Greenhouse Tomato Budgets for Mississippi

Growing greenhouse vegetable crops and growing tomatoes hydroponically are popular among small producers who want to diversify their farms and landowners looking for extra income. Before breaking ground for a new greenhouse, you should understand how much time and work is involved. In fact, raising greenhouse tomatoes requires about the same amount of time and effort as raising dairy cattle or poultry. The grower needs to be present to complete daily duties and chores. Leaving the tomato plants without care for a day or two could lead to substantial crop loss.

While hydroponic techniques are used for a variety of crop plants, tomatoes are the crop most commonly grown hydroponically for sale. Worldwide, other vegetables grown hydroponically in greenhouses include cucumbers, peppers, lettuce, eggplant, spinach, melons, various herbs, and other specialty crops. Flowering crops and some fruit crops, such as strawberries and raspberries, are also well suited to hydroponics. You can grow other crops using hydroponic methods, but you must think about how well the crop will sell. If there is little demand for the crop in your area, sales will be poor. In Mississippi, tomatoes are in high demand, so they are the best vegetable crop for businesses to grow in greenhouses.

Corporate owners with 20 or more acres in greenhouse tomato production manage most of the greenhouse tomato acreage in the United States. However, most of the greenhouse tomato growers in this country farm them on less than one acre of floor space. In Mississippi, the average greenhouse tomato grower has 2.4 freestanding or gutter-connected bays, totaling about 6,000 square feet. Greenhouse tomato acreage has been increasing since the mid-1990s. Much of the expansion was caused by a changing consumer preference for the best quality vegetables. Greenhouse tomatoes are harvested when they are ripe (or at least well on the way to a red-color stage), so they have a good flavor. Greenhouse tomato varieties are more uniform in size, shape, and color, and they are more resistant to diseases than field-grown tomato varieties. These are some of the reasons for their higher value.

In many cities, consumers are not concerned about the higher price of greenhouse tomatoes; however, they do expect high quality. Greenhouse tomatoes are never picked green and gassed with ethylene to promote ripening, a common practice with field-grown winter tomatoes in the extreme southern United States, Mexico, and Central America.

Every greenhouse crop has special needs that traditional field crops do not have. Also, the greenhouse favors the breeding and rapid spread of some diseases and pests. Tomatoes are not an easy crop to grow in a greenhouse, and success depends on how well the grower can manage the crop and make the right decisions at the right time.

Information about greenhouse tomatoes is scarce compared to information about field vegetables, so it can be difficult to get help from county Extension agents or other trained personnel. An interested grower should read publications, attend short courses and seminars, and visit other growers to learn from their experiences.

This publication estimates the costs associated with starting a greenhouse tomato business. Figures in this budget reflect average experiences of various systems and are geared toward the typical Mississippi grower. The budget includes capital and operating expenses associated with production of greenhouse tomatoes. If your circumstances differ from the circumstances assumed in this budget, recalculate the estimated budget to reflect your situation. Production information is not included in this publication. Growers seeking production information can refer to the following MSU Extension publications:

- Publication 1828 — *Greenhouse Tomato Handbook* (http://extension.msstate.edu/publications/greenhouse-tomato-handbook)
- Publication 2364 — *Greenhouse Tomato Growers' Glossary* (http://extension.msstate.edu/publications/greenhouse-tomato-growers-glossary)
- Publication 1879 — *Environmental Control for Greenhouse Tomatoes* (http://extension.msstate.edu/publications/publications/environmental-control-for-greenhouse-tomatoes)

- Publication 2037 — *Fertigation: The Basics of Injecting Fertilizer for Field-Grown Tomatoes* (http://extension.msstate.edu/publications/fertigation-the-basics-injecting-fertilizer-for-field-grown-tomatoes)
- Publication 1995 — *Starting Vegetable Transplants* (http://extension.msstate.edu/publications/publications/starting-vegetable-transplants)
- Publication 1861 — *Greenhouse Tomatoes: Pest Management in Mississippi* (http://extension.msstate.edu/publications/greenhouse-tomatoes-pest-management-mississippi)
- Publication 2875 — *Tomato Troubles: Common Problems with Tomatoes* (http://extension.msstate.edu/publications/tomato-troubles-common-problems-tomatoes)

Initial Capital Investment

The polyethylene-covered Quonset-type structure is the most common greenhouse in Mississippi and is the type talked about in this budget. This type of structure is the least expensive to build and has few cross members, letting in more light.

