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by

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In the production of sweetpotato plants the essentials to success are good seed stock, suitable propagating beds, suitable bedding medium, proper bedding methods, and proper attention to pulling and care of the plants. In this paper brief consideration is given to each of these essentials. The information is designed to be of practical benefit to Mississippi growers.

GOOD SEED STOCK

Disease Freedom. Seed stock sweetpotatoes should be produced so as to be free of all diseases which cause decay losses during storage and low production of plants in the beds. The best way to be assured of this is to use vine cuttings for growing the seed crop and set these cuttings on disease-free land. If new land is available, it is by all means preferred; but, if it is not available, use land that has not grown a crop of sweetpotatoes in at least five years. The diseases which cause sweetpotato rots live only on sweetpotatoes, and if this crop is not grown on the land for several years the diseases die.

Seed Size. The roots kept for seed should be the small sizes from high producing hills. The work of many investigators as well as the experience of growers show that the small roots produce more plants per bushel than the large roots. During 1935, 1936, and 1937 work was done by the writer at Laurel to compare the sprouting of "small" and "large"* seed of the Triumph variety and the yielding ability of plants from the two sizes of seed. The results of these experiments are presented briefly in tables I, II, and III.

These data show that while there were more plants produced per root by the "large" seed, these plants were not significantly larger than those produced by the "small" seed. Almost twice as much weight of root of the "large" seed was required to produce a plant as of the "small" seed. The "small" seed produced more plants per bushel early in the season and for the entire season than the "large" seed. While the difference of 312 plants per bushel may seem small, it is a significant difference.

While the data in table III show that in some cases a few more bushels of roots were produced by plants from "large" seed, these differences are not significant, and considerable variation in the yield of individual plots in the field occurred. In the light of these experiments, growers are justified in using small seed.

*The "small" seed included roots that were 1 to 1½ inches thick and the "large" seed included roots that were 2 to 3½ inches thick.

Table I. Effect of Size of Seed Stock on Plant Production of the Triumph Sweetpotato; Summary of Three Years Results

Seed Size	No. Plants Per Root			Grams Root Per Plant			No. Plants Per 60 lb. Bushel		
	1935	1936	1937	1935	1936	1937	1935	1936	1937
Large	12.7	15.8	5.2	22.4	21.6	54.1	1215	1255	502
Small	6.6	8.3	4.1	17.5	12.4	23.6	1612	2190	1152
Difference	6.1	7.5	1.1	4.9	9.2	20.5	397	935	650

Table II. Effect of Size of Seed Stock on Earliness of Sprouting and Total Plant Production of the Triumph Sweetpotato, Three Year Average

Seed Size	Plants Produced Per Bushel by 10-Day Periods			Total Plants
	1	2	3	Per 60 lb. bu.
Large	219	243	383	845
Small	256	265	636	1157
Difference in favor of small seed	37	22	253	312

Table III. Effect of Size of Seed Stock on Yield of the Triumph Sweetpotato; Average of Two Years Results

Plot Pair	Seed Size	Yield Per Acre in 60 lb. bu.				
		Jumbo	No. 1	No. 2	Culls	Total
1	Large	62	195	28	19	304
	Small	49	194	31	12	286
2	Large	11	217	25	14	267
	Small	29	215	25	13	282
3	Large	15	203	26	26	270
	Small	12	202	19	21	254
4	Large	40	195	29	21	285
	Small	47	159	32	17	265
Average	Large	27	202	27	20	276
	Small	34	192	27	15	268

Harvest Date. Sweetpotatoes that are to be used for seed should by all means be harvested before any frost occurs. Results of experiments by Lauritzen (3) show that sweetpotatoes do not need to be frozen or "frost bitten" to be injured so that little or no sprouting occurs. If they are chilled by temporary exposure to temperatures below 40° F they may not sprout. The roots do not freeze until their temperature reaches 29° F. When the vines are injured by frost the roots are likely to be chilled so that although they do not rot in storage, they may be useless as seed stock.

