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IRISH POTATO CULTURE

BY

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AND

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The small steer-feeding barn, Experiment Station farm.

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IRISH POTATO CULTURE

By F. J. SUTTON

The Irish potato is one of the few plants of purely American origin occupying a prominent place among our agricultural products. It is a native of South America and was an important article of food in what is now Chili and Peru, when the Spanish explorers first went there in the sixteenth century. The wild potato has small tubers, the large ones which we now produce being the result of years of selection and improvement. The Spaniards took the potato from South America to Spain and to Florida, whence it probably came to Virginia. When the English colonists first came to Virginia in the latter part of the sixteenth century, they found the potato growing there. From Virginia it was introduced into Great Britain and Ireland. The Irish welcomed the potato and planted it extensively, so that it became their staple food crop. Because of its great importance there it became known as the Irish potato. Today the white potato is a very important food crop in the United States, Canada and central Europe, and Australia, Japan, China, South Africa and South America grow it on a commercial scale.

Table I. Acreage and Value of Kentucky's Leading Farm Crops in 1918.

Crop	Acreage	Farm	Farm
		Value	Value
			Per Acre
Corn	3,600,000	\$136,656,000	\$ 37.96
Hay	1,072,000	33,038,000	30.82
Wheat	933,000	25,956,000	27.82
Tobacco	475,000	98,325,000	207.00
Oats	400,000	8,640,000	21.60
Potatoes	75,000	9,281,000	123.75

According to the Yearbook of the United States Department of Agriculture for 1918 (see Table I.) the Kentucky potato crop for that year was sixth in acreage and fifth in value of the principal field crops of the state. In value per acre Irish potatoes was second, being surpassed only by tobacco. The total production in the United States in 1918 was 400,106,000 bushels. New York, with 34,960,000 bushels, led the states and Kentucky was twenty-first, with 5,625,000 bushels. Altho Kentucky ranked twenty-first in total production, she dropped to thirty-eighth in yield per acre. Eighty bushels per acre was our average for the ten-year period of 1909 to 1918, inclusive. Maine averaged 205 bushels for every acre of potatoes grown. By planting good varieties, using proper culture, selecting the seed from the best hills and controlling diseases and insects, there is no reason why Kentucky should not double eighty bushels. We have growers who produce 160 to 275 bushels per acre.

Part I. Early or First-Crop Potatoes.

Kentucky raises two crops of Irish potatoes in a year. The early or first crop is planted in the latter part of March or the forepart of April, according to the season and the section of the state, and harvested in June and July. The culture of the second crop, as far as it differs from that of the first, is described in Part II. of this circular.

Place in Rotation. Among the best crops to precede potatoes are clover and alfalfa. Their deep roots loosen and aerate the soil and, because of the ability of these plants to utilize atmospheric nitrogen, they increase the supply of that element in the land. Where it is difficult to get a stand of clover, substitute cowpeas or soy beans. The best crop with which to follow Irish potatoes depends upon the fertility of the land and upon the type of farming that is being carried on. The rotations given herein are merely suggestive. The second crop can follow the first crop of potatoes the same year but this is not generally advisable, except on very fertile soil. Corn, wheat and oats usually grow better after potatoes, altho oats often tend to lodge. Potatoes, wheat and clover furnish a good three-year rotation. Corn may be inserted after the clover and thus make the rotation occupy four years. Leaving the cornstalks on the ground to be plowed under in late fall improves the physical condition of heavy land. If a stalk-cutter is not available a heavily weighted disk harrow will help to put the stalks into condition for quick decay. On a truck farm late cabbage, fall spinach or fall kale are excellent crops to grow after Irish potatoes. Late beets and turnips should not follow potatoes because they draw heavily upon the same plant food constituents of the soil.

Soil. The best potato soils are loose and friable. A deep, sandy loam is ideal, altho any type of land that produces satisfactory grain crops will grow good crops of potatoes. Light-working soils produce higher quality and cleaner potatoes than clayey lands and the tubers are freer from disease. They also give an earlier crop, which is important because of the high prices paid early in the season for new spring potatoes. Sandy soils, however, often lack fertility and organic matter and they

suffer more for want of moisture in periods of drouth. Good drainage is more essential to successful potato culture than is the type of soil. Wet land is sour and cold and what potatoes are produced are found near the surface. They are usually irregular in shape, rough-skinned, with soggy flesh of poor quality, and are subject to rot.

Manure and Fertilizers. Most soils on which potatoes grow are improved by increasing their organic matter or humus content. This is especially true of heavy land. Clay soils are made more open and porous and sandy soils are made more compact by humus. Organic matter increases the moisture-holding capacity of any soil. It is supplied by the use of barnyard manure, or by plowing under cover crops and crop residues (stalks, straw, etc.). Fresh manure used on soil infected with the potato scab organism increases scabiness and therefore it is best to add it to some previous crop in the rotation. Well-rotted manure, however, should be spread after plowing and thoroly harrowed into the soil when preparing the seed bed for potatoes. Manure should be supplied generously in the rotation. Ten to twenty tons per acre are advised in most cases. In addition to its beneficial physical effect stable manure adds plant food to the soil, particularly nitrogen. It does not contain sufficient phosphoric acid to make it a balanced "ration" for this crop. Many growers apply partially rotted manure as a top dressing alongside the row and then it acts as a mulch to conserve moisture, in addition to supplying plant food.

Large sums of money are invested each year in commercial fertilizers and undoubtedly some of this is spent unwisely. The matter of fertilization is a local proposition, local in that the results obtained may hold good only on that particular kind of soil, and fertilizer facts derived in other parts of Kentucky or in neighboring states may not apply to a given region.