Polyethylene greenhouses use two layers of plastic to cover the structure. Air is forced between the layers of plastic to create a 4- to 6-inch airspace, which forms an excellent insulation barrier. Several other types of coverings exist, including acrylic sheets, polycarbonate plastic, and fiberglass. Each of these coverings has some advantages, but they cost more than polyethylene.

Construction Costs

Greenhouse building costs vary, depending on the materials and equipment you use. When selecting materials, be careful not to sacrifice quality to keep costs low. Also be careful not to spend too much or buy more greenhouse than you need. Choose a greenhouse frame with the right load-bearing strength and useful life expectancy. Galvanized steel tubing and aluminum tubing are strong, economical materials for a greenhouse frame.

Greenhouse flooring can greatly affect cost. The floor in this budget is made of a ground cloth, black plastic, and pea gravel for walkways. This type of flooring is the most common among Mississippi growers. Other floor choices are bare ground, wall-to-wall gravel, concrete walkways, or wall-to-wall concrete, depending on what you want and can afford. This budget assumes that water and natural gas are available to the greenhouse. If water or gas is not available, add the expenses of digging a well or buying gas storage tanks to the budget.

You must also consider the advantages and disadvantages of buying automated equipment for the greenhouse. Automated equipment costs more but reduces labor requirements. If you lack reliable labor, you may want to invest in more automated equipment. The equipment package used in this budget reflects what is common for Mississippi growers. Table 1 presents the estimated capital requirement of $22,983 for one 24-foot by 96-foot Quonset-type greenhouse equipped for typical tomato production in Mississippi. This is equivalent to an investment of $9.98 per square foot of greenhouse.

Production Budgets

The production budgets were based on interviews with several growers in Mississippi, greenhouse tomato industry suppliers, researchers, and Extension specialists familiar with greenhouse tomato production in Mississippi. The engineering, or "synthesis," method was used to describe the production system and to estimate current costs for that system.

Fixed Costs

The cost items in this budget follow generally accepted classification of fixed costs. Fixed costs are shown in Table 2 and represent a lump sum of total annual ownership costs divided proportionately among the production crops typical for Mississippi greenhouse tomato production. The fixed costs include interest on investment, depreciation, insurance, taxes, and some common overhead expenses.

Depreciation was estimated using the straight-line method with no salvage value. Assets were divided by their useful life expectancies to determine an annual cost for depreciation. Interest on investment was calculated by charging a rate of 5.25 percent on one-half of the initial cost of depreciable assets. Insurance and taxes were estimated to be 2 percent of the initial cost of depreciable assets.

Ownership costs also include general overhead expenses that are not directly related to producing the crop.

In this publication, overhead expenses include heating, water, electricity, telephone, lab fees, and repair and maintenance. Annual ownership costs for one 24-by-96 greenhouse totaled $7,080.

Variable Costs

Tables 3–6 present the variable costs of a spring crop, a fall crop, and a continuous crop of greenhouse tomatoes. The variable costs associated with crop production are all inputs that directly relate to producing tomatoes. The cultural practices in these budgets are typical of two tomato crops per year or one continuous crop for one greenhouse in Mississippi. Input prices are current prices of local and regional suppliers.

Interest on operating capital was charged at a rate of 5.25 percent on one-half of the total direct expense for each

crop. Direct cost of producing a spring crop of tomatoes totaled $3,640, and the direct cost of producing a fall crop totaled $2,936. Direct cost of producing one continuous crop of tomatoes was $5,828.

Total Cost of Production

Total production cost is the sum of direct costs plus annual ownership costs (Table 7). The total estimated annual cost of producing two tomato crops (spring and fall) in a 24-foot by 96-foot greenhouse is $13,656, while the total estimated annual production cost for one continuous crop is $12,908. Given the total cost of production and assuming a conservative yield level of 8,000 pounds in the spring, 6,000 pounds in the fall, or 14,000 pounds for a continuous crop, a tomato price of around $1 per pound is needed to break even: that is, to cover all the direct and fixed/overhead costs.