Handling. Experiments (1) have shown beyond doubt that it pays to handle seed sweetpotatoes more carefully during harvesting than is usually practiced by growers. Seed stock that is placed carefully into crates or other containers in which they are to be stored directly from the plowed-up row shrink less and decay less during storage, and produce about twice as many plants per bushel as seed stock that is thrown into heap-rows and subsequently taken up into storage crates. "Carefully" handled seed stock also sprout earlier, thus insuring a greater supply of plants for early setting from a given quantity of seed stock. See table IV.

Table IV. Influence of Handling Seed Stock on Earliness of Sprouting of the Triumph Sweetpotato. 1936.

Treatment	No. of Plants per 60 lb. bu. Seed at Various Pullings									Total
	1	2	3	4	5	6	7	8	9	
"Carefully" handled	269	213	284	160	192	137	139	158	185	1737
"Commercially" handled	0	65	136	125	152	109	135	127	135	984
Difference in favor of "Carefully" handled	269	148	148	35	40	28	4	31	50	753

Curing. The object of curing sweetpotatoes is to heal wounds as quickly as possible and hasten the thickening of the skin to give protection against rot fungi. Wounds heal most rapidly at temperatures between 80° and 85° F. and a relative humidity of 90 per cent. Effective healing will take place in about ten days when potatoes are kept under these conditions. The old idea of curing was that by driving off a lot of moisture the roots were protected from rotting. The newer conception is to keep the roots in a moist atmosphere during curing so as to aid the healing process and to prevent excessive loss of moisture. Only enough ventilation should be given to prevent moisture from forming in drops on the potatoes or on the walls in the curing house. This conception of the curing of sweetpotatoes is the result of exhaustive experiments by Artschwager and Starrett (2), Lauritzen and Harter (4), and Lauritzen (5).

Storing. As soon as the curing period is over (in about ten days) the temperature of the house should be gradually reduced in about two days to around 55° F. If the temperature is lowered too quickly, moisture will condense in the house and rots may start to develop if spores are present. This temperature should be maintained as nearly as practicable throughout the storage period. The relative humidity should be kept as nearly as possible to 85 or 90 per cent. If the house is properly constructed and well insulated, it is not difficult to maintain those conditions by manipulation of ventilators and by keeping pans on the floor filled with water when the humidity drops below 75 per cent.

PROPAGATION

Kind of Bed. Several kinds of propagating beds may be used depending upon the needs or size of operations of the grower. When high total yield is desired, plants must be set early. Early plants can be produced in hotbeds made by any one of several plans. Where sufficient quantities of fresh horse and mule manure are available, a good manure-heated hotbed can be made. Otherwise, various flue-type hotbeds can be made. These may be heated by smoke from wood burning in a fire box at one end being conducted under the bed. Several types of flue beds have been used in Mississippi, and the grower may choose the type best suited to his needs. Hotbeds may also be built so that heat is supplied by steam or hot water being conducted under the bed through iron pipes. Steam may also be exhausted into 3-inch drain tiles laid underneath the bed. In any kind of bed a cloth cover, made of light weight sheeting should be provided. This cover is essential to prevent the cooling effects of spring rains and the rapid loss of moisture by evaporation, and to maintain high humidity in the bed. Sweetpotatoes sprout better at high humidities.

Single Ditch Flue Hotbed. Figure 1 illustrates a flue bed which is very simple in construction. This bed should be not longer than 50 ft. nor wider than 6 ft. To improve drainage from the flue and to help the draft without a tall smoke stack, this bed should be built on a slope with the stack at the higher end. This bed is satisfactory, however, when built on level locations, but a drainage ditch must be provided at the fire-box end and the stack must be about 10 ft. high. As the sketch in Figure 1 shows, the flue of this bed consists simply of a ditch three feet wide, with the sides cut sloping to prevent caving. This ditch is dug in the center of an excavated area which is the same width as the bed. This excavated area is dug out 18 inches deep at the fire-box end and 6 inches deep at the stack end. Some old pieces of junk iron, such as can be found at any junked automobile dumping ground, should be used to cover 12 to 15 feet of the ditch at the fire end. Poles, slabs, boards or anything convenient that will carry the weight of the soil can be

