UNIVERSITY OF KENTUCKY

COLLEGE OF AGRICULTURE

Extension Division

THOMAS P. COOPER, Dean and Director

CIRCULAR NO. 307

(Revised)

POTATO GROWING

Lexington, Ky.

April, 1940

Published in connection with the agricultural extension work carried on by cooperation 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.

CONTENTS

	Page
Soil and management	4
Manures and fertilizers	5
Seed	9
Treating the seed	13
Cutting the seed	15
Planting	16
Cultivation	19
Digging	20
Insects	22
Diseases	24
Spraying	26
Dusting	29
Spraying program for early potatoes	31
For late potatoes	32
Dusting program for early potatoes	32
For late potatoes	33
The early varieties	33
The late varieties	35
Storage	37

Page
. . 4
. . 5
. . 9
. . 13
. . . 15
. . . 16
. . . 19
. . . 20
. . . .22
. . . 24
. . . 26
. . . 29
. . . 31
. . . 32
. . . 32
. . . 33
. . . 33
. . . 35
. . . 37

Circular No. 307

POTATO GROWING

(Revised)

By JOHN S. GARDNER

Altho Kentucky lies south of the so-called "potato belt," potatoes constitute an important crop, commercially and for home-supply. A large part of the commercial crop is produced in the spring and is sold on the general market extending to other states. Nevertheless, Kentucky consumes more potatoes than she produces. That some of this deficiency could be met by local production is undoubted, for altho the whole state may not offer conditions under which the potato can thrive best, great parts of it are suitable for this crop both in climate and soil, and it would be profitable for many more farmers to endeavor to produce potatoes. Certainly, every farmer, and every householder who has the space, should grow enough potatoes to meet home needs.

In Kentucky, potato growing divides itself into three phases, the early crop for table use, the late crop for use as seed, and the late crop, of late varieties, for table use in winter.

The early crop, mainly Irish Cobblers and Triumphs, begins to move to market soon after the crops of North Carolina, lower Tennessee and Tidewater Virginia have passed their peak. They compete more or less directly with the Cobblers of Missouri and Kansas, and with those of California, the Eastern Shore Region and lower New Jersey.

The late crop, for seed, is exclusively Irish Cobbler and Bliss Triumph. This "second crop" is so called because much of it is grown on land from which early potatoes have just been removed. A considerable proportion of this crop is certified. Kentucky certified Cobbler and Triumph seed potatoes have repeatedly demonstrated their merit.

The production of late-crop winter table potatoes from late varieties is mainly a home enterprise, but farmers here and there annually raise surpluses for sale in local markets. This phase of potato growing could well be expanded, even to the point of having potatoes to ship, for weather conditions during the autumn are usually favorable for producing large yields.

SOIL AND SOIL MANAGEMENT

The best "potato land" is sandy loam, but potatoes can be grown in any soil that is capable of holding sufficient moisture, and is loose enough to permit the formation of shapely tubers. The character of the subsoil is important. It must be well drained, for potatoes cannot thrive in water-logged soil. On the other hand, the subsoil should not be so open and porous as to interfere with its moisture-holding capacity.

Humus. Because moisture plays such an important part in the production of profitable yields of potatoes, and because the humus content of soil is an important factor in determining its water-holding capacity, maintenance of the humus supply is important in the management of potato land. When potatoes are grown in a rotation that includes grasses or, preferably, clover, the humus content is maintained sufficiently, so far as moisture is concerned. When, however, high value of land or restricted acreage makes continuous cropping necessary, other means for supplying humus must be found. These include the application of stable manure or the turning under of green-manure-crops grown between seasons.

Stable manure is not always to be recommended as a source of humus. Applied fresh, immediately before the crop, it may increase scab. On the other hand, to use it composted is wasteful because plant food may be lost in composting. Nevertheless, if a gardener wants to keep his land fully occupied with crops more remunerative than green material to be turned under, there is nothing better than manure for putting humus into potato land. This is true particularly of land for early potatoes.

Green-manure Crops. For the grower who has a large acreage, green-manure crops afford an effective means for building up a humus supply. Green-manure crops grown between seasons not only furnish the cheapest and most easily applied form of humus, but their use minimizes the loss of plant food thru leaching, lessens the danger of winter soil-washing and has a corrective effect on land infected with potato scab. Because leguminous and non-leguminous cover crops are available, both hardy and tender, a range of choice wide enough to meet any condition is offered.

On land to be used for first-crop potatoes, the green-manure

crop should be sown early in the fall, so that it will have made sufficient growth by the time the land is to be plowed, usually in February. The following green-manure crops are satisfactory. The rate of seeding is for one acre:

Hairy vetch, 1 bushel, sown August 1 to September 1.
Hairy vetch, 30 lbs. and rye 1 bushel, sown August 1 to September 15.
Crimson clover. 10 lbs. and hairy vetch, 30 lbs., sown August 1 to 15.
Rye, 2 bushels, sown as late as October 15.

Green-manure crops to be used on late-potato land need not be turned under until late spring; hence, they may be sown much later than those for early-potato land. In fact, sowing may be delayed with a fair chance of success until after harvesting the late-potato crop. If potato digging is delayed until after November 1, however, it is better to wait until the following spring and then sow oats, 1 bushel, and Canada field peas, ½ bushel, per acre.

The best time to plow under rye or oats is when they begin to head. Clover or vetch should be turned under when in full bloom. If breaking is delayed until the stems become too mature, decomposition will not be rapid enough to furnish the moist humus necessary for the use of the growing potatoes.

Breaking the Ground. The variation in seasonal conditions in Kentucky is such that no fixed time for breaking ground can be stated to apply everywhere within the state. However, since a sod or cover crop must be partially decayed before it can supply humus or plant food, it must be turned under in time for this change to take place. Usually, fall breaking or winter breaking is best for early-potato land, especially if the soil is heavy; for the late crop, late spring breaking is recommended. It is a good practice to disk the land thoroly before breaking, whether there is any plant growth to turn under or not. Thus, a deep, well-pulverized seedbed is assured. The depth of breaking is governed by the depth of the top soil; it is not wise to turn up more than one inch of subsoil a year. Subsoiling is beneficial in dense subsoils, but if the subsoil is gravelly it had best be left undisturbed.

MANURES AND FERTILIZERS

An important item in potato growing is the cost of the fertilizer used. Usually this amounts to about 20 percent of the total

expense or nearly half the cash expense. The following itemized statement of the cost of raising an acre of potatoes represents the average cost found by leading growers.

Rent of land, etc.	$15.00
Seed—15 bu. at $1.50	22.50
Fertilizer, 1000 lbs. 5-10-5	20.00
Labor, about	35.00
Insecticide and Bordeaux	8.25
	$100.75

Since the price of potatoes is quite variable the fertilizing should be done judiciously. All three of the plant foods contained in complete fertilizer are needed; nitrogen to establish a vigorous, thrifty plant quickly: phosphorus, to hasten the starting of tubers; potash, to swell them. From demonstrations conducted under a variety of conditions, it appears that a proper ratio of the commercial plantfood is 1:2:1 or, expressed as a fertilizer analysis, 5-10-5. This general recommendation may be modified by the kind of crop that preceded potatoes and how it was handled; also by whether manure is used in conjunction, whether a cover crop, whether legume or not, and so on. Specific cases are discussed later.

Nitrogen. Nitrogenous fertilizers should be used cautiously, because an excess of nitrogen causes rank top growth and light setting of tubers. On the other hand, prompt and vigorous plant growth is necessary to produce a heavy yield of potatoes, and such growth is obtained mainly thru an adequate supply of nitrogen.

A sod, top dressed with manure, or a cover crop of legumes, contains enough nitrogen for a heavy crop of potatoes, but this nitrogen must first become available thru the rotting of the organic matter. For the early crop these sources of nitrogen are not dependable, so recourse must be had to commercial fertilizers. With late potatoes, partial decay of the manure or legume will have taken place and some of the nitrogen becomes useful to the crop. Even then, it is often wise to apply some commercial nitrogen.