Table 1. Estimated capital requirements for greenhouse tomato production, Mississippi, 2020. [1]

Item structure	Description	Unit	Number	Cost per unit	Total initial cost	Useful life (years)
Greenhouse package [2]	24 ft. x 96 ft.	sq. ft.	2304	2.34	5,392.00	20
Personnel door	Aluminum 42 in.	each	1	410.00	410.00	20
Heater system	Gas 145,000 BTU	each	2	1,095.00	2,190.00	10
Cooling fans	48", 1 HP	each	2	1,170.00	2,340.00	5
Cooling pads	48" x 12" x 6"	each	24	40.50	972.00	3
Pump and plumbing	wet wall 300 gal	each	1	680.00	680.00	5
Inlet shutters	33" x 33" motorized	each	4	193.00	772.00	7
Electrical	wiring package	each	1	627.20	627.20	20
Irrigation/fertigation	drip system	each	1	4,438.66	4,438.66	7
Ground cover	woven plastic	sq. ft.	2304	0.08	181.98	0
Pea gravel		cu. yd.	7.5	36.00	270.00	0
Bags (four plants per bag)		each	100	0.82	82.00	0
Pine bark soil media		cu. yd.	6.5	22.00	143.00	0
Subtotal greenhouse structure					**$18,499**	
Auxiliary Equipment						
Backpack sprayer	pump type	each	1	94.99	94.99	3
Thermostat	single stage	each	2	142.50	285.00	3
Respirator		each	1	83.95	83.95	3
Pollinator		each	1	259.00	259.00	3
Thermometer	hi/lo type	each	1	22.00	22.00	2
Transplant benches	wood	each	2	39.20	78.40	10
Meters	EC/pH combo	each	2	264.00	528.00	3
Backup generator	gasoline	each	1	999.00	999.00	10
Subtotal auxiliary equipment					**$2,350**	
Assembly and installation [3]		hour	95	$ 16.69	$1,585	
Utility hookup (electrical, gas, and water) [4]					$549	
Total					**$22,983**	
Cost per square foot					**$9.98**	

[1] Land and site preparation was not included in the budget. This cost will vary depending on location.

[2] Greenhouse package includes frame, end walls, 6-mil plastic double layer, base locking rail, and inflation kit.

[3] Installation cost may vary significantly depending on location and owner's ability and involvement.

[4] Cost may increase if water well is required for water supply and if LP gas storage tanks must be purchased.

Table 2. Estimated annual ownership costs for greenhouse tomato production, Mississippi, 2020.				
Item	**Depreciation**	**Interest**	**Insurance and taxes**	**Total**
Structure				
Greenhouse frame	270	142	108	519
Aluminum personnel door	21	11	8	39
Heater system	219	57	44	320
Cooling fans	468	61	47	576
Cooling pads	324	26	19	369
Pump and plumbing	136	18	14	167
Inlet shutters	110	20	15	146
Electrical	31	16	13	60
Irrigation/fertigation	634	117	89	839
Auxiliary equipment				
Backpack sprayer	32	2	2	36
Thermostat	95	7	6	108
Respirator	28	2	2	32
Pollinator	86	7	5	98
Thermometer	11	1	0	12
Transplant benches	8	2	2	11
Meters	176	14	11	200
Backup generator	100	26	20	146
Total greenhouse and equipment	**$2,749**	**$530**	**$403**	**$3,682**
General overhead				
Heating				1,012
Electricity				806
Telephone				739
Repairs and Maintenance				370
Lab fees				470
Total general overhead				**$3,398**
Total annual ownership costs				**$7,080**

Table 3. Summary of spring, fall, and one crop input costs.			
Item	**Spring**	**Fall**	**One continuous crop**
Labor	1,707	1,335	2,726
Seed	261	261	261
Fertigation	452	425	833
Fungicide	220	165	331
Insecticide	39	29	59
Boxes	780	585	1,365
Other	163	136	225
Total	**$3,622**	**$2,936**	**$5,800**
Cost per square foot	**$1.57**	**$1.27**	**$2.52**