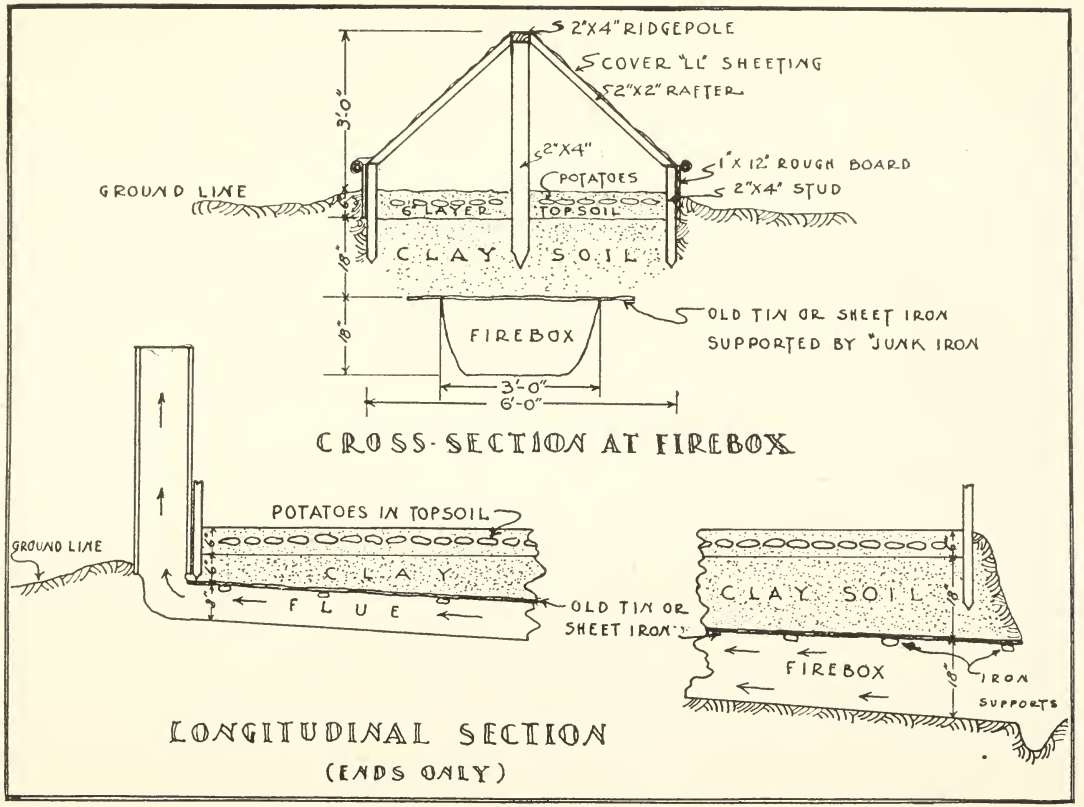

Figure 1. Single Ditch Flue Hotbed

used to cover the remaining part of the ditch. Four 12-inch boards nailed together to form a box makes a good smoke stack and can be easily transported and used from year to year. Clay soil is best for the covering over the flue because it can be tamped until firm and will heat more uniformly than ordinary sandy loam. In the more temporary type structures the side walls of this bed are made of poles, the bedding medium is of new top soil, and at the end of the season nothing is salvaged for use another year except the cover, stack, and irons at the fire box. The temporary bed is built at a new location the next year or in a location where new or disease-free soil is available.

Tile Flue Hotbed. Figure 2 illustrates a flue bed which is somewhat more permanent in structure but more expensive to build than the bed illustrated in Figure 1. In this bed the flues are 8-inch drain tiles. The bed may be wider if more flues are installed. This bed, too, should not be longer than 50 ft. An old 50-gallon oil drum with one end cut out makes a good fire box for this type bed. If a completely permanent structure is desired, the fire box can be built of fire brick and the walls of the bed of concrete or brick. In any event the tiles should be covered with well compacted clay.