Outside of the Bluegrass region, most soils are deficient in nitrogen and phosphorus. The addition of organic matter will largely supply the nitrogen. The soil bacteria which change the nitrogen in the organic matter to a form available to our farm crops may not be sufficiently active in the early spring to furnish the desired amount of nitrogen to the potato crop in the fore-

part of the growing season. Therefore the use of some quick-acting nitrogenous fertilizer, such as nitrate of soda, is advisable for early potatoes, in order to give the crop a good start. It is doubtful if the late or second crop will give a profitable increase from the addition of a commercial nitrogenous fertilizer, when organic material is provided. Phosphorus is commonly added to the land as acid phosphate. Potassium is more abundant in most of our soils than either of the other two elements. The potato likes plenty of potassium and many sandy soils need applications of it. A 3-8-6 fertilizer (three per cent. of nitrogen, eight per cent. of phosphoric acid and six per cent. of potash) applied at the rate of five hundred to one thousand pounds per acre was very popular with potato growers before potash salts became scarce. On small areas, use one pound of such fertilizer for fifty square feet of ground. The equivalent of one thousand pounds of this mixture is made by mixing two hundred pounds of nitrate of soda, five hundred pounds of sixteen per cent. acid phosphate and one hundred and twenty pounds of sulphate of potash. In the home garden use about 4 ounces of nitrate of soda, 9 ounces of acid phosphate and 2 ounces of sulphate of potash for fifty square feet.

The best results are secured when some or all of the commercial fertilizer is applied in the row. Some use as high as 1000 pounds per acre in the furrow. Generally, when more than 500 pounds per acre are being used, half of it is scattered broadcast when fitting the seedbed, after plowing, and the remainder is applied in the row. When scattered in the rows by hand the fertilizer should be mixt with the soil by dragging a chain or piece of wood thru the furrow, before dropping the seed. This is all taken care of by the fertilizer attachment, in planting with a machine. On soils infected with the scab organism, the addition of ground limestone or lime makes conditions more favorable for scab injury, especially if the soil is made alkaline, as may be done by lime when used in sufficient quantities. Lime, used cautiously, may benefit the growth of potatoes and often is required to get a stand of clover in the rotation. In that case it had better be applied to the clover or some preceding crop, instead of to the potatoes.

Varieties. The market desires a round, white potato with shallow eyes and weighing four to ten ounces. Cincinnati is an exception for it pays more for a pink-skin potato. In addition to these requirements the grower wants a high-yielding variety. For the first crop a variety must be selected that matures early. Some farmers have failed in growing early potatoes because they planted late varieties which do not come on fast enough for our climate. The Irish Cobbler is most commonly planted for the first crop. Early Ohio is the pink variety most used in that section of Kentucky near Cincinnati. Irish Cobbler has been grown recently by a few truckers in that region and, after being tried by Cincinnati consumers, has been well liked. Bliss Triumph and Early Rose, both pink-skin potatoes, are used occasionally. A safe practice in choosing a variety is to plant one that has proved successful in the local community.

Source of Seed. The custom of sending north for new seed every few years is, no doubt, justifiable under the present methods of saving seed, because of the increased yield that often results from such a change. However, if the grower will select his seed potatoes as explained in Part IV. of this circular, there will be no need for changing seed every few years. Not only will the seed as grown in Kentucky not run out but we believe the yield will be increased over any that can be secured from imported seed. A strain is developed which is particularly adapted to local conditions. According to experiments conducted in Virginia*, northern seed potatoes may be advisable for that part of the first crop which is to be dug for the early market. When harvested three to four weeks before maturity the northern seed was more productive. However, when dug ten days or more later than that, the home-grown second-crop seed equaled or out yielded the Maine seed. Good seed-tubers are firm, true to variety type and free from disease. The northern potato-sections have diseases which we do not have in this State, and the southern grower runs the risk of introducing new diseases through the use of northern-grown seed. Avoid potatoes with knobs or second growths, for they are less vigorous than smooth tubers.

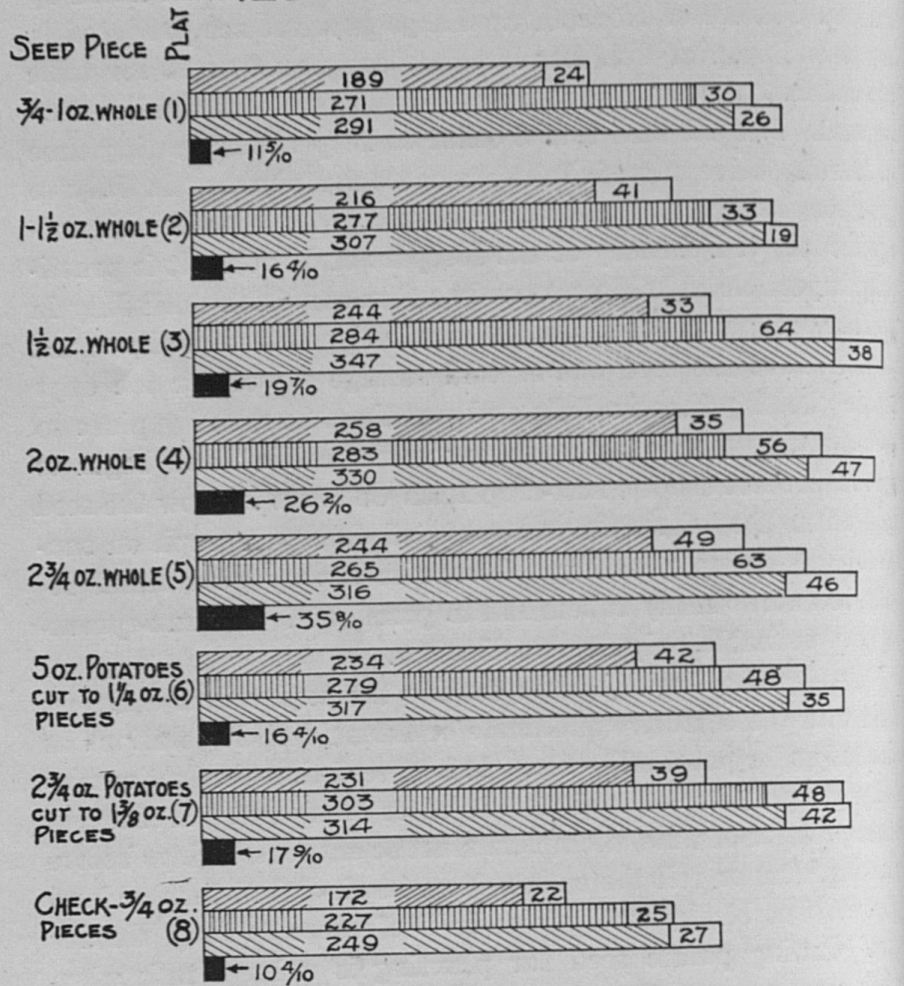
*Johnson, T. C., and Rosa, J. T. 1917 Seed Potato Experiments and Variety Studies. Virginia Truck Experiment Station Bulletin 24.

