

Greenhouse Sweet Potato Slip Production Budget for Mississippi



In Mississippi, sweet potato slips are grown in greenhouses to increase the production of virus-tested and true-to-type sweet potato material in accordance with certification standards set forth by the Mississippi Crop Improvement Association (see these standards at www.mcia.msstate.edu). Since 1999, the Mississippi Agricultural and Forestry Experiment Station's Pontotoc Ridge-Flatwoods Branch Experiment Station near Pontotoc has provided this service. Due to increased demand for virus-tested sweet potato material, there is an interest among producers to grow their own virus-tested material in greenhouses. However, producing sweet potato slips in greenhouses can be expensive and very labor-intensive, so it is important to conduct an economic analysis before jumping into this venture.

The demand for virus-tested slips depends on the number of acres dedicated to sweet potato production in the region and the relative proportion of acreage planted to virus-tested slips. The production of greenhouse-grown, virus-tested slips is one step in the production of certified seed roots. Producers should first determine the demand for seed roots, either for their own farming enterprise or to sell to other producers. The estimated demand for seed roots can be used to determine how many greenhouse-grown slips are needed using the following equation:

$$\text{Desired \# of 20-bu bins} \times 73 = \text{\# of greenhouse slips required}$$

This equation assumes that an estimated 73 greenhouse-grown slips are required to produce one (20-bushel) bin of seed roots based on the following conditions:

- 13,068 slips are required to plant 1 acre with 40 inches between rows and 12 inches between plants.
- After greenhouse-grown slips are established, 10 field cut slips can be taken from each plant.
- Yield = 18 (20-bushel) bins of seed roots per acre.

The next step is to estimate the costs associated with producing greenhouse-grown sweet potato slips. This publication estimates these costs based on a 30-by-96-foot greenhouse and a production goal of 60,000 slips. Budget estimates reflect average capital and operating expenses. You may experience different production costs and demands from those assumed in the budget; therefore, customize the budget to reflect your particular situation.

Capital Investment

The greenhouse costs are based on a 30-by-96-foot "hoop house" greenhouse structure that includes a galvanized steel frame, end wall, ground stakes, and double cover of 6 mil clear UV film. The heating system includes a properly vented propane heater and strategically placed interior fans to help circulate air throughout the greenhouse. The electrical system consists of waterproof electrical outlets spaced 15 feet apart for each row of aluminum benches, along with a 200-amp breaker box.

Table 1 describes the estimated capital investment required to build a greenhouse with these specifications. Estimated assembly costs are included in the budget, but these will change depending on whether you hire someone to do the work or do it yourself. A smaller greenhouse would incur less initial investment cost as well as lower overall production costs, but a higher per-unit production cost (increased \$/slip). For more information on components of a greenhouse for sweetpotato slip production, see MSU Extension Publication 3368 *Environmental Control for Greenhouse-Grown Sweetpotato Slips*.

Production Budgets

The production budgets are based on information and experience gathered by faculty and staff at the Pontotoc Ridge-Flatwoods Branch Experiment Station. The production system is based on producing sweet potato slips for sale or transplanting during the sweet potato planting season.

Table 1. Estimated capital requirements for greenhouse sweet potato slip production in Mississippi, 2019.*

Item	Description	Number	Units	Cost/unit (\$)	Total initial cost (\$)	Estimated life (yr)
Greenhouse structure**	30 by 96 feet	2,880	sq ft	2.19	6,307	20
Electrical system	200-amp breaker box, wire, conduit, and waterproof outlets	1	ea	646	646	20
Ventilation fans	48-inch, 1 HP	2	ea	1,130	2,260	5
Thermostat	120V, digital	1	ea	143	143	3
Heaters	Propane, 150,000 BTU	2	ea	1,095	2,190	10
Benches	Aluminum	47	ea	553	25,991	20
LED lights	Vegetative growth lights	90	ea	230	20,700	10
2-gallon sprayer	Weed management of greenhouse floor	1	ea	41	41	3
Pots	7 by 7 inches	200	ea	1	200	3
Pots	13 by 9 inches	12	ea	2	24	3
Cutting supplies	Metal garden scissors	3	ea	60	60	5
Irrigation system	Sprinkler system with polyethylene pipe, solenoid valves, and 2 GPH sprinkler drops	1	ea	1,510	1510	5
Ground cover	Woven polypropylene	2,880	sq ft	0.10	288	5
Personnel door	Aluminum, 42-inch	1	ea	382	382	20
Insect screen		1,600	sq ft	0.30	480	5
Assembly cost***		95	hr	15	1,425	20
Utility hookup****	Electric, gas, water	1	ea	529	529	20
Total					63,176	

*Land and site preparation are not included in this budget.

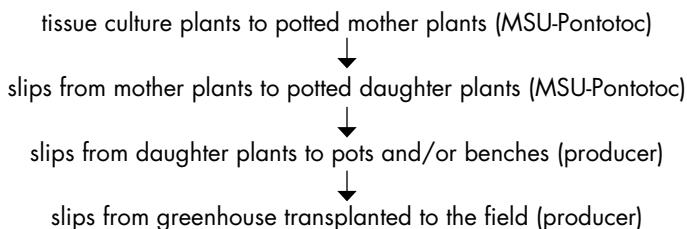
**Structure includes frame, end walls, stakes, and 6 mil plastic double layer.

