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THE POTATO AS A TRUCK CROP.

BY

L. C. CORBETT,

Horticulturist in Charge of the Arlington Experimental Farm and Horticultural Investigations, Bureau of Plant Industry.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., June 1, 1910.

SIR: I have the honor to transmit herewith and to recommend for publication as a Farmers' Bulletin a manuscript entitled "The Potato as a Truck Crop," prepared by Prof. L. C. Corbett, Horticulturist in Charge of the Arlington Experimental Farm and Horticultural Investigations.

Respectfully,

G. H. POWELL,
Acting Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

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THE POTATO AS A TRUCK CROP.[a]

INTRODUCTION.

The term "potato," when not modified by an adjective, suggests to the mind of an American the so-called Irish potato (*Solanum tuberosum*). When the name is modified by the word "sweet," reference is made to a different plant, belonging to the morning-glory family and known botanically as *Ipomoea batatas*. In this discussion attention will be directed entirely to the Irish potato.

This plant, which is now recognized as an important article of food, as well as an important commercial crop throughout the north temperate regions of the earth, is of American origin. Among the New World plants which have been brought under cultivation since the discovery of America, this stands out as one of the most important, being second only to Indian corn. Taking the world over, the potato is probably eaten by a greater proportion of the earth's inhabitants than any other crop except rice. The potato early found a wide use throughout Great Britain and the northern portion of the continent of Europe. With the development of the New World it immediately became an important garden crop and its cultivation has kept pace with the increase in population until now it is distributed over the entire area of North America occupied by civilized peoples. It is a commercial product in Mexico as well as in Alaska.

The potato is of great economic importance, not merely as a food plant for man, but because of the variety of other uses to which it can be applied, principal among which is the manufacture of starch. Varieties have been developed which adapt it to the great range of climatic conditions which exist throughout the world. It is grown extensively as an early market-garden and truck crop, and even more extensively as a field crop in the northern portion of the United

[a] For other publications on the potato the reader is referred to the following Farmers' Bulletins: No. 324, entitled "Sweet Potatoes;" No. 365, entitled "Potato Growing in Northern Sections;" and No. 386, entitled "Potato Growing on Irrigated Farms of the West." These may be obtained free of charge upon application to the Secretary of Agriculture, Washington, D. C.

States. In some sections the same land can be made to produce two crops of potatoes in a single season, thus rendering it a very important and profitable industry.

The adaptation of the potato in the great territory over which it can be grown has been mentioned. It is found, however, that certain varieties are peculiarly fitted for certain climatic regions. The repeated attempts which have been made to introduce European and particularly English varieties of potatoes into the United States have proved very discouraging, thus showing that varieties which are of great importance in England may or may not be well adapted to American conditions. Some varieties are especially adapted to the sandy lands and short season of the Southern States, while other varieties are preeminently adapted to the cool, retentive, and heavy soils of the Northern States. Some require only a short season for maturity, while others demand the entire growing period to perfect their crop. With this great diversity of character it is evident that the potato can be modified to meet almost every condition of soil and climate which exists in the Temperate Zone. This is not saying, however, that every soil and climate can be made to produce a profitable yield of potatoes. There will always be certain regions possessing soil and climatic conditions peculiarly adapted to the development of this crop which will form the leading commercial areas for the cultivation of this product.

The discussion of this subject most naturally falls into the methods adapted to growing potatoes as a truck crop and the methods best suited to growing them as a farm crop. This publication is confined to a consideration of the potato from the standpoint of the truck grower.

THE POTATO AS A TRUCK CROP.

The growing of Irish potatoes as a truck crop at the South has assumed large proportions. Thousands of acres are annually planted to early varieties of potatoes which are harvested as soon as they have reached suitable size, regardless of their maturity (as suggested by fig. 1), and immediately transported to northern cities for distribution and consumption. This industry extends along the Atlantic seaboard from the southernmost terminals of railway transportation to the vicinity of the great centers of consumption, Florida producing a large annual crop of early potatoes, followed by Georgia, South Carolina, North Carolina, Virginia, Maryland, and New Jersey in turn. The great early-potato-producing sections of Florida are centered around Hastings; in Georgia the sections are largely confined to the vicinity of Savannah; in South Carolina a large acreage is

cultivated in the trucking region about Charleston; in North Carolina a very extensive crop is planted in the vicinity of Wilmington; while Norfolk, Va., probably outclasses all other regions along the Atlantic coast so far as acreage and yield are concerned. This vicinity is one of the oldest and largest early-potato-producing sections of North America, figure 2 showing a familiar condition at a wharf during the potato season. Besides this belt of country devoted to this industry there are isolated regions along the Gulf coast and in northern Texas, Kentucky, and Missouri where potato growing has been established and has proved quite profitable.

