor producing burley tobacco.
3. A farmer who cuts and shocks his corn can swap with one who snaps or shucks from the standing stalk.
4. A farmer who has power machinery can swap with a man who uses horses for power. Especially in land preparation, seeding, and planting of corn and small grain, one man could be preparing the land while the other plants the crop.
5. For work that is best done by crews of 5 to 15 men, 3 to 5 farmers can join forces and operate as a group, as in housing tobacco, in hay harvest, and grain harvest.

Make Wider Use of Power Machinery

Full use of power machinery results in lower costs per day used, speeds up the work, and increases accomplishment. As compared with the use of horse-drawn machinery, the use of a tractor trebles the

speed of breaking, nearly doubles that of disking, more than doubles that of cultivating and mowing.

During rush periods machines available for hire in the community, such as combines, tractors, pick-up balers, and mechanical corn pickers should be kept busy as much as possible.

Change or Modify Crop and Livestock Practices

Regardless of how well the planning is done, there will be some weeks when two or more jobs need to be done at the same time. By all means farmers should not consider reducing the production of important crops, but should study these rush periods to see what changes can be made to get the work done. Many farmers, moreover, will have to operate thruout the year with less help than usual. Following the best practices is therefore decidedly to the farm operator's advantage.

Most farmers who study their farm practices carefully will find that they can leave out or change some of their practices with almost every crop or livestock enterprise. A few of the practices most likely to need changing are listed here.

Corn

Corn production makes heavy demands on labor, and in fall and spring conflicts with several other farm jobs. The following labor-consuming operations are practiced by many farmers. Modifying or omitting them will make for better use of labor.

1. *Don't plant corn thick with the intention of thinning it later.* Using good seed and planting only at the rate desired for a good stand will save much labor.
2. *Avoid hoeing.* The practice of hoeing corn can be omitted on most farms, *especially* if the soil is thoroly prepared before planting.
3. *Cultivate only as needed and use large implements.* Except in weedy fields 3 cultivations are usually enough. Use the larger implements available, such as a 1- or 2-row cultivator. When the corn is small use a section harrow instead of a cultivator.
4. *Don't ridge the ground high along the corn row.* Except on bottomland this practice is hard to justify. After corn harvest the ridges must be leveled.

5. *Harvest from standing stalk whenever practical.* As compared with cutting, shocking, and then husking corn, harvesting from standing stalks saves about as many days of labor as there are acres of corn. Other things to be considered, however, are a good cover crop and the saving of fodder for feed. In late seasons the corn should be cut and shocked so as to get a cover crop sown in time; but when the corn ripens early it can be harvested from the standing stalks and the cover crop sown afterwards. Planting early and using hybrids results in early ripening of corn; and by planning ahead, enough hay can perhaps be produced to supply the roughage needs without fodder.
6. *Don't try to take every shuck and ribbon off the ears when husking.* Fairly clean husking is desirable but a few husks left on will not reduce the feed value.
7. *Use large wagon boxes with sideboards to haul corn to the crib.* Fewer trips are needed than with smaller boxes, and much labor is saved, especially if the grain is hauled a considerable distance.

To show clearly how choice of practice affects the amount of labor necessary, a comparison of methods of harvesting corn is shown in the following tabulation:

	Hours per acre
Hogging down	1.0
Mechanical picker	3.0
Snapping from standing stalk	6.7
Husking from standing stalk	8.0
Cutting and snapping corn from the shock	16.7
Shredding	22.0
Cutting and shucking corn clean from the shock	23.0
Ensilling	25.0

Tobacco

Where much tobacco is grown, the time for setting, cutting and housing, and stripping are rush periods. Moreover, cutting and housing tobacco conflicts with harvesting corn and hay.

Stripping accounts for one-third or more of the labor on burley or dark fire-cured tobacco, and about one-fourth of the labor on one-sucker. Other operations, except topping and suckering of the dark tobaccos, require less labor. These operations, however, follow one another, and several overlap. Nearly every operation in the production of tobacco conflicts with one or more other farm jobs.

Small reductions in labor on each operation saves a considerable amount for the whole crop. Having everything convenient will save much labor on tobacco. Several examples of such conveniences are: growing the tobacco near the barns, having the plant bed near the field, and having a well-located stripping room. A stripping room is badly needed on many farms. Stripping in open barn doors results in less hours work per day and less comfort.

Wheat, barley, oats, and rye

Labor demands in the production of small grain occur at the seeding and the harvest seasons. Small-grain harvest conflicts with corn and tobacco cultivation and hay harvesting on many farms. Small-grain seeding conflicts with corn harvest and late tobacco housing. Some opportunities for saving labor are—

1. *Fields may be disked rather than plowed.* Breaking is justified in many cases, especially in onion infested fields. However, 4 or 5 times as much land can be disked in a day as can be broken.
2. *Use a combine for harvesting.* Harvesting with a combine requires much less labor than with a binder and thresher. Cutting and threshing small grain requires about 5 man hours per acre while harvesting with a combine requires about 1.5 hours per acre.

Hay

On most farms putting up hay means hiring extra labor. Putting up hay loose requires about ½ to 1½ hours less labor per ton than baling with a stationary baler. The use of a pickup baler usually requires less labor than putting the hay up loose. Putting hay in large stacks in the field with a temporary hay carriage and sweep rakes requires a comparatively small amount of labor, and is particularly suitable if a large hay crew cannot be assembled at one time.

Livestock

Livestock production demands a fairly uniform amount of farm labor thruout the year, tho somewhat more in winter than in summer. It fits particularly well with crop farming because most of the heavy labor on crops comes in summer.

In order to get along with less labor during the war many farmers will probably increase their live-

DORMANT SPRAYS. For Apples and Peaches. To control scale insects on dormant fruit trees use a spray such as tank-mixed oil emulsion, commercial oil emulsions, miscible oil, or lime sulfur. For control of peach leaf curl a fungicide, such as Bordeaux mixture or lime sulfur, may be used.

Note that lime sulfur is both a scalecide and a fungicide. It is satisfactory for use on small plantings where the combination is necessary. It is the simplest dormant spray and it usually is effective if thoroly applied. The liquid form is preferred. Dilute each gallon with 8 gallons of water. Dry lime sulfur should be used as recommended by the manufacturers.

The cheapest combined spray for peaches is Bordeaux mixture added to the tank-mixed oil emulsion. Oil emulsions have given better control of San Jose scale than lime sulfur.

TANK-MIXED EMULSION. Use Lubricating Oil. Specifications: Viscosity between 125 and 200 seconds Saybolt, at 100 degrees Fahrenheit; volatility less than 2 percent loss in 4 hours at 105 degrees Centigrade. These oils are sold by companies at their bulk stations under such names as "agricultural spray oil," "orchard spray oil," "scale oil," at about 15 to 20 cents per gallon.

Formulas For Apples

Small quantities in hand pumps		Large quantities in power pumps	
Oil	1 gal.	Oil	2 gals.
Calcium caseinate	5 ozs.	Calcium caseinate	6 ozs.
Water to make	50 gals.	Water to make	100 gals

Mixing 50 Gallons of Emulsion for Apples (barrel sprayer)

1. Mix 5 ounces of calcium caseinate in a bucket with ½ pint of water, making a thick paste. Add water gradually until the bucket is full. This step is important.

2. Put this calcium caseinate mixture into the spray tank and add sufficient water to operate the pump; usually 2 or 3 gallons. Warm water is preferred.

3. Start pumping and allow the discharge from the open spray rod to flow back into the tank under full pressure.

4. Add 1 gallon of oil, continuing agitation, and pump for a few minutes; then fill the tank with water. Apply the spray immediately.

Formulas For Peaches

The spray mixture is the same as for apples except that 6-6-100 Bordeaux is used instead of water. The experienced commercial peach grower may omit the calcium caseinate and emulsify the mineral oil in a mixture of 2 pounds of bluestone, 5 pounds of chemical hydrated lime, and 7 gallons of water, after which are added 4 pounds of powdered copper sulfate, 1 pound of lime and water to make 100 gallons, making 6-6-100 Bordeaux.

Mixing 50 Gallons of Emulsion for Peaches (barrel sprayer)

Prepare calcium caseinate and oil as for apples, fill tank two-thirds full and while pumping add 3 pounds of chemical hydrated lime, previously mixed in a bucket of water. Then add 3 pounds of bluestone previously dissolved in a bucket of water. Fill the tank with water. Apply the spray immediately.