Nitrate of soda and sulfate of ammonia are the nitrogen carriers commonly used in potato fertilizers. Both have the virtue of easy solubility, the nitrate releasing its plant food first, and the sulfate following close behind. The exclusive use of nitrate of soda might result in making soil so alkaline as to make potato scab

troublesome, whereas if sulfate were used alone the land might become so acid that yields would be reduced. Because of this, it is good practice for growers to specify such percentages of these ingredients, in commercial fertilizers, that a proper balance with respect to soil acidity may be maintained. Assuming that a ton of fertilizer contains 5 percent of nitrogen, the nitrogen carriers may be proportioned as follows:

200 lbs. of sulfate of ammonia (20% N)	=40 lbs. of nitrogen
375 lbs. of nitrate of soda (16% N)	=60 lbs. of nitrogen
575 lbs.	100 lbs.

Phosphorus. Potatoes need phosphorus. Phosphorus serves to induce maturity, and plays a large part in the formation of starch. Because the growing period of the potato is relatively short, the most quickly available form of phosphorus should be used; superphosphate is recommended. Phosphorus is present in all Kentucky soils, but outside the Bluegrass region the amount that can become available is too small to supply the need of a good crop of potatoes. Even on the rich soil of the Bluegrass, a fertilizer for potatoes should contain superphosphate because not enough soil phosphorus may become available in a 90-day season.

From demonstrations thruout the state, it appears that the proper ratio of phosphoric acid to nitrogen is 2 to 1. A fertilizer carrying 5 percent of nitrogen should contain 10 percent of phosphoric acid. A ton of such fertilizer should contain:

1000 lbs. of 20% superphosphate, or
625 lbs. of 32% superphosphate, or
500 lbs. of 40% superphosphate.

Potassium. Potassium has several functions, but the one that most concerns a potato grower is that it aids in the formation of starch, of which potatoes so largely consist. Altho the exact requirements of a potato crop are not known, demonstrations show that under average Kentucky conditions, with the humus well maintained, the proportions of potash and nitrogen should be the same. This makes the complete fertilizer formula 5-10-5, and a ton would contain 200 lbs. of muriate of potash. Muriate is recommended because of its relative cheapness, compared with sulfate.

Also, tests made with it in Kentucky have shown no advantages in yield or in quality in favor of the higher priced sulfate.

Summing up the foregoing, a ton of fertilizer well suited to potatoes under average conditions can be mixed from:

425 lbs. nitrate of soda, 16%	=	68 lbs. nitrogen	
225 lbs. sulfate of ammonia, 20%	=	45 lbs. nitrogen	
		113 lbs. nitrogen	= 5.6%
1,125 lbs. superphosphate, 20%	=	225 lbs. phosphoric acid	= 11.2%
225 lbs. muriate of potash, 50%	=	112 lbs. potash	= 5.6%
2,000 lbs. of 5.6—11.2—5.6 fertilizer			

Altho growers may mix their potato fertilizer, following the directions just given, they frequently find that the economy in so doing is offset by the time and trouble home-mixing entails. This much is true, however, that any grower may profitably try test mixtures in which he may vary the proportions of the plant foods, nitrogen, phosphorus, and potassium just given, in order to discover the formula best suited to his soil.

Home gardens are usually much more fertile than commercial potato fields, hence fertilizers with analyses of 3-8-6, 4-8-6, and 4-10-4 should prove adequate for use by home gardeners.

Amount of Fertilizer to Use. To lay down definite rules that apply to the whole state of Kentucky is not feasible, for conditions differ so greatly, but here follow a few suggestions.

For early potatoes, grown on land top-dressed with manure, or if a legume has been turned under the previous fall, 750 to 1000 pounds of 5-10-5 or 6-10-6 fertilizer per acre should be used. If manure is not available the amount of fertilizer may profitably be increased.

For late-crop potatoes on such land, allowance may be made for the nitrogen and potash in the manure and in the legume, and the percentage of nitrogen (and perhaps of potash) in the fertilizer may be less. Accordingly, the recommendation for late potatoes would be 500-750 pounds per acre of 4-10-4 or 4-8-6.

If the manure crop were rye, and no manure used, all the plant food must be provided in the fertilizer. A recommendation to meet such a case is to use 750 to 1000 pounds per acre of 5-10-5 fertilizer. Growers who wish to use the "high analysis" fertilizers

may determine the correct rate of application by means of the figures in the formulas. Thus 750 pounds of 5-10-5 fertilizer is equivalent to 469 pounds of 8-16-8, or 250 pounds of 15-30-15.

How to Apply Fertilizer. Because the root system of the potato is restricted, the most effective way to apply fertilizer is in the row, on the same level as the seed rather than above or below it, but not actually touching it. Potato planters with double fertilizer spouts, apply fertilizer in the best possible way. Too, their finer fertilizer-feed adjustments make them capable of handling the "high analysis" fertilizers, the use of which is increasing. When planting is done by hand, the procedure is to lay off the furrows with a plow and sow the fertilizer by hand, mixing it with the soil in the bottom of the furrow by dragging a chain or wood block thru it, to obviate any danger of fertilizer coming in contact with the seed and destroying it. When "high analysis" fertilizers are used, this danger is greater.

The rate of sowing to correspond with various acre-application rates, for 36-inch rows, is:

1 lb. to 60 feet equals 250 lbs. per acre;
1 lb. to 30 feet equals 500 lbs. per acre;
1 lb. to 20 feet equals 750 lbs. per acre;
1 lb. to 15 feet equals 1000 lbs. per acre.

In hand planting, it is not advisable to use more than 750 pounds of complete fertilizer (or 250 pounds of "high analysis") per acre, because of the difficulty in so mixing it in the soil that seed-burning may not take place.

SEED

Good seed potatoes should not be larger than 12 ounces, for large potatoes cannot be cut economically into pieces of the proper size and shape. Moreover, in cutting a large tuber the eye on the stem end piece is weak and this may result in a missing hill or at best an unproductive one. On the other hand, to use small tubers, planted whole, unless they are known to be of productive stock, is to invite low yields, for small potatoes frequently are the progeny of diseased and weak plants. The ideal seed potato weighs 5 ounces and should be cut into four pieces.

Good seed potatoes should be reasonably free from scab and

black scurf, but even if these diseases are present, the seed may be made safe by treating it. Even seed which is apparently clean should be treated, whether purchased or home-grown, to guard against the introduction or the spread of these diseases.

Seed potatoes should be true to type, without "second growth" knobs or "spindle tuber" characteristics. On cutting across the stem end the flesh should show no ring discoloration since such a condition may indicate disease.

The condition of potatoes to be used for seed should be considered carefully. They should not be sprouted because of having been kept at too high temperature; generally 40 degrees is not too warm. They should not have been allowed to wilt because of having been stored in too dry atmosphere; generally, there is no difficulty of this sort in cellars with earth floors, for these automatically provide enough humidity. The potatoes must not have been stored at a temperature below freezing, which weakens the sprouts or prevents sprouting from taking place at all. Accepted safe temperature is between 34 and 36 degrees Fahrenheit, particularly for potatoes kept in cold storage.

Certified Seed. The simplest way to make sure of getting satisfactory seed potatoes is to specify only certified seed. The word "certified," honestly used, means that the stock has been passed by qualified inspectors as being practically free of the degenerative or "running-out" diseases that cause yields to be low. Original packages of genuine certified seed bear tags to that effect. That such seed will produce superior crops has been proved in hundreds of demonstrations thruout Kentucky, increases of from 30 to 70 percent being common.

The use of the word "certified" sometimes is abused. A statement on a tag to the effect that "The stock herein contained is certified for seed use," means nothing. Neither does the statement that "These seed potatoes are certified to be grown under non-irrigated conditions and are free from visible disease, and true to type" carry any significance. Furthermore, the tag "U. S. No. 1 grade" means only that the potatoes are graded according to standards for eating stock and for size. Authentic certified seed potatoes bear tags which name the certifying agency, usually

a state department of agriculture or a state agricultural experiment station, but always an authority of unquestioned standing. Certified stock does not retain its good qualities indefinitely, for even in the first season it is grown it may take any of the diseases to which potatoes are subject.