It is impossible to give accurate statistics in regard to this crop, for it changes annually with the markets of the preceding year, those who engage in the industry, particularly in the West, being influenced

FIG. 1.—A potato field in a trucking region just before harvest.

very decidedly by the previous year's return. This is an exceedingly unfortunate condition, as the growers should determine their planting, not by their previous year's experience, but by the condition of the crop at the North. The crop of so-called winter potatoes produced at the North has more influence upon the price which will be received for the early crop than any other single factor. The truck farmer should therefore keep a very careful record of the crop at the North preceding the year his planting is to be done. The quantity, quality, and price of the held-over northern crop are factors which decidedly influence the price of the new crop when it reaches the market. A market which is well stocked with old potatoes which have been kept in fairly good condition means a very low price for the early crop when it comes in competition with such stock. As this new crop can not be retained long in the soil at the extreme South without

rapid deterioration, neglect on the part of the grower to determine the quantity of old potatoes in sight at planting season, as compared with a normal supply, may mean a very meager profit, if any, or a very heavy loss if the crop can not be moved at the proper season and at a satisfactory price.

SOIL.

The character of soil which is best adapted to the production of early potatoes is a light sandy loam, what the truck growers call a "quick" soil, rather than a heavy, retentive one. In order to produce

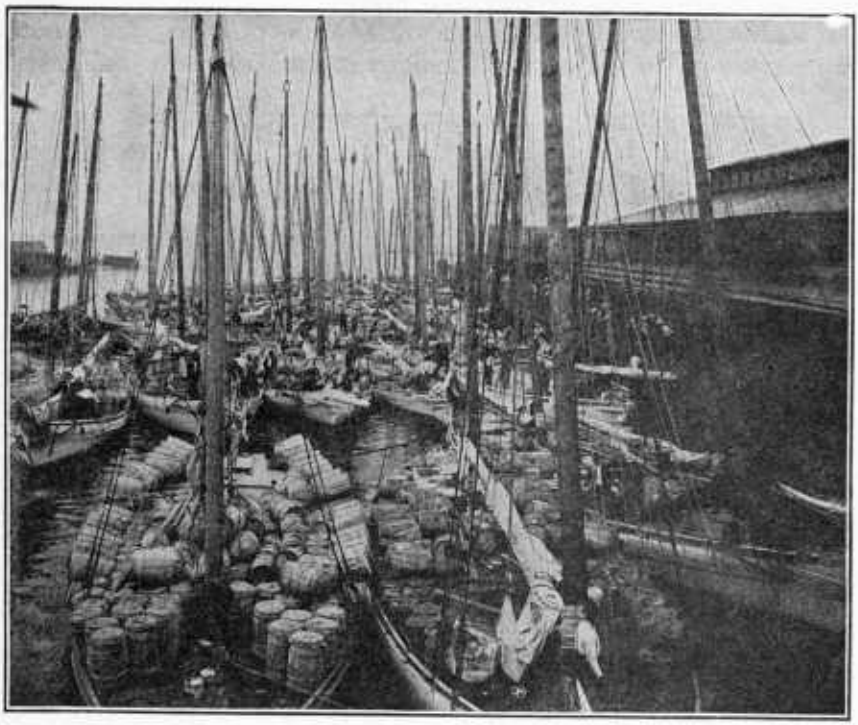

FIG. 2.—A wharf scene in a trucking region during potato harvest.

early potatoes it is necessary to make use of every factor which will stimulate rapid growth and quick maturity. Light, rather dry, warm soils are nearest to the ideal for this purpose.

PREPARATION OF THE SOIL.

Thorough, deep preparation of the soil is essential for success with potatoes. The soil should be prepared by growing a hoed crop upon it the previous year, if possible one of the legumes, and should be cleared of all débris and rubbish during the fall or winter. As soon as conditions are favorable in the early spring or late winter, the

ground should be deeply and thoroughly plowed either with a disk plow or a good turning plow. Following the plowing the ground should be thoroughly fined and moderately well compacted by the use of a harrow and clod crusher if there has been a tendency on the part of the soil to bake.

The depth of plowing should not be greater for potatoes than for other truck crops. As a general rule, the seed bed should be deep and mellow, but it is not safe to turn up too much subsoil at any one time. It is well to deepen the soil gradually, an inch a year, until the desired depth has been attained.

SEED.

The term "seed" as applied to the cultivation of potatoes has reference to the tubers which are used for the reproduction of the crop. Technically the word "seed" applies to the fruit of the plant which is borne in the seed balls formed after the blossoms fall, but with potatoes the term is never confused, as it is applied universally to the tubers for planting, which are used either whole or cut.

NORTHERN-GROWN SEED.

In growing early potatoes, perhaps more than any other single crop, the sources from which the seed is obtained influence the resulting crop. The practice which is almost universally followed is to plant tubers of early varieties which have been grown for several seasons at the North. The demand by truck farmers for northern-grown seed has developed a very considerable industry in some of the potato-producing regions, notably Maine, Michigan, and Wisconsin. Early varieties which are especially adapted to truck work at the South are in these northern regions planted extensively for the purpose of producing seed to be used in the South. The crop is harvested and placed in storage houses either at the North or at the South, where it can be made available to the growers at the South early in the spring to meet the demand for seed for early planting.

QUANTITY OF SEED.

The quantity of seed used to the acre depends largely upon the manner in which it is planted; that is, the distance between the rows, the distance between the hills in the rows, and whether the seed is used whole or cut. It may, however, be stated in general terms that from 8 to 12 bushels of seed as ordinarily grown are required to plant an acre. If the potatoes are small and are cut to two eyes, 8 bushels will plant an acre; if the potatoes are large and cut to two eyes, 8 bushels will not plant a measured acre. Some successful growers use small or medium-sized whole potatoes, others cut the potatoes

in half, while still others cut to one or two eyes. If the potatoes are sound and have not sprouted to any considerable extent previous to planting and have not been subjected to unreasonably low or high temperatures, one or two eye pieces from a medium-sized potato will give good results. When seed potatoes are scarce and high in price, growers will endeavor to make the seed go as far as possible by cutting it to one or two eye pieces.