Power spray pumps are more satisfactory than hand pumps for making tank-mixed emulsions. The procedure is the same, but the formula calls for less calcium caseinate when the power sprayer is used.

NOTES. In orchards where scale is moderate to heavy, the formula for Bordeaux-oil spray should be modified by using 3 gallons of mineral oil and 9 ounces of calcium caseinate in each 100 gallons, thus making a 3 percent rather than a 2 percent oil emulsion.

Do not apply oil sprays when the temperature is below 45° F. The dormant sprays may be applied at any time after the leaves have fallen and before growth commences in the spring if the weather is suitable.

H-1.

Apple Spraying Program

Including Dormant Sprays For Peaches

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The main factors in successful spraying are **correct timing, thoro application** and use of **proper material.** Success cannot be expected if any one of these three is neglected.

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EXTENSION DIVISION, COLLEGE OF AGRICULTURE
University of Kentucky, Lexington, Kentucky
Thomas P. Cooper, Dean and Director
February, 1940

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APPLE SPRAYING PROGRAM

The entire schedule as printed in this circular is needed in orchards where infestation with codling moth is very bad. The average commercial orchard may need only the sprays marked * and **; the home orchard should have at least the latter.

Apple Scab. Losses from apple scab each year are probably greater than from any other disease or from any insect affecting apples. In a rainy spring, the apple crop sometimes fails to set and the reason given is too much rain or too cold weather, whereas apple scab is the actual cause. In 1933 and 1935, unsprayed orchards in Kentucky lost their entire crop from apple scab. The scab attacked the leaves, also, to the extent that many trees were defoliated in early May. Many of our standard Kentucky varieties such as Winesap, Stayman, Black Twig, Red Delicious, Golden Delicious and King David are very susceptible to scab.

Bitter Rot. To keep bitter rot in check, a Bordeaux spray should be applied in all orchards each year, about the first of July (Spray 12). Growers who had loss from bitter rot last year should apply a 4-6-100 Bordeaux spray about the middle of June (See "Remarks" to Spray 11), and at two-week intervals thereafter, until four sprays have been applied. The grower should be alert to observe the first appearance of the disease. Hand-pick and destroy all bitter-rot-spotted fruits and search for overwintering places, such as old fruit stems, mummied fruits, cankers and dead wood. The source will usually be found directly above the first rotted fruits and should be removed. With the first appearance of bitter rot, remove spotted fruit and spray affected trees and neighboring trees immediately. For codling moth control add lead arsenate alone to the Bordeaux.

Codling Moth. In the Paducah district, the first second-brood spray (No. 12) should be applied during the last week in June. In the vicinity of Henderson and Bowling Green, the first summer spray should be applied during the three or four days after July 4. These dates are good only for average years. Chemically treated bands, put on in early June, are a valuable aid in codling-moth control.

APPLE SPRAY SCHEDULE

Sprays Nos. 4, 6, and 8 (boldface type) may be all that are necessary for the farm orchard. Prevent bitter rot by using spray No. 12, annually.

	Spray	Time	Material in 100 gals.	For	Remarks
*	1. Dormant	After leaves have fallen and before growth begins	3 gals. oil emulsion or 11 gals. liquid lime sulfur or 30 lbs. dry lime sulfur	Scale	Spray only when temperature is above 45 degrees.
	2. Green tip	When green tips of leaves are exposed	2½ gals. liquid lime sulfur	Scab	This spray is especially desirable on Red Delicious.
*	3. Pre-pink	Before cluster buds separate	2 gals. liquid lime sulfur	Scab	If wet weather prevailed during green-tip stage, do not omit this spray.
**	**4. Pink**	**Fruit buds pink, clusters separated**	**2 gals. liquid lime sulfur**	**Scab**	**This is perhaps the most important spray in the schedule and should never be omitted.**
	5. Full bloom	1/3 of blossoms open	Weak Bordeaux made of 2 lbs. copper sulfate 6 lbs. hydrated lime	Blossom blight	Especially desirable on Transparent, Polly Eades, Jonathan, Wealthy, Hagloe, King David, Grimes. Do not use lead arsenate.
**	**6. Calyx or petal fall**	**When petals are ¾ off**	**Lead arsenate 3 lbs. Lime sulfur 2 gals. Hydrated lime 3 lbs.**	**Codling moth**	**A very important spray for codling moth. Many growers substitute 6 lbs. wettable sulfur for the lime sulfur in this spray.**
	7. First cover	7 days after the calyx spray.	Lead arsenate 4 lbs. Hydrated lime 4 lbs.	Codling moth	Recommended in orchards where codling moth is an important factor.
**	**8. Second cover**	**2 weeks after calyx spray**	**Lead arsenate 4 lbs. Hydrated lime 4 lbs. Wettable sulfur 8 lbs. Or Bordeaux 6-8-100 Lead arsenate 4 lbs.**	**Codling moth Scab, Blotch King David Spot Sooty Blotch**	**For blotch, sooty blotch and King David spot, use Bordeaux instead of sulfur. A very important spray where codling moth is a factor.**
	9. Third cover	3 weeks after calyx spray	Hydrated lime 4 lbs. Soybean flour ¼ lb. Lead arsenate 4 lbs.	Codling moth	The soybean flour is added as a spreader and sticker.
*	10. Fourth cover	4 weeks after calyx spray	Hydrated lime 4 lbs. Soybean flour ¼ lb. Lead arsenate 4 lbs.	Codling moth King David spot Blotch Sooty blotch	If blotch, sooty blotch and King David Spot are expected, use Bordeaux and lead arsenate, as suggested in Spray 8.
	11. Fifth cover	10 days after fourth cover	Hydrated lime 3 lbs. Soybean flour ¼ lb. Lead arsenate 3 lbs.	Codling moth	If bitter rot has been a factor, see note page 2 and use 4-6-100 Bordeaux with or without lead arsenate.
**	**12. First summer**	**See note for timing. Page 2.**	**Lead arsenate 3 lbs. Bordeaux 8-10-100**	**Second-brood codling moth Bitter rot**	**Omit lead arsenate and lime if codling moth is not a factor. Do not omit Bordeaux spray.**
	13. Second summer	10 days after No. 12	Lead arsenate 3 lbs. Hydrated lime 3 lbs.	Second-brood codling moth	If bitter rot has been a factor, see note page 2.
	14. Third summer	10 days after No. 13	Lead arsenate 3 lbs. Hydrated lime 3 lbs.	Second-brood codling moth Bitter rot	If bitter rot has been a factor, see note page 2.

*, ** The average commercial orchard may need only these sprays.
** The home orchard should have at least these sprays.
See Kentucky Bulletin 393, "Fruit Pests and Their Control," for a more complete discussion of insects and diseases.

enough from the rows not to damage the roots. No ridging is needed; only enough soil should be drawn to the hill to fill the cracks.

7. Control insects and blight

Colorado potato beetles, blister beetles, tobacco worms, cabbage worms, black fleabeetles, plant lice, and leafhoppers commonly attack potatoes in Kentucky. These, and also blight, can be controlled by dusts or sprays.

For dusting—Use "copper-lime dust" while the plants are still wet with dew in the morning, or in the evening after dew begins to form.

For spraying—Use 5-5-50 bordeaux mixture to which calcium arsenate or lead arsenate has been added at the rate of 2 rounded tablespoons to each gallon of the bordeaux, mixed into a paste and stirred thoroly into the bordeaux. Apply the first spray when the plants are 2 to 4 inches high, and repeat each 10 days to 2 weeks thereafter until the plants are well grown. If plant lice or leafhoppers are especially troublesome add nicotine sulfate, 40 percent, 1 tablespoon to 8 gallons of spray.

To make 2½ gallons of **BORDEAUX MIXTURE**—

First, dissolve 1 pound of blue vitriol by hanging it in a cloth sack just into 5 quarts of water in an earthenware crock.
Next, pour 9 quarts of water into a nonmetal container, such as a wooden tub, then add 1 quart of the blue-vitriol solution. Stir thoroly into this mixture 12 level tablespoons of screened hydrated lime previously made into a paste with a little water. This mixture must be used while it is fresh. Save the rest of the blue-vitriol stock for making more of the mixture.