Table 4. Estimated resource use and direct costs for spring crop, tomatoes, greenhouse, Mississippi, 2020.					
Operation/operating unit	**Month**	**Unit/size**	**Quantity**	**Cost/unit**	**Total cost**
Labor (potting)	November	hour	1	11.74	11.74
Potting mix	November	3 cu. ft.	1	11.60	11.60
Seeding trays	November	each	6	1.40	8.40
Transplant cell packs	November	each (72 ct.)	6	1.70	10.20
Labor (seeding)	November	hour	3	11.74	35.22
Seed	November	each	480	0.54	261.12
Labor (watering)	November	hour	1.65	11.74	19.37
Fertilizer	November	pound	0.71	2.41	1.71
Electricity	November	day	7	0.58	4.06
Labor (watering)	December	hour	8.25	11.74	96.86
Fertilizer	December	pound	3.54	2.41	8.53
Electricity	December	day	35	0.58	20.30
Labor (watering)	January	hour	2	11.74	23.48
Labor (transplanting)	January	hour	2	11.74	23.48
Labor (pollination)	January	hour	2	11.74	23.48
Labor (pruning)	January	hour	4	11.74	46.96
Fungicide	January	ounce	32	0.69	22.04
Insecticide	January	ounce	9	0.60	5.36
Labor (stringing)	January	hour	2	11.74	23.48
Twine	January	bundle	0.4	25.95	10.38
Clips	January	box	0.4	56.50	22.60
Labor (pollination)	February	hour	5	11.74	58.70
Labor (pruning)	February	hour	4	11.74	46.96
Fungicide	February	ounce	64	0.69	44.09
Insecticide	February	ounce	12	0.60	7.14
Labor (pollination)	March	hour	5	11.74	58.70
Labor (pruning)	March	hour	4	11.74	46.96
Fungicide	March	ounce	80	0.69	55.11
Insecticide	March	ounce	15	0.60	8.93
Labor (harvest)	March	hour	4.05	11.74	47.55
Labor (grade/pack)	March	hour	6.15	11.74	72.20
Labor (pollination)	April	hour	5	11.74	58.70
Labor (pruning)	April	hour	4	11.74	46.96
Fungicide	April	ounce	64	0.69	44.09
Insecticide	April	ounce	12	0.60	7.14
Labor (harvest)	April	hour	8.1	11.74	95.09
Labor (grade/pack)	April	hour	12.3	11.74	144.40
Labor (pollination)	May	hour	2.5	11.74	29.35
Labor (pruning)	May	hour	4	11.74	46.96
Fungicide	May	ounce	64	0.69	44.09
Insecticide	May	ounce	12	0.60	7.14
Labor (harvest)	May	hour	8.1	11.74	95.09
Labor (grade/pack)	May	hour	12.3	11.74	144.40
Labor (pruning)	June	hour	1	11.74	11.74
Fungicide	June	ounce	16	0.69	11.02
Insecticide	June	ounce	6	0.60	3.57
Labor (harvest)	June	hour	6.75	11.74	79.25

Table 4 (continued). Estimated resource use and direct costs for spring crop, tomatoes, greenhouse, Mississippi, 2020.					
Operation/operating unit	**Month**	**Unit/size**	**Quantity**	**Cost/unit**	**Total cost**
Labor (grade/pack)	June	hour	10.25	11.74	120.34
Labor (misc.)	Jan. – June	hour	17	11.74	199.58
Fertigation	Jan. – June	application	1	441.28	441.28
Boxes	April – June	each	400	1.95	780.00
Subtotal					**$3,547**
Interest on operating capital					**$75**
Total direct costs					**$3,622**