Tests conducted to determine the best character of seed to use indicate that a potato weighing about 3 ounces, when cut in half and planted one piece in a place, gives the best results so far as yield is concerned. In some localities, however, particularly where excessively wet or excessively dry planting periods occur, it has been determined that whole potatoes are safer for the early crop than cut seed.

SECOND-CROP POTATOES FOR SEED AT THE SOUTH.

Within recent years there has been a marked increase in the use of second-crop potatoes for seed throughout the southern potato-growing sections. This crop is frequently grown on the same land from which the first crop of potatoes was harvested. In most instances, however, it follows beans or cucumbers, as the seed for this second potato crop is not usually planted until July or August. The seed for this crop is, as a rule, saved from the early crop, the small tubers being stored in a well-ventilated shed, where they are protected from the direct action of the sun and from storms until about ten days or two weeks before the time of planting, when they are spread thinly upon the ground and lightly covered with straw or litter to partially protect them from the sun. Under these conditions the tubers quickly "green" and all those suitable for seed will develop sprouts. As soon as the sprouts are visible, and before they are large enough to be rubbed off in handling, the potatoes are ready to plant. The product of this planting gives a crop of partially matured tubers which are held over winter for spring planting. This practice gives excellent results in many localities and is found to be more economical than the purchase of northern-grown seed. To what extent it is safe to follow this practice without renewing the seed from the North by the use of fully matured tubers has not been determined. Those following the method should carefully observe the quality and yield of the crop for the purpose of determining whether or not it is deteriorating under this treatment. In general, it is believed that it will be within the limits of good practice to secure every second or third year enough northern-grown seed to supply seed for the second crop; in fact, some of the most successful growers of potatoes who use second-crop seed get enough northern-grown seed each year to supply planting material for the second crop. In this practice it will be economy to err on the side of safety and

obtain fresh seed frequently from reliable northern sources. In a majority of instances it is found that second-crop home-grown seed is slower to germinate, as shown in figure 3, and later in maturity than northern-grown seed, and as quick development is an important element in the crop at the South, growers are urged to consider this point carefully.

RAPID GERMINATION OF SECOND-CROP SEED.

A novel practice for securing quick growth from second-crop seed has been developed by a successful potato grower in Texas. Mr. Morrell has developed an idea which is closely akin to the practices

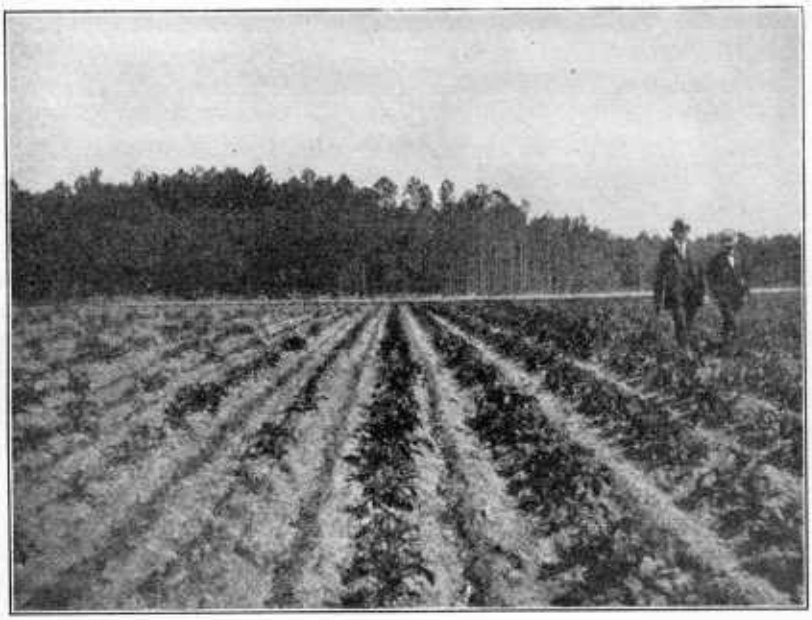

FIG. 3.—A field of potatoes produced from home-grown southern seed, at the left, and from northern-grown seed, at the right.

of the potato growers of the Channel Islands. The method consists in storing the tubers of the second crop in a tight building, which by the use of artificial heat can be kept frostproof. At harvest time the tubers are placed in slatted crates and the temperature of the storage house held as low as practicable without freezing until four to six weeks before planting time, when the temperature is raised to 68° or 70° F. This temperature is maintained until the eyes of the potatoes show activity. The sprouts should not be allowed to develop to any considerable length before planting the tubers, on account of the danger of breaking them in the necessary handling at planting time. If the sprouts are one-eighth of an inch or less in

length there should be little loss from handling. If the house can be well lighted at the time the temperature is raised, the sprouts which develop will be much stouter than those developed in the dark. This plan provides a congenial temperature for the germination of the tubers and makes it possible to delay planting until outside conditions are generally favorable for the rapid growth of the plants, and to use for seed only those tubers which are actually viable. With good preparation and cultivation this method should give a perfect stand and a decidedly increased yield, together with the early maturity of the crop.