Lexington, Kentucky April, 1942
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H—2 20M—4-42

SEVEN POINTS on POTATO GROWING

Seed • Soil • Insects

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service

Thomas P. Cooper, *Dean* and *Director*

Seven Points on Potato Growing

By John S. Gardner

1. Grow an early crop for summer, and a late crop for storage

For the early crop in Kentucky the recommended varieties are Irish Cobbler, Bliss Triumph, Warba, and Burbank, planted March 15 to April 10. For the late crop Cobbler, Bliss Triumph, Burbank, Katahdin, and Chippewa are recommended, planted June 25th to July 25th.

2. Use good seed, preferably certified

Seed potatoes should be free from shriveling and sprouting, but should be capable of producing large vigorous sprouts. They should also, of course, be free from disease. The simplest way to make sure of getting such seed, true to name, is to use only certified seed. The word "certified" means that the stock has been inspected by qualified persons and found to be practically free of the degenerative or "running-out" diseases that cause low yields. Each bag of genuine certified seed carries a lead seal and a "Certified Seed Potatoes" tag giving the name of the certifying agency, usually a state department of agriculture or a state agricultural experiment station, but always an authority of unquestioned standing. That such seed will produce superior crops has been proved in hundreds of demonstrations thruout Kentucky, increases of 30 to 70 percent being common.

3. Treat the seed to guard against scab and black scurf

Use an organic mercury compound, such as can be bought under various trade names, or make a solution of corrosive sublimate, at the rate of 1 ounce to 7½ gallons of water. Follow the directions of the manufacturer in using an organic mercury compound. If using the corrosive sublimate, dip the first batch of potatoes for 1 hour; the second, 1¼ hours; the third, 1½ hours; and the fourth, 2 hours. The potatoes

may be cut immediately after treating, or any time later. Containers for holding treated seed should be treated in the same solution.

4. Plant "blocky" seed pieces

Plump, blocky pieces weighing about 1¼ ounces are better than thin or narrow pieces, for they "bleed" less. One eye, far enough from the cut not to be weakened by bleeding is enough. Dusting the pieces with sulfur helps to stop bleeding and aids in healing.

5. Plant in a deep seedbed in clean, fertile, friable soil

Good potato land should contain plenty of rotted vegetable matter, and the subsoil should drain well but still be dense enough to hold moisture close to the potato roots. Do not apply manure just before planting unless it is very well rotted. Turning under sod or a cover crop of vetch or crimson clover with small grain is better. The cover crop for early potatoes should be sown in August; for late potatoes it may be sown as late as October.

Sod for early potatoes should be broken in fall or early winter; land in cover crop can wait until about 6 weeks before planting. The land should be broken deep—at least 10 inches if the topsoil is that deep.

Apply a 5-10-5 or a 6-10-6 fertilizer at the rate of 1 pound to 25 feet of row. In hand planting, sow the fertilizer in the bottom of the furrow, and then mix it with the soil by using a narrow bull-tongue, or dragging a heavy chain, or stirring with a hoe handle.

Drop the seed in furrows 3 to 5 inches deep for the early crop, 5 to 6 inches deep for the late crop, and 12 to 14 inches apart in the row. Rows should be 30 to 36 inches apart. Cover the seed thoroly early in the season; leave the furrows partly unfilled in later plantings.

6. Cultivate to control weeds

Potatoes may be harrowed until the plants are 4 inches high. After that, until the plants begin to cover the ground, they should have shallow cultivation, far

it is found apply bordeaux mixture with 1 teaspoon level full (1/6 ounce) of 40-percent nicotine sulfate added per gallon of mixture. A few scattered aphis attacks may be controlled by a spray of 40-percent nicotine sulfate (1 teaspoon level full) and soap flakes (2/3 ounce) in 1 gallon of water, applied with a small hand sprayer.

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H-3

FIVE POINTS

on growing

Large-Seeded Lima Beans

Low yields have discouraged many gardeners from trying to grow large-seeded lima beans. The vines are vigorous and full of blooms, but few pods set. Fortunately, this difficulty can be largely overcome by following the best-known methods of growing the crop.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service
Thomas P. Cooper, *Dean* and *Director*

Five Points on Growing Large-Seeded Lima Beans

By E. M. EMMERT

1. Prepare a good seedbed on well-drained land

One of the causes of blossom drop in lima beans is too much or too little moisture. The seedbed should therefore be deep and thoroly worked so as to hold plenty of moisture, but it should be well drained. Some provision for watering in a dry season will help.

2. Plant on land that is low in nitrogen

Probably the chief cause of blossom drop in lima beans is too much nitrogen in proportion to the other plant foods. Therefore, do not plant on land heavily manured or on land where a crop of legumes has recently been turned under. The soil should contain plenty of humus to work well and hold moisture, but the humus should be supplied from manure or cover crops turned under a year or two before planting to lima beans.

3. Watch the plants to determine needs for nitrogen

Vines growing at a moderate rate with good, green color of foliage are best. Stunted growth and pale color are signs that more nitrogen or better drainage are needed. If, just after the first true leaves have formed, plants are stunted and pale on well drained land, add a little nitrate of soda or dried poultry or sheep manure as a side dressing, and again after the pods are set. Be careful not to add too much nitrogen. Fifty to 100 pounds of nitrate of soda per acre, or 1/3 to 2/3 pound per 100 feet of row, is about right. Poultry or sheep manure should be applied at the rate of about 1/3 bushel per 100 feet of row. Unless the plants are pale and stunted, however, no nitrate fertilizer is needed.

Very vigorous vine growth usually is a sign that the soil contains too much nitrogen to be suitable for lima beans.

4. Feed the plants plenty of phosphate

Phosphorus is needed in relatively large amounts by lima beans from the time the pods begin to set until the seeds are grown. Unless the soil is known to be especially rich in phosphorus, apply 20-percent superphosphate along the row in a furrow 3 or 4 inches deep and 4 to 6 inches from the row. The rate should be about 500 pounds per acre, or 3 to 4 pounds per 100 feet of row. The superphosphate should be applied when the first blooms begin to open.

If the soil is very low in phosphorus, use a similar treatment with superphosphate at the time the beans are planted.

5. Spray or dust to control insects and diseases

Usually spraying with bordeaux mixture and calcium arsenate protects the plants from insects and diseases. For 50 gallons of mixture, use 2 pounds of copper sulfate, 4 pounds of hydrated lime, and 1½ pounds of calcium arsenate. Because the materials in the bordeaux mixture settle rapidly, always stir the mixture thoroly before spraying and during the spraying.

CAUTION: As calcium arsenate is a POISON, wash the bean pods thoroly before shelling if this spray has been used.

Apply the first spray as soon as beetles or brown spots appear, and the second 10 to 15 days later. Cover the under side of the leaves thoroly. Usually two sprayings will be enough to protect the blossoms, tho if bean beetles are numerous more sprays will be needed. If the planting is small, use rotenone dust on the undersides of the leaves to control bean beetles. Look for aphis thruout the season, and if

How to Prevent BLOSSOM DROP of TOMATOES

By taking care that growing tomatoes get the right amounts of the plant foods they require, gardeners can very largely overcome this most annoying difficulty with tomatoes.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service

Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky July, 1942

H-4

For:

FOR MORE INFORMATION about tomato growing and other gardening problems, consult Kentucky Extension Circular 376, "The Vegetable Garden Month by Month," or see your county agricultural agent.

Cordially yours,

County Agent.

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating

How To Prevent Blossom Drop of Tomatoes

By E. M. Emmert

Blossom drop and the consequent failure of fruit to set often prevents a full yield from tomato plants. The blossoms drop noticeably in wet weather and from some of the large-fruited varieties, such as Ponderosa and Winsall. Fortunately, this difficulty can be largely overcome by taking the right steps to prevent it.

Use Well-Drained Land

Since nothing can be done to control rainfall, make certain that the tomato field is properly drained. This precaution provides relief from excess moisture in wet weather when the blossoms fall in largest number.

Avoid Recently Manured Land

Plant tomatoes on soil only medium in nitrogen. Where legumes or large amounts of manure have been turned under the same year the plants are to be set, there will be too much nitrogen for tomatoes. When tomatoes are planted on such land, an ample supply of phosphorus must be added. It is better to plant on land low in nitrogen and build up the supply as needed through the season, than to plant on land having too much nitrogen at the start.

The lack of phosphorus in proportion to nitrogen is the most common cause of blossoms dropping during wet weather. These conditions affect all varieties of tomatoes to some extent but the large-fruited varieties such as Ponderosa and the vigorous types such as Marglobe are affected most of all.

