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AGRICULTURAL EXTENSION SERVICE, UNIVERSITY OF FLORIDA
FLORIDA STATE COLLEGE FOR WOMEN
AND UNITED STATES DEPARTMENT OF AGRICULTURE
COOPERATING
WILMON NEWELL, Director

SWEET POTATOES

By A. P. SPENCER

Fig. 1.—Sweet potatoes piled for the round bank.

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Agricultural Extension Service
GAINESVILLE, FLORIDA

SWEET POTATOES

By A. P. SPENCER

The total production of sweet potatoes in the United States for the year 1930 was estimated at 71,154,000 bushels. The Florida sweet potato average has for the past ten years been 2,800 to 2,900 acres. There has, however, been a tendency in recent years to increase the acreage in early plantings. The yields per acre in Florida over a period of years are about the same as the average for the United States.

The sweet potato crop of Florida should be one of its major crops, particularly in the former cotton growing area where the soil is so well adapted to growing sweet potatoes. Many of the difficulties that have arisen in storing and shipping sweet potatoes have been overcome. These facts are sufficient to warrant considerably more emphasis being placed on the growing of sweet potatoes than has been heretofore.

SOIL REQUIREMENTS

A sandy loam soil with a clay subsoil is well adapted to the growing of sweet potatoes. The crop, however, can be grown under a variety of soil conditions with a fair degree of success. This is true particularly in Florida, due to this state's light soils and warm climate.

Of all the types of soil, rolling pine land is usually selected because of its suitability to the crop and the ease with which it can be tilled. With sufficient drainage, proper culture, and a fair amount of organic matter in the soil, a good yield of potatoes may be expected from such soil, if moisture conditions are held fairly uniform throughout the season.

Sandy flatwoods lands also produce good crops. Where drainage is provided and the plants are set on beds, a satisfactory yield may be expected, if other conditions are favorable. However, special provision for drainage is essential for most flatwoods lands.

Rolling hammock lands with compact subsoils are used very generally for growing sweet potatoes, and, with a fair amount of humus, a satisfactory crop may be expected from such soil. But if these hammock lands are not well drained or are too heavy, they are not as suitable as the pine lands.

A fair amount of organic matter is essential. Without it the soils dry out during dry periods, and they require much more

fertilizer. Where vegetation can be turned under each year, it results in the same beneficial effects for sweet potatoes as for other farm crops.

Muck soils tend to produce a heavy growth of vines and uneven sizes of tubers, and in some cases no tubers at all. In some cases tubers become abnormally large and almost worthless for table use. However, as muck lands become compact and well drained, particularly if they contain some sand, fairly good crops may be expected.

Very thin sandy lands usually produce sweet potatoes of a good quality, but too often the yield is low. Such soil, being so thin, is lacking in organic matter and, consequently, has not the power to retain moisture. In most cases it is not profitable to grow sweet potatoes on such land, unless it is improved by turning under vegetation and by fertilizing heavily.

Sweet potatoes can be grown successfully on new land, particularly when planted as a mid-summer crop. They do not produce best when planted early in the spring. The soil must be moist and warm to produce a satisfactory yield, otherwise the potatoes are likely to be long and stringy and unfit for market.

GENERAL CULTURE

Like any other root crop, the sweet potato requires good cultivation as long as it is possible to get between the rows. As the

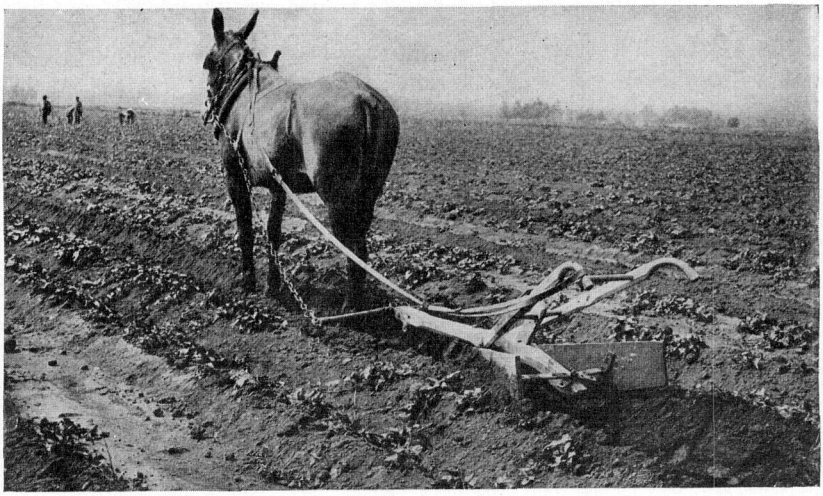


Fig. 2.—Siding up the beds with a specially constructed implement. (Courtesy USDA.)

plant is grown on beds in Florida, surface cultivation requires special implements, especially after the vines begin to run.

It is important that the land be prepared thoroughly far enough in advance of setting that a good moisture supply may be insured. Where potatoes are to be planted early in spring, the land should be plowed early in January, in order that it may settle and capillary attraction be established between the soil and the subsoil before the dry months. During dry weather, if plowed immediately before the plants are set, the soil will become very dry and many plants will die. It will be difficult to make those that live grow off rapidly, which is necessary for good yields. The plowing should be broadcast and from six to eight inches deep, depending on the soil. If no crop is to precede the sweet potatoes, it is well to keep the surface of the soil harrowed in order to make it firm and moist.

Usually it is not advisable to rebreak the land before planting. Simply make the beds, apply the fertilizer, and set the plants. Where early preparation is not provided, the soil is likely to dry out, which will result in a poor stand, a slow growth of the vines, and most commonly a low yield of potatoes that are mainly culls and unfit for market.

A good supply of humus in the soil is important for supplying plant food, as well as for retaining moisture. Therefore, on the average pine lands where leguminous crops, grasses, or other vegetation can be turned under and rotted before planting time, the soil will be much improved and the plants will get a greater amount of fertility from the commercial fertilizer applied. In addition the soil will retain much more moisture, making doubly sure the prospects for a good yield.

TIME TO PLANT

The time of planting will have a decided effect on the yield. The yields from very early plantings which are harvested early are usually lighter than those from plantings made just previous to the season of summer rains. This is principally due to a warmer soil and a more constant supply of moisture during summer. When plants are set in early spring, the soils which hold moisture well should be selected. On the higher sandy soils used generally for mid-summer plantings, unless irrigation is supplied, early plants are likely to suffer from lack of moisture. Sweet potatoes require warm soils and the temperature of the

soil in early spring is usually not quite enough to induce the most rapid growth.

To have an early summer crop, it is necessary to set plants in March or early in April; but where a maximum yield is desired and no special preparations are in mind for marketing early, it seems best to set the plants in May or June. Slips should be used for setting up to June 1, after which vines should be used.

The season of planting, however, must be determined to some extent by the dampness of the soil. It is unwise to set out plants when the soil is very dry, unless an irrigation system has been provided, as many of the plants will die and those that live will grow off slowly, becoming spindling, and produce a poor yield.

Under favorable conditions planting can continue up to August 1, but usually this is too late for heaviest yields. Plants set as late as this are likely to make a vigorous growth, while young, when the soil is very moist, but will yield poorly, if there should be a lack of rainfall in September or before the plants have set any potatoes. Had such potatoes been started well in advance of the rainy season, allowed to establish a good root system and to make a substantial growth by September, rainfall and temperature variations would have affected them less.

For the main crop it is seldom advisable to plant before May 15, for, if planted earlier and not harvested until late fall, many potatoes are likely to be over-sized and cracked, and unfit for market purposes. Therefore, a good time to set sweet potato plants for the late crop is between May 15 and July 10. An exception to this is when the rainy season is prolonged through September.

FERTILIZATION

Experiments conducted at the Florida Experiment Station and published in Bulletin 156 of that station show that sweet potatoes make the heaviest yields on average lands when a complete fertilizer is used. These experiments were conducted for five successive years on sandy pine land of average fertility. In each case where any one of the three essential elements—**ammonia, phosphate,** and **potash**—was omitted, the yield was notably less than where these elements were applied.