This plan has been used for northern-grown seed, but it is found that the mature northern-grown seed responds more quickly to a given heat stimulus and consequently does not require to be placed in a warm room more than ten days to two weeks before planting.

The practice on the Channel Islands accomplishes the same results in a slightly different manner. The tubers are placed one layer deep on germinating trays which are arranged on racks or are provided with corner posts a few inches long so as to admit air and light. The tubers are induced to germinate in the trays, and at planting time only those with well-developed sprouts are used for planting. As the work is all done by hand there is little danger of damage to the seed from breaking off the sprouts. In all sections of the South where hand planting is practiced this method of procedure is perfectly practicable, and would entirely obviate losses from poor stands resulting from uncongenial conditions due to cold, damp spring weather and inferior seed. Planting could be delayed until conditions were favorable and poor seed would be detected before it was planted.

HELD-OVER SEED.

The consensus of opinion is that in southern localities it is impracticable to keep early potatoes from harvest time to the next season's planting period. The conclusions of those who have given this problem careful study are that the exposure of the tubers to the sun at harvest time is the chief factor in determining their keeping qualities. In other words, it is possible to keep potatoes in the extreme South from season to season provided the tubers are not exposed to the sun after being dug. They should be immediately carried to a protected place where there is ample ventilation and where they will receive only diffused light, such as a cyclone or other cellar, or the basement of a house, or even where brush protection will prevent the sun shining directly upon them. It is, of course, necessary that the tubers be well matured before being dug and that they be the product of disease-free plants. Plants killed by blight yield tubers which seldom keep well even under the most favorable conditions.

TREATMENT OF SEED FOR SCAB.

In preparing seed for the early crop, even at the South, where the potatoes are to be marketed immediately after harvesting, the treatment of the seed is believed to be equally as important as at the North. The treatment of potatoes to control potato scab has become a regular practice among the most successful growers at the North. Either of two practices may be followed to accomplish this result. The potatoes may be soaked in formaldehyde or a solution of bichlorid of mercury, or, better still, where conditions will permit, fumigated while in the car or warehouse with formaldehyde gas.

The corrosive sublimate (bichlorid of mercury) treatment is as follows: Soak the uncut seed one and one-half to two hours in a solution made by dissolving 2 ounces of corrosive sublimate in 16 gallons of water. This solution is exceedingly poisonous and must be guarded to prevent stock gaining access to it.

The most economical and effective method of disinfecting seed potatoes on a large scale is by the use of formaldehyde gas liberated by mixing the commercial solution with potassium permanganate. The following description of this method of disinfection is presented in Circular 23 of the Bureau of Plant Industry, entitled "Potato Diseases in San Joaquin County, California," by Mr. William A. Orton, being adapted from Bulletins 141 and 149 of the Maine Agricultural Experiment Station, by Mr. W. J. Morse:

To use it, an air-tight shed should be constructed of sufficient size to hold whatever quantity it may be desired to treat at one time. This may be made of rough lumber, lined with building paper, and provided with a tight door. The potatoes may be treated in sacks, but these sacks must be piled so as to allow a free circulation of air all around them. It is suggested that they be piled in tiers, with two 2 by 4 inch scantlings between the layers of sacks. Space should be left in the center of the building for placing the charge of formaldehyde, which should be set off in shallow pans, such as galvanized washtubs. For each 1,000 cubic feet 23 ounces of potassium permanganate and 3 pints of formaldehyde should be allowed. After the potatoes are properly stacked and everything is made ready, the permanganate should be spread in a thin layer on the bottom of the pan, the required quantity of formaldehyde poured in and stirred quickly, and the building vacated. The building should then be kept closed tight for twenty-four hours, when it may be opened and the potatoes taken out.

Formaldehyde is a nonpoisonous but highly irritant fluid which can be purchased in small lots at about 50 cents a pound, in carboy lots at 20 cents, or in barrel lots at about 12 cents. Potassium permanganate is a reddish-brown crystalline substance, purchasable at from 13 to 25 cents a pound.

The precaution should be taken not to pile any potatoes directly over the pans or within 3 feet laterally, as the gas there might be strong enough to injure the potatoes and destroy their germinating power. The formaldehyde works best in a humid atmosphere. It is therefore advised that the floor of the shed be wet down before the treatment is made. The potatoes, however, should not be wet, as the disinfection is more thorough if the surfaces are dry.

Small quantities of potatoes may be disinfected by soaking in a solution of 1 pint of formaldehyde to 30 gallons of water for two hours. Either the gas or the solution treatment may be applied some time previous to planting, provided the potatoes are not exposed to reinfection by being put into receptacles that have previously held scabby potatoes. The treatment should also be made before the potatoes are cut for seed.

The expense connected with the treatment of seed potatoes by the gas method will vary in different cases according to the amount of labor required in handling and whether a special building has to be erected for the purpose. The cost of labor and of the building will be the principal items. The cost of the materials need not amount to over 1 cent per sack. For example, a shed 12 by 24 feet and 7 feet high contains 2,016 cubic feet and would require 3 pounds of potassium permanganate, costing 60 cents, and 6 pints of formaldehyde, costing $1.20; total, $1.80. Two hundred sacks can easily be treated at once in such a shed. An entire day should be allowed for each treatment.