Flue Hotbed With Flues Above Ground. Figure 3 illustrates a flue bed which has not been used generally by Mississippi growers, but has proven to be a very satisfactory structure where tried. Several of these beds built by the Mississippi Experiment Station and the Sweetpotato Growers Cooperative Association at the Laurel Starch Plant have produced plants satisfactorily. This type bed may be 10 or 12 feet wide, but not longer than 50 feet. Here again it should be emphasized that the soil covering over the hot air space should be well compacted clay. The fire should be 10 feet from the edge of the bed, and the fire box should be 4 x 4 ft. The combustion chamber should be widened toward the bed so that the smoke may enter the air space throughout the width of the bed. If made of good lumber, concrete or brick, this type bed would last indefinitely with little or no repairs. Made of 2-inch rough cheap lumber it should last for at least three years without repairs. Heat is more uniformly distributed in this type bed than in either the ditch-flue or tile-flue types.

Two-Ditch Flue Type Hotbed. Figure 4 illustrates still another type of flue bed which has been used quite generally by commercial growers in south Alabama. This bed is similar to the one illustrated by Figure 2, differing from it mainly by the sloped ditches instead of tiles serving as flues. This is a less expensive bed than the tile-flue bed, and if made of good lumber it will last for several years. Similar to the bed in Figure 2, drainage from the flues and fire box and the draft will be improved if this bed is built on a slope with the fire box located at the lower end. However, if the fire box is lowered by digging down for the oil drum so that its bottom is about two feet below the level of the bottom of the stack, and if care is taken to see that the soil is banked tightly around the bed so that there are no air leaks, sufficient draft will be obtained. In this bed it is advisable to arrange for a draft control vent over the combustion chamber as illustrated. It can be partly or completely covered by a small piece of tin, as required to obtain the proper draft through the bed. All of the smoke should go through the flues and should come out of the stack practically cool. If it comes out cool, all of the heat is being absorbed by the bed, and the maximum benefit is being obtained from the fire.

This bed is usually built seven feet wide outside measurement. The bedding medium length is 30 feet. Because it provides a very even distribution of heat throughout, this bed is especially good for use in producing very early plants. During 1937 a number of growers in south Mississippi built beds of this type on their farms, and they report very satisfactory results from their operation.