The plots receiving no **ammonia** produced an average of approximately 37 bushels to the acre less than the plots receiving ammonia.

The plots receiving no **phosphate** produced an average of 52.2 bushels to the acre less than where the phosphate was applied.

The plots receiving no **potash** produced 121.9 bushels to the acre less than the plots that received potash.

These experiments, therefore, indicate the advisability of a complete fertilizer and, in particular, the importance of the potash element.

Two forms of ammonia were used, sulphate of ammonia and dried blood. Dried blood gave an increase of 5.6 bushels to the acre over sulphate of ammonia.

Superphosphate (acid phosphate) was the only form of phosphate used.

Two forms of potash, sulphate and muriate of potash, were used. The plots fertilized with muriate of potash yielded an average of 18.2 bushels to the acre more than the plots fertilized with sulphate of potash, thus showing the superiority of muriate.

Plots that received an application of 2,000 pounds of ground limestone to the acre produced approximately the same yields as where no lime was used. This indicates that lime is of little or no value for sweet potatoes on the average Florida land.

Fertilizer Application.—To produce maximum yields on average pine land, apply from 600 to 1000 pounds of fertilizer per acre for the late crop and from 1,500 to 2,000 pounds to the acre for the early crop. The actual amount needed is determined by soil conditions.

On light, poor soil it is seldom profitable to apply more than 600 pounds of fertilizer to the acre. A larger amount may increase the yield, but not sufficiently to pay for the extra expense.

Conditions determining the amount of fertilizer that can be used profitably depend on the kind of soil, its natural fertility, the character of its subsoil, the humus it contains, and its general physical condition. Usually where the soil is in a high state of cultivation and has more than the average natural fertility, large amounts of fertilizer may be used profitably. But where the soil is loose and open, lacks humus and fertility, and is apt to be affected by unusual rains or continued drought, large amounts of fertilizer are seldom profitable. No definite amounts or formulas can be recommended for giving best results. However, the above suggestions can be used as a guide.

Where the soil contains large amounts of humus and organic matter, as does muck soil, the amount of ammonia may be re-

duced to one-half or one-third, but the phosphate and potash should be decreased very little if any. These soils are unusually rich in ammonia but do not have an excess of either phosphate or potash.

Analysis.—A sweet potato fertilizer analysis should show approximately the following: 4 percent ammonia, 6 percent phosphoric acid, and 6 percent potash. This formula may be purchased in mixed goods or made from the following materials:

Sulphate of ammonia	25 percent	320 pounds
Superphosphate	16 percent	750 pounds
Muriate or sulphate of potash	48 percent	252 pounds
Inert matter (filler)		678 pounds
	Total	2,000 pounds (1 ton)

If the goods are home-mixed, there is no occasion to add the filler material.

In case it is desired to apply a fertilizer with analysis 4-6-6 from the above materials equivalent to 100 pounds to the acre, mix together the following materials:

Sulphate of ammonia	25 percent	16 pounds
Acid phosphate	16 percent	38 pounds
Muriate or sulphate of potash	48 percent	13 pounds
	Total	67 pounds

This gives a total application of 67 pounds to the acre, but it is equivalent to 100 pounds to the acre of 4-6-6 fertilizer. The amount of each material needed for making up any given amount can be calculated from these figures. To illustrate—if you wish to apply 900 pounds to the acre, multiply by 9 the amount stated for 100 pounds. Do this for each of the materials used.

When to Fertilize.—If the fertilizer is applied early in spring, one application two weeks before the plants are set is recommended. If, however, the fertilizer is applied for summer planting the amount used should be divided into two applications. The first application should be made two weeks before the plants are set, and the second after the plants have been set one month.

Stable Manure, if available, can be used to advantage at the rate of two to five tons to the acre. Apply manure and fertilizer to the soil in about the following manner: After the ground has been prepared and is ready for planting, open up furrows four feet apart and distribute the manure into them. Then cover this manure with two furrows, one on either side. This forms a shallow bed. Apply commercial fertilizer on these half-made beds and work it into the soil by running a one-horse fertilizer

distributer over the top of the beds. Allow the beds to remain in this condition for about two weeks, until about ready to plant. Then finish preparing the beds by plowing furrows on either side, making the beds as high as necessary. Set the plants in these beds.

Fig. 3.—On fertile soils, well-fertilized, sweet potatoes grow luxuriantly in Florida.

Where no stable manure is used the opening of this furrow is unnecessary. Plow up the shallow beds and proceed with the commercial fertilizer, the first application of which should be in the ground two weeks before the plants are set, lest it injure the newly set plants. The second application should be made about thirty days after the plants are set. This will make it necessary to apply it in the sides of the beds. Work it in with a cultivator. This will tend to pull down the beds, but they can be thrown up later with a plow.

Sweet Potatoes on "Cowpenned" Land.—The penning of cattle on land to be planted to sweet potatoes usually gives good results because of the manure and tramping the land gets. It, at least, emphasizes the importance of using manure for sweet potatoes.

Vegetation in the Soil.—The importance of adding vegetable matter to the average sweet potato soil of Florida cannot be overestimated. All vegetation should be plowed under soon enough to decay well by planting time. A leguminous crop is particularly beneficial for sweet potatoes where it can be turned under in time to decay before the crop is planted.

Results from the use of added fertilizing matter are best when the soil has a good supply of organic matter. Because it improves moisture conditions in the soil during the life of the crop, it is advisable to incorporate into the soil as much of such material as is possible.

Fig. 4.—A plant bed properly laid off and boarded up, and of convenient width.

GROWING POTATO PLANTS

As sweet potatoes are propagated from plants, provision must be made for growing an ample supply of plants. In Florida they can usually be grown early enough, when set in the open. However, if it is desired to set plants in the field on or before April 1, the plant beds will need some protection and artificial heat, especially in Middle, North and West Florida. In South Florida, if covered with pine straw or some similar material, they will be protected against freezing.

For a plant bed one should select a protected spot, preferably on the south side of a windbreak, where the plants will get all the sunlight possible. The sweet potato does best in a warm soil with a relatively high temperature. The location should be well drained and the soil should be fairly fertile.

A plant bed may be either in a shallow excavation or on a

level; in either case the bed should be about five feet wide and of the necessary length. The bed should not be so wide that it is inconvenient to pull the plants without stepping on the beds. Inclose in a frame made of eight-inch boards, as shown in Fig. 4.

In the bottom of the bed should be placed from four to six inches of fresh horse stable manure. On top of the manure place a layer of soil three inches thick. Then spread the seed potatoes over this layer of soil. On the potatoes place one to one and a half inches of sand or loam soil. If potatoes are covered too deeply, they will be slow to sprout, as a deep layer of soil

Fig. 5.—Healthy, strong, vigorous plants make the best potatoes. (Courtesy USDA.)

tends to keep the soil cool and retards sprouting. When the plants begin showing through the ground, add an additional layer of soil. To insure long stocky shoots, there should be six inches of soil over the potatoes at pulling time. After the potatoes are planted the soil must be kept moist by sprinkling. However, too much water is detrimental, as the temperature of the bed will be kept down. Add just enough moisture to promote growth. The bed needs comparatively little attention until the draws are big enough to transplant.

A slip five inches long is ready to be transplanted. After each crop of draws is pulled, keep the soil moist and in 10 days or two weeks another crop will be ready to take off.

In estimating the amount of seed potatoes necessary to grow draws for a given acreage, it is estimated that one bushel will produce 800 to 1,000 plants for the early crop. Twelve bushels should be planted for each acre of early planting. If, however, the seedbed is planted early and the slips are allowed to grow into vines, three bushels will produce enough vines to set an acre, if conditions are favorable. When this is done, the slips should be transplanted to where they will have ample room to grow and make vines.