As the potato scab remains in the soil from season to season, as well as being carried to the field by the seed, it is of the utmost importance that the potato crop be used in rotation with other truck crops, so as to allow as long an interval as possible between successive crops of potatoes upon the same land. This will have the tendency to "starve out" the potato scab in the soil; then by the use of scab-free treated seed the prospect for a crop of smooth tubers is greatly enhanced.

CUTTING THE SEED.

If the seed is cut so that each piece carries two eyes, it is customary to plant one or two pieces in the hill, most growers preferring to plant two pieces in a hill, with the hills about 15 inches apart, rather than to rely upon a single piece. Many trials have been very successful in which a single eye was used for each hill. Under such circumstances, however, the seed must be of excellent quality and the land in a very high state of cultivation.

The practice on Long Island is to use northern-grown seed cut to a single eye and to plant one piece in a place at intervals of 13 or 14 inches.

PLANTING.

In the ordinary practice of growing potatoes as a truck crop it is customary to plant them so as to admit of cultivation in one direction only, the rows being spaced from 30 to 36 inches according to the character of the land and the implements used in cultivation. The seed potatoes are then dropped 12 to 15 inches apart in the rows, the strength of the land and the size of the tubers desired being taken into consideration to determine this planting distance. In some instances the potatoes are planted slightly above the general level of the field by first throwing up ridges, which are split at

planting time to admit the seed and provide soil for covering it. Ordinarily, however, the potatoes are planted practically on the level without throwing up ridges, either by the use of a potato planter or by opening a furrow with a 1-horse plow and dropping into the furrows the whole or cut seed by hand at the intervals already mentioned. It is customary to cover the seed from 3 to 4 inches deep, depending on the soil, whether it is a heavy, retentive loam or rather light and sandy in its nature, the shallower depths being employed when the soil is retentive and the deeper planting followed when the land is light and sandy or if at all subject to drought.

Everything considered, for the extremely early crop in regions where irrigation is not depended upon and where conditions are severe it is undoubtedly best to plant whole potatoes, a single potato of moderate size in each place. It is believed that uncut tubers can withstand the vicissitudes of excessive moisture or excessive drought better than cut tubers. This practice requires more seed than when the tubers are cut and does not increase the yield sufficiently to justify the use of the whole potatoes when the climate is not subject to extremes of drought and to excessive rainfall.

FERTILIZERS.

Three types of fertilizers are used in the cultivation of potatoes, namely, commercial fertilizers, green manures, and farmyard manures. Commercial fertilizers are extensively used in the production of truck-crop potatoes, particularly on the Atlantic seaboard. If they are supplemented at all it is by growing a crop of green manure upon the land the previous season and turning it under so that it will become thoroughly decomposed before the potatoes are planted. For this purpose soy beans, cowpeas, or velvet beans are chiefly used. These should be plowed down the previous fall as soon as they are sufficiently mature.

As little farmyard manure is available in the Southern States where the early crop of potatoes is chiefly produced, this seldom enters as a factor in the production of the crop. Commercial fertilizers of a nature especially adapted to the potato crop form the chief reliance of the growers. A fertilizer carrying 3 to 4 per cent of nitrogen, 6 to 8 per cent of phosphoric acid, and 8 to 10 per cent of potash is used at the rate of 500 to 1,500 pounds to the acre, depending upon the crop which is to follow the potato crop and the liberality of the grower. The fertilizer may be applied broadcast if put on at the rate of 1,000 pounds or more to the acre. When less than 1,000 pounds to the acre are used it is almost universally applied along the line of the row, a furrow being opened for the reception of the fertilizer, which is scattered by hand or by a distributor which can be used to fertilize

several rows at a time, as shown in figure 4. After the fertilizer has been distributed, a cultivator is run along the line of the rows to incorporate the fertilizer with the soil in order to prevent its coming in contact with the seed when planted. Sometimes the furrow is refilled and reopened prior to the planting of the seed, so as to incorporate the fertilizer more completely with the soil. Still another plan is to open the furrow, distribute about one-half the quantity of fertilizer to be used in the bottom, incorporate it with the soil, plant the potatoes, partially cover them, and scatter the remainder of the application on the seed bed above the seed.

FERTILIZER CONSTITUENTS.

Preliminary results of investigations now in progress to determine the kind and quantity of fertilizer best adapted to truck crops indicate that on the soils of the Long Island and Norfolk areas the source of potash for a potato fertilizer should be sulphate of potash and that

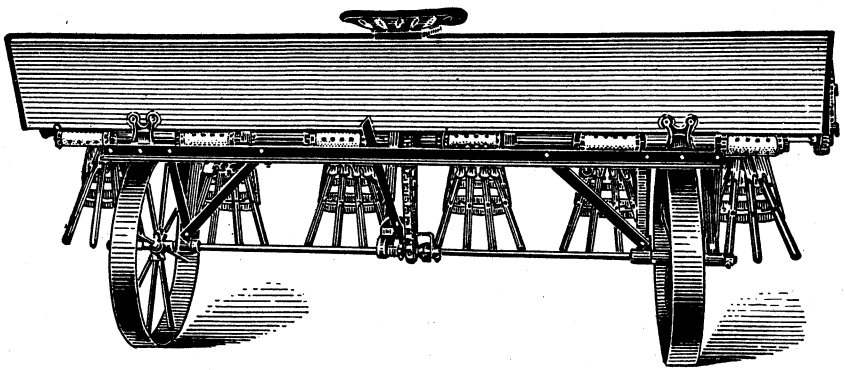

FIG. 4.—A fertilizer distributor.

the use of large quantities of nitrate in the form of nitrate of soda is not economical. The treatments which show greatest promise in both areas as a result of two years' trial are heavy applications of cottonseed meal, tankage, and sulphate of potash.