Seed Potatoes. Raise the Irish Cobbler seed for the first crop in the autumn before they are needed. Make a planting the latter half of July and harvest after the vines are killed by frost in October or November. Large potatoes are produced in the second crop of Cobblers but they are usually sold for table use and only the small tubers of 1 1-2 inches across and less used for seed. Put the seed into a cellar to keep until planting time in March. Save enough Irish Cobblers for planting in July to grow the seed for the following year and place these in cold storage the last of February or the forepart of March. It is practically impossible to hold potatoes in a firm condition until July in a cellar, and much-sprouted, shrivelled potatoes make weak plants. Take the seed out of cold storage a week or ten days before planting time in July and put them in a shady place so that the tubers have a chance to "come to life" and begin to sprout. Do not use the first-crop Irish Cobblers to grow the seed crop unless the tubers are sun-sprouted (see paragraph on sun-sprouting) before planting. Otherwise a very poor stand results, because so many tubers fail to germinate. The sun-sprouting is practicable only for small areas.

Cutting the Seed. Before cutting the seed tubers disinfect them with the corrosive sublimate or formaldehyde solutions as directed under potato diseases. It is agreed that the best results follow the planting of seed shortly after being cut. If because of the pressure of time, the tubers must be cut several days before planting, dust or roll the cut surfaces in air-slaked lime or lard plaster. Cut blocky seed pieces in preference to long, slender ones. Cutting potato seed for planting is a large task when many acres are grown. Some growers use a cutting machine. The objection to the machine is that it does not "think," with the result that as much as twenty-five per cent. of the seed pieces may contain no eyes whatever. A machine does its best work with potatoes having numerous eyes.

Have at least one good eye in each seed piece and after that the size of the seed piece is more important than the number of eyes it contains. Of course two or three eyes give more assurance of there being at least one that will grow but the number of eyes is secondary to the size of the seed piece.

TABLE II. EFFECT OF SIZE OF SEED PIECE UPON YIELD.



- BUSHELS OF MARKETABLE POTATOES PER ACRE AT FIRST HARVEST
- BUSHELS OF MARKETABLE POTATOES PER ACRE AT SECOND HARVEST
- BUSHELS OF MARKETABLE POTATOES PER ACRE AT THIRD HARVEST
- BUSHELS OF CULL POTATOES PER ACRE
- BUSHELS OF SEED POTATOES PLANTED PER ACRE

Size of Seed Piece. The young potato shoot depends for approximately two weeks upon the food stored up in the seed piece. If the seed piece is large, the shoot is vigorous and strong.

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On the other hand, if the seed piece is small, the young plant may be checked and delayed in its growth, because of an insufficient quantity of food from the mother tuber. Table II. shows the effect of the size of the seed piece upon the yields, as secured in Virginia* with Irish Cobbler seed which had been grown there the preceding fall. Whole potatoes, three-fourths to two-and-three-fourths ounces, were planted without being cut. Five-ounce tubers were quartered and two-and-three-fourths ounce potatoes were halved, for planting some plats. Potatoes cut the ordinary way, which gave seed pieces averaging three-fourths of an ounce, were used for the last plat. Three diggings were made at ten-day intervals and the table shows the relative yields secured when the potatoes were harvested at each of these three stages of maturity of the crop. "At the time of the first harvest all the plants were green and growing vigorously. At the second harvest most of the vines were still making some growth. At the third and last harvest the foliage was practically all dead but the vines were still erect and showed signs of life."

A seed piece weighing about an ounce and a half is the best size to use, as shown in plats 3 and 7. That requires eighteen to twenty bushels of seed per acre, about twice the amount ordinarily used, but it pays. Plat 7 produced 52 or 69 bushels of markable potatoes per acre more at the first and second harvests, respectively, than plat 8 and that gain was over and above the quantity of seed used. Increasing the amount of seed potatoes planted to twenty bushels per acre is one of the easiest and cheapest means of enlarging our production per acre. It might be said that greater yields per acre decrease the cost of production per bushel, for practically the same labor is required to plow, plant and cultivate an acre of potatoes yielding 200 bushels as for one giving only 125. For small areas use one-half peck to plant one hundred feet of row.

Sun-sprouting Potatoes. Potatoes with long, white sprouts such as frequently develop in a warm, poorly lighted cellar, have lost vigor and therefore are undesirable for seed. However,

*Johnson, T. C., and Rosa, J. T. 1917 Seed Potato Experiments and Variety Studies. Virginia Truck Experiment Station Bulletin 24.



One-Man Potato Planter

tubers bearing short, green sprouts produce their crop earlier and give larger yields. In order to secure these short, green sprouts, about three weeks before planting time spread out the tubers on a floor or table where the light is good but do not place them in direct sunlight. Use for seed those potatoes that develop the stubby green sprouts and cut the tubers so there is at least one sprout on each seed piece. These sprouts must not be over one-half inch long, for planting by hand, or over one-fourth inch, when planted by machinery, because of the danger of their being broken off. Disinfect the potatoes before sprouting, as the chemicals are injurious to the sprouts. Sun-sprouting potatoes is hardly feasible for commercial growers but is a valuable aid in securing earliness as well as productiveness on small areas.