A slight application of commercial fertilizer analyzing 4 to 5 percent ammonia should be broadcast on the plant bed about the time the sprouts are appearing above the soil. Work into the soil by means of a light rake or hoe. This added plant food will stimulate and hasten the growth of the plants.

It is also advisable to provide thin canvas or cheesecloth for the protection of the beds. This material can be stretched over the bed at night and removed during the day. It prevents radiation of heat from the bed, and thus keeps it warm. Plants require a temperature of 70° to 80°F. to grow well. There will be little difficulty in holding it above 50°F., if the foregoing precautions are taken.

Where the plants are needed for late planting only, forcing

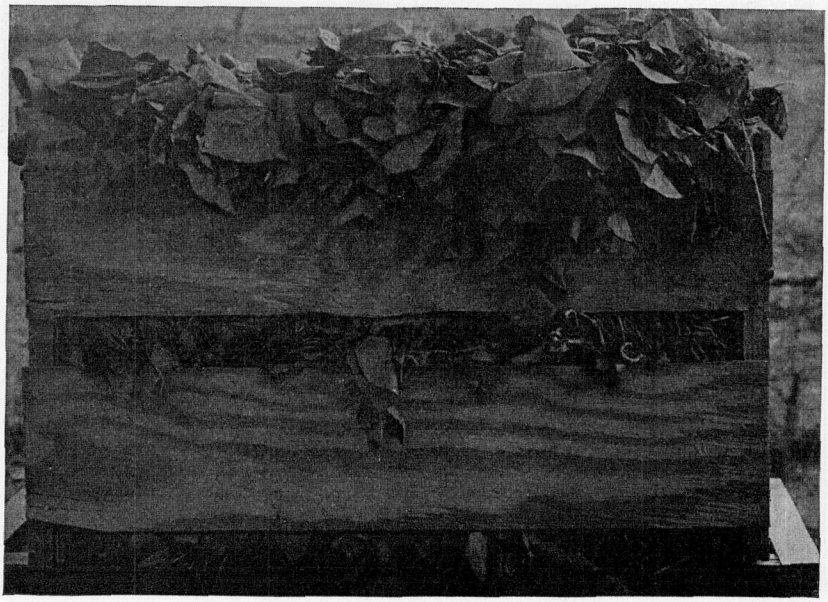


Fig. 6.—Draws, or slips, crated for shipment. (Courtesy USDA.)

methods will not be necessary, as late plantings will produce all the plants needed.

SETTING POTATO PLANTS

Nothing is gained by transplanting potato draws before they are sufficiently strong, since to do so checks their growth. When the plants are pulled from the bed, it is best to set them out immediately. However, if they are to be shipped, allow them to wilt in the shade for at least six hours before packing. This tends to harden them and to reduce the number dying. Immediately following a rain is a good time to set out potatoes. If the area to be planted is small, the plants can be transplanted at almost any time and watered.

Number of Slips to Plant an Acre.—It requires about 8,000 slips to plant an acre of potatoes with four-foot rows, when the plants are set 15 inches apart in the row. The width and distance for planting depend on the richness of the soil and the variety of the potatoes. In soil that is rich the plants can be set closer than in poor soil; and with varieties that produce many vines the rows should be a little wider than with varieties that produce but few light vines. The rows should be wide enough to permit cultivation for five or six weeks after the plants are set, particularly if set in early spring when the weather is likely to be dry. If planted in mid-summer when rains are frequent, cultivation to conserve moisture is not necessary.

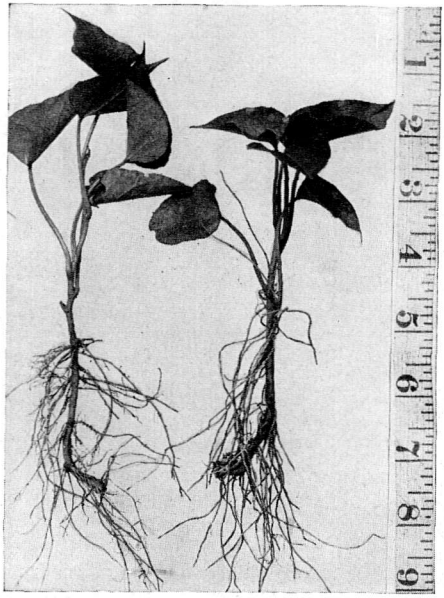


Fig. 7.—Proper root development and top for transplanting. (Courtesy USDA.)

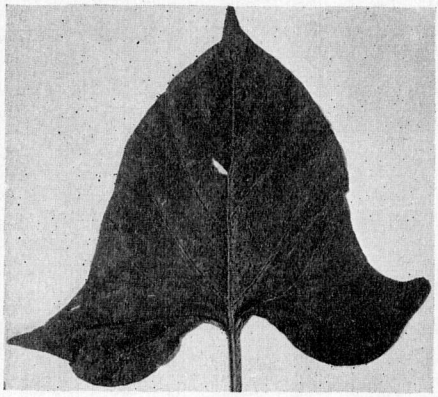
Slips Compared with Vines.—There is no difference in setting the vines and in setting the slips. However, as the vines usually are set later in the season and are larger and stronger, they can be set under less favorable conditions than can slips. This is largely due to the superior strength

of the vine and its ability to withstand unfavorable conditions.

In setting the vines, first cut them into 15-inch lengths, insert the butt end at least 6 to 8 inches deep. The soil should be left firm around the vine in order to prevent the bed from drying out.

Vines are preferred to slips, where it is practical to grow them, since the vines are usually stronger and mature their crop quicker than do slips. This is due to the vigor of the vine cuttings. It is further true that many more vine cuttings than slips can be secured from a bushel of seed. For early planting one must depend on slips, but for late planting it will not be difficult to secure ample vine cuttings from a much smaller amount of seed, especially if the slips are transplanted into rows for the purpose of growing vines.

VARIETIES



There are four or five commercial varieties of sweet potatoes recommended for Florida. Several others are grown locally but do not seem to have any particular merit and, consequently, have little commercial importance.

The most important commercial varieties are Porto Rico, Improved Porto Rico, Triumph, Nancy Hall, and Big Stem Jersey. The Red

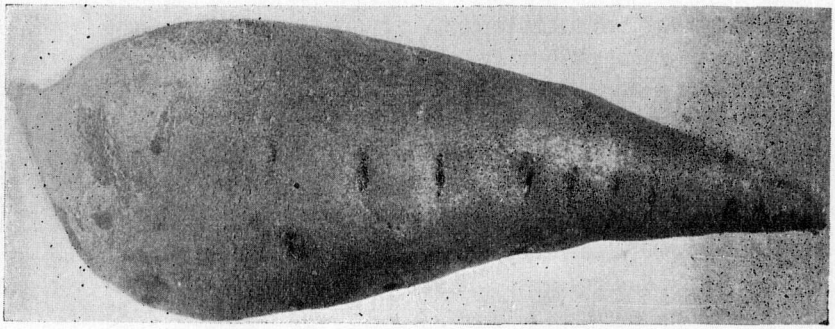
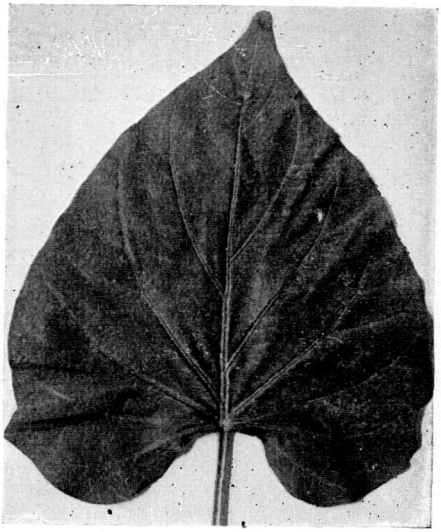


Fig. 8.—The Porto Rico, famous in the South for its richness of flavor and rare delicacy.