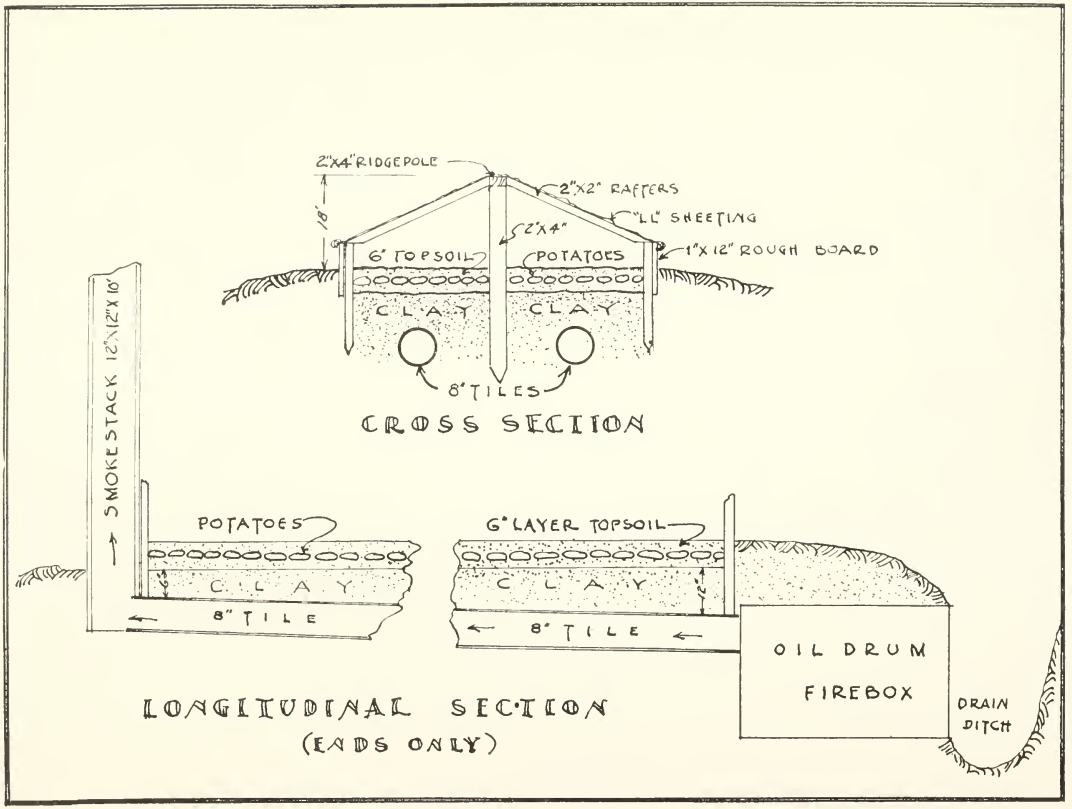

Figure 2. Tile Flue Hotbed

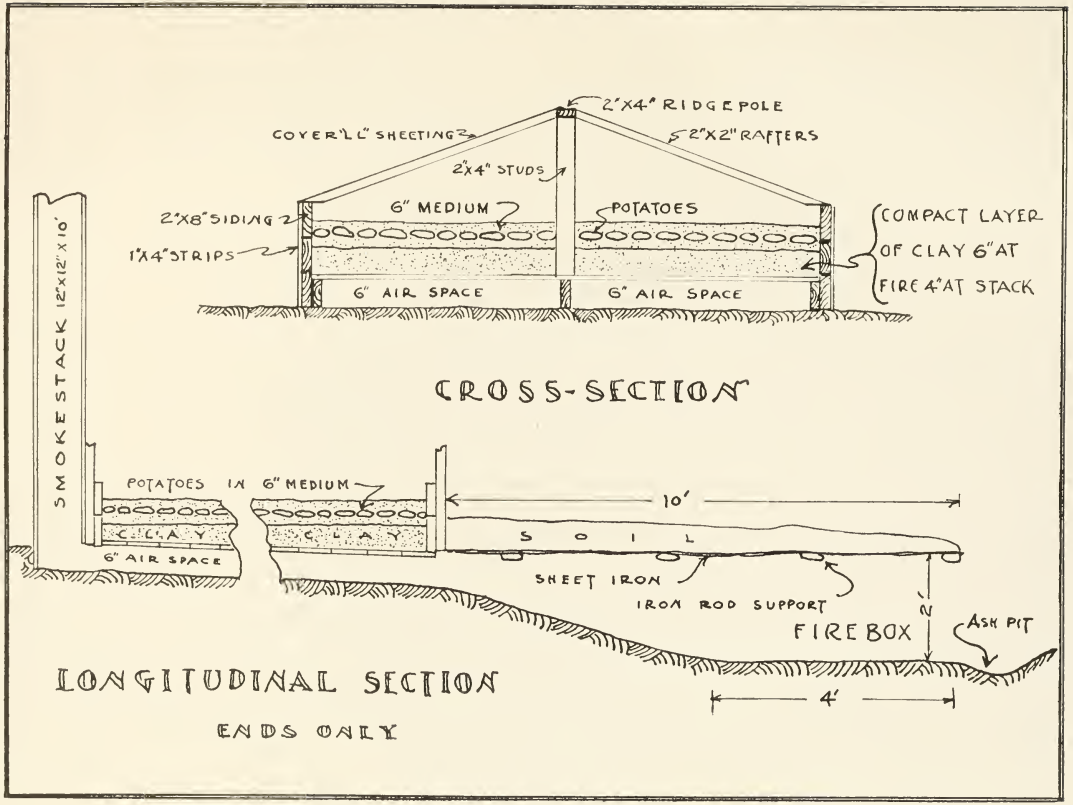

Figure 3. Flue Hotbed With Flues Above Ground

Bedding Medium. Soil, sand or sawdust may be used as a bedding material. If sandy loam soil that has not before grown sweetpotatoes or plants is used, clean plants can be produced. Soil requires less fertilizer application than sand or sawdust, and less frequent watering than sand. Sawdust beds hold heat longer than soil or sand beds. However, if no bottom heat is used, sawdust beds warm up very slowly by the heat of the sun on the surface. Sand beds get too hot in the latter part of the season unless partly shaded in the middle of the day, and they cool down more quickly during the night than either soil or sawdust beds. The root systems of plants produced in sawdust are larger than those of plants produced in soil or sand. Soil produces larger root systems than sand. If sawdust is used, the older the better. New sawdust is too coarse for bedding material. Sawdust is more easily transported, is easier handled in the beds, and lends itself more easily to steam sterilization than soil or sand. Any of these bedding materials can be easily disinfected with chemicals. No bedding material should be used the second time without being sterilized with steam or treated with bluestone (copper sulphate) solution according to the directions of the Mississippi State Plant Board. If disease occurs in an area in the bed after sprouting starts, the potatoes and bedding material should be removed for several feet around the infected spot and burned. This space should then be disinfected with bluestone (copper sulphate) solution.