Two-Man Potato Planter

Preparation of Seedbed and Planting. Plow the land deeply in the early spring and then thoroly harrow it to get a fine condition preparatory to planting. Where washing is not apt to take place during the winter, plow the field in the autumn but leave it rough thru the winter. With a plow run off rows two to three feet apart, thirty inches being the most common distance. Drop the seed 12 to 18 inches apart in the furrows and use only one piece in a hill. Cover the seed with hoes or with some horse-drawn implement. The old custom of dropping the potatoes in every third furrow in plowing does not pay as in that method the potato roots cannot penetrate the firm, hard soil at the bottom of the furrow. Use a planting machine where potatoes are grown at all extensively. With six or eight acres, a planter will save enough labor to justify its use. Several farmers who grow small areas might own a planter together. A machine will plant three to six acres a day. There are two types of potato planters upon the market and each is popular with its respective users. Both types open the furrow, sow and mix the fertilizer with the soil, drop the seed and cover it, and mark the next row, all at the same time. The picker type is a one-man machine. It takes up the pieces of potato by means of automatic pickers or arms, car-

rying them over and dropping them into the feed spout. Blocky or chunky seed pieces are necessary for uniform dropping. The other type has the potatoes fed into sections in a horizontally revolving wheel and the seed drops from these sections into the feed spout. Two men are required for this kind of a planter, one to drive and one to sit at the rear to fill any vacant spaces in the wheel or to remove any extra pieces, thus insuring one piece and no more to every hill.

The depth of planting potatoes depends upon the type of soil and the method of cultivation used. Three to four inches gives the best results with clay loams and four to five inches on sandy loams. In other words, the lighter soils require deeper planting to secure maximum production. The greater depth reduces the amount of sunburn injury. If level cultivation is practised, put the seed in deeper than where ridging the rows is the custom.

Cultivation. Within a week after planting go over the potato field in both directions with a spike-tooth harrow. This levels the ridges that may have been left over the rows in planting, kills the newly started weeds and conserves soil moisture by breaking the crust which may have been formed. Set the teeth of the spike-tooth drag to slant backwards and repeat this harrowing at weekly intervals until the plants appear. In a small garden use the rake or hand wheel-cultivator for this work. As soon as the rows are clearly defined, use a one-horse five-tooth cultivator or a riding tooth-cultivator, as used for tilling corn fields, between the rows to kill the weeds and to maintain a dust mulch. A single or double shovel plow is not so efficient for this work. Practise level cultivation instead of ridging. Ridging exposes a greater soil surface and therefore causes greater loss of moisture from the ground and it is advisable only in seasons of excessive rainfall. At first cultivate deeply and as near to the rows as possible without injuring the potato roots. As the plants grow, practise more shallow cultivation and confine the cultivation more to the middle between the rows. Cultivation is of the greatest benefit from the first formation of green leaves till the tops are eight to twelve inches high, but it should be con-

tinued as long as the growth of the vines permits. If tubers lie close to the surface of the ground, ridge slightly about the bases of the plants in laying by the crop, in order to prevent sun-burning of the potatoes.



Elevator type of potato digger. The gasoline engine mounted on the digger takes the place of extra horses.

Harvesting. If the price of early potatoes is high, dig the first-crop potatoes as soon as they have reached marketable size. Otherwise leave them until mature to secure the greater yield. Dig the potatoes by hand with a potato hook or a potato fork or plow out the rows. Iron rods substituted for the mould board give a better implement for this work than the regular turning plow. For large areas an elevator digger is used but often this bruises the tender skin of the immature potatoes. This elevates the soil and tubers from the row, shakes the potatoes free from the soil and deposits them on top of the ground in the rear of the machine. The best types of mechanical diggers require four horses to pull them but some growers mount a small gasoline engine on the digger and then two horses draw the implement. One man can dig and pick up one-eighth to one-half of an acre

in a day. A mechanical digger harvests four to six acres daily and requires five to seven men to pick up the potatoes after it. The tubers should not lie on the ground any longer than necessary to dry their surface. Ship first-crop Irish potatoes in barrels with burlap covers, in sacks or in bulk in cars. The first two methods are more common and the last is not recommended. Avoid rough handling of the potatoes, as they are easily injured, particularly when immature.

Grading. The pickers gather the large, marketable tubers in one basket and the small ones in another. Frequently a 24 inch round hand sieve with one and one-half inch wire mesh is used to take out the very small potatoes as the potatoes are put into barrels in the field. A mechanical sorter performs this work more efficiently and is necessary for commercial areas. Potatoes have not been graded to any wide extent in the past but the last three seasons the United States Food Commission greatly stimulated the interest in this phase of Irish-potato production. They, in cooperation with the United States Department of Agriculture, recommend the following grades:

U. S. Grade No. 1, "shall consist of sound potatoes of similar varietal characteristics, which are practically free from dirt or other foreign matter, frost-injury, sunburn, second growth, growth cracks, cuts, scab, blight, soft rot, dry rot, and damage caused by diseases, insects, or mechanical or other means." The minimum diameter of potatoes of the round varieties shall be one and seven-eighths inches and of potatoes of the long varieties one and three-fourths inches. "In order to allow for variations incident to commercial grading and handling, five per cent. by weight of any lot may be under the prescribed size and, in addition, six per cent. by weight of any such lot may be below the remaining requirements of this grade, but not more than one-third of such six per cent., that is to say not more than two per cent. by weight of the entire lot, may have the flesh injured by soft rot."

U. S. Grade No. 2, "shall consist of potatoes of similar varietal characteristics, which are practically free from frost injury and soft rot, and which are free from serious damage caus-

ed by sunburn, cuts, scab, blight, dry rot or other disease, insects or mechanical or other means." The minimum diameter shall be one and one-half inches. "In order to allow for variations incident to commercial grading and handling, five per cent. by weight of any lot may be under the prescribed size and, in addition, six per cent. by weight of any such lot may be below the remaining requirements of this grade, but not more than one-third of such six per cent., that is to say, two per cent. by weight of the entire lot, may have the flesh injured by soft rot."

"Practically free" means that the appearance shall not be injured to an extent readily apparent upon casual examination of the lot, and that any damage from the causes mentioned can be removed by the ordinary process of paring without appreciable increase in waste over that which would occur if the potato were perfect. Loss of the outer skin only shall not be considered as an injury to the appearance.

"Diameter" means the greatest dimension at right angles to the longitudinal axis.

"Free from serious damage" means that any damage from the causes mentioned can be removed by the ordinary processes of paring without increase in waste of more than ten per cent. by weight over that which would occur if the potato were perfect.