Providence and Norton Yam are grown commercially but are of less importance. Other varieties such as Dooley Yam, Pumpkin Yam, Nigger Killer, "Pattysaw" and Red Buck, are grown in gardens but are not recommended for commercial plantings.

The Porto Rico is the most popular variety throughout Florida on account of its rich color, moist soft flesh, and its rich, sweet and juicy flavor. It is also very popular in the markets of other southern states, and, in fact, wherever a moist-fleshed potato is demanded. It yields on the average a good crop of marketable potatoes, which can be stored several months and kept in good condition, if harvested without being bruised.

It produces heavy, purple vines, the leaves being large and thick and greenish brown in color with purple markings on the veins, around the edge of the leaf and on the petiole stems.



The Improved Porto Rico is a strain of the Porto Rico variety having a deeper color than the standard Porto Rico. This variety has come into much favor in recent years and is now extensively grown.

The Nancy Hall is less popular for home use and for most Southern markets than is the Porto Rico. The potato is light yellow in color with flesh of a creamy-pink-yellow. When cooked, the

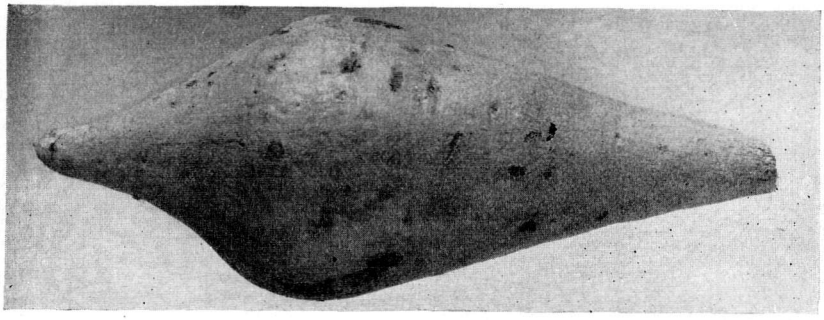


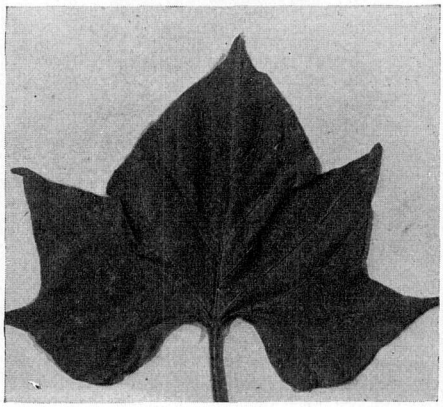
Fig. 9.—The Nancy Hall cooks soft, moist and sweet and is popular on the Northern markets.

flesh is moist, soft and sweet, but not as rich in appearance as the Porto Rico.

It is an average yielder on light soils and has proven a satisfactory variety to grow under average conditions. Of moist potatoes it is one of the most satisfactory for northern markets. It has the disadvantage of a tendency to crack, if grown on rich soil or if allowed to remain in the soil for some time after maturing. The vines are inclined to be bushy. The leaves are mottled greenish yellow with purple markings at the junction of the blade and stem.

The Triumph is recommended for early planting, particularly when the crop is to be shipped to northern markets. It is drier than the Porto Rico or Nancy Hall and for that reason is less liable to bruising and is a better shipper.

When propagated from slips, there is little difficulty in producing early potatoes of this variety. And for spring shipments to northern markets it is one of the most dependable. Since it is a comparatively dry potato, it is not very popular on southern markets. However, where the quality is good it is comparatively free from stringiness and when ripe is fairly sweet. The vines make a heavy growth and the leaves are deep green with purple stems and veins. Both the peel and the flesh of the roots are light yellow in color.



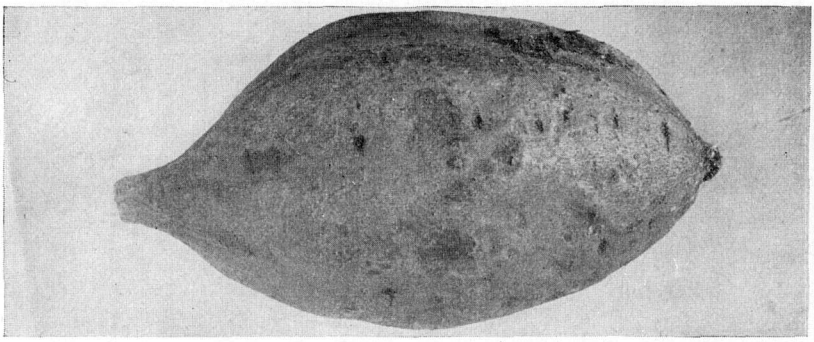
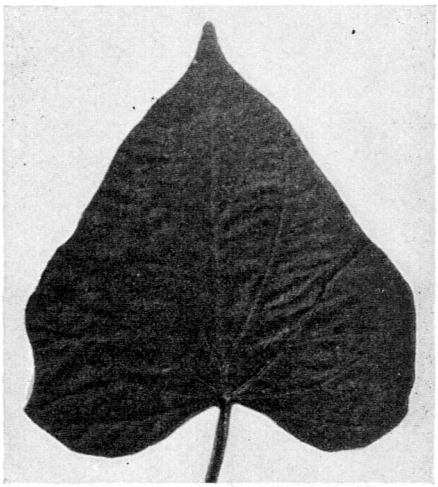


Fig. 10.—The Triumph is a good shipper.

The Big Stem Jersey is a dry mealy potato and sells much better on northern than on southern markets. It has not been popular in the South because of its dryness. In the North it is well known as being dry and mealy. It can be handled easily without bruising.

When this potato is planted in Florida it is usually with an idea of shipping to the early northern markets. It can be produced and placed on those markets in July, or earlier than most other varieties. This requires very early planting. When grown early in spring, particularly if the soil is dry, the yield is often light. For that reason it has not been grown to any extent except by those who have made special preparation to grow it at this season. It is doubtful if it ever will be a satisfactory variety for home or local consumption.



The vines are rather scant, long and creeping, and the leaves are small and green in color. The roots are dark yellow and their flesh creamy yellow in color. When cooked it is dry and mealy.

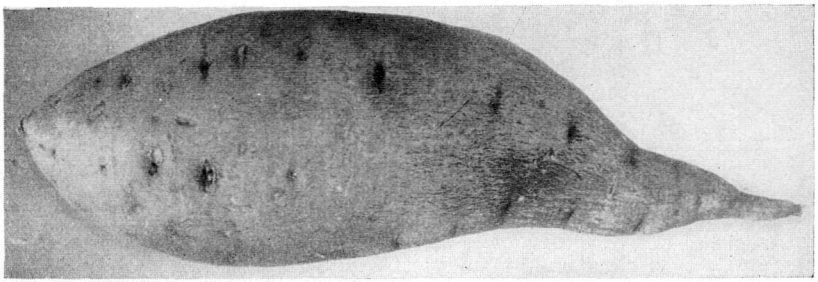
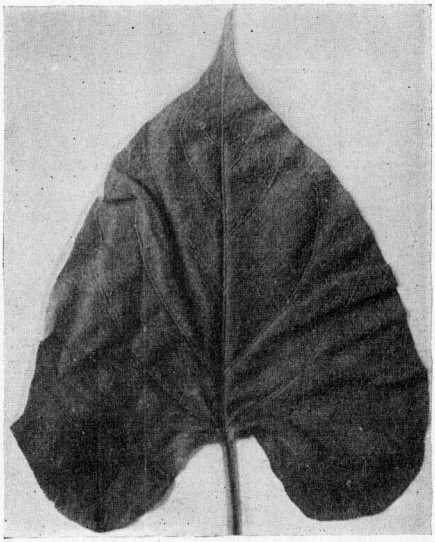


Fig. 11.—The Big Stem Jersey, a good shipper and popular in the North because of its dryness and mealiness.