Add Phosphate At Planting

If the soil is known to be low in phosphorus, place 2 ounces (or 2 heaping tablespoons) of 20-percent superphosphate in the bottom of the hole in which the plant is to be set, mixing it with several inches of soil before setting. Most Kentucky soils except those of the Inner Bluegrass region are low in phosphorus unless they have recently been treated with phosphate fertilizer.

Apply Nitrate After Planting

If the soil is low in nitrogen, apply ¼ to ½ ounce (about 1 teaspoonful) of sodium nitrate or ammonium sulfate per plant, on top of the ground around each plant, before a rain, soon after setting. Avoid getting the crystals on the plants. Do not apply this fertilizer on soil high in nitrogen, since at this stage too much nitrogen will cause blossom drop later. If the plants make only a slow growth and are pale or yellow, the soil is probably low in nitrogen.

Add Phosphate At Blossom Time

Even if the soil is quite rich in phosphorus, if large amounts of manure or legumes have been turned under recently, or if considerable nitrogen is known to be present, a phosphate fertilizer should be applied when the first blossoms appear. Apply about ¼ pound (4 heaping tablespoons) of superphosphate per plant in a furrow around each plant, 6 to 8 inches from it and about 2 inches deep, and cover with soil without mixing the fertilizer with it. More phosphorus than is needed will do no harm.

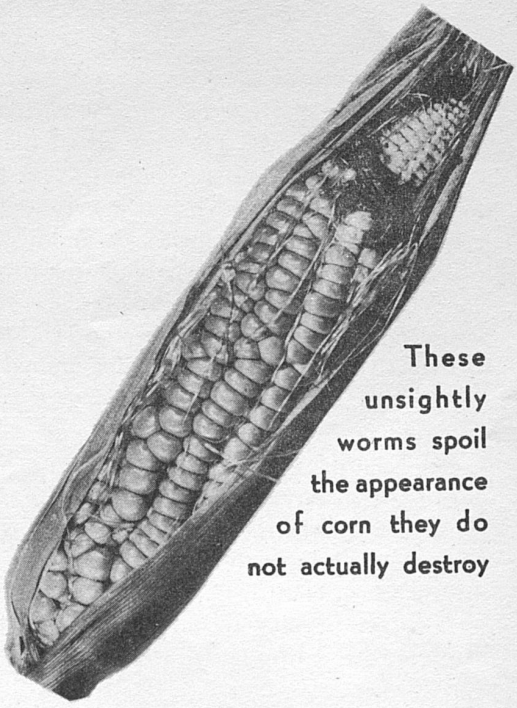
Apply Nitrate After Fruit-Set

After the first 3 or 4 clusters have set fruit, apply ½ to 1 ounce of either of the nitrogen fertilizers, in the same way as when applying it just after planting. Even if plenty of nitrogen should already be present, no harm will come from this application unless the soil is exceptionally high in nitrogen. Since danger from blossom drop is now past and the young fruits need a large amount of nitrogen to grow into larger tomatoes, there is not likely to be too much nitrogen at this stage of growth.

Spray For Stilt Bugs

Occasionally the stilt bug sucks the stems of blossoms and causes some blossom drop. As soon as the bugs are found either make a thorough application of home mixed 4-6-50 bordeaux mixture to which ⅜ pint of nicotine sulfate has been added, or use prepared bordeaux to which 1 teaspoonful of nicotine sulfate has been added for each gallon of spray. Repeat the treatment whenever the plants are blooming and the bugs are present.

How to Prevent EARWORM DAMAGE to SWEET CORN



These unsightly worms spoil the appearance of corn they do not actually destroy

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Extension Service

Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky July, 1942

H-5

For:

FOR MORE INFORMATION about sweet-corn growing or other gardening problems, see Kentucky Extension Circular 376, "The Vegetable Garden Month by Month," or consult your county agricultural agent.

Cordially yours,

County Agent.

Cooperative Extension Work in Agriculture and Home Economics: University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating

10M—7-42

How To Prevent Earworm Damage To Sweet Corn

ACTIVE EFFORT to control the corn ear-worm began some 50 years ago, but the habits of the insect made its control extremely difficult. Announcement now of a simple way to destroy the pest is welcome news to sweet-corn growers.

By E. M. Emmert and W. A. Price

Damage by the corn earworm is particularly severe on sweet corn. The tiny worm bores directly into the silk and feeds on it. Next it eats the young kernels of corn. Sometimes, after feeding on one ear, it moves to another until several ears have been partly destroyed. The character of the injury, the presence of the worm and its excrement make the ears of corn unattractive. The pest spoils for human consumption a larger portion of the corn than it eats itself.

The Kentucky Agricultural Experiment Station has tried several ways to combat this worm. In 1933 it found the method of clipping both easily done and effective. The Station has tested this means of control for several years and with such success it now recommends it to growers of sweet corn. Clipping is carried out as follows:

1. **Watch the silks of the corn.** When about two-thirds of them have started to dry and brown, prepare for action. Get a pair of sharp pruning shears; or for small plantings, a sharp knife. Also get a container which may be easily carried to collect clippings.

2. **On the fourth day after two-thirds of the silks have browned, clip off the end of the shuck about 1/2 inch from the tip of the cob.** Examine the fresh-clipped surface. If it is discolored brown, the worm is below the cut. Clip further down on the ear until the worm is removed. If the end of the cob is clipped off little or no harm is done. At this stage in the growth of the corn the cut heals readily. Put all clippings into the container. Ears without brown silks also should be clipped at this time.

3. **As soon as the clipping is done, destroy the worms** by burying, submerging in water, burning, or by any other thorough-going method.

4. **If worms are numerous, a reclip in the same way, 4 to 6 days later, will be worth while if the grower has time to do it.** At this time do not clip off the ends of the cobs since they may not heal. This condition invites injury from birds and may cause rot. The first clipping is the more important and usually gives satisfactory protection from worm damage.

After carefully destroying the seed heads one season, don't be surprised if crabgrass appears in the lawn again the next year, for the seeds live more than a year and some from previous years may have lived over. By cutting and burning each year, however, the crabgrass can be gradually overcome.

2. Sweep bare spots to remove seed that has dropped.— After frost the brown or bare spots in the lawn where crabgrass has died should not be cultivated, for cultivation merely serves to plant the seeds that have escaped the lawn mower. Rather, these spots should be carefully swept and the sweepings collected and burned. Where it is feasible to do so without danger of spreading fire, the spots may be covered with hay or straw and then burned over to destroy the crabgrass seed. Not much heat is required to kill the seed. After the sweeping or burning the bare spots should be seeded to bluegrass, or sodded with heavy bluegrass sod.

3. Use lawn fertilizers in late fall and winter, not in summer.— By feeding the lawn in late fall, after the crabgrass has been killed, and in winter or early spring, the bluegrass will get the greatest benefit from the plant food, and the crabgrass will get least. On the other hand, if fertilizers are applied in summer or late spring, the crabgrass will get more benefit from them than the bluegrass, for the crabgrass is then making its most active growth while the bluegrass is more or less dormant.

4. Don't water the lawn in summer.— Neither is it good practice to water the lawn from midsummer until fall, for the bluegrass goes thru a rest period then, whereas the crabgrass is growing actively. To water the lawn then merely helps the crabgrass make a better growth. Even if enough water is applied to stimulate the bluegrass into an unnatural growth, the crabgrass benefits more than the bluegrass.

25M—9-42

TO THE READER:

To keep crabgrass out of a fine-looking lawn, or to get rid of it once it has become established, is a year-round job. This folder suggests a series of measures to be used in combating this pest.

Cordially yours,

County Extension Agent

Cooperative Extension Work in Agriculture and Home Economics, University of Kentucky, College of Agriculture and Home Economics, and the United States Department of Agriculture, cooperating.

U. S. Department of Agriculture
EXTENSION SERVICE
WASHINGTON, D. C.

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Penalty for Private Use to Avoid Payment of Postage, $300

Protect your Lawn from CRABGRASS

A well-developed crabgrass plant produces several hundred seeds. Where the stem is bent over so as to touch the ground, roots and new stems grow at the joints.