. *Maintaining Good Seed.* Potato seed-stocks tend to degenerate or "run out" because of the spread of virus diseases unless steps are taken to prevent it. Thus, growers who wish to keep their yields high, practice some manner of selection. The simplest is to dig only the best hills for seed. This method is uncertain because it is impossible to know how much disease may have been transmitted from nearby hills by insects present thruout the growing season. It is much better to remove all affected hills as soon as they can be noted. This is the procedure used to produce certified seed.

Still another way to improve the seed is by the "tuber-unit" method. Desirable tubers of uniform size are selected and each is cut into the same number of seed pieces. The pieces from each tuber are planted in a group or unit and a space is left between the groups so that each unit can be studied separately. Inspection is begun as soon as the plants emerge. If any plants in a unit are found to be diseased or questionable, all plants and seed pieces in the unit are removed. If the unhealthy units are removed before opportunity for transmission of disease by insects occurs those remaining should make high-grade seed.

Effective as the "tuber-unit" method is, there is a better way for improving seed potato stocks, called the "tuber-index" method. The procedure is to select tubers of desirable characteristics, and from each cut a seed piece, preferably from the stem end. Give the seed piece and the remnant a corresponding number, as "Seed Piece No. 1 — Remnant No. 1; Seed Piece No. 2 — Remnant No. 2," etc. In the spring, the seed pieces are planted in the order of their numbers and a careful record is kept to make sure of the identity of each piece. The "remnants" must be put into cold storage for planting in late July.

As the plants begin emerging, differences are noted; of these, careful record should be made, identifying each "index" by its location on the planting plan. Besides notes concerning disease,

those bearing on earliness (in blooming) and other desirable characteristics should be faithfully kept. Removal of faulty plants is not necessary; in fact their removal might cause confusion when final record is made. About July 1, the "indexes" or samples are dug, each separately, so that final check may be made of each index by the potatoes produced.

At second-crop planting time, mid-July, the remnants are taken from storage, and the undesirable ones, culled, using the performance record of the "indexes" as a guide. The remnants found desirable to keep, are planted all together or separately. The resulting crop should be a stock of seed of the best quality.

Advantages of the "index" method over all others are as follows:

1. The potatoes are tested for performance in the spring, which is the time when most of Kentucky's potatoes are grown.

2. Transmission of disease is minimized, for diseases usually are spread from growing plant to growing plant, rather than from seed piece to seed piece, as from one "remnant" to another, in storage.

3. Less labor is involved in this method. It is easier merely to make note that an index is to be discarded than to remove the offending plant.

4. Finally, the desirable remnants may be planted by machine, resulting in better stands than hand planting sometimes gives, in midsummer.

It should not be expected that seed stocks selected by whatever means will long stay superior, for there is always the risk of fresh disease infection from potatoes grown nearby. The work should be done continually, if superiority is to be maintained.

The foregoing discussion refers only to fall-grown potatoes for seed stock. Potatoes from the early crop of Irish Cobbler, Carman, Triumph, and Early Ohio are not suited for use as seed, regardless of how good the stock was, for they will have become too old by planting time the following spring to make vigorous hills. The loss from using such seed may easily be 75 percent of the crop. The Early Rose and Burbank varieties are not so much affected by age as those just named, but in growing even these varieties it is better to use seed potatoes that have matured toward fall.

TREATING THE SEED

Seed potatoes should be treated to guard against scab and black scurf. This is best done a short time before cutting, tho treating the cut seed is permissible. The potatoes may be cut immediately after treatment or any time later. The containers for holding treated seed should be treated with the same solution to make sure that they do not carry these diseases. If cut seed is to be treated, a few days should elapse after cutting, so that corking over of the surfaces may take place. After cut seed has been treated, it is best to give it opportunity to dry quickly.

Two methods of treatment are discussed. Each has its special merits when used under the conditions for which it is intended. The grower may choose which suits his conditions best.

"Standard" Corrosive Sublimate Treatment. Corrosive sublimate is a deadly poison, taken inwardly, but it is not absorbed thru the skin, and does not injure the hands. Because it attacks metals, only wooden or crockery containers should be used. Corrosive sublimate is dissolved in water at the rate of 1 ounce to 7½ gallons. Because it dissolves with difficulty, it is best to dissolve an ounce of the chemical in 2 quarts of hot water and add this solution to 7 gallons of water in the treating container to make the ratio one ounce to 7½ gallons of water.

For sake of economy of solution, it is best to pour in the potatoes loose or, if the seed is to be treated in sacks or crates, the fit should be close. The treating container should have a capacity twice the amount of treating solution used, for the solution will rise to twice its original height when potatoes are put into it, loose. Four lots of potatoes may be dipped in one batch of solution as follows:

1st lot, 1 hour.
2nd lot, 1¼ hours.
3rd lot, 1½ hours.
4th lot, 2 hours.

This solution should then be brought to its original level and half the original quantity of corrosive sublimate added, after which it is ready to use on three lots, dipping them for the following times:

1st lot, 1¼ hours.
2nd lot, 1½ hours.
3rd lot, 2 hours.

The solution may be reinforced, as before, and three new lots treated. After this an entirely new solution should be made, as in the beginning.

When large quantities of potatoes are to be treated, a number of 50-gallon barrels, each provided with a hole thru which to drow off the solution, may be used. (See figure 1.) Into all except one should be put 22½ gallons of water in which 3 ounces of corrosive sublimate have been dissolved. The empty barrel is to be used to "rotate" the solution.

FIGURE 1. An effective seed-treating outfit.

Quick-Dip Corrosive Sublimate Treatment. At the request of potato growers in Fayette and Jefferson Counties for tests which would demonstrate the value of shorter methods of treating seed potatoes, the writer developed the "quick-dip" corrosive sublimate treatment and demonstrated it in these two counties during the past ten years. This treatment gave apparently the same results as the "standard" method of treatment used for comparison in these tests.

Corrosive sublimate was used in the same proportion as for

the "standard" treatment, adding one ounce of hydrochloric acid for each ounce of corrosive sublimate. The formula used was:

1 ounce of corrosive sublimate,
1 fluid ounce of hydrochloric acid, (muriatic)
7½ gallons of water.

A batch of the solution was used to treat four lots of potatoes and the time of dipping each lot was five minutes. After the solution had been used four times, water was added to bring its level up to the original mark, and half the original quantities of corrosive sublimate and hydrochloric acid were put in. This solution was used three times and then reinforced as before, after which three lots more were treated. After that it was found best to make a fresh solution as in the beginning.

Two 50-gallon barrels, used alternately, with 22½ gallons of solution, constitute equipment to keep two men working at top speed.

The "quick-dip" formula is a modification of the "Acid-Mercury Dip"* recommended by some northern states, but does not contain so much acid and corrosive sublimate.

Commercial Treating Compounds. Several commercial treating materials are on the market. By their use potatoes may be treated rapidly, and, on the whole, they are effective.

CUTTING THE SEED

Seed pieces should be blocky and plump rather than thin or narrow, for blocky pieces have relatively small cut faces thru which "bleeding" and consequent wilting of the seed piece may take place. One eye, placed far enough away from a cut surface to guard against its weakening thru bleeding, is sufficient, but a larger number of eyes on a seed piece is not objectionable. Hills in which there are an excessive number of sprouts result from diseased seed pieces rather than from pieces bearing too many

* The "Acid-Mercury Dip," recommended by the Minnesota Agricultural Experiment Station, is made as follows:

6 ounces of corrosive sublimate,
1 quart of hydrochloric acid,
25 gallons of water.

This solution may be used to treat 40 or 50 bushels of potatoes. By adding one-fourth of the amounts of corrosive sublimate and hydrochloric acid, given above, and filling the container to its original water line, it may be used for treating 40 or 50 bushels more. Then it should be discarded and a new solution made.

eyes; a healthy group of eyes will give rise to a normal number of sprouts. Seed pieces weighing about 1¼ ounces have been found satisfactory, tho some growers and experiment station workers have obtained larger yields with larger seed pieces. Two methods of cutting seed potatoes are illustrated in figure 2.

As the seed is being cut, it is of advantage to dust it with flour of sulfur. Sulfur stops bleeding and aids the healing of cut surfaces. It appears to have a deterrent effect on some of the rot organisms in the soil, which are particularly active in the hot, dry weather that generally prevails when the "second" crop is being

FIGURE 2. Two methods of cutting seed potatoes.

planted. Ten ounces will dust a bushel of seed. To use an excess over this amount is wasteful, besides causing discomfort to the person doing the planting.