The Norton Yam is a good variety for local markets and for home consumption. It is a sweet, moist potato but is inclined to be stringy, if its growth is retarded by dry weather. The roots are russet yellow in color, and their flesh white, flaked

with yellow. The leaves and stems are rich green and the vines light green in color. The vines are inclined to have a long straggling growth.

The Red Providence is grown commercially and for home use. It is usually a good yielder and is propagated easily. In color the roots are tan, shading into yellow. The flesh has a tinge of pink. The potato is comparatively free from stringiness. It is moist and a good keeper, if harvested without bruising. The vines are green with purple markings at the nodes, and the leaves have purple stems which shade into green. The vines make a medium heavy growth.



The Pumpkin Yam is suited for local consumption. It is a very juicy potato and bruises easily, unless handled carefully. As to color, the roots are salmon with a rich yellow flesh. When cooked it is sweet and juicy. The leaves are long and irregular, with prominent yellow veins.

The Nigger Killer, "Pattysaw", and Red Buck are of little importance from any standpoint. They seem able to produce light inferior crops under neglected con-

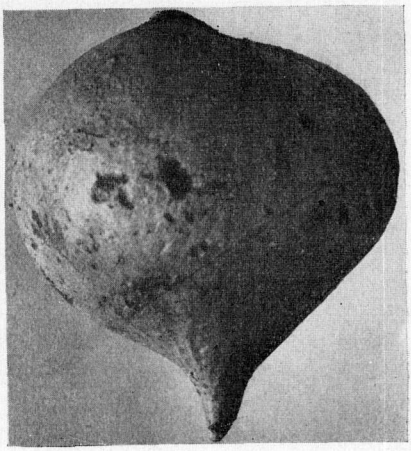
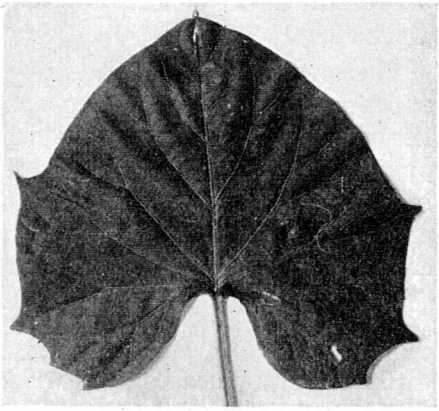


Fig. 12.—The Norton Yam is good for home use and to supply local markets. It is a sweet, moist potato. However, it does not do well when the weather is dry.

ditions. They are moist and comparatively sweet, but are not recommended for commercial plantings.

SEED SELECTION

The practice of selecting seed has been neglected very greatly in much of the sweet potato growing area. Little along this line has been done in Florida, with the result that the average yield is low. In fact it is difficult to secure a high yield of uniform, marketable potatoes. While the lack of good seed is not altogether responsible for this condition, it is an important factor.



The planting of sweet potato vines from volunteer plants is partly responsible for many low yields. These volunteer vines come up from potatoes which were overlooked when the previous year's crop was harvested. Usually such potatoes are small and inferior. One cannot expect plants from such seed to give the best returns, nor to produce roots uniform in color and shape and true to variety.

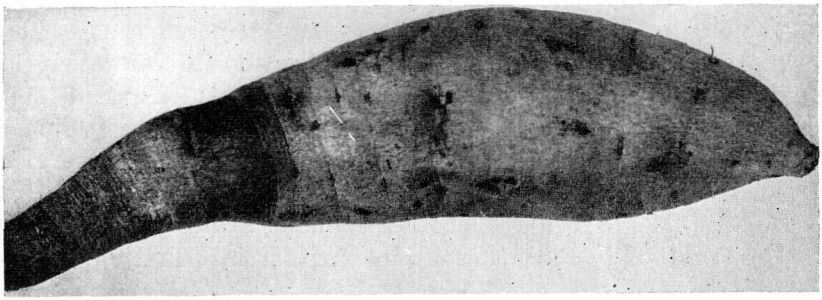


Fig. 13.—The Red Providence is grown to some extent for commercial and home use.

The practice of bedding the inferior or cull potatoes for seed is also responsible for low yields. While there are many small roots suitable for seed, the probability of getting low-yielding plants from them is so great that it is better to feed them to

livestock and to purchase seed, if necessary, even at a much greater expense.

Sweet potato seed should be selected for uniformity of type, color and variety, and should be free from disease. Careful seed selection year after year results in the ultimate production of a higher percentage of marketable potatoes. Such potatoes can be graded and packed so as to compare favorably with the best that reach the eastern markets, and also make a decided improvement in the general appearance of the potatoes on southern markets.

There are several diseases of sweet potatoes that mar their appearance and increase the number of seconds and culls. By the proper selection of seed when the potatoes are dug, the proper storing of seed potatoes, the careful re-sorting, the throwing out of all diseased tubers, and the disinfecting of seed, the amount of diseased potatoes will be reduced, their yield increased, and their quality improved.

SEED TREATMENT

Since many diseases are carried into the field by planting diseased seed, it is advisable to treat all seed immediately before bedding. This is done by placing the potatoes in a solution made of 1 ounce of corrosive sublimate crystals (mercuric chloride) dissolved in 8 gallons of water. Use a wooden container, let potatoes remain in the solution for 10 minutes, then spread them out to dry without being rinsed. Then bed immediately. In case the soil is generally infested, this treatment is of little service. In such a case, plant some other crop.

Bulletin 212 of the Florida Experiment Station, Diseases of Sweet Potatoes in Florida, contains further information on diseases and seed treatment.

HARVESTING

Much care is needed when harvesting sweet potatoes to avoid bruises. Southern potatoes, because of their high content of water, are bruised more easily than the drier varieties. The diseases of sweet potatoes can do comparatively little damage, unless the potatoes are bruised or broken. If the crop is to be stored for several months, too much care cannot be exercised to prevent bruising. If comparatively free of diseases and if carefully handled to prevent bruises, breaks and cuts, practically

all potatoes will cure well and few will rot. However, if they are hauled loose in the ordinary wagon body, handled carelessly from the wagon to the curing house by forks or shovels, the blemished and rotted will amount to as high as 75 percent or more of the original bulk.

A turning plow with two rolling colters attached to the beam in such manner that they will cut the vines is a satisfactory implement for getting sweet potatoes out of the ground. Sweet potatoes should be picked up carefully before being exposed to the sun for any length of time. They should not be thrown into piles as this is sure to bruise them.

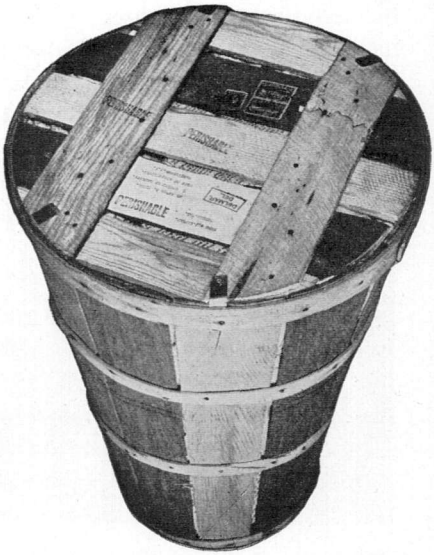


Fig. 14.—The hamper is suitable for use where sweet potatoes are being shipped in carloads; it is easily loaded into the car. (Courtesy USDA.)

PACKAGES

Sweet potatoes are packed in hampers, baskets, crates, and barrels. The kind of package used is determined largely by how the potatoes are shipped. For car-lot shipments the hamper has the advantage of being packed easily in the car. For express shipments this package is objectionable in that it is more easily broken than the bushel basket or crate.