Table 5. Estimated resource use and direct costs for fall crop, tomatoes, greenhouse, Mississippi, 2020.					
Operation/operating unit	**Month**	**Unit/size**	**Quantity**	**Cost/unit**	**Total cost**
Labor (potting)	July	hour	1	11.74	11.74
Potting mix	July	3 cu. ft.	1	11.60	11.60
Seeding trays	July	each	6	1.40	8.40
Transplant cell packs	July	each (72 ct.)	6	1.70	10.20
Labor (seeding)	July	hour	3	11.74	35.22
Seed	July	each	480	0.54	261.12
Labor (watering)	July	hour	1.65	11.74	19.37
Fertilizer	July	pound	0.71	2.41	1.71
Electricity	July	day	7	0.58	4.06
Labor (watering)	August	hour	8.25	11.74	96.86
Fertilizer	August	pound	3.54	2.41	8.53
Electricity	August	day	35	0.58	20.30
Labor (watering)	September	hour	2	11.74	23.48
Labor (transplanting)	September	hour	2	11.74	23.48
Labor (pollination)	September	hour	2	11.74	23.48
Labor (pruning)	September	hour	4	11.74	46.96
Fungicide	September	ounce	32	0.69	22.04
Insecticide	September	ounce	9	0.60	5.36
Labor (stringing)	September	hour	2	11.74	23.48
Twine	September	bundle	0.25	25.95	6.49
Clips	September	box	0.25	56.50	14.13
Labor (pollination)	October	hour	5	11.74	58.70
Labor (pruning)	October	hour	4	11.74	46.96
Fungicide	October	ounce	64	0.69	44.09
Insecticide	October	ounce	12	0.60	7.14
Labor (pollination)	November	hour	5	11.74	58.70
Labor (pruning)	November	hour	4	11.74	46.96
Fungicide	November	ounce	80	0.69	55.11
Labor (harvest)	November	hour	7.74	11.74	90.87
Labor (grade/pack)	November	hour	11.95	11.74	140.34
Insecticide	November	ounce	15	0.60	8.93
Labor (pollination)	December	hour	5	11.74	58.70
Labor (pruning)	December	hour	4	11.74	46.96
Labor (harvest)	December	hour	10.26	11.74	120.45
Labor (grade/pack)	December	hour	15.85	11.74	186.03
Fungicide	December	ounce	64	0.69	44.09
Insecticide	December	ounce	12	0.60	7.14
Labor (misc.)	July – Dec.	hour	15	11.74	176.10
Fertigation	Sept. – Dec.	application	1	414.40	414.40
Boxes	Oct. – Dec.	each	300	1.95	585.00
Subtotal					**$2,875**
Interest on operating capital					**$61**
Total direct costs					**$2,936**

Table 6. Estimated resource use and direct costs for one continuous crop, tomatoes, greenhouse, Mississippi, 2020.					
Operation/operating unit	**Month**	**Unit/size**	**Quantity**	**Cost/unit**	**Total cost**
Labor (potting)	August	hour	1	11.74	11.74
Potting mix	August	3 cu. ft.	1	11.60	11.60
Seeding trays	August	each	6	1.40	8.40
Transplant cell packs	August	each (72 ct.)	6	1.70	10.20
Labor (seeding)	August	hour	3	11.74	35.22
Seed	August	each	480	0.54	261.12
Labor (watering)	August	hour	1.65	11.74	19.37
Fertilizer	August	pound	0.71	2.41	1.71
Electricity	August	day	7	0.58	4.06
Labor (watering)	September	hour	8.25	11.74	96.86
Fertilizer	September	pound	3.54	2.41	8.53
Electricity	September	day	35	0.58	20.30
Labor (watering)	October	hour	2	11.74	23.48
Labor (transplanting)	October	hour	2	11.74	23.48
Labor (pollination)	October	hour	2	11.74	23.48
Labor (pruning)	October	hour	4	11.74	46.96
Fungicide	October	ounce	32	0.69	22.04
Insecticide	October	ounce	9	0.60	5.36
Labor (stringing)	October	hour	2	11.74	23.48
Twine	October	bundle	0.6	25.95	15.57
Clips	October	box	0.6	56.50	33.90
Labor (pollination)	November	hour	5	11.74	58.70
Labor (pruning)	November	hour	4	11.74	46.96
Fungicide	November	ounce	64	0.69	44.09
Insecticide	November	ounce	12	0.60	7.14
Labor (pollination)	December	hour	5	11.74	58.70
Labor (pruning)	December	hour	4	11.74	46.96
Fungicide	December	ounce	80	0.69	55.11
Labor (harvest)	December	hour	7.74	11.74	90.87
Labor (grade/pack)	December	hour	11.95	11.74	140.34
Insecticide	December	ounce	15	0.60	8.93
Labor (pollination)	January	hour	5	11.74	58.70
Labor (pruning)	January	hour	4	11.74	46.96
Labor (harvest)	January	hour	10.26	11.74	120.45
Labor (grade/pack)	January	hour	15.85	11.74	186.03
Fungicide	January	ounce	64	0.69	44.09
Insecticide	January	ounce	12	0.60	7.14
Labor (pollination)	February	hour	5	11.74	58.70
Labor (pruning)	February	hour	4	11.74	46.96
Fungicide	February	ounce	80	0.69	55.11
Insecticide	February	ounce	15	0.60	8.93
Labor (harvest)	February	hour	4.05	11.74	47.55
Labor (grade/pack)	February	hour	6.15	11.74	72.20
Labor (pollination)	March	hour	5	11.74	58.70
Labor (pruning)	March	hour	4	11.74	46.96
Fungicide	March	ounce	64	0.69	44.09
Insecticide	March	ounce	12	0.60	7.14