CULTIVATION.

It is not far from the truth to say that the major part of the cultivation of the potato patch should be done before the potatoes are planted. In other words, the ground should be most carefully and thoroughly prepared and as soon as the seed has been placed in the ground, cultivation, in the ordinary acceptance of the word, can be begun by going over the field with a spike-tooth harrow. This will serve to restore a uniform surface and will at the same time destroy any small weeds which may have appeared. Even after the young plants have appeared above the surface of the ground it is a very

economical way of continuing the cultivation to use the harrow, and after the vines have reached a height of 3 or 4 inches cultivation can be most economically and advantageously carried on if level culture is practiced by the use of the weeder. If all cultivation must be done by a single horse, the use of a weeder and modern implements, such as the spike-tooth harrow and five-toothed cultivator of improved type will best serve the purpose. With the last-mentioned implement it is possible to keep the surface of the soil very fine and practically level, and later in the season, if it is desirable to ridge the vines slightly for the purpose of keeping the tubers thoroughly covered and free from sun scald, this can be accomplished by the use of winged teeth upon the cultivator, as shown in figure 5.

While it is a common practice throughout the truck-growing region of the country to carry on practically all of the cultivation of potatoes with 1-horse implements, yet for the sake of economy it is believed that the type of cultivator employed in the West for cultivating corn would prove to have advantages over the 1-horse implements. By means of this device it is possible to work both sides of the row at the same time, and one man can accomplish considerably more upon a riding implement of this type than with a 1-horse walking implement, such as that described.

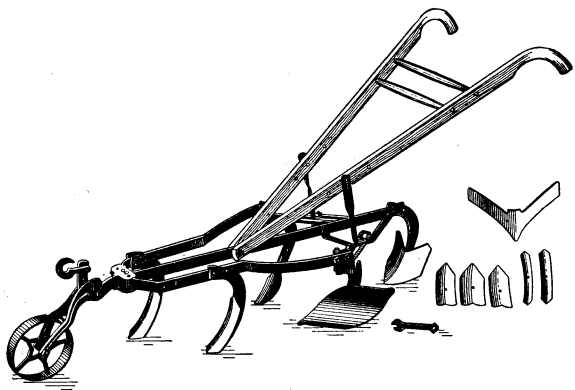

FIG. 5.—A cultivator with wing or hilling teeth.

The frequency of cultivation depends largely upon the character of the season. If showers which have a tendency to make a crust upon the soil or compact it are frequent, the soil should be stirred as soon as it can be worked after each rain. When the land is weedy, the more frequent the cultivation with horsepower, the less work will be necessary with the hoe in order to keep the area clean. It is impossible, therefore, to determine the number of cultivations necessary to perfect a crop of potatoes, so much depending upon the character of the season and the character of the soil.

SPRAYING.

The fact that the early varieties of potatoes used by truck farmers and market gardeners are dug, as a rule, before full maturity renders the necessity for spraying somewhat less imperative than in the more

northern sections, where large yields depend upon maintaining growth as late in the fall as possible.

Spraying with arsenicals for the beetle is necessary except in the extreme South, and injuries from arsenical poisoning, tipburn, and the early-blight fungus are so general that spraying with Bordeaux mixture and an arsenical combined should become the established farm practice. The poison may be either Paris green or arsenate of lead at the rate of 8 ounces to 50 gallons of water. The former burns the leaves when used alone and in large quantities, but not when applied with Bordeaux mixture. The Bordeaux mixture is not a poison to the beetle, but acts as a partial deterrent. It also diminishes the tipburn, probably by protecting the plants against excessive loss of water and by direct stimulation.

PREPARATION OF BORDEAUX MIXTURE.

To make the Bordeaux mixture on a small scale take two half-barrel tubs, one for the copper-sulphate solution and the other for the milk-

FIG. 6.—An elevated platform, showing a modern arrangement for the preparation of Bordeaux mixture.

of-lime solution. Place 5 pounds of lime in one tub and slake this with sufficient water to thoroughly break up the lime without allowing it to burn. After the lime is thoroughly slaked dilute it to 25 gallons. Into the other tub pour 25 gallons of water and suspend in it 5 pounds of copper sulphate in a gunny sack or other porous sack for 24 to 48 hours before the solution is required. Bordeaux mixture is then made by pouring these two solutions through a wire-cloth sieve which has about 18 to 20 meshes to the inch, equal quantities

of the two solutions being poured at the same time through the strainer, which should be suspended over a barrel or other receptacle sufficiently large to hold 50 gallons of the mixture. In making this combination it is best to have two men dipping simultaneously from the two receptacles and pouring the two solutions together into the strainer. The milk-of-lime and the copper solutions should at all times be kept thoroughly stirred.