PLANTING

Whether to use a planter or not, is not a simple question to answer. If depreciation and interest on investment alone are

taken into account, it is doubtful whether an area of less than 10 acres warrants the use of a planter, but considering how important timeliness of planting may be, especially in the early-crop planting season when favorable days are few, a planter used on as few as four acres may easily be a profitable investment. Besides, the economy and efficiency in the application of fertilizers by the planter's fertilizer attachment are factors in favor of the use of a planter.

There are two types of planters: one requires an extra man in addition to the driver, who sees that the hopper is fed properly; the other requires no extra help, but drops the seed pieces, one by one. A point in favor of the "one-man" or "picker" planter is its light draft; on the other hand, it does not always do satisfactory work when whole seed or seed not uniformly cut is used. The two-man, or "plate" planter has relatively simple machinery and this is an important point. A point against it, however, is that the speed of the attendant in keeping the plate properly supplied with seed pieces determines the speed at which the planter may travel; the "picker" planter operates satisfactorily at a speed limited only by the speed of the team, and it can continue at top speed all day.

The majority of potato planters are one-row, horsedrawn. Some farms use two-row planters, drawn by tractors. A four-row planter can be improvised from two two-row planters. Properly adjusted, such a combination is capable of planting a surprisingly large acreage.

Whatever the type of planter, it should have a fertilizer distributor which places the fertilizer on both sides of the seed piece, about an inch away, and on the same level rather than above or below it.

In the absence of a planter, a turning plow or a single-shovel plow may serve. (Figure 3.) The fertilizer is dropped into the furrow by hand, and a piece of chain or a block of wood is dragged thru it to mix the fertilizer with the soil. This is important as fertilizer contains soluble nitrogen compounds and potash salts which may cause injury and prevent a satisfactory stand if they come into contact with the seed. Following the fertilizer the seed

is dropped and covered with a plow. Sometimes planting is done before danger of freezing is past and two furrows are thrown over the row to protect the seed from cold. It is doubtful if there is advantage in planting potatoes so early that such precautions are necessary. Rather, the advantage lies with the grower who waits until the season is safe, and plants his potatoes in a deep furrow but covers them only enough to be safe, filing the furrow as the plants grow. Besides overtaking his neighbor who may have

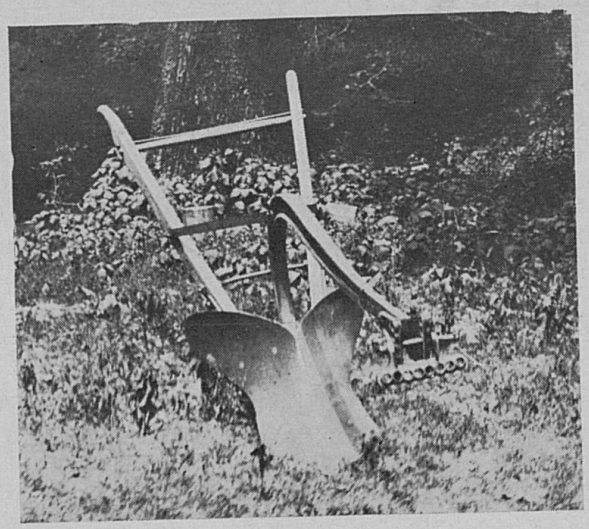

FIGURE 3. A "middle-buster," sometimes used in planting potatoes.

planted his potatoes several weeks previously, the grower who uses the method of deep placing of seed, but only shallow covering, will find his crop less troubled with black scurf, the disease that causes premature death of vines and a consequent light yield.

If ridges are made, they should be dragged level in time or, if the alternative method of planting is followed, filling the furrows should be begun as early as possible. Either of these operations serves as the first cultivation to take care of any weeds that may have started.

Planting Depth. Usually, spring potatoes are planted not more than 2½ inches deep, especially when ridges are to cover them. When the deep furrow and shallow covering method is used it is not difficult to put the seed pieces 4 inches deep and reap the benefit that always follows having potato plants deeply rooted.

For summer-planted potatoes, the same applies; the deeper the roots are, the greater likelihood of both coolness and moisture. Four inches is not too deep; in fact 5 inches is better.

Amount of Seed Per Acre. If seed pieces weigh 1¼ ounces the following rates of spacing will require the quantities of seed shown in Table 1.

Table 1. Quantity of seed potatoes required for different spacings.

Inches between rows	Inches space in row	Bushels per acre
30	6	46
30	9	31
30	12	23
30	15	19
30	18	16
30	21	13
36	9	25½
36	12	19
36	15	15¼
36	18	12¾
36	21	11
36	24	9½

Planting Time. The early crop is planted as early as the ground can be prepared. On especially early land and in the southwestern part of the state, this may be in February, tho a comparable gain in earliness of the crop does not always follow. In normal years, most early potato planting is done in March, frequently continuing into the first and second weeks of April. However, except in an abnormally cool spring, planting after April 1st does not give maximum early crops in Kentucky. From Experiment Station records long kept at Lexington, it appears that every day's delay after April 10 is reflected in reduced yield.

Planting time for Green Mountain, Russet Rural, McCormick, and Snowflake extends from July 1 to July 15. The late crop of Irish Cobbler, Bliss Triumph, Warba, and Chippewa is planted from July 15 to August 10.

CULTIVATION

Proper cultivation is an important part of successful potato growing and mistakes may prove costly. After the ridges have been dragged down, the middles need stirring, to put the land in order for later cultivation and to kill weeds that may have started.

This may be done with a single-shovel plow, tho a three-point or five-point cultivator is better. This cultivation may be deep and fairly close to the rows, but later workings should be shallow and far enough from the rows to make certain that no roots are touched. The best tool to use is the fourteen-tooth cultivator.

When the tops have made so much growth that cultivation must cease, a finishing cultivation, sometimes called "laying-by" is given. This operation may mean anything, from throwing a decided ridge with a turning plow, to dragging soil toward the rows or making a very low ridge by means of a simple board drag. Success is had with any of these three methods of "laying-by." But, generally a high ridge is best on the early crop, when moisture is plentiful where the land is poorly drained; a low ridge or even level cultivation is best on the late crop, as protection against late summer drouth.

DIGGING

Dates for digging differ in different parts of the state. Usually the early crop is dug when slightly immature so as to get it on the market early. The second crop is dug after the vines have been killed by frost. If the vines have been killed otherwise than by frost, it is well to lose no time in getting the potatoes out of the ground, particularly if wet weather is expected.

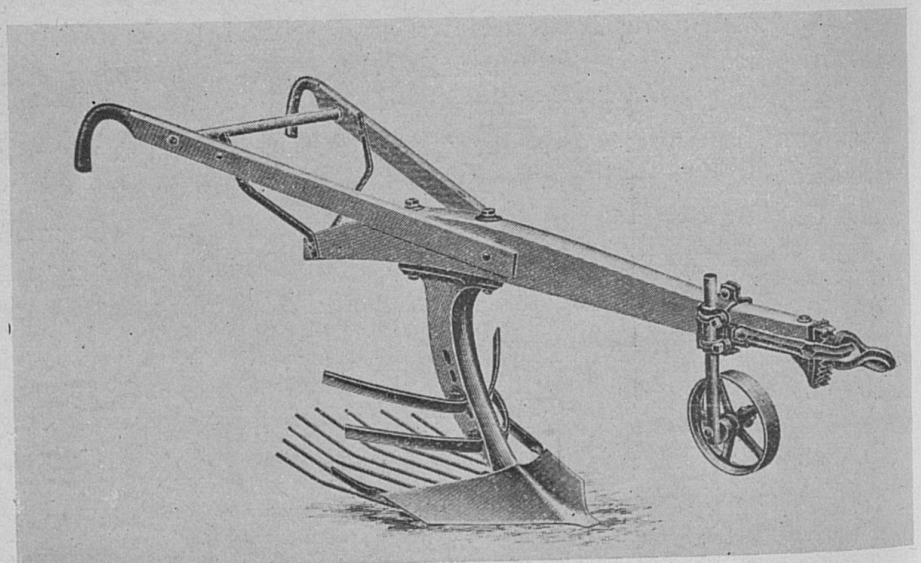

FIGURE 4. A potato-digging plow.