Bedding. Seed should be bedded about one month before plants are desired for setting. From 10 to 15 bushels of seed should be bedded for each acre expected to be set from the bed, depending upon the size of the seed. A bushel of seed when properly laid so that the roots do not touch, will occupy approximately 10 sq. ft. of bed space; thus, the standard bed 10 x 50 ft. will provide space for approximately 50 bushels, or 1 bushel per linear foot. Never bed large and small seed together, as small seed may be covered too deep. When ready to bed, the grower should look carefully through the seed stock and discard any roots that have dark spots or show any signs of disease whatsoever. This precaution may save much trouble later on. The roots should be dipped for ten minutes in a solution of 1 ounce of bichloride of mercury dissolved in 8 gallons of water immediately before bedding. The bed should be warmed up to around 85° F before the seed are placed in the bed. The roots should be covered with three inches of bedding medium. Thermometers ought to be placed in the bed so that frequent readings of the temperature can be made and the heat applied accordingly. Use two thermometers, placing one in the coldest and one in the hottest place in the bed. The bed should be kept around 85° F. It is better to keep a slow fire steadily burning than to let the bed cool down and then try to heat it up quickly with a big fire. Watering should be done as often as is necessary to keep the medium moist around the roots. Usually one good watering per week is sufficient. The covers should not be opened except during the day time for two days just prior to pulling dates.

Pulling Plants. Large plants are better than small plants because they transplant more successfully and usually yield more potatoes than small plants. See table V. The first plants usually reach the best size for setting in about four weeks from the bedding of the seed. Successive pullings can be made at 5- to 7-day intervals. Immediately after each pulling the beds should be given an application of a nitrate fertilizer at the rate of 2 pounds per bed 10 ft. x 50 ft., watered, and the covers closed.