UNIVERSITY OF KENTUCKY

College of Agriculture and Home Economics
Agricultural Extension Service

Thomas P. Cooper, *Dean* and *Director*

Lexington, Kentucky September, 1942
H-6

Protect Your Lawn From Crabgrass

By N. R. Elliott

Crabgrass is undoubtedly the worst weed pest in the lawn. Usually it starts in a few spots not more than 1 or 2 feet across, easily recognized by their light green in contrast to the dark green of bluegrass. If left uncontrolled, the crabgrass will in a short time ruin the best lawn by starving and crowding out the bluegrass. It makes its rapid growth in hot summer, when bluegrass grows but little; and it uses so much plant food and moisture that the bluegrass suffers from lack of both. Moreover, it produces so dense a turf that the bluegrass crowns decay and die. In fact, well-established crabgrass makes so dense a sod that many people mow their lawns all summer without realizing they are not cutting bluegrass. In the fall, however, when frosts come, the crabgrass turns brown and dies, leaving the ground bare. By that time, of course, the damage is done, and it is too late to sow bluegrass to establish a new sod that winter.

To combat crabgrass successfully one must take into consideration its nature and habits of growth. It is an annual wild grass that produces seed each year and that grows from seed each year—though the seed will live for several years waiting for conditions favorable for germination. A single well-grown plant produces several hundred seeds. In Kentucky the seed normally matures in September and October and germinates the next spring in late April or May.

Young crabgrass plants have 2 or 3 light green leaves about 1/8 inch wide and, after a short time, a jointed stem that grows 10 to 18 inches long if undisturbed. This stem bears the seed head, usually with 6 or 8 prongs or branches along the sides of which the seeds develop. If the stem is bent down by the lawn-

mower so as to come in contact with the ground it develops roots at each joint and produces new stems. This habit accounts for its rapid growth and the solid turf it produces in such a short time.

To Keep Crabgrass From Coming Into Your Lawn—

If your lawn has a good stand of bluegrass, or of bluegrass and white clover, and is now free of crabgrass, follow these practices to keep crabgrass from getting a start in it:

1. Mow the grass high.—If the lawn has a good, dense sod of bluegrass and is never cut closer than 2½ inches, crabgrass is not likely to get started in it. Set the lawn mower, therefore, to cut at 2½ inches or higher. On large lawns that are cut with farm mowing machines very little crabgrass is found, because it simply cannot get established where bluegrass is making a rank growth and is being cut high. On the other hand, on a neglected lawn with a thin sod, crabgrass will come in no matter how high the grass is clipped.

2. Pull crabgrass plants that appear.— By watching for the appearance of young crabgrass plants and pulling them up when they are 2 or 3 inches tall, the lawn can be kept free of them. At this time the young plants are shallow-rooted and, especially after a heavy rain, can easily be pulled and destroyed. If left to grow larger they develop extensive roots, are hard to pull, and if they are pulled are likely to leave ugly holes in the lawn.

Crabgrass can be most easily pulled or killed when the plants are young—before the jointed stems develop and the roots grow deep into the soil.

3. Kill young crabgrass plants by shading them.—If crabgrass is coming in on a few spots in the lawn, but it is inconvenient to pull the plants, they can be killed by covering them and keeping them covered 8 to 14 days, with some material that will keep out the light. A piece of tin or composition roofing is good for the purpose. Bluegrass under the cover will turn yellow also, but when the cover is removed it will soon regain its color. Success in such shading depends largely on the time it is done. When the plants are ½ to 1 inch tall they are much easier killed by shading than when they are larger. The quicker the crabgrass can be killed, the sooner the covering can be removed and the better it will be for the bluegrass.

Home owners often ask why crabgrass is not found under trees in the lawn. The answer is that this grass does not grow in the shade.

To Get Rid of Crabgrass Already Established—

If your lawn is already badly infested with crabgrass it will be a slow and toilsome process to get rid of it, but well worth the effort in improved appearance of the lawn. Short of resodding the lawn with a heavy sod of bluegrass, not much can be done to eradicate the crabgrass all at once; but several steps can be taken to check it and gradually overcome it.

1. Prevent crabgrass seeds from maturing.— As crabgrass is an annual plant, that must come up from seeds anew each year, the stand can be thinned out by keeping the plants from producing seed. This is done by cutting the seed-bearing stems before the seed ripens. As soon as the seed stems appear (usually in September or October, though sometimes as early as August), mow the lawn as close as possible, and collect the clippings. Then rake the lawn to lift the stems of crabgrass not cut by the mower, and mow again. Repeat this until all the seed stems are cut. Collect all the clippings and burn them. Repeat again in a few days, as new seed heads begin to form.

How to Keep the Bugs From Ruining Your Garden

For insects that eat the leaves or other parts of the plant put poison where they feed. The best poison is rotenone dust or spray. Another is a dust made by mixing 1 part calcium arsenate, or arsenate of lead, or magnesium arsenate, with 6 parts lime. Or, a wet spray may be used, 2 rounded tablespoons of any of the arsenates dissolved in 1 gallon of water. Because of danger of poisoning people, don't use the arsenates on greens, cauliflower, cabbage in head, or beans in pod. Rotenone, however, is safe on these. Except for bean beetle and cucumber beetle, begin dusting or spraying at the first sign of damage.

For sap-sucking insects (plant lice, "squash bug" and the like) use "contact poisons" that actually hit their bodies. There are two such "contact poisons"—tobacco "tea" and rotenone dust or spray. If the insects are not dead in 30 minutes after such treatment they should be dusted or sprayed again.

For the Mexican bean beetle don't wait until there are holes in the leaves, but begin dusting or spraying when the first egg-clusters are seen on the underside of the leaves, and then dust or spray again in 10 days, and perhaps in 10 days again. Dusters or sprayers with up-turned nozzles must be used, to put the material where the beetle always feeds, the undersides of the leaves, and covering should be complete.

The striped cucumber beetle, sometimes called the "melon bug," is the cause for the early death of cucumbers, melons, and squash. Dead plants have their side-roots eaten away, by worms that hatched from the beetle's eggs laid in the first soil cracks the seedlings made as they came up. Start poisoning, therefore, when the soil over the hills begins to "hump." Use rotenone, or this dust:

Calcium arsenate, 1 part by weight
Gypsum or "fiber plaster," 15 parts

Sift the dust from a loosely woven sack over the middle of the hill. Repeat the dusting every 3 days, for at least 15 times.

Protect Your Garden From Diseases

Vegetable diseases are of three kinds — "wilt," "blight," and a "general" kind that causes the crops to do poorly. The last is usually a sign that rotation has not been practiced. No vegetable should be planted where it grew last year; there should be a gap of at least one year.

Wilt dries up cabbage, tomatoes, and watermelons, and is caused by germs that live in the soil. The only way to combat it is to use resistant varieties, as *Wisconsin All Seasons* cabbage (or others the seedsmen list as "resistant"), *Break O'Day, Marglobe,* or *Rutgers* tomatoes, and *Kleckley No. 4* (or others) watermelons.

Blight may be caused by several germs, but the result is the same: the spotting and final killing of the leaves. As the germs are carried by the wind, the control is to "copper coat" the leaves, by spraying with bordeaux mixture. Start when the spotting first is seen (on the lower leaves) and repeat in 2 weeks. *Complete covering* is necessary, with a good sprayer; "splashing on" will not do.

This is an easy way to make bordeaux mixture in a garden-size amount:

1. In a stone crock, dissolve 1 lb. of bluestone in 5 quarts of water, the bluestone hung in a cloth sack so that its tip is just in the water. This is "bluestone stock."
2. In the tank (preferably brass) of a sprayer, put 9 quarts of water, 1 quart of "bluestone stock" and ¼ pound of screened lime, and if insects are present, the proper amount of any of the arsenates named under "Insect Control."
3. Close the sprayer, and shake it end-wise, 10 to 15 times. The result is 2½ gallons of 4-4-50 bordeaux.

This leaflet is prepared by
JOHN S. GARDNER, Field
Agent in Gardening.

THIS FOLDER is given to you by

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who has voluntarily agreed to bring this and other important war information to families in your neighborhood.

H-7 Lexington, Kentucky 500M—12-42

YOUR Vegetable Garden ★ ★ ★ in 1943 ★ ★ ★

- What to plant
- How to plant it
- How to take care of it

HELP UNCLE SAM produce "food for war" by growing the vegetables your family will need this year. It will be patriotic—and it will pay you, too! At best, many foods are going to be scarce this year, so the wise thing to do is to grow as much of your own as you can. This folder will help you plan and take good care of your garden.