***Assembly costs may vary depending on location and how involved the owners are in the assembly process.

****Costs may increase if a water well or propane storage tanks are needed.

Production Costs

Several steps must be completed to maintain slip production, as depicted here:



Through summer of 2020, the first three steps in this process will be the responsibility of MSU. Beginning in the fall and winter of 2020, MSU will establish mother plants used to produce potted daughter plants and/or rooted daughter plugs, and producers will be responsible for steps three and four of the process. This budget only calculates expenses associate with step three of this process. **Table 2** summarizes the yearly costs associated with step three. Daughter plants purchased from MSU can be cut and planted into pots or directly into greenhouse benches lined with landscape fabric and filled with potting soil. Once the initial daughter plants have grown, they can be propagated repeatedly until the greenhouse is full.

Annual Ownership Costs

Annual ownership costs are presented in **Table 3**. Costs include depreciation, interest on investment, insurance, taxes, and overhead costs. Depreciation was estimated using the straight-line depreciation method, with assets being divided by their life expectancies to calculate the annual cost for depreciation. Interest on investment was calculated by using a rate of 5.25 percent charged on one-half of the initial cost of assets (it is assumed that one-half of the initial capital investment was financed with debt). Insurance and taxes are estimated at 2 percent of the initial cost of the assets. Overhead costs include heating, water, and electricity expenses.

Labor Costs

Table 4 shows the labor cost breakdown associated with slip production. Labor costs are estimated at a wage rate of \$22 per hour for the greenhouse owner and \$11 per hour for all hired labor. Wage rates are estimated from average labor rate reports from the United States Department of Agriculture for 2018. Labor requirements are estimated based on the average time needed for multiple slip cuttings from daughter plants to fill growing benches in a 30-by-96-foot greenhouse. It is assumed that

Table 2. Estimated yearly production costs for greenhouse sweet potato slip production in Mississippi, 2019.

Item	Description	Number	Units	Cost/unit (\$)	Total cost (\$)
Fertilizer	25-lb bags	10	ea	25	250
Potting soil	3-cf bags	203	ea	12	2,436
Irrigation	Gallons	70,200	gal	0.02	1,404
Insecticides	Various	-	-	360	360
Green shield	Sanitizer	91	oz	0.43	39
Landscape fabric	Bench liner	1	ea	100	100
Pots	1 gallon	200	ea	1	200
Total hired labor	Plant propagation	132	hr	11	1,452
Total owner hours	Plant management	66	hr	22	1,452
Inspection fee	MCIA	1	ea	500	500
Total production costs (\$)					8,193

Table 3. Estimated annual ownership costs for greenhouse sweet potato slip production in Mississippi, 2019.

Item structure	Depreciation (\$)	Interest (\$)	Insurance and taxes (\$)	Total (\$)
Greenhouse structure w/double covering	315	166	126	607
Electrical system	32	17	13	62
Ventilation fans	452	59	45	556
Heaters	219	57	44	320
Benches	1300	682	520	2,502
LED lights	2070	543	414	3,027
Irrigation system	302	40	30	372
Ground cover	58	8	6	72
Personnel door	19	10	8	37
Insect screen	96	13	10	119
Assembly cost	71	37	29	137
Utility hookup	26	14	11	51
<i>Auxiliary equipment</i>				
Pots	50	4	3	57
Pots	8	1	1	10
Cutting supplies	12	2	1	15
2-gallon sprayer	14	1	1	16
Total greenhouse and equipment costs (\$)	4,987	1,649	1,258	7,894
<i>Overhead</i>				
Heating				9,075
Electricity				778
Total overhead costs (\$)				9,853
Total annual ownership costs (\$)				17,747

Table 4. Estimated labor cost breakdown for greenhouse sweet potato slip production in Mississippi, 2019.

Activity	Total hired labor hours	Hired labor wage (\$)	Owner hours*	Owner wage (\$)	Total cost (\$)
Cutting and planting slips	120	11	60	22	2,640
Total labor costs (\$)					2,640

*It is assumed that the owner will spend half the time required for the transfer process supervising hired labor.

the owner will primarily supervise hired labor; if they are physically involved, labor costs will need to be adjusted accordingly.

Total Annual Costs and Breakeven Points

Table 5 presents the estimated total annual costs and breakeven points for different levels of slip production. The total annual costs include total yearly production costs from Table 2 and total annual ownership costs from Table 3. The breakeven point reflects the price needed to cover all production costs (including overhead). For instance, if a grower produces 60,000 slips, he/she must receive 43 cents per slip in order to cover yearly costs. Any price below the breakeven point will result in a loss, and any price above this point will result in additional revenue. Estimated breakeven points for producing 40,000, 60,000, and 80,000 slips are included and assume that production costs remain the same regardless of how many slips are produced.

Additional Considerations

LED lights represent a substantial initial investment and are not required to produce sweet potato slips. However, supplemental LED lighting does improve production efficiency, especially during winter months with long nights and cloudy days.

It is likely that growers producing greenhouse-grown sweet potato slips would also plant the slips into a certified field, conduct an in-field cutting to increase acreage of G1 slips, and sell certified G1 seed roots to others or use them on-farm.

Total annual costs (production and ownership costs including overhead)	\$25,940
Approximate breakeven point for producing 40,000 slips (\$/slip)	0.65
Approximate breakeven point for producing 60,000 slips (\$/slip)	0.43
Approximate breakeven point for producing 80,000 slips (\$/slip)	0.32
*It is assumed that production costs remain the same regardless of the amount of slips produced.	

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