The method used in digging may range from the employment of a "grabbling hook" to that of an engine-driven digger. Sometimes it is important to get digging done quickly; if hoes or potato forks are used, a considerable force of diggers is needed and while the tools are inexpensive, the amount of labor required may make this method quite costly.

When the ordinary turning plow is used, many potatoes are lost unless the pickers take time and care in gathering them, and even then the next rain usually discloses many that have been overlooked. Better than a turning plow is a digger plow, one

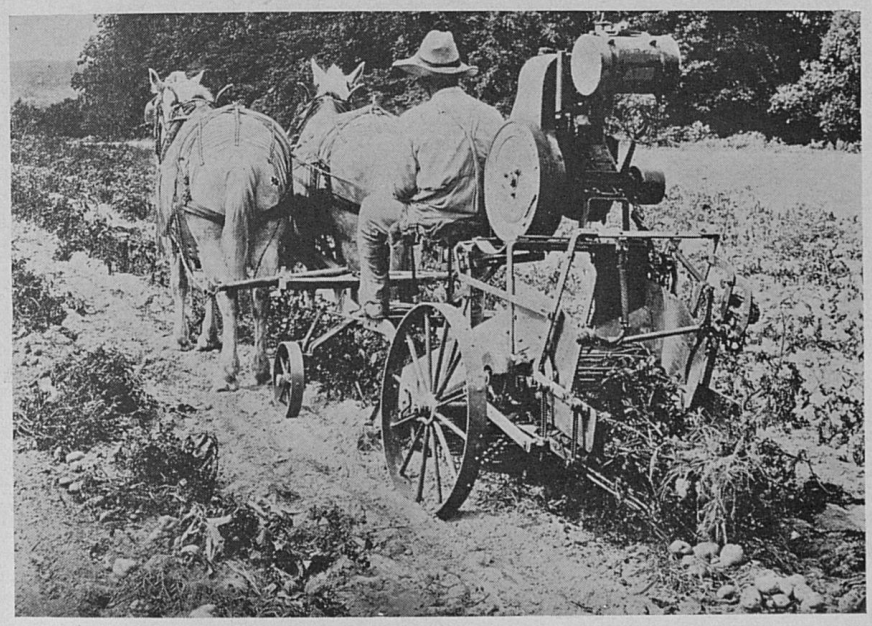

FIGURE 5. A power-driven potato digger.

type of which is illustrated in figure 4. Instead of merely upturning the hills, it separates the potatoes from the soil and tends to deposit them on the surface, in plain sight. Its moderate price makes its purchase a profitable investment, even when the amount of potatoes to be dug is small. Much better, however, is the elevator digger shown in figure 5. It consists of a broad digger shoe which lifts the row of potatoes and soil, and an elevator apron which shakes the soil from the potatoes, which are then deposited

on the ground in a narrow pile. The apron may be operated by gears connected with the wheels of the digger itself or independently, by a gasoline engine. The latter type is preferable because of the work it saves the team. From a purely economic consideration, an elevator digger is not practicable to use on an acreage smaller than ten, but where speed and general satisfaction are considered, a planting of five acres may warrant the investment.

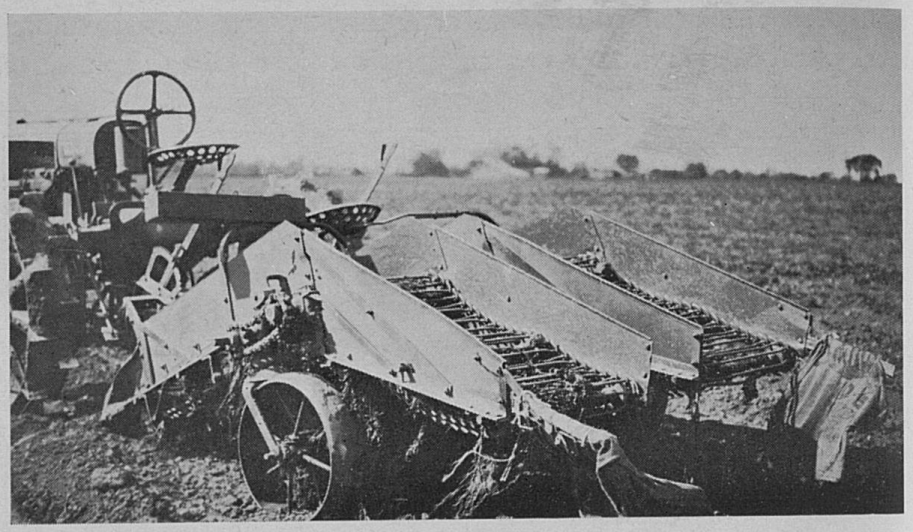

FIGURE 6. A two-row potato digger.

The two-row digger illustrated in figure 6, is designed to do even more rapid work. The elevator apron is operated by the power take-off from the tractor engine. Equipment of this sort is recommended only for very large acreage.

INSECTS

The mild winters usual in Kentucky enable many insects injurious to potatoes to survive. Insect control is accordingly a necessary part of successful potato culture. Tho an exhaustive discussion of this matter cannot be entered upon here, the important pests and their control are described.

Colorado Potato Beetle, Blister Beetles, Tobacco Worm and Cabbage Worm. These are chewing insects that cause leaf injury. They are too well known to need description here. Because they

eat the leaves of potato plants, the poison sprays and dusts described later in this circular are effective against them.

Black Fleabeetle. The insect is so named because of its resemblance to the common flea. It is a chewing insect that riddles the leaves with minute holes. When fleabeetles are numerous and the season is dry, total destruction of the foliage may ensue. Bordeaux mixture, with or without the addition of arsenate, is effective against them.

Cutworms and Army Worms. These are chewing insects, but they are combated by scattering poisoned bait (poison bran mash) rather than by spraying. The following formula may be used:

25 pounds of bran,
1 pound of Paris green, or 1 lb. of finely powdered white arsenic,
2 quarts of cheap molasses.

The bran and the poison should be mixed dry, then the molasses is added and enough water to make a crumbly mash. The mash should be sown along the rows where injury is observed, and over a zone surrounding the affected area. Ten pounds of bran make enough mash to treat one acre. For cutworm control it is best to sow the mash in the evening, for this insect works at night: for the army worm it may be sown at any time.

The sucking insects that attack potatoes are the plant lice, the leaf-hopper and sometimes, the white fly.

Plant Lice. These are small, soft-bodied insects that accumulate usually on the higher parts of the plants. Their color is generally pale green. They feed on the plant sap and their injury reduces the vigor of the growing tips, sometimes destroying them. Even tho their apparent injury is not severe, plant lice may be the means thru which the "running-out diseases" (virus diseases, page 24) are introduced and spread: thus they may become quite formidable pests. The control for them is given on page 33.

The Leaf-Hopper and the White Fly. These are tiny insects difficult to see except when they are set in motion by disturbing the foliage of the potatoes. Both lower the vigor of the plants by sucking the juice, the leaf-hopper, especially, causing the browning of the margins of the leaves. This injury, called "hopper-burn," often is attributed to dry weather. Complete control of the white

fly is not practicable with ordinary means, but "hopper-burn" may be reduced by following directions given in the spraying and dusting programs on page 32.

DISEASES

Potato diseases may be arranged in three groups. The first includes those that are borne within the seed but not in the soil. These are the "running-out," or virus, diseases: mosiac, leaf roll and spindle tuber. The second comprises those that may be introduced on the seed and persist in the soil for many years. They are scab, stem rot (black scurf), and wilt. The last group includes the foliage diseases, notably the blight.

Mosaic. Several mosaic diseases are recognized. One produces intense dwarfing and yellowing of the entire plant; another, dwarfing of the foliage only, which sometimes is splashed with pale color. Still another is shown by the slightly frilled edges of the leaflets which frequently stand askew from the main stem. Altho these kinds of mosaic differ in harmfulness, all tend to reduce yield. No cure is known for mosaic, but to avoid it, certified seed should be used.