Table 6 (continued). Estimated resource use and direct costs for one continuous crop, tomatoes, greenhouse, Mississippi, 2020.					
Operation/operating unit	**Month**	**Unit/size**	**Quantity**	**Cost/unit**	**Total cost**
Labor (harvest)	March	hour	8.1	11.74	95.09
Labor (grade/pack)	March	hour	12.3	11.74	144.40
Labor (pollination)	April	hour	2.5	11.74	29.35
Labor (pruning)	April	hour	4	11.74	46.96
Fungicide	April	ounce	64	0.69	44.09
Insecticide	April	ounce	12	0.60	7.14
Labor (harvest)	April	hour	8.1	11.74	95.09
Labor (grade/pack)	April	hour	12.3	11.74	144.40
Labor (pruning)	May	hour	1	11.74	11.74
Fungicide	May	ounce	16	0.69	11.02
Insecticide	May	ounce	6	0.60	3.57
Labor (harvest)	May	hour	6.75	11.74	79.25
Labor (grade/pack)	May	hour	10.25	11.74	120.34
Labor (pruning)	June	hour	1	11.74	11.74
Fungicide	June	ounce	16	0.69	11.02
Insecticide	June	ounce	6	0.60	3.57
Labor (harvest)	June	hour	6.75	11.74	79.25
Labor (grade/pack)	June	hour	10.25	11.74	120.34
Labor (misc.)	Aug. – June	hour	22	11.74	258.28
Fertigation	Oct. – June	application	1	823.20	823.20
Boxes	Dec. – June	each	700	1.95	1,365.00
Subtotal					**$5,679**
Interest on operating capital					$121
Total direct costs					**$5,800**

Table 7. Summary of costs and break-even price for spring, fall, and one crop.			
	Spring crop	**Fall crop**	**One continuous crop**
Direct cost	3,640	2,936	5,828
Fixed and overhead cost [1]	4,036	3,044	7,080
TOTAL COST	**7,676**	**5,980**	**12,908**
Expected yields (pounds)	8,000	6,000	14,000
Cost per square foot	$3.33	$2.60	$5.60
Yield (pounds per square foot)	3.47	2.60	6.08
Price (dollars per pound) needed to cover production (Direct) costs	**$0.46**	**$0.49**	**$0.42**
Price (dollars per pound) needed to break even (to cover Direct + Fixed and overhead costs)	**$0.96**	**$1.00**	**$0.92**

[1] For spring and fall crops, the rate of greenhouse utilization during the year is assumed at 57 percent and 43 percent, respectively. Thus, 57 percent of the annual fixed and overhead costs are allocated to the spring crop, and 43 percent are allocated to fall crop. Note, however, that if you only have a spring crop during the year, then the fixed and overhead cost allocated to the spring crop would be the entire annul cost which is estimated at $6,979.

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