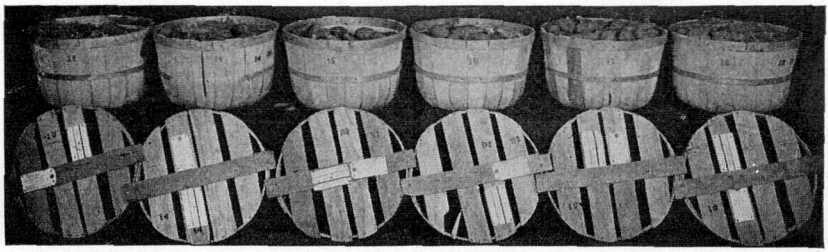


Fig. 15.—Baskets are convenient containers. (Courtesy USDA.)

If sweet potatoes are placed in storage houses, the bushel crate is preferred, since crates of this type may be filled with pota-

toes immediately from the field and stacked up in such a way as to provide ventilation. This last crate, therefore, minimizes handling and bruising. If the potatoes are carefully sorted in the field, they can be placed in these crates immediately; but usually they must be re-sorted just before being shipped in or-

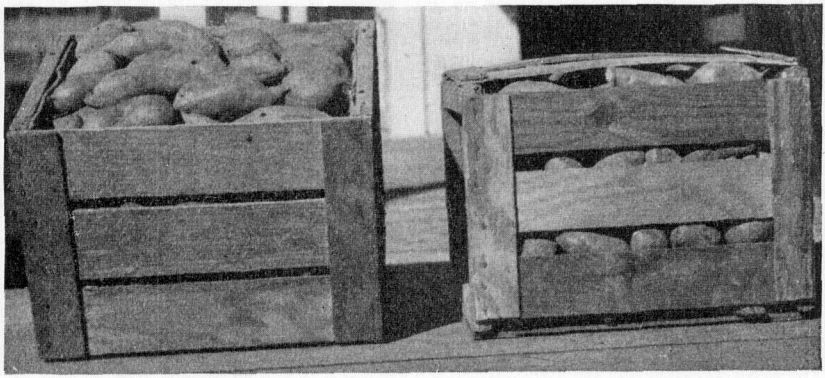


Fig. 16.—Crates minimize handling and brusing. (Courtesy USDA.)

der to remove the blemished or unmarketable. The tight barrel is used generally when shipping direct from the fields to the market. This barrel is not headed as is the Irish potato barrel,

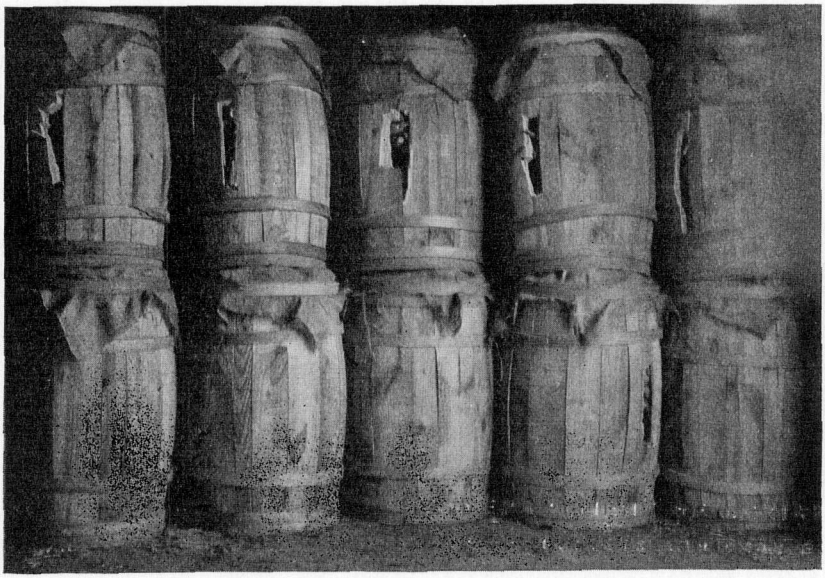


Fig. 17.—Barrels are generally used when shipping direct from field to market. (Courtesy USDA.)

the potatoes being held in by a covering of burlap fastened down with a hoop. Such a package would not be suitable for storing in a storage house because good ventilation cannot be secured.

Packages filled and ready for marketing should contain potatoes uniform in color, size, and quality. The packages should be well filled so that they will be held firm in the pack and thus prevented from settling down and being bruised in transit.

Never ship sweet potatoes in sacks for long distances. This is impossible to do without practically every potato becoming bruised. As with any other product, potatoes in a neat-appearing package usually find a ready sale at a good price, and, therefore, care must be exercised in placing sweet potatoes on the market that they may sell for the best price.

STORING SWEET POTATOES

Sweet potatoes to be stored in houses or banks for two or more months must be comparatively free of bruises and blemishes and well-matured, or many will decay and others grade low. Before being piled together, broken and bruised ones should be sorted out for immediate use.

Rotting in storage is caused by a fungus that develops slowly when the potatoes are spread out thin and have a free circulation of air over them. When they are piled together and have but a limited circulation of air, there is usually some increase in temperature and moisture in the air about them, which makes conditions favorable for the action of the fungus. This accounts for the fact that potatoes stored in small banks keep better than those sored in large banks.

The round bank, as shown in Fig. 1, has an advantage over the larger bank in that the pile is small and there are more potatoes exposed to a free circulation of air. If the bank contains 15 bushels or less, it will hardly be necessary to place a ventilator in the center of it. However, the top should have a ventilator so that, if there is any heating, the warm air can escape. After the potatoes are shaped up they should be covered with about four inches of straw, and over this a thin layer of dirt in order to keep out cold and rain.

When a larger quantity of potatoes is to be stored, the bank can be long and narrow. But on account of the larger pile there will be more heating, consequently more ventilation will be needed. The ventilated bank, as shown in Fig. 18, provides a free circulation of air from one end to the other.

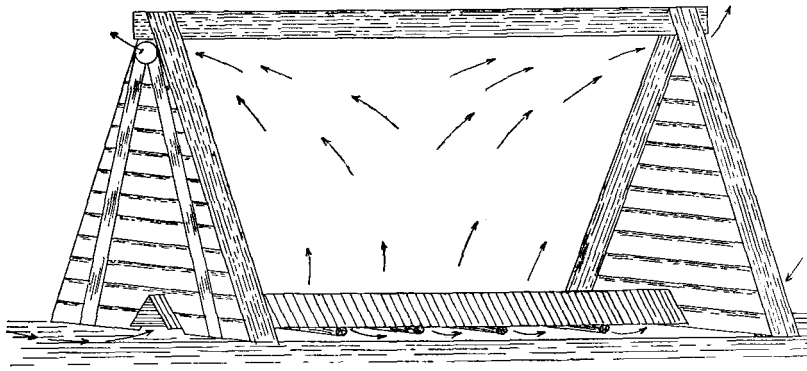


Fig. 18.—A ventilated sweet potato bank, designed and used by T. K. Godbey, Waldo, Florida.

Invert a V-shaped trough and lay it in the bottom of the bed. Under this place supports to hold the trough two inches off the ground. Pile the potatoes over this ventilator.

Such a bank can be made five or six feet wide at the bottom and about four feet high and can have any desired length up to 20 feet. Such a bed 20 feet long will hold about 200 bushels. When the beds are shaped up and ready to be closed in they should have a light layer of straw, held down and protected by a layer of boards, the upper ends of which rest on a ridge pole. The boards should overlap sufficiently to keep out rain. No straw should be placed in the bottom of the bed. The potatoes will keep better if laid on the ground.

A layer of dirt can be placed over the boards. This will be needed during frosty weather. The potatoes will keep much better, if a fairly uniform temperature is maintained both day and night. To provide such a temperature, a thicker wall than provided by the boards and straw will be necessary. In unusually cold weather both ends of the ventilator in the bottom of the bed can be covered with dirt.

Ample ventilation is necessary to keep sweet potatoes sound and fresh after being stored. If fresh air can enter from the bottom, circulate through the potatoes and escape at the top of the bank, the potatoes will keep with comparatively little shrinking or rotting. And if a uniformly cool temperature is maintained, there will be little sprouting.