"Soft rot" means a soft, mushy condition of the tissues, from whatever cause.

Mark the grade plainly upon the outside of all containers of graded potatoes.

There are various types of grading machines: (1) the slat-table grader, over which the tubers roll, the dirt and small potatoes dropping thru between the slats; (2) the wire-screen table grader; (3) the barrel machine consisting of an inclined, revolving cylinder made of wire of the desired mesh or of narrow slats separated so that the dirt and small tubers will fall thru; and (4) the ring grader composed of one or more chain belts. The last is the best type to grade potatoes dependably into different sizes. Each chain belt contains round holes of a specified diameter. The most simple of these machines has only one belt to

take out the small tubers but, by using more belts with different size holes, a machine will grade the potatoes into as many sizes as is desired. So far the type most used in this state is the wire screen table grader with the upper screen having a mesh of one and seven-eighths inches and the lower screen of one and one-half inch mesh. This makes two marketable grades beside culls.

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Part II. Second Crop Irish Potatoes.

As previously stated, Kentucky grows a second crop of potatoes. They are planted the latter half of July or the first week in August and harvested in October. This part of the circular gives cultural directions for the second crop, as far as they differ from those for early potatoes. Many of the practises for the first crop hold equally true for the late one.

Varieties and Source of Seed. Failures with second-crop potatoes frequently trace back to the use of unsuitable varieties or improperly kept seed. For the late crop most growers plant Bull Moose, Green Mountain, or Carman No. 3. Irish Cobblers or other early varieties do not do so well for table stock when grown in the fall but they are grown in the fall primarily for seed purposes (see paragraph on Seed Potatoes in Part I). Large potatoes are produced in the second crop of Cobblers grown for seed but not so abundantly as with the regular late varieties. Whether the late potatoes are sold or stored, in the autumn, save a quantity sufficient to plant the field in July and place these seed tubers in cold storage in February. Cold storage holds the tubers in a firm, fresh condition thru the hot weather and thus insures vigor in the seed at planting time. Cellar-stored seed is weakened. Differences of opinion exist among good growers as to the time of cutting seed potatoes for planting the second crop. Some growers cut the seed before placing the potatoes in cold storage, while others cut them after removal from storage in July. In hot, dry seasons, at planting time, freshly cut seed potatoes seem not to give so good a stand. The regular late varieties are planted from the 10th to the 25th of July, in the Louisville district, whereas the second-crop Irish Cobblers are not planted until July 20th to 30th.

Harvesting and Storing. Do not harvest late potatoes until after frost kills the vines, because the yield increases as long as the tops remain green and vigorous. Second-crop potatoes are good keepers and large quantities are stored each year. Whether to store or to sell in the fall depends upon the price offered then and upon the crop of potatoes in the country. Bear in mind that potatoes shrink about eight per cent. in five months storage

and in addition there will be losses from rots. Potatoes keep well in an open box or bin in a cool cellar under the house, provided fresh air is admitted occasionally and the floor is sprinkled to prevent the tubers from shriveling. Out door pits, sufficiently covered to provide insulation against external heat and cold, are very satisfactory for storing potatoes. On a well-drained location make a slight hollow and fill it with straw. Then on this pile a conical or inverted V mound of potatoes. Cover the tubers with a six-inch layer of straw and a four-inch layer of dirt and, as the weather gets colder, put on two or three more alternating layers of straw and soil. Make the final layer of soil six to eight inches thick in order to shed rain and snow. Potatoes go thru a sweat immediately after being piled and, in order to furnish air to lessen the heat and to take away excess moisture, set a flue in the center of the mound as the potatoes are being piled. To make a simple triangular flue, nail three six-inch boards together along their edges and bore several holes in the bottom end of each board to facilitate the passage of air from the potatoes. The top must extend above the outermost layer of soil and an inverted V cap must be nailed on top of the flue to keep out the rain. A few weeks after storing pull out this flue and close up the hole in the mound or, if the flue is left in place, stop up the openings at the top in cold weather. Dig a shallow trench around the base of the hill to carry away surplus water. For large quantities of potatoes a regular potato cellar or a potato house is most satisfactory. Those interested in this type of storage should read Farmers Bulletin 847, of the U. S. Department of Agriculture for a full discussion of potato storage houses.

Part III. Insects and Diseases.

Rotating the crops, plowing the land in the late fall, practising clean cultivation and destroying crop refuse after harvesting, help to check disease and insect pests. With reference to the injuries and the methods of combating them, the insects which injure potatoes may be classified in two groups: (1) those insects which chew off portions of the plant, and (2) those which insert their beak-like mouth parts into the plant tissues and suck the sap. Chewing insects are killed by covering their food with poison; poisons applied thus do not affect sucking insects. They must be hit with a caustic spray that kills by coming into contact with the body of the pest. A spray for diseases of plants is generally ineffective against insects. Therefore a particular type of spray material is usually necessary, according to the cause of the trouble, tho it is often advantageous and economical of time and labor to combine two sprays, as by adding lead arsenate to Bordeaux mixture.

Paris Green and Arsenate of Lead. Both of these control chewing insects. Arsenate of lead comes in paste and powder forms. Use three pounds of paste, or one and a half pounds of powder in fifty gallons of water. For small quantities dissolve one level tablespoonful of paste or two heaping tablespoonfuls of powder in one gallon of water. Powdered arsenate of lead may be dusted on the plants at full strength or mixed with air-slaked lime. Make the dust application while the dew is on the plants. Use one pound of Paris green and three pounds of lime in seventy-five gallons of water. Add the lime to prevent any burning of the leaves by the Paris green. For the garden, dissolve a level tablespoonful of this poison and three of lime in one gallon of water. Use Paris green as a dust on plants, diluting it with five to ten times as much air-slaked lime.

Tobacco. To control aphids mix forty per cent. nicotine sulphate at the rate of three-fourths pint to one hundred gallons of water. Add four pounds of laundry soap to increase the spray adherence. For the home garden dissolve one teaspoonful of nicotine sulfate and an inch cube of soap in one gallon of water. Churn the liquid in order to get a thoro mixture. When

forty per cent. nicotine sulfate is combined with Bordeaux mixture, omit the soap.