Leaf Roll. This causes an upward curling of the leaves. It might be confused with the rolling of leaves caused by drouth. Leaf roll may be distinguished in that the leaflets crackle and feel turgid when squeezed in the hand, whereas leaves curled by drouth feel wilted and flaccid. The means for preventing leaf roll are the same as for mosaic.

Spindle Tuber. The appearance of plants with spindle tuber is very similar to that of plants affected with rhizoctonia stem rot. The tubers are small, with pointed stem ends. Sometimes they are pear-shaped; sometimes jug-shaped, and sometimes slim and cylindrical. Another symptom, more difficult to recognize, is that the "eye-brows" are straight instead of curved about the eye. In addition to the recommendations given under "Mosaic," much of it may be avoided by discarding all seed potatoes that show the symptoms just described.

General Control for the "Running-Out" Diseases. The following precautions should be used:

1. Use certified seed.
2. Do not use small potatoes for seed unless certain that they come from healthy hills.
3. If the crop is to be used for seed, keep the planting under close observation and remove all subnormal plants, together with the seed pieces, as soon as they are recognized.
4. Combat plant lice, when present, for they are the chief means by which the "running-out" diseases are spread.

Scab. Scab is caused by an organism that affects the tubers. It produces unsightly spots, irregular in shape and size. In a mild form, the spots are shallow and only impair the appearance and salability of the potatoes. In the severe form, the spots are sunken, entailing waste in the preparation of the potatoes for the table, and sometimes the entire crop is made worthless. The disease is more prevalent under drouth conditions than when moisture is plentiful. It is also more likely to occur in hot seasons than when the weather is more favorable for potatoes.

Scab is troublesome thruout Kentucky, the organism causing it being found in most soils. It is most severe in slightly alkaline soil. Thus it is likely to be troublesome in limed land or when horse manure is used. It is wise to avoid the use of land that has been heavily limed within two or three years. On the other hand, land that was limed lightly, from which several crops of alfalfa or clover have been removed since liming may be quite satisfactory for potatoes. Commercial fertilizers should be used as the source of plant food, rather than manure, unless the manure can be applied long enuf before potato planting for it to have become at least partially decayed. Practicing crop rotation helps in controlling scab, because of the opportunity for turning under a green crop (of rye, for example). The general control for scab is seed treatment and the avoidance of alkaline soil. All seed potatoes should be treated as directed on pages 13 to 15.

Rhizoctonia Stem Rot and Black Scurf. The organism that causes stem rot occurs on the seed potatoes in hard, sooty-black masses. This condition is called "black scurf" but is seldom found on potatoes grown in Kentucky. Plants affected by stem rot usually are undersized and may be identified further by their peculiar habit of growth, in that their branches tend to point upward like those of a Lombardy poplar. Inspection discloses large brown

or black diseased areas on the stems and roots. Another common symptom is the tendency of the plants to bear tubers above ground. Stem rot reduces yield, for affected plants die early. The disease is almost completely prevented by seed treatment (pages 13 to 15).

Black-Leg. The symptom of black-leg is soft-rot of the stem, beginning at the seed piece and extending to the ground line or above with consequent yellowing and unthriftiness of the plants. The decayed stems turn brown or black and may be distinguished from other somewhat similar troubles by being easily pulled from the soil. As black-leg usually starts in the seed piece, this is nearly always found to be decayed. Affected plants die early, usually before any marketable potatoes are formed.

The organism which causes this disease is introduced by the adult of the corn seed maggot when it lays its eggs on the seed piece. For this reason control is difficult. In soil inclined to be wet, planting should be shallower than customary. Kentucky-grown seed seems to be more resistant to this trouble than the more mature northern-grown seed.

Wilt. Wilt is caused by an organism that grows in the vein tissue of the roots, stems and leaves, causing the plant to die prematurely. It rarely causes injury to more than a small proportion of the plants. Means for prevention are not known.

Blight. Blight is a foliage disease It begins with spotting of the leaves, the spots increasing in size until they cover the entire leaves, which dry up and drop off. This loss of foliage stops the further development of the plants and a light crop of small tubers results. Systematic applications of Bordeaux (pages 28 and 29), begun early, protect the foliage from infection and lengthen the life of the plants, thus increasing the yield.

SPRAYING

The first essential in effective spraying is complete covering. This is true particularly when Bordeaux mixture is applied; the under surfaces as well as the upper surfaces of the foliage should be covered. Good covering is attained by adjusting the sprayer nozzles properly, and by using sufficient pressure. Just what should be the pressure at which to deliver the spray is not altogether de-

cided. Good results have been had with pressure as low as 125 pounds to the square inch, when strained Bordeaux mixture was used, the nozzles carefully adjusted to cover the rows, and the nozzle disks new. With a pressure of 200 pounds to the square inch, good covering and a minimum of trouble from stopped nozzles are assured, but pressures of 300 or even 400 pounds sometimes are recommended. Such pressures can be maintained only by an engine-driven pump (see figure7) or a good three-cylinder traction-driven pump (see figure 8).

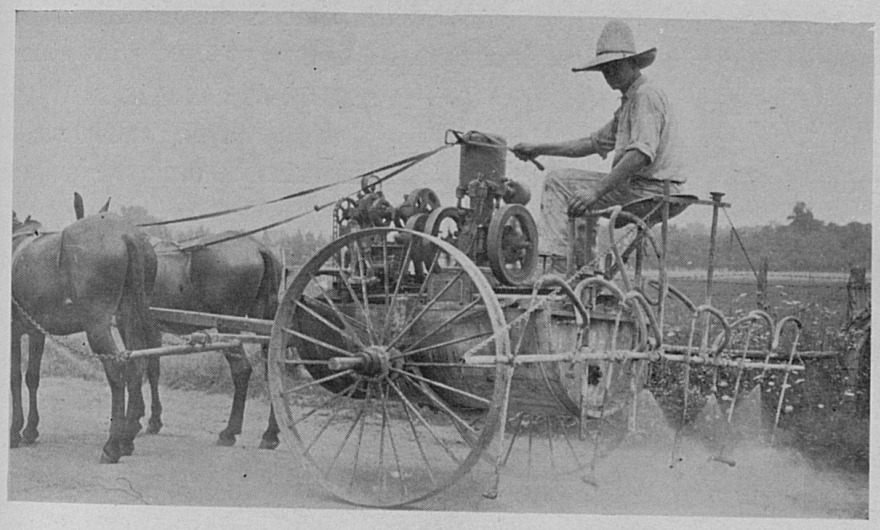

FIGURE 7. An engine-driven sprayer.

If the planting is less than one acre, an elaborate sprayer would be too expensive to operate and maintain; the grower should use a smaller pump, such as a hand-operated barrel pump mounted on skids or wheels or placed on a wagon body. Wheelbarrow and hand-carried sprayers may do good work, if care is taken to reach every part of the plant.

The larger machines, in proper adjustment, apply 100 gallons of spray per acre. Hand outfits, under skilled operation, may cover an acre with less material, but this saving does not offset the increased amount of labor and time necessary when they are used.

TO MAKE BORDEAUX MIXTURE

Bordeaux mixture is a combination of lime, copper sulfate, and water. For use on potatoes, it is made as follows:

1. *Lime Stock Solution.* In a 50-gallon barrel mix 65 pounds of a pure chemical hydrated lime with 50 gallons of water. If stone lime is preferred, slake 50 pounds of stone lime in the barrel by adding water in small quantities to avoid drowning. When slaking is accomplished, fill the barrel with water.

2. (a) *Copper Sulfate Stock Solution.* Use large or small crystals. In a 50-gallon barrel of water dissolve 50 pounds of crystal copper sulfate by putting it in a sack that is suspended in the barrel so that two or three inches of its tip are covered with water.

(b) *Instant Method with Powdered Copper Sulfate.* When powdered copper sulfate is used the solution may be made up as needed and at any desired dilution. It may also be used for making

FIGURE 8. A traction-driven sprayer.

the stock solution described under (a). To dissolve in water, the desired amount usually is placed in a wooden pail, water added and the solution stirred with a wooden paddle until all the copper sulfate is dissolved.