CURING AND STORING

Sweet Potato Curing Houses are in general use in many sweet potato sections. Where a large acreage is grown for several

years in succession, a curing house is recommended. Such a house is not recommended unless there are 1,500 bushels or more to be stored. In small houses it is not easy for the temperature to be held uniform. When the outside temperature is frequently 70°F., or higher, it is often difficult to prevent sprouting. This can be controlled in a large house better than in a small one. Also, for a crop of 1,500 bushels or less, the initial cost and necessary supervision will be too large to justify a storage house. Therefore, if the crop is small, it is more profitable either to market the potatoes at harvesting time or to store them in a bank.

A storage house with a capacity of from 5,000 to 10,000 bushels can be operated at a relatively low cost. A small house requires practically the same supervision that a large one does. In either case an attendant must watch and hold the temperature and moisture in the house at their proper places.

Digging and Handling.—Potatoes to be cured in a storage house should be left in the ground until well matured. If frost destroys the vines, the potatoes should be dug at once or have their vines cut off at the level of the ground. If the dead, rotting vines remain attached, germs of decay will enter the potatoes and they will decay in storage. After the potatoes are dug they should be placed in the storage house just as soon as they are dry. If the weather is clear and relatively cool, allow to dry before storing; but, if the weather is hot, do not let them remain exposed to the sun, since to do so will cause them to sunburn. It is usually best to house the potatoes as they are dug, allowing them to remain on the ground just long enough to dry.

In digging potatoes care should be taken not to bruise them by throwing from one row to another or into a loose wagon bed or into bags. Sort and put into a basket or box, load onto the wagon and haul them directly to the storage house. If stored in crates, there is no occasion to handle more than once. If the grading is done in the field and the different grades are kept separate, handling at the cars will be facilitated.

Houses can be built with or without bins. Those without bins require that the potatoes be stored in crates. This is economical and usually most practical, as it saves handling the potatoes after they reach the storage house, and the boxes can be piled up in such a way that air can circulate freely through them.

Curing the Potatoes.—As soon as the potatoes are stored excess moisture in the house should be driven off by means of a

stove or heating flue. For the first ten days the temperature in the house should be from 80° to 85°F. with ample ventilation. The temperature maintained will depend on weather conditions. Ventilation is needed to drive off the excess moisture and to keep the potatoes fairly dry. During the day the windows and doors may be opened but at night they should be closed.

After 10 days the temperature within the curing house should be gradually reduced to 55°, where it is kept as near as possible as long as the potatoes are in the house. In case the temperature falls to 45° or lower, a fire should be started again and the temperature raised to 55°. If the house becomes moist at any time during the curing period, it will be necessary to dry it out.

A storage house can be heated with an ordinary sheet-iron stove. The more uniform the temperature can be held the better the potatoes will keep. For this reason coal is preferred to wood for heating purposes. In commercial storage houses with a capacity of 10,000 bushels or more, a large heating system is advisable. The important points in the control of heat in a storage house are to bring in fresh air, to drive out all moisture-laden or foul air, and to keep the temperature within the house

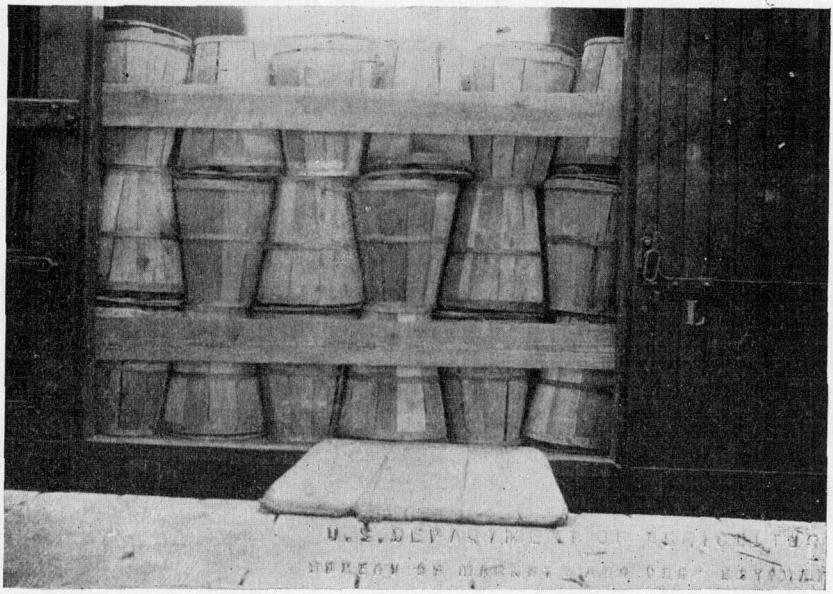


Fig. 19.—Crated sweet potatoes on the way to market. (Courtesy USDA.)

to 55°. In Florida it is difficult to hold the temperature down to 55°, particularly in the fall months when the ouside temperature is from 70° to 80°. It is important, therefore, in the construction of the house to be sure that ventilators are placed properly and that air spaces are in the walls so that a uniform temperature may be maintained and not constantly varied.

Advantages of the Sweet Potato Storage House are as follows:

First, the sweet potatoes can be kept in a marketable condition until prices are satisfactory, even for several months after harvesting.

Second, the potatoes can be placed on the market in good condition with a minimum loss from decay.

Third, sweet potatoes that are stored properly can be shipped to distant markets several months after being harvested.

Fourth, the grower is enabled to watch his potatoes while they are in storage, and should they show a tendency to rot or sprout, he may be able to dispose of them.

Sweet potato storage houses have not been generally used in Florida largely due to the limited acreage usually grown by farmers. Before the expense of erecting a storage house is justifiable, there should be from one to two thousand bushels of marketable potatoes to be stored, and with a probability of continued use of the house for three or more years, due to the building cost and maintenance. Growers also report difficulty in preventing the sprouting of potatoes due to relatively warm weather.

However, anyone planning to grow or store sweet potatoes through several years on a relatively large scale could hold the potatoes from three to six months in such a storage house and thereby avoid selling them when the markets are oversupplied.

The details for the construction of a sweet potato storage house are contained in Farmers' Bulletin 970, United States Department of Agriculture, Washington, D. C.

SWEET POTATOES FOR EARLY MARKETING

Sweet potatoes may be grown as an early market crop in Florida if conditions are made favorable for having the crop ready to harvest in June or July. The demand for this crop is larger in the northern markets, although there is a limited demand in the southern markets.

The variety most generaly recommended for the early crop is

the Big Stem Jersey. The Porto Rico is also grown but as it does not represent the type of potatoes usually found in the early markets of the North, the sale of the product is more restricted. The Big Stem Jersey, being dryer and more acceptable to trade, usually brings a satisfactory price, especially when it can be marketed in July or earlier.

In tests made to compare Big Stem Jersey and Porto Rico sweet potatoes and covering three or more years at the Coastal Plain Experiment Station, Tifton, Ga., (Bulletin 12), it was found that the Porto Rico variety consistently gave a higher yield per acre of total, also marketable potatoes. Where planted for the early market, the largest yield with both varieties was obtained when the potatoes were planted on high beds.

In order to produce the early crop, special preparations must be made. In the first place there must be a good supply of plants available that are ready to set out early in March. As a rule there is no difficulty in getting an ample supply of plants to set out a crop in June but the growth of plants is usually slow during the early spring months and this has been one of the great drawbacks in getting an early crop started.

For the early crop, the plant beds should be planted on or before January 10 and every care should be exercised to promote early growth. A statement covering the making of the bed is carried elsewhere in this bulletin and applies to the early as well as to the later crop. Care must be taken that the beds are kept warm by covering them when the temperature is below the average. There must also be a good, moist condition to induce rapid growing. At the same time the plants must be grown in the open, otherwise they will be spindling and weak.