Poisoned Bait. For cutworms mix one quart of bran and one teaspoonful of Paris green and then add one tablespoonful of molasses and a little ground lemon. Add enough water to make a thick mash. Scatter this poisoned bait on the ground alongside the rows of plants. Do this late in the evening since the cutworms work during the night. Pen up the chickens to prevent their getting poisoned.

Bordeaux Mixture. This is a spray for diseases altho it also helps to repel flea beetles. Dissolve four pounds of copper sulfate (bluestone) in twenty-five gallons of water. Slake four and a half pounds lump lime with a little water and dilute to twenty-five gallons. Then pour these two solutions together thru a strainer into the spray tank. For five gallons of Bordeaux mixture, use six and one-half ounces of bluestone and seven ounces of lime.

Formalin and Corrosive Sublimate. Before cutting the seed potatoes, soak them in a solution of formalin or of corrosive sublimate. Formalin controls the common scab but not the black scurf. Corrosive sublimate is effective for both of these diseases. Use one pint of formalin in thirty gallons of water and soak the potatoes for two hours. This solution will treat at least ten lots of tubers without losing strength but the quantity becomes less each time. Dissolve one ounce of corrosive sublimate, or bichloride of mercury, in seven and one-half gallons of water. As the bichloride does not dissolve easily in cold water it is best to stir the ounce of powdered substance in about a quart of boiling hot water until it is entirely dissolved and then add this solution to enough cold water to make $7\frac{1}{2}$ gallons. Thirty minutes and no more, is the time to leave the tubers in this solution. Corrosive sublimate is a deadly poison; therefore keep it out of children's reach. Do not mix it in a metal container. Do not use corrosive sublimate solution more than three times, unless renewed with fresh solution, for it loses strength rapidly. After treating the potatoes with either substance, spread the tubers out to dry but not in the sun.

Spray Program. To save time and labor, apply combination sprays. To control sucking and chewing insects and diseases, add one-third pint of forty per cent. nicotine sulfate and three pounds of paste arsenate of lead to fifty gallons of Bordeaux mixture. The season's spray program consists of (1) dusting the plants with Paris green after they appear above ground, (2) spraying with Bordeaux mixture and arsenate of lead when plants are six inches high, and (3) repeating the Bordeaux and arsenate of lead spray four to six times, at intervals of ten days to two weeks. Add forty per cent. nicotine sulfate if plant lice are present.

INSECTS AND METHODS OF CONTROL

Insects	Nature of Injury	Remedy
Colorado potato beetle	Eats leaves.	When plants first come up, dust with Paris green or arsenate of lead and give subsequent dusting or spraying as needed.
"Old-fashioned" potato beetle	Eats leaves	Spray as for Colorado beetle with stronger solution.
Flea beetle	Eats small holes in leaves	Spray with arsenate of lead and Bordeaux mixture.
Cutworm	Cuts off stem of plant near the ground	Scatter poisoned bait around the plants.
Grubs and wireworms	Eat holes and make tunnels in tubers	Avoid planting potatoes in ground previously grown to grass and weeds.
Aphis or plant lice	Suck sap from plants. Cause leaves to curl	Spray with forty per cent. nicotine sulfate. Repeat this spray 3 to 4 days later.

DISEASES AND METHODS OF CONTROL

Diseases	Nature of Injury	Remedy
Common scab	Tubers show rough, irregular, scab-like spots on surface.	Rotate crops. Avoid applying lime or fresh manure to the potato crops. Treat seed tubers before cutting with corrosive sublimate or formalin.
Black scurf, stem rot, or little potato	Tubers have small, black lumps like dirt, that won't wash off. Girdles stem of plant. Causes potatoes on branches above ground. Only little potatoes found in hill.	Treat seed tubers before cutting with corrosive sublimate. Formalin is ineffective.
Late blight	Dark brown, water-soaked spots on leaves, which involve whole leaf in a few days. Tubers show shallow dry rot.	Spray with Bordeaux when plants are 6 inches high. Apply 5 to 7 sprays in the season.
Early blight	Round, brown spots with concentric rings appear in leaf. Leaves finally shrivel and die.	Spray as for late blight.
Tip burn	Margins of leaf shrivel and die.	Injury lessened by thorough cultivation and by spraying as for late blight.

Practice crop rotation.

Choose clean seed potatoes and disinfect tubers.

Spray in time. Our pest control is mainly preventive and not curative.

Use proper spray materials.

Spray before instead of after a rain.

Spray thoroughly to cover all parts of the plant.

Spray more often in damp weather.

Part IV. Improvement of Seed Potatoes.

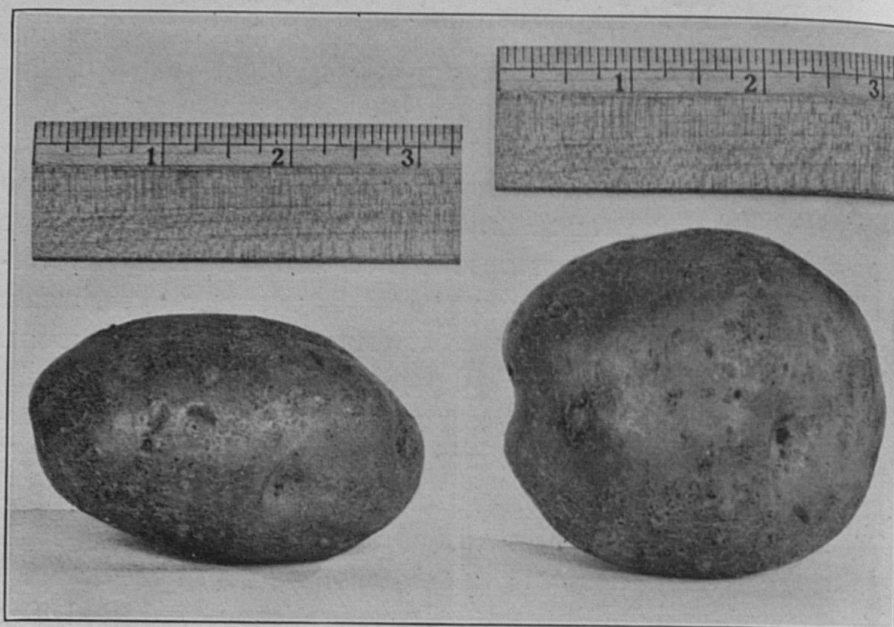
By F. E. Merriman.