When large quantities of Bordeaux mixture are required stock solutions are made in 50-gallon casks (see fig. 6), the concentration of the copper-sulphate solution being 1 pound of copper sulphate for each gallon of water; that is, 50 pounds of copper sulphate to

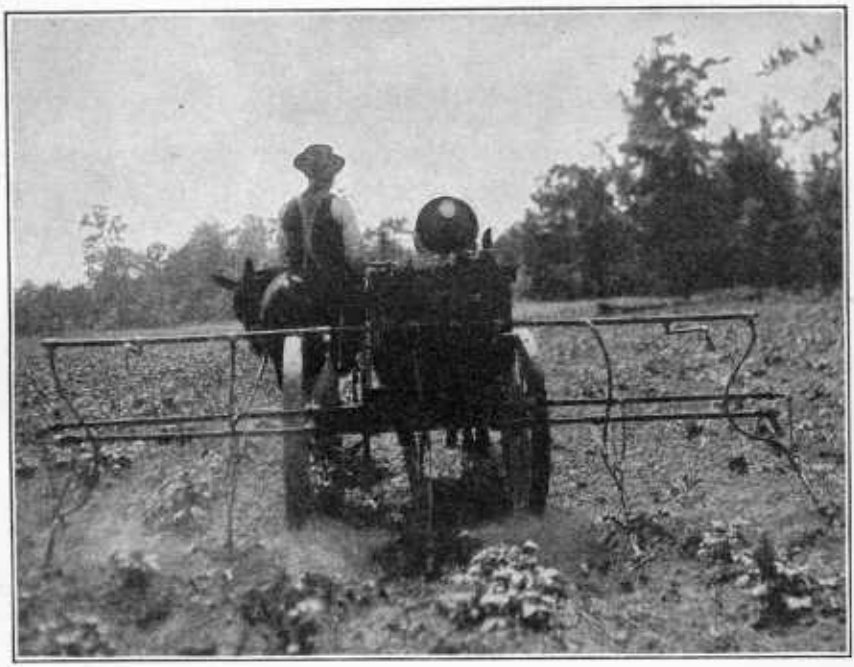

FIG. 7.—A spraying rig for applying liquid to both the upper and the under surfaces of leaves.

50 gallons of water. The lime solution carries 1 pound of lime for each gallon of water; that is, 50 pounds of lime to 50 gallons of water. In making Bordeaux mixture 5 gallons of the copper-sulphate stock solution are placed in one dilution barrel and 5 gallons of the stock solution of lime in a second dilution barrel; each dilution barrel is then supplied with sufficient water to make 25 gallons in each receptacle. These diluted solutions are then drawn or poured together, as above described, to make Bordeaux mixture.

The mixture should be applied by means of nozzles producing a mistlike spray, carried so as to apply the solution to both the top

and the under sides of the foliage of the vines. On a large scale automatic horsepower machines, such as shown in figures 7 and 8, will be required to do the work economically, but on a small scale the work can be done with a knapsack or other hand-power sprayer. The spraying must be thorough to be effective.

Frequently flea beetles occur in potato fields in vast numbers, attacking the leaves and causing innumerable tiny holes to appear. In infested regions, when systematic spraying for the control of blight by the use of Bordeaux mixture is carried out, it is a well-known fact that injury from flea beetles is decidedly less. It is fortunate that

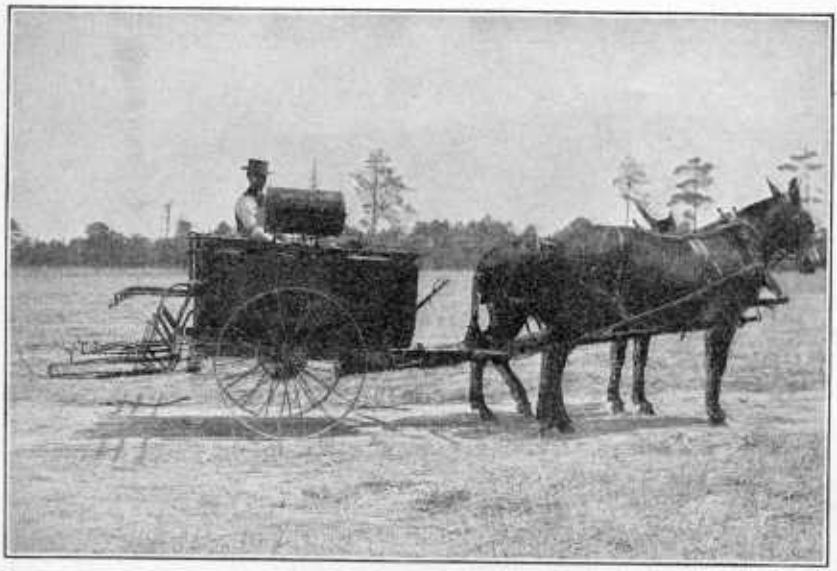

FIG. 8.—A side view of the spraying machine shown in figure 7.

the treatment for the control of the blight is also a satisfactory and economical treatment for this form of insect pest.

HARVESTING.