Under very favorable weather conditions, plants may be available from well prepared beds by the latter part of February but unless conditions for growing are made favorable, the plants may not be large until late in March. Even this may not be too late for planting the early crop if the soil and weather conditions are favorable for planting. The methods of growing the early crop do not differ from those used with the later crop except that it may profit to use more fertilizer. Emphasis is placed on having early-grown, strong, sturdy plants in liberal quantities so that the early planting will not be delayed.

In the planting of Big Stem Jerseys, preference is given to seed that has been grown in the Eastern states. Seed grown in Virginia has given a better stand of plants than Florida-grown

seed. Although this supply of seed may be relatively expensive, one cannot afford to take chances on getting a poor stand by planting seed that is uncertain.

When a good yield of potatoes can be harvested on or before the 20th of July, one may reasonably expect to receive from $6 to $10 per barrel.

The early spring crop usually produces a lower yield than the late summer crop but with the higher price per barrel, the crop is usually profitable if 75 bushels of No. 1 potatoes per acre can be produced.

The early crop must be shipped in standard barrels and competes with early sweet potatoes from other sections that supply the Eastern markets.

MARKETING

In order to market sweet potatoes to best advantage, they must be properly graded and packed. The general practice of shipping all the potatoes from a field in loose cars, unsorted, is wasteful. The seller usually gets only the price of his lowest grade, the best potatoes being sold for the price of the poorest.

It is always best not to ship cull potatoes. They have little or no market value, at least not sufficient to cover the added freight charges. Such potatoes have a value from 30 cents to 50 cents a bushel for stock feed or for canning.

UNITED STATES GRADES FOR SWEET POTATOES

Following are the recognized grades of sweet potatoes in the United States:

U. S. Grade No. 1

U. S. Grade No. 1 shall consist of sound sweet potatoes of similar varietal characteristics which are practically free from dirt or other foreign matter, frost injury, decay, bruises, cuts, scars, cracks, and damage caused by heat, disease, insects (including weevils), or mechanical or other means.

The diameter of each sweet potato shall not be less than one and three-quarters inches nor more than three and one-half inches, and the length shall not be less than four inches nor more than ten inches, but the length may be less than four inches if the diameter is two and one-quarter inches or more.

In order to allow for variations incident to commercial grading and handling, five percent, by weight, of any lot

may not meet the requirements as to diameter and length, and, in addition, six percent, by weight, may be below the remaining requirements of the grade.

Any lot in which the diameter is not less than one and one-half inches and which contains a greater percentage by weight of sweet potatoes below one and three-quarters inches than is permitted in U. S. Grade No. 1, but which otherwise meets the requirements of such grade shall be designated as U. S. Grade No. 1 Medium.

Any lot in which the length is not less than six inches nor more than twelve inches and which contains a greater percentage by weight of sweet potatoes above ten inches in length than is permitted in U. S. Grade No. 1, but which otherwise meets the requirements of such grade shall be designated as U. S. Grade No. 1 Long.

U. S. Grade No. 2

U. S. Grade No. 2 shall consist of sound sweet potatoes of similar varietal characteristics, not meeting the requirements of the foregoing grades, which are free from serious damage caused by dirt or other foreign matter, frost injury, decay, bruises, cuts, scars, cracks, heat, disease, insects, or mechanical or other means, and which are not less than one and one-half inches nor more than three and one-half inches in diameter.

In order to allow for variations incident to commercial grading and handling, five percent by weight of any lot may not meet the requirements as to diameter, and, in addition, six percent by weight may be below the remaining requirements of this grade.

U. S. Jumbo Grade

U. S. Jumbo Grade shall consist of sound sweet potatoes of similar varietal characteristics, which are free from serious damage caused by dirt or other foreign matter, frost injury, decay, bruises, cuts, scars, cracks, heat, disease, insects, or mechanical or other means, and which are not less than three and one half inches in diameter.

In order to allow for variations incident to commercial grading and handling, five percent by weight of any lot may be less than the diameter prescribed, and, in addition, six percent by weight may be below the remaining requirements of this grade.

U. S. Grade No. 3

U. S. Grade No. 3 shall consist of sweet potatoes not meeting the requirements of any of the foregoing grades.

Definition of Grade Terms as Used in These Grades

"Practically free" means that the appearance shall not be injured to any extent readily apparent upon casual examination of the lot, and that any damage from the causes mentioned can be removed without appreciable increase in waste over that which would occur if the sweet potatoes were perfect.

"Diameter" means the greatest dimension at right angles to any portion of a central line running through the sweet potato from stem end to root end.

"Free from serious damage" means that any damage from the causes mentioned can be removed without increase in waste of more than ten percent by weight over that which would occur if the sweet potatoes were perfect.

SWEET POTATOES AS STOCK FEED

Sweet Potato Silage.—The value of the sweet potato as a silage crop has been determined by the Florida Experiment Station and reported in Press Bulletin 274 of that station.

In these experiments potatoes were stored in the silo just as is corn or sorghum. Or, in other words, the potatoes were run through an ensilage cutter at harvesting time and kept in a concrete silo until the following May. Sweet potato silage, compared with corn silage, shows the following analysis:

	Moisture	Crude protein	Nitrogen free ext.	Fat
Sweet potato silage	54.8	1.82	39.4	0.66
Corn silage	72.7	2.1	15.4	.08

During those experiments a test was made with 10 cows to compare the feeding values of sweet potato and sorghum silages for milk production. Both were fed with a concentrated ration of wheat bran and cottonseed meal. The test was continued for 43 days with the following results:

The cows fed with sweet potato silage produced 2,641 pounds, or 307 gallons of milk. During the same period the cows fed sorghum silage produced 2,416 pounds, or 281 gallons of milk. This gave a difference of 26 gallons in favor of the sweet potato silage.

The cows in this test were as nearly average cows in every respect as can be selected from the ordinary herd. The test serves to indicate that the advisability of making sweet potatoes into silage can be determined only by their market value.

Sweet Potatoes for Milk Production.—In feeding tests conducted by the Florida Experiment Station for the purpose of

comparing sorghum silage and sweet potato silage for milk production, it was found that, when fed with cottonseed meal and wheat bran, 4,819½ pounds of sweet potatoes produced 3,122¼ pounds of milk at a feed cost of 17 cents a gallon, and that 6,898 pounds of sorghum silage, with the same additional feeds, produced 2,800¼ pounds of milk at a cost of 14 cents a gallon. In making these tests the amount of silage fed was based on the digestible nutrients in the foods given, so that practically the same amount of food value was contained in the sweet potatoes as in the sorghum silage. It was also estimated that the cost of the sweet potatoes was 30 cents a bushel and that of the sorghum silage $3 a ton.

For feeding dairy cows the value of sorghum silage may be estimated at $6 a ton, and sweet potatoes at 60 cents a bushel, when made into silage. This will give a fair idea of the relative value of sweet potatoes compared with sorghum silage.

Sweet Potatoes as Hog Feed.—The advisability of feeding sweet potatoes to hogs is determined also by the market value of the sweet potatoes. When sweet potatoes are worth more than 60 cents a bushel, it is seldom profitable to feed them to hogs. There is, however, in every crop a quantity of broken, bruised, and unmarketable potatoes which can be utilized to good advantage as hog feed. On account of their high moisture and relatively low protein and fat content, sweet potatoes must be supplemented with grain, if fed to fattening hogs.

Supplemented with concentrates and pasture, sweet potatoes are an excellent hog feed. By using approximately half the grain that would be used with pasture alone, growing shoats do well on this root crop. Hogs turned into the sweet potato field after the main crop is harvested eat many small potatoes and roots that otherwise would be wasted. Or the potatoes may be gathered and stored and fed as needed to the hogs in troughs or on a platform. Approximately two pounds of grain for 100 pounds of live weight of hogs, added to a ration of sweet potatoes, will produce satisfactory gains.

According to an experiment reported in Florida Experiment Station Bulletin 90, when the ration was entirely of sweet potatoes the hogs became unthrifty and actually lost weight after being fed 42 days.