UNIVERSITY OF KENTUCKY
College of Agriculture and Home Economics
Agricultural Extension Service
Thomas P. Cooper, *Dean* and *Director*

Plan Your Garden Early

To save time and worry later on, and to be sure of getting the things planted that you really want, make a detailed plan of your garden before the planting season comes around. Make a plan like the one shown here, on a cardboard big enough to be read easily, and tack it up where it is handy to see. Measure your garden so you will know exactly how much room you have.

The sample garden shown on this sheet should supply five persons 21 servings a week of fresh vegetables in season, and 12 servings of canned or stored vegetables, besides potatoes, each week during the rest of the year. This garden has variety, and makes double use of ground for the fall garden.

If your garden is small, make full use of it by planting late crops in rows of early crops taken out, or between the rows of crops that will be out of the way when the later crops come on. Some of the rows could be crowded a little closer than shown in the sample plan, but it doesn't pay to crowd very much.

Keep the Garden Soil Rich

Plow under stable manure, if you can get it, at the rate of 10 tons an acre. Plow about 10 inches deep. As manure by itself may cause the vegetables to "grow to top," it should be balanced by broadcasting 20-percent superphosphate, 400 pounds per acre, after breaking, working it in as the seedbed is being finished. When enough manure cannot be got, use a complete fertilizer (4-8-6 or 5-10-5) at a rate of 400 to 1,000 pounds per acre, in the same manner as just described for superphosphate.

Make a Fine, Deep Seedbed

In a good seedbed the top 3 to 6 inches of soil is as fine as the smallest seed to be sown. The right depth to sow seed is 8 times the least thickness

of the seed. There is more likelihood of planting too deep than too shallow.

Use Fresh Seed of a Good Variety

Don't risk the disappointments that come from planting poor seed; unless you know it is good, don't plant it. The variety should be suited to Kentucky's climate, and the seed should be fresh, to insure a good stand. In Kentucky seed sold in lots of 1 pound or more must bear official state tags stating the true varietal name, the percent of germination, and the year in which the seed was grown.

Keep the Weeds Out

The reason for cultivating a garden is to stop the weeds, not merely to loosen the soil. In fact, deep working and chopping with a hoe, even in the middles of the rows, can do serious damage to the roots.

Weeds can be stopped easiest when they are small, before they rob the vegetables of plant food and moisture. They can be *scraped off* with a sharp hoe or with the scuffle-hoe attachment of a garden plow, without digging deep into the soil. If a horse cultivator is used, the 16-tooth cultivator is best.

Keep the surface of the garden smooth at all times; don't make hills and ridges. It takes extra work to make them, and in scraping soil away from the middles of the rows to make the ridges you rob the vegetables of valuable moisture and sometimes ruin part of the roots.

White Potatoes

This garden plan takes for granted that 1,500 to 2,900 feet of row of potatoes will be grown in a separate patch, outside the garden. But if the potatoes must be grown in the vegetable garden, one way to have them and still not have to do without the other vegetables, is to plant them early (before April 10) in rows 3 feet apart, and then between June 15 and July 15, to plant late tomatoes, late sweet corn, late beans, late cabbage, between the potato rows.

SAMPLE GARDEN PLAN for a FAMILY OF FIVE

(Recommended varieties, when to plant, and planting distances; the heavy border represents the boundary of the 100 ft. x 100 ft. garden)

WHEN to plant	Feet between rows	WHAT and HOW MUCH to plant (rows 100 ft. long)
(Perennial)	2	ASPARAGUS *(Martha Washington)*, 2 ft. apart in the row
	4	ASPARAGUS *(Martha Washington)*, 60 ft. —— RHUBARB *(Victoria)*, 40 ft., 3 ft. apart
March 15 to April 1	3	PARSNIPS *(Guernsey)*, 75 ft., thinned to 2″ in row —— SWISS CHARD *(Lucullus)*, 25 ft.
	2½	PEAS *(Alaska)*, 1½ lb. seed sown 1 to 2 inches apart
	2½	PEAS *(Telephone)*
	2	LETTUCE *(Wonderful, Grand Rapids)*, 30 ft. —— RADISHES *(White Tip Scarlet)*, 70 ft. 2 plantings
	2	MUSTARD *(Southern Curled)*, 50 ft. —— SPINACH *(Bloomsdale)*, 50 ft.
	2½	CABBAGE *(Golden Acre)*, 100 plants
	2½	CABBAGE *(Succession, Copenhagen,* or *Wisconsin All Seasons)*, 100 plants
April 1 to April 15	2	ONIONS *(Yellow sets)*, 1 gallon of sets planted 2 to 3 inches apart
	2	BEETS *(Crosby's Egyptian)*, 2 oz. seed; thin to 3 inches
	2	CARROTS *(Chantenay)*, 1 oz. seed; thin to 2 inches
	2½	BEANS *(Valentine)*, 50 feet, 1 lb. seed; *Henderson Bush* lima, 50 ft., 1 lb. seed
April 15 to May 1	3	SWEET CORN *(Adams)*, 1 oz. seed; in hills 2-3 ft. apart, or drilled ½ ft. apart
	3	SWEET CORN *(Adams)*
May	3	SWEET CORN *(Golden Cross Bantam)*, with 20 hills of CUSHAWS *(Green-Striped)*
	3	SWEET CORN *(Golden Cross Bantam)*
	3	TOMATOES *(Earliana, Break O'Day)*, 35 plants, staked
	3	PEPPERS *(Ruby King)*, 50 ft., 25 plants —— EGGPLANT *(New York)*, 50 ft., 20 plants
	3	SQUASHES *(Summer Straightneck)*, 30 hills
	3	SQUASHES *(Table Queen)*, 20 hills
	3	OKRA *(White Velvet)*, 50 ft., 1 oz. seed; thin to 18 in. —— BEANS *(Stringless Greenpod)*, 50 ft.
	3½	SWEETPOTATOES *(Porto Rico)*, 75 slips set 15 inches apart
	4	SWEETPOTATOES *(Porto Rico)*
June 1 to June 15	4	TOMATOES *(Marglobe, Greater Baltimore)*, 25 plants, mulched
	4	TOMATOES *(Marglobe, Greater Baltimore)*, 25 plants, mulched
	4	TOMATOES *(Marglobe, Greater Baltimore)*, 25 plants, mulched
	3½	BEANS *(Stringless Greenpod, Kentucky Wonder)*
	3	SWEET CORN *(Stowell's Evergreen, Bantam Evergreen)*
	3	SWEET CORN *(Stowell's Evergreen, Bantam Evergreen)*
	3	SWEET CORN *(Stowell's Evergreen, Bantam Evergreen)*
	3	SWEET CORN *(Stowell's Evergreen, Bantam Evergreen)*
June 15 to July 1	3	SWEET CORN *(Stowell's Evergreen, Bantam Evergreen)*
	3	BEETS *(Detroit Dark Red)*, 2 oz. seed; thin to 3 inches
	2	
Late crops following early crops		LATE CABBAGE, in *Alaska* pea row
July 1 to 15		BEANS *(Stringless Greenpod)*, in mustard-and-spinach row
		BEANS *(Stringless Greenpod)*, in half of *Telephone* pea row
July 15 to August 1		BEANS *(Stringless Greenpod)*, 50 ft. in rest of *Telephone* pea row
		KALE *(Siberian)*, 100 ft. in lettuce row, or TURNIPS *(Purple Top Globe)*, 100 ft., 1 oz. seed
August		SPINACH *(King of Denmark* or *Norfolk)*, in *Golden Acre* cabbage row
		KALE *(Scotch)*, 50 ft.; and CHINESE CABBAGE, 50 ft., in one of *Adams* corn rows
September		GREENS or TURNIPS in other *Adams* corn row and in early beet row
		Remove harvested crops and sow rye or barley for winter cover crop. Continue this through October, using *Balbo* or *Rosen* rye.

nonstock and stock organizations. The capital-stock type of organization is used where a large amount of capital is needed for facilities and operating overhead, and the membership organization where little capital is needed.

Thru what is known as the "revolving-indebtedness plan," the nonstock type of organization may also be used where substantial amounts of capital are needed. Under this plan farmer members contribute to the capital of the organization and are given by the association a "certificate of indebtedness"—really a note recognizing the organization's indebtedness to the member, but carrying no due date or specific rate of interest. Deductions are then made from current business receipts to retire old certificates of indebtedness and thus to keep ownership and control of the organization in the hands of current patron members.

Should the Cooperative Be Incorporated?