3. To make 50 gallons of 5-5-50 Bordeaux mixture, put into the container 35 gallons of water and stir in 5 gallons of well

stirred and strained lime stock solution. Then pour in 5 gallons of copper sulfate stock solution, while stirring vigorously. If lead arsenate or calcium arsenate is to be put in for insect control, stir 1½ pounds of either in enough water to make a smooth paste, and pour this into the spray and stir again. Water to make up 50 gallons should then be added, and the whole thoroly stirred.

FIGURE 9. A compressed-air hand sprayer.

Bordeaux mixture should be used immediately after it is made because on standing the ingredients settle to the bottom and even vigorous stirring will not make a uniform spray again.

DUSTING

A wide selection of dusting outfits is offered. Several good types of crank dusters that deliver a continuous stream of dust are on the market. With any of these an acre can be covered thoroly in two hours. A drawback to their use is that the nozzle is in front of the operator, who is therefore surrounded by a cloud of the dust during the dusting. One-horse and two-horse traction-driven dusters of high efficiency are made, also those with engine-driven blowers. Any of these, with feeds and nozzles properly adjusted, can be made to do a good job, provided the dust is of proper composition and fineness.

Copper-Lime Dust. Applying arsenicals in dust form is simple, but because Bordeaux applications are effective only in so far as the plants are completely covered, the practice of applying Bordeaux mixture in dust form has not become general. Extreme fineness of ingredients is necessary for the dust to distribute well and to stick. Several such dusts are on the market, under the general name of "Copper-Lime Dust." "Copper-Lime Dust" must not be confused with the Bordeaux mixture prepared in dust form, designed for use in making Bordeaux spray.

Altho the results obtained with copper-lime dusts do not warrant abandoning the use of liquid Bordeaux, nevertheless their use sometimes may be recommended. For example, the apparatus to apply dust is simpler and cheaper than a sprayer of equal

FIGURE 10. A traction-driven potato duster.

efficiency. Too, the weight of the dust is much less than that of an equivalent application of liquid spray. This makes it possible to carry thru a dusting program in wet seasons that would make application of liquid Bordeaux impossible. Again, shortage of water frequently occurs at the time Bordeaux should be applied on the late potatoes, rendering it impracticable to use liquid spray.

Comparative demonstrations show that when equal amounts of copper are used, the effectiveness of copper-lime dust is about

70 percent of that of the spray, as measured by increase in yield. Per acre, the cost of the copper-lime dust is approximately twice that of the ingredients in the liquid Bordeaux. To offset this, however, it was found possible to dust 41 acres a day, whereas the sprayer covered only 11. Best results are obtained by dusting while the plants are still wet with dew in the morning, or in the evening after the dew begins to form. It appears that there is a definite place for using copper-lime dust in Kentucky's potato-growing industry.

SPRAYING AND DUSTING PROGRAMS

Inasmuch as the blight, leaf-hoppers and flea-beetles always may be expected, an excellent basis for a potato pest control program is Bordeaux mixture applied according to a schedule. Three applications are suggested, but five are better, at intervals of ten days to two weeks. To the Bordeaux should be added the specific insecticide needed at the time. If attacks of insects develop between times, special sprayings or dustings with the required insecticide should be made. The following typical "programs" ordinarily will serve, tho the weather may make slight changes necessary. The amount of spray or dust given is for one acre.

SPRAYING PROGRAM FOR EARLY POTATOES

First Spray. When the potatoes are two to four inches high, use 5-5-50 Bordeaux mixture (page 28), 100 gallons to the acre, to which add 4 pounds of calcium arsenate* or 4 pounds of lead arsenate. Controls *Colorado beetles, flea-beetles* and other chewing insects.

Second Spray. Ten days later, if growth is rapid, or two weeks later in a slow season, use 5-5-50 Bordeaux mixture, 100 gallons to the acre. Arsenicals are not added unless injury by chewing insects is anticipated.

Third Spray. Ten days, or two weeks later, same as the first spray.

A fourth and a fifth spray may be given, according to judgment. The last should contain arsenate, as in the first spray, to

*Calcium arsenate usually is cheaper than lead arsenate, and is to be preferred in Bordeaux for use on potatoes only.

kill the remaining Colorado beetles that might go to the late potatoes. If the third spray is the last, it should be applied just before the top growth makes it impossible to get the sprayer thru, without damage to the tops.

Special Sprays. If *Colorado beetles* or other chewing insects are causing injury between regular Bordeaux applications, use the following spray, to the acre:

Lead arsenate 4 pounds,
Water 100 gallons.

This formula, reduced to garden size, is:

Lead arsenate 1 heaping tablespoonful,
Water 1 gallon.

For *Blister beetles* use barium fluosilicate or cryolite, 1 part to 3 parts of talc or dusting gypsum, applied as a dust, at the rate of 25 to 30 pounds per acre.

If *plant lice* and *leafhoppers* become troublesome at the time of a regular Bordeaux spraying, add nicotine sulfate, 40 percent, 1 pint to 100 gallons of spray.

If a special spray for either must be given, use, for an acre:

Water 100 gallons,
Nicotine sulfate, 40 percent solution, 1 pint,
Soap 4 pounds.

SPRAYING PROGRAM FOR LATE POTATOES

First Spray. Same as the first spray for early potatoes (page 31).

Second Spray. Same as the second spray for early potatoes (page 31).

Third Spray. Same as the first spray if chewing insects are present; if they are absent, omit the arsenate. In order to get maximum protection against blight and insects, apply this spray as late as possible without risk of causing injury to the potato tops.

Special Sprays. The same as the "special sprays" for early potatoes (page 32).

DUSTING PROGRAM FOR EARLY POTATOES

First Dusting. When the potatoes are two to four inches high, use copper-lime dust with arsenate, 20 pounds to the acre.

Second Dusting. Copper-lime dust, plain, 20 pounds to the acre.

Third Dusting. Same as the first dusting.

If a fourth or fifth dusting is given, use copper-lime dust, either plain or with arsenate. The last dusting should contain arsenate, to kill the remaining Colorado beetles.

Special Dusting. For the *Colorado beetles* or any other chewing insect use, to the acre:

Hydrated lime 20 pounds,
Calcium arsenate* 4 pounds.

For the *plant lice*** the dusting material should be 3 percent nicotine sulfate dust, commercially prepared or made at home, in a special mixing device, from the following ingredients:

Hydrated lime 50 pounds,
Nicotine sulfate, 40 percent solution, 3 pounds.

The quantity to use per acre cannot be specified, but usually 50 pounds is effective.

DUSTING PROGRAM FOR LATE POTATOES

This is the same as for early potatoes, except that it is advisable to make an additional dusting, or perhaps two, with 3-percent nicotine sulfate dust for the control of the *leafhopper.* The special dustings are made with the same materials as for early potatoes.

THE EARLY VARIETIES

Red Bliss, or Bliss Triumph. The tubers of this variety are roundish, symmetrical, with few and shallow eyes; the skin is bright red. The tops are rather upright, making close planting possible. The quality is not the best, but the shapeliness of the tubers and earliness outweigh this disadvantage to some extent. Objections to this variety are its light yield and the tendency of the tubers of the fall crop to make second growth. It is recommended only for very early planting, because it lacks quality as compared with some of the later varieties, and is extremely susceptible to disease, when planted to mature in the warm months.

Carman No. 3. This variety is characterized by oblong, roundish tubers, somewhat flattened, with shallow eyes and generally desirable conformation. The tops branch freely and, because of

* Calcium arsenate is preferred for use as a dust.
** Kentucky Agricultural Experiment Station Circular No. 45.

their recumbent habit of growth, require wider planting than Bliss. Carman tends to set more tubers than can reach marketable size in dry seasons, but in favorable years the yield from Carman is not exceeded by that of any other variety. In seasons of rapid growth hollow potatoes are found quite commonly. The color of the foliage is pale green. Carman seems to contract more than its share of potato troubles and is particularly subject to blight. The table quality is mediocre, but the large yield of which this variety is capable in a good season, tends to offset this objection.