During the past few years a gradually increasing emphasis has been placed upon the importance of seed selection in potato growing. In the chain of factors which go to produce a large crop of any kind, the importance of good seed can hardly be overestimated. Its value has been proved by accurate experiments extending over a series of years at several experiment stations. Potato growers have always had an idea that a particular strain of any variety of potatoes was something unchangeable. Nevertheless they believed that, sooner or later, it would "run out."

There is a common complaint among the growers of Jefferson county, that a given strain of a variety, after being grown for several years, runs out; that is, shows a continual decrease in vigor and productiveness. Investigations conducted five years ago, under the personal supervision of the County Agricultural Agent, showed that this condition existed, which explains why once popular varieties were, in time, discarded as unprofitable. These investigations also disclosed a widespread practice of using small potatoes for seed, without much attention being given as to whether they came from vigorous or inferior hills.

We have evidence, both from growers and from the results of experimental work conducted by experiment stations, that the indiscriminate use of small potatoes for seed, year after year, results in the gradual "running out" of any particular strain of a variety.

This indicates that the decline in yield is due largely to the lack of proper seed selection on the part of the grower. A given strain of a variety cannot be expected to retain its yielding qualities without constant care and selection. We should always keep in mind the old adage that "like produces like" and that potatoes from unproductive plants or hills, if used for seed, will yield a similar harvest. Good seed from high-yielding hills is one of the determining factors to insure a profitable crop.

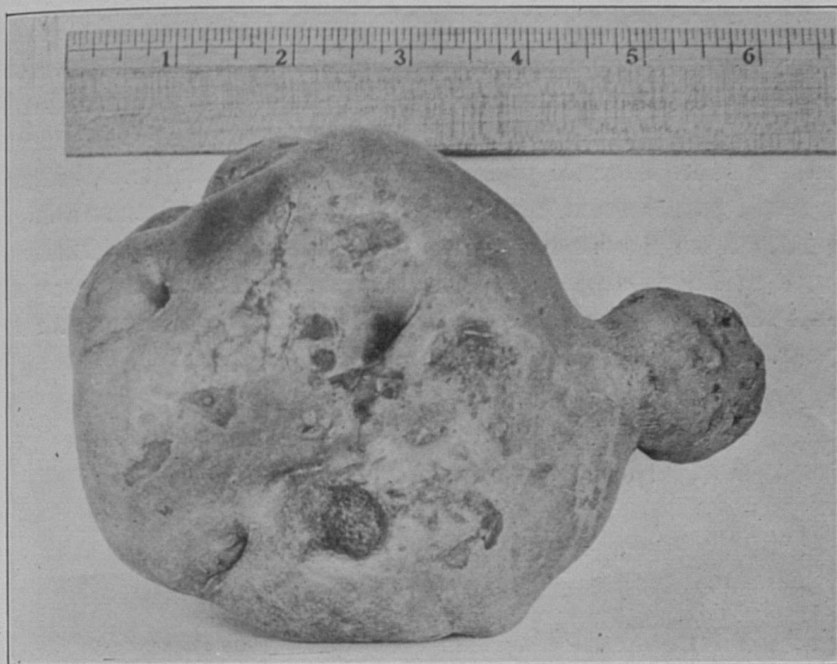


Desirable type of potato. Side view at left. Top view at right. Note smoothness, shallow eyes and medium size.

The test of good seed potatoes is the quantity of marketable tubers they will produce when given proper cultural attention. Experience proves that when potatoes of any hill are used as seed each has a strong tendency to resemble the parent hill in all its qualities; that seed coming from inferior or low-yielding hills produces a larger proportion of small, unmarketable potatoes than seed from superior or high-yielding hills. Seed from diseased hills is almost certain to produce a light yield and a greater proportion of small tubers. Every potato grower is consciously or unconsciously changing the strains of the varieties grown, either for better or worse.

For the purpose of separating the superior seed potatoes from the inferior, a number of methods of choosing seed stock are in use. Before beginning seed selection, the grower should make sure that he has the type and variety best suited to his climate, soil and markets. The type of potato that finds greatest favor on most markets is one that is oval in shape, weighs six to nine ounces and has smooth skin and shallow eyes. Deep-

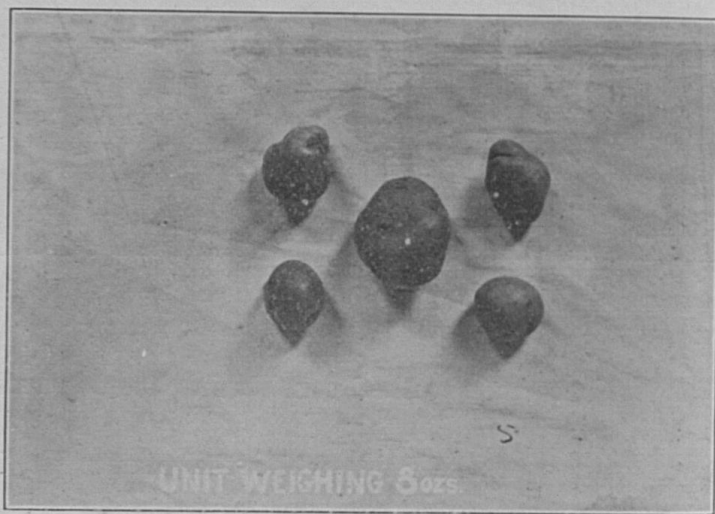
eyed potatoes occasion a great deal of loss in preparation for cooking, since a large amount of the potato has to be pared away.



The wrong type of potato. The deep eyes, rough surfaces and the second-growth knob all cause great waste in paring.