After determining the type of organization that should be set up, the next question will probably be whether to incorporate the organization. Incorporating an organization is merely setting up a legal way of limiting the liability of individual members for any shortcomings of the cooperative organization. The cost of incorporating in Kentucky is about fifteen dollars—a small amount to pay for the satisfaction of the members in knowing that they individually are not financially liable (beyond the investment they have in the cooperative) for any activity in which their incorporated cooperative organization may engage.

Articles of incorporation must be filed with the Secretary of State, the county clerk in the county in which the organization is formed, and the Dean of the College of Agriculture and Home Economics.

After an organization is incorporated, it is then in a position to adopt its by-laws, purchase property and facilities where needed, hire the necessary management and other help, and enter into membership agreements or producer contracts with its members. A great deal of study should be given in the preparation of articles of incorporation and by-laws, as they define the procedures to be followed by the cooperative in the conduct of the future business.

Should a Membership Agreement Be Used?

The membership contract is a very valuable device for determining the approximate volume of business which may be expected from the membership. In drawing up a membership agreement, a statement

of the obligations of the association to the member should be set forth as well as the obligations of the member to the association. The association agrees to perform certain services for the member, and the member in turn agrees to patronize the association in the amount as defined in the agreement.

Such a contract, signed by the member and the association, is a legal document which may be enforced by courts if necessary. It is well, however, not to enforce such contracts so strictly as to stir up ill feeling among the patrons. A cooperative can succeed only when the members feel the need for it and patronize it because of the advantage they obtain from it. An organization will not long exist if it has to force compliance with the terms of the contract thru court action. On the other hand the members must recognize that the real benefits of a cooperative extend over a long time, and that it will very likely pay them in the long run to support the organization even at times when such support may seem at the moment to be to their disadvantage. During such short periods when the cooperative might not otherwise be able to meet competition from private sources, the contract may be very useful in helping to keep the farmers with the organization.

Lexington, Kentucky February, 1942

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Should We Form a COOPERATIVE?

IF a Cooperative IS TO SUCCEED-

- It must be needed, and its membership must recognize the need
- Its capital must be sufficient and the major part of it contributed by the members
- Its volume of business must be great enough for ~~s~~efficient operation
- Its membership must be loyal to the organization and well informed as to its operation
- The service it renders must in the long run be better or cheaper than its members can get elsewhere

UNIVERSITY OF KENTUCKY

College of Agriculture and Home Economics

Extension Service ... Thomas P. Cooper, *Dean* and *Director*

Should We Form a Cooperative?

By L. A. Vennes

Before deciding to form a cooperative, those interested should know what can reasonably be expected of a cooperative and what cannot. They should be familiar with the conditions existing in the area to be served by the prospective cooperative, and they should give thought to such changes as would be likely to occur in the area if the cooperative were formed. A cooperative can succeed only where there is a definite economic need for it, and where farmers recognize this need and are willing to contribute time, thought, and money to it and turn a sufficient volume of business to it to enable it to function efficiently.

What Can a Cooperative Do?

Cooperatives often succeed in lowering the cost of marketing service and farm supplies, thereby increasing the net returns from farm operations of the members. They have succeeded also in bringing about orderly marketing of agricultural products, and thru collective bargaining have often been able to increase the net price received for their products. They have taken much of the speculation out of selling and have, generally speaking, followed the policy of making the returns to farmers in accordance with the quality of the products delivered to the association. Moreover, the fact should not be overlooked that the organization and operation of a cooperative association has in many instances contributed greatly to a finer rural life.

Cooperative no Cure-All

It is well to keep in mind, however, that altho many things can be done better thru cooperation than in any other way, there are some which cooperatives never have been able to do. A cooperative cannot eliminate the necessary functions of a middleman, but it often performs these functions better than the ordinary middleman. Cooperatives cannot perform miracles nor serve as a cure-all for farmers' troubles. Over a long period of time they cannot fix prices for the products handled and disregard the law of supply and demand. A monopoly control of prices can be hoped for only when monopoly control of production is practiced. Not price fixing, but better merchandizing, better grading, better packing and economical operation are the definite accomplishments of successful cooperative effort.

Does an Economic Need Exist?

Whether there is real need for a cooperative can best be determined by making a fact-finding survey which will help to answer many of the questions in the minds of the farmers interested. Usually an investigation committee is set up for this purpose. The survey should be rather complete, listing the type of commodities to be purchased or sold, the organizations now serving the farmers, the advantages and disadvantages of the services as now being performed, the prospective membership, and a preliminary estimate on the amount of business which may reasonably be expected. These facts, when properly gathered and summarized may enable the interested parties to arrive at the answer as to whether there is an economic need and whether a cooperative should or could be set up.

Market Outlets

If the proposed association is to engage in marketing farm products, it is important that alternative selling methods be considered. Occasionally it may appear desirable to establish working relationships with existing marketing agencies. Sometimes it may be found that the existing channels can be broadened and thus made to do a more efficient job of distribution. In still other cases the investigating committee will determine that the cooperative's interests may best be served by having its own representatives in the distribution centers. In short, the committee should have full information concerning present and prospective outlets and a well-rounded program to present for further consideration.

Facilities

When it has estimated the probable volume of business, the committee should look into the facilities required to take care of the business, with proper allowance for future expansion. It is important that the expected volume be estimated conservatively, so that the association will not be burdened with the cost of carrying excess facilities. When the facilities required are extensive and elaborate, the advice of skilled engineers or technicians should be obtained.

In making plans for acquiring buildings or equipment it is usually desirable to investigate existing facilities and determine whether they can be purchased or leased at a reasonable price.

Who Should Make This Survey?

Fact-finding surveys are much more fruitful when conducted by the farmers themselves rather than by

an outside individual. The county agricultural agent and the extension specialist are available for giving assistance in planning the survey and in analyzing the information after it has been gathered. The Farm Security Administration, the Bank for Cooperatives, and other similar organizations may be also called upon for assistance.

What Are the Next Steps?

If the information gathered in the survey indicates that there is a real need for a cooperative and that the farmers are eager to form one, the next step should be the establishment of a committee for drawing up plans of organization, working out temporary articles of incorporation, by-laws, and membership agreements, and conducting meetings with farm groups to interest them in becoming members of the prospective organization.

What Type of Organization Should Be Formed?

The type of organization which should be set up will depend very largely upon the type of business contemplated. If farm supplies are to be bought for members one of two general plans may be followed.

First, the organization may function as a collective buying organization, acting merely as a buying agent for its members, taking orders and receiving cash in advance for the farm supplies needed by the individual members. Orders are grouped and purchases made on a cash basis. It is at once recognized that such an organization would need very little capital, as all business would be done on a cash basis and few or no facilities would be needed, as no goods would be stocked. A nonstock membership organization would probably be advisable for this type of effort.

Second, the cooperative might plan to keep such supplies as feed, seeds, fertilizer and farm machinery on hand and available for the farmers whenever needed by them, and for such purposes a considerable amount of capital would be required. In this case, probably a capital-stock organization would be most desirable. Ownership of common stock would be the basis of membership in the organization, and a substantial proportion of the capital necessary for operation would be furnished by the members. This capital stock would bear a low interest rate, and savings from the operation of the business would be prorated to the members on the basis of their volume of patronage.

Types of marketing organizations would also fall largely in the two classes mentioned above, namely

Sheep

1. Save every lamb possible, and make every ewe with milk raise a lamb.

2. Creep-feed lambs until plenty of pasture is available.

3. Dock all lambs, and castrate all ram lambs when 1 to 3 weeks old except those for breeding.

4. Shear as soon as weather will permit and fleeces are in good condition for shearing.

5. Wean by July 15 all lambs still on hand. Sell when finished in the fall as No. 1 shearlings.

6. Control internal parasites through quarantine and treatment of incoming animals, pasture rotation, sanitation, and timely use of anthelmintics.

7. Dip to control external parasites. Use local vat if available; if not, a community vat or the portable plan is the answer.

8. See that salt and water are within easy reach of the flock at all times.

Dairy Cows

1. Improve the pastures. From good pasture, cows can get about half of their annual feed, at less than one-third the cost of other farm feeds.

2. Provide more and better legume hay. Good legume hays produce more protein and require less labor than other feeds, with the exception of pasture.

3. Feed grain mixture more liberally, containing more soybean and cottonseed meal. Feed about 1 pound grain to 3 pounds of milk, daily, in addition to what good roughage the cows will eat.