Irish Cobbler. One of the varieties most dependable for use the state over is Irish Cobbler. There are two tuber types. One is round, with the stem end square, the eyes set in depressions, and the bud cluster to one side of the tip. The other type is rather more cylindrical and the eyes somewhat shallower, particularly those of the bud cluster. The habit of growth is upright, making close planting possible. Irish Cobbler is valued for its excellent quality and its ability to mature profitable crops either in the spring or fall, if the season is at all favorable, even in seasons too dry for the other varieties in this list.

Early Ohio. The tubers of this variety are cylindrical, shallow-eyed, and the skin is dull pink. The variety makes moderate top growth of medium green color. It is a favorite in Ohio markets, which accounts for its rather general culture in the northern counties of Kentucky. Quality and yield are fair in localities suited to it. Its main disadvantage is its tendency to make knobby tubers in seasons favorable to the occurrence of second growth.

Warba. A cross of Bliss Triumph on a white-skinned seedling. Warba is a "white" potato with pink splotches about the eyes. In shape it resembles Cobbler tho inclined to be thicker. Eyes are not numerous but those about the blossom end tend to be deep, particularly when the tubers attain large size. The table quality of Warba is superior, even when fresh-dug; the flesh is white faintly tinged with cream. Warba tends to set a great number of tubers and in good seasons, gives excellent yields. Warba is well worth wider acquaintance among both those who grow their potatoes for the home supply and those who are engaged in producing early potatoes for sale.

Burbank. This variety sprang from the Early Rose which it resembles in all particulars except skin color. Burbank is a "white" potato. There are two sub-varieties, Smooth and Russet. Burbank is an excellent potato for the home winter supply because of the ease with which it can be kept, and because of its late sprouting. It makes good yields under conditions in which Early Rose excelled.

Chippewa. A new comer among potato varieties, Chippewa has already indicated its worth both to producers of potatoes for sale and to those who raise them merely for home use. The tubers are quite showy, long oval in shape, somewhat flattened, the eyes few and extremely shallow, and the skin white. Tried but three years in Kentucky, Chippewa exceeded in yield every sort except Warba and, graded strictly, outyielded all. The flesh is white and somewhat inclined toward waxiness, but this apparent handicap is overcome by the other good points of this variety.

Spaulding Rose. This is a typical Rose except that its tubers are somewhat broader and more flattened than Early Rose, and the skin color is not so deep, there being an undercolor of pink or orange. Spaulding has a tendency to rot after the vines have died, in land not well drained. Correctly taken care of, Spaulding should occupy the place Early Rose has held for generations.

THE LATE VARIETIES

Green Mountain. This variety is characterized by the symmetrical shape of the tubers, the few, shallow eyes, and its excellent quality. It is subject to blight rather early, under Kentucky conditions, and the tubers are susceptible to scab. Green Mountain sets its tubers early, however, and in a season of favorable moisture conditions, and when not cut down prematurely by frost, it is capable of making heavy yields.

Russet Rural. The tubers are flattened oblong to roundish, with tapered ends and with skin distinctly russeted over a deep cream color. The eyes are shallow, the flesh is white, and the quality is exceptionally good. Russet Rural appears to be especially adapted to a cooler climate than that of Kentucky, but it has shown promise in the northern counties of the state. It is to be

recommended for its uniformity in tuber shape and size, and its satisfactory yields when moisture conditions are favorable.

McCormick. The McCormick variety or, better, the McCormick family, thrives in all parts of Kentucky. McCormick, or selections from it, bears several names, some authentic and some merely local, such as Hoosier Boy, Late Hoosier, Peachblow (not Jersey Peachblow), Maggie Murphy (not the true Maggie Murphy), Mortgage Lifter, and the July Potato. The tuber shape and eye depth of some of these selections are quite desirable, tho some retain too much of the gnarled appearance of the original McCormick.

The outstanding good points of McCormick are the ease with which seed can be kept in common storage for late planting, and the heavy yield obtained, almost regardless of season and of the care taken in the various steps of its culture. A point against this variety is that the tubers show a pronounced tendency to "green up" if left exposed to even faint light for only a short time. Good practice is to cover them in storage with tarpaulin or with sacking so as to keep light and moving air from them, for they tend to become "strong" when this precaution is not taken.

In localities where cold storage for seed potatoes is not available, the McCormick family certainly holds an important place as a home-supply potato and, if reasonable care is taken to safeguard its quality, it is doubtful whether any other variety answers the same purpose.

Kentucky Snowflake. The Snowflake is a selection from McCormick, developed in McCracken County of this state. It is characterized by better uniformity in tuber size and conformation than the parent. Its keeping qualities have been improved and it does not become "strong" when ordinary precautions are taken in storage. The eyes are somewhat shallower than those of the original McCormick. It thrives well under quite dry and hot seasonal conditions, and sprouts late enough in the spring to make its seed easy to keep in common storage until July, the month in which it usually is planted.

Early Harvest. Altho Early Harvest is not generally considered a commercial variety, its exceptional adaptability to hot and dry

growing conditions make it a valuable variety for the southern half of the state. Planted in July from seed that has been kept in cold storage, it makes an excellent "main crop" potato. The tubers are flat-cylindrical and shapely, and the eyes are moderately shallow. The skin is cream, with a slight tendency to russet, and the flesh, white.

STORAGE

The essentials for correct potato storage are proper temperature with adequate ventilation and humidity. During the first few months after digging, the storage temperature may be as high as 40 degrees Fahrenheit, but in late spring and summer, as for "late-crop" seed, 35 degrees is better. A house cellar may serve, particularly if there is no furnace to make it too warm, and so dry as to induce wilting. All light should be excluded from stored potatoes intended for table use, because even the pale light reflected from whitewashed walls may turn them green, destroying their original flavor. Figure 11, shows a simple potato pit. This form of storage is effective for both table and seed stock, if care is taken to provide ventilation until after the "sweating" in the early part of the storage period is over and to guard against any sudden fall in temperature after that.

FIGURE 11. A potato "pit" or "hill."

A more readily controlled storage structure is shown in figure 12. Seed potatoes for the early crop may be kept in good condition in such storage until March. The seed for the late crop should be removed into cold storage in February. This is particularly necessary with the early varieties, Irish Cobbler, Carman, Warba, Chippewa, and Early Ohio. Growers who use the McCormick or Green Mountain varieties frequently depend on common storage until planting time in June or July, with generally favorable results, but even these varieties give better crops if the seed is kept in cold storage.

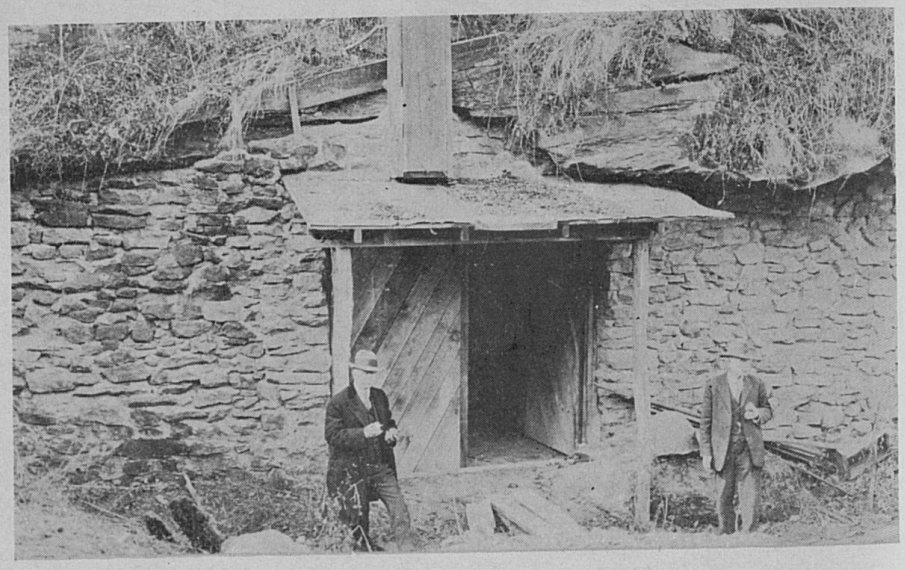

FIGURE 12. A hillside potato "cave."

For more information on the construction of places for storing potatoes, see Kentucky Extension Circular No. 266, Home Storage Structures and Equipment.