Early potatoes grown as market-garden or truck crops and intended for immediate consumption are, as a rule, harvested as soon as they have reached marketable size, regardless of the maturity of the crop. Because of the immature condition of the tubers it is essential that the crop be handled carefully and quickly. The tender tubers are easily bruised and damaged in appearance; consequently care should be exercised in the conduct of all operations connected with the harvesting of this crop. As a further safeguard to loss from bruising at harvest time or during transit the growers and the trade have determined upon the red-skinned varieties as best adapted to withstand

these misfortunes. Scars and bruises show less on red-skinned than on white-skinned sorts.

The varieties in most common use among truckers are known as Irish Cobbler, having a white skin, and Bliss Triumph, a red-skinned sort.

Notwithstanding the fact that red-skinned sorts handle better, the smaller yield usually obtained from such varieties has led all growers except those located at extreme distances from the market to use white-skinned sorts. Red varieties are not employed extensively along the Atlantic coast, although they make up the bulk of the crop grown in the Gulf Coast States.

DIGGING.

While the harvesting of early Irish potatoes grown for home consumption is largely carried on by hand, in some localities improved

FIG. 9.—Harvesting potatoes in a trucking section.

implements, such as potato diggers and potato sorters, are brought into service. The truck farmers along the Atlantic coast, however, adhere largely to the simpler methods of handling the crop, as suggested in figures 9 and 10. This is undoubtedly accounted for by the fact that labor is more abundant and not so well trained in the use of improved machinery as in the more northern and western districts. In digging early potatoes in the Atlantic coast district ordinary 1-horse turning plows are used. Laborers follow the plows and gather the potatoes from the soil and throw them, four or six rows together, in piles, after which they are sorted and put into barrels

for shipment. In the potato regions of Louisiana and Texas, where early potatoes form a crop of considerable importance, improved machinery is largely depended upon for harvesting.

PACKAGES.

The packages for early potatoes are determined partly by custom and the demands of the market, but largely by the local timber supply. In regions where timber is plentiful and barrels and crates figure largely in the shipment of other truck crops, potatoes are chiefly shipped in barrels, as shown in figure 11. In other localities burlap sacks are chiefly employed, as is the case in most regions growing late potatoes.

FIG. 10.—Potatoes in barrels in the field ready for shipment.

Up to the present time no standard measure, barrel, or bag for the handling of potatoes has been adopted. Recently certain States have passed laws requiring that these packages should come up to a given standard, usually 170 pounds net for a barrel, and that all short-measure packages entering their markets should be so marked. The barrel used by the trucker of the Atlantic coast region during past years holds about 11 pecks and weighs from 155 to 165 pounds net. These barrels cost the grower about 22 cents each, including the burlap cover. The bags used for the handling of the crop grown in the southwestern region cost the grower about 5 cents each in lots of 1,000 or more. These packages are used but once and are not returned to the grower.

GRADING.

The grading of early potatoes is quite as important as the grading of fruits. Large and small tubers should not be mixed in the same barrel. The pickers should be taught to gather the large and merchantable tubers in one basket and the small or seed potatoes in another, and these if placed upon the market should go in separate receptacles and be clearly marked so as to represent the grade. If a mechanical sorter is used this work will be more effectively accomplished than if left to the pickers.

The type of grader usually used is similar to that employed in some sections for grading apples and peaches, although the common type of potato grader is a rotary screen which separates the earth from the tubers and allows the small tubers to fall through the large meshes of the screen before reaching the general outlet which carries away those of merchantable size. The objection to a mechanical grader of this type is that it bruises the immature tubers and renders them somewhat less attractive than when not so handled and probably also shortens the length of time they can be safely held on the market.

FIG. 11.—A barrel of new potatoes ready for the northern market.

MARKETING.

The perishable nature of the immature potato renders it necessary to place it upon the market in such quantities only as will admit of immediate consumption. Producers in regions where the growing of early potatoes has been extensively developed appreciate this and

have provided for this condition by organizing shippers' associations through which the crop is graded, often trade-marked, and distributed chiefly in carload lots. The officers of the association being in constant telegraphic communication with the various markets are thus informed regarding the most satisfactory destination for every consignment which may be necessary. It is the purpose of these associations, however, to conduct their business in such a way that the product can be sold f. o. b. shipping point instead of by consignment, and the best organized associations are usually able to do this. Some of the best managed truck exchanges are able to dispose of over 90 per cent of the total product handled on an f. o. b. (free-on-board) shipping-point basis.

The great advantage of such a system of selling is that it enables the brokers in a small city or town to buy direct from the producer instead of through another city broker. It enables the consumer to obtain fresh products, as they are shipped direct from the point of production to the place of consumption. The plan carries other benefits which are of great moment to the producer. He is enabled to sell in carload lots at shipping point, thus saving to himself the cost of transportation, which ranges from 7 to 15 per cent of the gross selling price. The exchange secures a much wider distribution of the crop, with the result that overstocked markets are much less likely than under the consignment system. Transportation companies provide better service, and claims are more promptly settled through the exchange than in the case of individuals. This plan enables the producer to be his own salesman. It transfers the distributing point from the city to the field, where it should be. It brings the market to the field instead of the product to the market. The exchange becomes the farmer's commission house, and it is much easier to keep informed regarding the transactions of a home association than of a foreign concern.

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