Hill Selection. This method consists in choosing seed from individual hills, in the field, at the time of digging the fall crop. The grower goes over the field, while the plants are in full growth, marking the strong, vigorous hills that have the ideal characteristics of growth. A more uniform selection can be had by confining one's self to the one-stalk hills. This is varied, however, by setting a standard for hills in about the ratio of not less than four marketable potatoes to each hill of one stalk, seven to each hill of two stalks and ten to a three-stalk hill, all grown from a single seed piece. Plants with an erect growth of stalks produce more potatoes of better quality than plants with a spreading habit of growth. Earliness of maturity is highly desirable.

When the field is ripe and ready for digging, go over it with a fork and dig the marked hills. Save for seed all the hills that measure up to the yield requirements. Any marked hill producing large, overgrown potatoes as well as small ones or in which the product varies from the type of the original stock, is discarded. A few small potatoes in a hill should be no objection to the choosing of that hill, provided the hill contains a liberal yield of marketable potatoes. Small potatoes may be expected in any hill. Save all potatoes from these selected hills, because a small potato from a good hill is better for seed than a large potato from a poor hill. The products of the chosen hills are used as improved seed for the following year. This process of hill selection from the field should be continued from year to year.

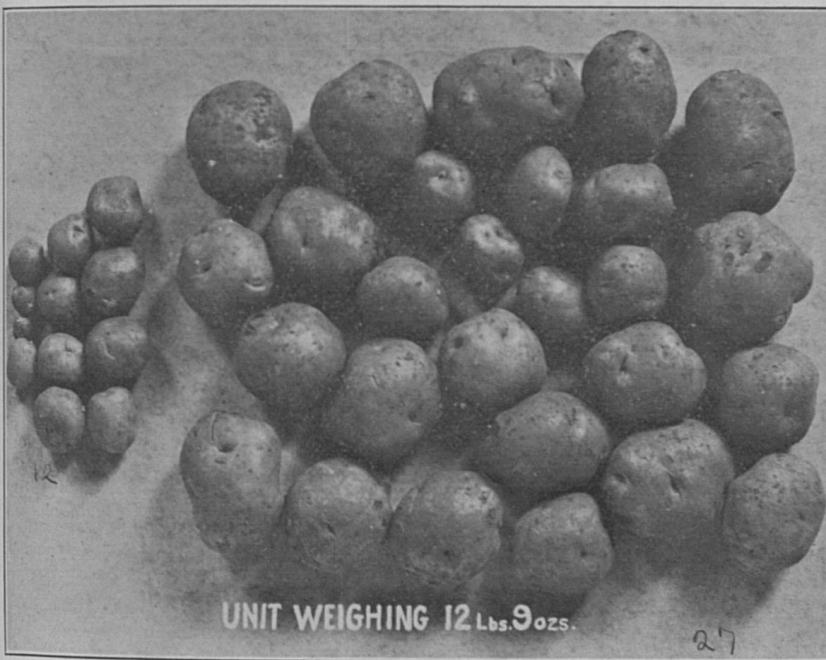


The low-yielding plants reduce the production per acre. The yield from the four hills of this unit was 5 potatoes weighing 1.2 pound, all together.

Tuber-Unit Method. Select two hundred potatoes ranging from six to eight ounces in weight and true to type. In July treat them with the formalin or corrosive sublimate solution before cutting. Then cut each potato into four pieces of approximately equal size, splitting the bud-eye cluster into

four parts, from seed to stem end, each potato representing a unit. Take particular care that each potato quartered be kept to itself. Plant these quarters in the row at a distance of ten or fourteen inches apart, omitting a hill between each set of four. The grower can readily observe any differences in vigor and uniformity between the several units during the growing period.

At harvest time, dig separately by hand and pile together the product of the four hills comprising a tuber unit. Weigh the product of each four hills or unit and also the amount of marketable potatoes in each unit. Beginners should use spring scales until they train their eyes to judge the weight of the units with fair accuracy. At first a tuber-unit with a few large potatoes may appear to the eye to be heavier than one with a larger number of medium-sized potatoes which sell



Contrast the yield from this unit with the preceding one. The mother potato for the four hills of this unit was productive. Total weight of potatoes was 12 1-2 pounds. There were 27 potatoes of marketable size and 12 culls.

better. Discard all tuber-units that are obviously poor in shape, color, or in total yield. From the most productive tuber units select one or two hundred tubers which most nearly approach the desired type. Use these for planting the seed plat in the following July. Plant the rest of the tubers from the high-yielding units, both large and small, in a plat by themselves, in order to grow sufficient seed of the selected strains for field planting.

Summary

The large tubers of the present-day Irish potato are the result of improvement by man.

Early potatoes are planted as soon as the ground can be worked in the spring. The second crop for seed is planted the last of July.

Potatoes do best after clover, in a rotation.

A well-drained sandy loam is the best type of soil for this crop. Potato soils need manure, to supply organic matter and nitrogen, and acid phosphate. Potash is abundant in most Kentucky soils.

Irish Cobbler is the leading early white variety and Early Ohio is the leading early pink one. Bull Moose, Green Mountain and Carman No. 3 are used for the second crop.

Home-grown seed, properly selected, is best. The seed for both first and second crops is grown in the preceding fall.

The one-and-a-half-ounce seed piece gives the most profitable yields. This requires twenty bushels of seed per acre.

Sun-sprouting the seed tubers increases the yield and gives earlier potatoes but is practicable only on a small scale.

Plant twelve to eighteen inches apart in rows thirty inches apart. Eight acres warrants a planting machine.

Plant three to five inches deep and practice level cultivation, except in wet seasons, when ridging is preferred.

Harvest early potatoes any time after the tubers reach a marketable size and the late crops after the tops die. A me-

mechanical digger and a grading machine are very desirable for large areas.

Potatoes are stored in cellars, outdoor pits and in special potato houses.

Yields can be increased markedly by saving the seed potatoes according to hill selection or tuber-unit methods.

The first of these is the
 fact that the population
 of the country has
 increased rapidly since
 the year 1850. This
 has been due to a
 number of causes, the
 most important of which
 are the discovery of
 gold in California and
 the opening of the
 Pacific coast to
 settlement.

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