Care of Plants. As soon as the plants are pulled, their roots should be immersed in 20-20-50 Bordeaux mixture and then heeled out in damp sawdust in partial shade until they are set or shipped. Experiments by Miles (6) show that this treatment prevents spread of black rot in the heeling-out bed

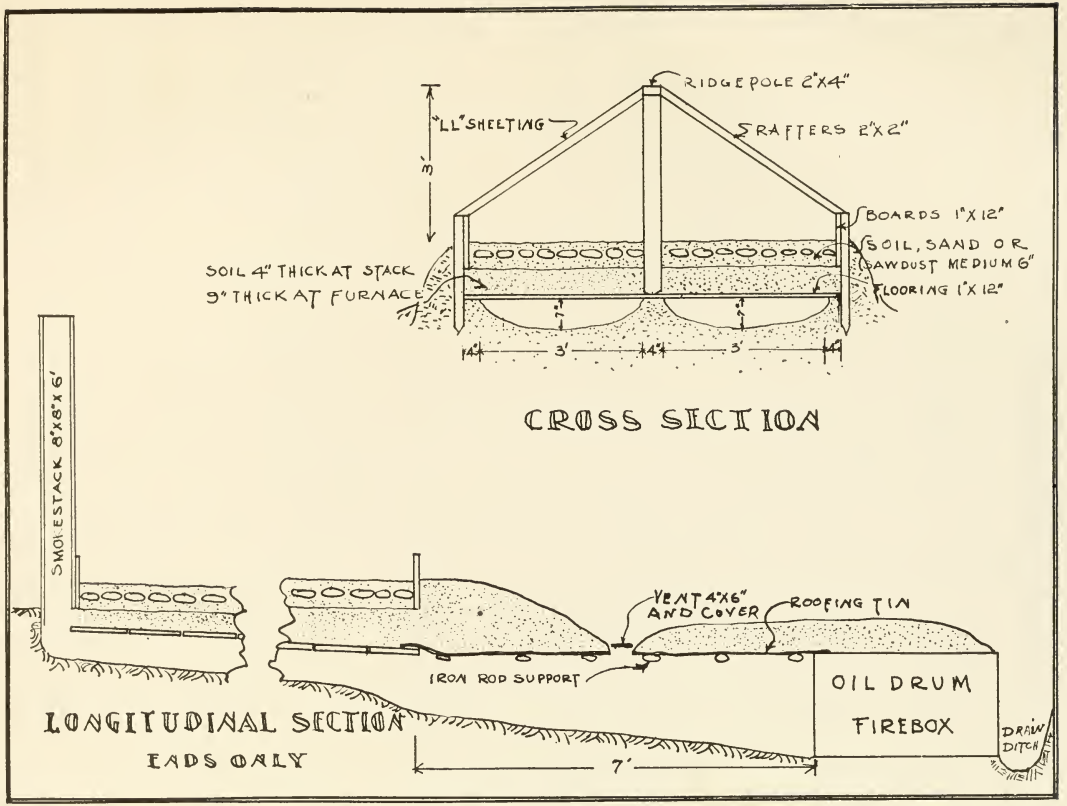

Figure 4. Two-Ditch Flue Type Hotbed

Table V. Effect of the Size of Plants on Yield of the Triumph Sweetpotato, Average of Three Year's Results

Plot Pair	Plant Size	Yield per Acre in 60 lb. bu.				
		Jumbo	No. 1	No. 2	Culls	Total
1	Large	7	297	36	21	343
	Small	10	218	24	23	275
2	Large	14	245	39	21	319
	Small	13	275	33	17	338
3	Large	15	304	36	29	284
	Small	16	224	25	16	281
4	Large	6	291	33	21	351
	Small	22	274	48	24	368
Average	Large	10	279	36	23	324
	Small	15	248	32	20	315

or in the crates during shipment. Roots of plants should never be allowed to dry out, as this results in delayed starting of growth in the field. The plants can be prevented from severe wilting by covering them with wet burlap bags during the interval between pulling and setting in the field. Attention to these details means the securing of good stands. A good stand is important in making good yields, and good yields are essential to obtaining profits.

Certification of Plants. It is illegal in Mississippi to sell or give away seed sweetpotatoes or potato plants that have not been inspected and certified by the State Plant Board. Growers who wish to produce certified seed should apply to the Plant Board at State College before June 15 of each year for field inspections. Certified plants can be produced only from certified seed handled according to Plant Board regulations.

ACKNOWLEDGMENTS

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