4. Give each cow a 6- to 8-week dry period, and continue to feed liberally.

5. Provide plenty of good clean water. A cow needs about 12 gallons of water a day. In winter, cows need water at least twice a day.

6. Keep the milk and cream clean, and market frequently. Clean, healthy cows, clean utensils, and prompt cooling are necessary for high quality.

Chickens and Eggs

1. Purchase good-quality chicks.

2. Provide proper feeders and waterers for both chicks and laying hens, and limestone hoppers for hens. The waterer should hold at least a day's supply.

3. Practice range rotation, disease and parasite control.

4. Self-feed grain, mash, and ground limestone. Store plenty of feed, and don't change feeds suddenly.

5. Provide good pasture for poultry of all ages.

6. After hatching season remove roosters to reduce loss of eggs.

7. Gather eggs often, store in cool place, and market frequently.

8. Cull loafing hens and slow-growing pullets throughout the year. Sell old hens just before housing pullets or provide adequate housing space for both.

9. Remodel old houses, provide dropping pits, ample nests, and litter.

GROW FAMILY SUPPLY OF VEGETABLES AND FRUITS

1. Use manure to stimulate fruiting of bearing fruit trees. Prune less than usual this year.

2. Plan the garden before the spring rush season comes. List vegetables and amount of seed needed. Select good varieties. Order seed at once but *don't buy more than you really need.*

3. Save labor by planting only the amount needed, by arranging for use of farm tools, by controlling weeds early while they can be uprooted easily.

4. Select fertile land for the vegetable garden, and use manure and commercial fertilizers.

5. Control insects and diseases on both fruits and vegetables. Get your equipment and supplies early.

6. Check facilities and supplies needed for processing, drying, canning, and storing to avoid loss of the crops after they are produced.

With determination, hard work, practical ability to get the most from what they have, and with favorable weather, Kentucky farmers can meet the demands for still more "food for war" in 1943. The way to get this tremendous task done is for all to do the best possible job of farming this year — to follow more thoroughly than ever before the methods that have been proved to be best.

—THOMAS P. COOPER, Dean of the College of Agriculture and Home Economics, University of Kentucky.

THIS FOLDER is given to you by

_____

who has voluntarily agreed to bring this and other important war information to families in your neighborhood.

350M—1-43

FARMING in 1943

. . . the biggest job Kentucky farmers ever faced!

MORE FARM PRODUCTS than ever before, is the goal for 1943 — and this in the face of shortages of labor, machinery, fertilizers and other supplies, and transportation. Farmers will need all their ability and determination, but the goals can be met! As a rule, the thing for each farmer to do is to produce *more* of the things he is best prepared to produce, rather than to take on too many new projects.

Good average-quality products and high yields are the order for 1943. There will probably be very little price premium for fancy quality, and the effort had better be used for greater output.

Home production of as much as possible of feed for livestock and food for the family will be an important help in meeting the national goals. It will assure the family of needed supplies, do away with much needless hauling, and release food for other uses.

Careful planning of marketing, and greater cooperation among neighbors and commercial truckers, will be necessary if farm products are to move into marketing channels without severe loss.

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KEEP THE SOIL PRODUCTIVE

1. Save and use crop residues and animal manure as fully as possible. This is especially important because of shortage of nitrogen fertilizer. Keep tobacco stalks under cover and spread them in the spring.

2. Improve pastures and hay crops for cheaper and more nutritious feed, saving of labor, protecting soil against erosion and leaching, reducing the amount of grain needed for livestock.

3. Grow as large an acreage of legumes as possible for soil improvement. Use winter cover crops to protect the soil and for pasture to reduce grain and hay needs.

4. Use lime and fertilizers to the extent needed, if obtainable.

5. If limestone is scarce, use it on land not limed before, rather than in reliming land, and lime larger areas at a lower rate rather than smaller areas at heavier rates. Good results may be had from 500 to 1,000 pounds per acre applied just ahead of legume crops. Use phosphate with the lime on phosphate-deficient soils. The lime and phosphate may be mixed for spreading.

6. Get as early as possible the fertilizers needed.

7. For high yields on soils heavily cropped without liberal use of manure, potash likely will be needed in the fertilizer.

8. Use nitrogen fertilizers on crops of high acre-value, particularly war crops, like hemp.

GROW GOOD VARIETIES OF CROPS

Don't risk crop failure by planting seed of varieties that have not proved themselves to be good, or that may not be well adapted to your part of the state. Plant hybrid corn and disease-resistant strains of crops, particularly tobacco.

GET FULL USE OF MACHINERY

1. Clean and protect machinery not in use.

2. Inspect all machinery, order new parts, and make needed repairs early.

3. Save usable parts of discarded machinery.

4. Keep field machines, trucks, tractors, and automobiles properly adjusted and lubricated.

5. To save man labor increase the size of teams and machine units per man.

6. Increase tractor speed, and load teams and tractors to capacity.

7. Use machines in the right way at the right time, to save labor and increase yields.

8. Pool use of labor and machinery.

9. Save labor by using portable motors, if available, for water pumping and so on.

10. Save time and mileage for truck and automobile by better planning for fewer trips.

11. Exchange hauling with neighbors, so as to load to capacity on every trip.

USE WORKSTOCK TO BETTER ADVANTAGE

1. Rid all workstock of parasites.

2. Clean, oil, and adjust harness, and harden workstock before heavy spring work begins.

3. Feed per day, when at heavy work, 1¼ pounds of sound corn and ½ pound of bright hay per 100 pounds weight of animal. This is in addition to good pasture at night.

4. On idle days turn workstock on good grass pasture and reduce other feed half or more.

5. Provide water and salt. Water workstock every hour while at hard work in the field.

6. Provide fly nets and nose bags in fly-time.

7. Use more animals per hitch and save labor.

USE LABOR SO IT WILL DO THE MOST GOOD

1. *Plan the farm operations* so that work will be spread as evenly as possible over the whole year. Do the indoor jobs in rainy weather. Use labor-saving devices, self-feeders for example.

2. Get the work done on time.

3. Exchange labor with neighbors; cooperate in group planning for use of custom machines.

4. Use farm labor committees to help mobilize high school boys and town men for emergency work on farms. The U. S. Employment Service may be helpful in getting hired workers.

KEEP THE FARM ANIMALS HEALTHY

If animals that die or are unhealthy from preventable causes were kept healthy there would be little need for further expansion of livestock numbers to meet the war goals. For healthier animals—

1. Use healthy prolific animals for breeders. Be sure that cows, ewes, and sows have normal udders.

2. See that the breeding stock and the young animals are not undernourished. Three common mistakes: (1) the animals don't get enough to eat; (2) they don't get enough clean water; and (3) salt is not kept where they can get it whenever they want it.

3. Keep barns, pens, yards, and pasture as *clean* as you can. Young animals especially should be kept away from filth. Spraying with commercial disinfectant is not enough. See that the barns and poultry houses are well ventilated.

4. Vaccinate for hog cholera, chicken pox, and blackleg.

USE SOUND PRACTICES WITH LIVESTOCK

Beef Cattle

1. Raise or buy cattle of the sex, quality, and age best for the equipment you have.

2. Produce more home-raised calves on milk and grass—save grain and labor.

3. Use home-grown roughage more completely.

4. Improve pastures, graze more, and feed grain where it will do most good.

5. Feed simple, low-cost rations supplying enough protein, minerals, and vitamins.

6. Provide shade, water, and salt at all times.

7. Control cattle grub, lice, other parasites, and infectious diseases.

8. Provide slop-fed steers with plenty of roughage, grain, and ground limestone.

9. Keep hogs with grain-fed steers.

10. Market cattle at heavier weights, and prevent bruising and other losses in marketing.

Hogs

1. Select meaty-type breeding stock from large litters of well-bred, rapid-gaining pigs. Breed as many sows and gilts as last year, or more if they can be handled efficiently.

2. Increase litter size by breeding sows on the second or third day of the heat period.

3. Raise two litters a year from each sow.

4. Feed pregnant sows a balanced ration of cereal grains, protein feed, simple mineral mixture, and alfalfa hay or pasture.

5. Save more pigs by providing guard rails and giving the sows and pigs proper care at farrowing time.

6. Keep pigs healthy by controlling parasites.

7. Self-feed balanced rations to pigs after 2 weeks of age. Provide and make full use of good legume pastures. Hog-off corn to save labor.

8. Provide plenty of shade and water.

9. Vaccinate against hog cholera.