

# Budget for Greenhouse Tomatoes

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Raising greenhouse crops, or hydroponically grown plants such as tomatoes, is popular among small producers who want to diversify their farms, or for landowners looking for extra income. Before breaking ground for a new greenhouse, you must understand how much time and work is involved. In fact, the time and effort in raising greenhouse tomatoes are similar to a dairy or poultry operation, because the grower needs to be present to do daily duties and “chores.” Leaving the tomato plants alone for a day or two without care could lead to a crop loss.

While hydroponic techniques are used for a variety of crop plants, tomatoes have received the most attention for business applications. Worldwide, other vegetables grown hydroponically in greenhouses include cucumbers, peppers, lettuce, eggplant, spinach, melons, various herbs, and other specialty crops. Some fruit crops (for example, strawberries and raspberries) and flowering crops 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 a crop does not have a strong market for a certain area, sales will be poor. In Mississippi, tomatoes have the strongest market demand. They are the best vegetable crop to raise in greenhouses.

Large corporate owners with 20 or more acres in greenhouse tomato production manage most of the greenhouse tomato acreage in the United States. But most of the growers in this country have fewer acres and less than 10,000 square feet of floor space. In Mississippi, the average greenhouse tomato grower has 2.4 free-standing or gutter-connected bays, totaling about 6,000 square feet less than one acre.

Greenhouse tomato acreage has been in a boom cycle since the mid- to late 1990s. Much of the expansion is explained by a changing consumer preference for the best quality vegetables. Greenhouse tomatoes are harvested vine ripened (or at least well on the way to a red-color stage), so they usually have a good flavor.

Tomatoes grown under controlled greenhouse conditions are close to the same size, shape, and color and are more resistant to diseases than the field-grown tomatoes. In many cities, consumers are not concerned with the higher price of greenhouse tomatoes; they want quality. Greenhouse tomatoes are never picked green and gassed with ethylene to promote ripening, a common practice of field-grown winter tomatoes in the extreme southern United States, Mexico, and Central America.

Any 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.

Not as much information is available about greenhouse tomatoes as compared to field vegetables. This can make it difficult to get help from county Extension agents or other trained personnel. An interested grower must prepare ahead by getting and reading publications, attending short courses and seminars, and visiting 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; however, special circumstances may cause an individual grower's costs to differ from this budget. In those cases, recalculate the estimated budget to reflect your circumstances. Production information is not included in this publication. Growers seeking production information can refer to the following publications:

- Greenhouse Tomato Handbook, Extension Publication 1828
- Environmental Control for Greenhouse Tomatoes, Extension Publication 1879
- Fertigation: The Basics of Injecting Fertilizer for Field-Grown Tomatoes, Extension Publication 2037
- Starting Vegetable Transplants, Extension Publication 1995
- A Spreadsheet Approach to Fertilization Management for Greenhouse Tomatoes, MAFES Bulletin 1003
- Greenhouse Tomatoes: Pest Management in Mississippi, Extension Publication 1861.

## Initial Capital Investment

The polyethylene-covered Quonset-type structure is the most common greenhouse among Mississippi growers and is the type talked about in this budget. It is the least expensive to build and has fewer crossmembers, 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 its advantages, but they cost more than polyethylene.

## Construction Costs

Greenhouse building costs can vary, depending on 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. Buy a greenhouse frame with the right load-bearing strength and useful life expectancy. Galvanized steel tubing and aluminum tubing are strong economical choices for building a greenhouse frame.

Greenhouse flooring can greatly affect cost. The floor type referred to in this budget uses a ground cloth, black plastic, and pea gravel for walkways. This type of flooring is the most common among Mississippi grow-

ers. Other floor choices are bare ground, complete coverage with gravel, concrete walkways, or solid concrete, depending on what you want and can afford.

This budget assumes that water and natural gas are available to the greenhouse. Some greenhouse locations may require more money for drilling a water well and buying LP gas storage tanks if water and gas are not available.

You must also consider the advantages and disadvantages of buying automated equipment for the greenhouse. You can reduce labor requirements based on the level of automation you can afford to install. Lack of availability or reliability of labor may make you think about investing in automated equipment to eliminate potential labor difficulties. The equipment package used in this budget reflects what most Mississippi growers use. Table 1 presents the estimated capital requirement of \$15,335 for one 24-foot by 96-foot Quonset-type greenhouse, equipped for tomato production typical for Mississippi, 2005.

## Production Budgets

Budgets were made after interviewing 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 and variable costs. Fixed costs are shown in Table 2 and are presented as a lump sum of total annual ownership costs divided equally between the two production crops typical for Mississippi greenhouse tomato production. The fixed costs include interest on investment, depreciation, insurance, and taxes.

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 7 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.

Also included in ownership costs were general overhead expenses. Overhead expenses are the costs of doing business but are not directly related to producing the crop.

Overhead expenses include heating, water, electricity, telephone, lab fees, and repair and maintenance. Annual ownership costs for one greenhouse 24 feet by 96 feet, producing two crops, totaled \$6,211.

**Table 1. Estimated capital requirements for greenhouse tomato production, Mississippi, 2005<sup>a</sup>**

| <i>Item</i>   | <i>Description</i>  | <i>Unit</i> | <i>Number</i> | <i>Cost<br/>Per Unit</i> | <i>Total<br/>Initial Cost</i> | <i>Useful<br/>Life Years</i> |
|---|---------------------|-------------|---------------|--------------------------|-------------------------------|------------------------------|
| <b>Structure</b>  |                     |             |               |                          |                               |                              |
| Greenhouse frame  | 24 ft x 96 ft       | sq ft       | 2,304         | \$ 1.36                  | \$ 3,133.44                   | 20                           |
| End-wall framing package  |                     | each        | 1             | 120.00                   | 120.00                        | 20                           |
| Aluminum 42-in personnel door                                   |                     | each        | 1             | 172.00                   | 172.00                        | 10                           |
| 6-mil plastic, 3 yr   | 48 ft x 100 ft      | roll        | 2             | 260.00                   | 520.00                        | 3                            |
| Base locking rail with inserts                                  |                     | foot        | 240           | 2.10                     | 504.00                        | 20                           |
| Inflation kit   |                     | each        | 1             | 64.00                    | 64.00                         | 10                           |
| Heater system   | Gas 145,000 BTU     | each        | 2             | 860.00                   | 1,720.00                      | 10                           |
| Cooling fans  | 48", 1 HP           | each        | 2             | 630.00                   | 1,260.00                      | 5                            |
| Cooling pads  | 48"x12"x6"          | each        | 24            | 42.00                    | 1,008.00                      | 3                            |
| Pump & plumbing   | wet wall 300 gal.   | each        | 1             | 625.00                   | 625.00                        | 5                            |
| Inlet shutters  | 33" x 33" motorized | each        | 4             | 250.00                   | 1,000.00                      | 7                            |
| Electrical  | wiring package      | each        | 1             | 400.00                   | 400.00                        | 20                           |
| Ground cover  | woven plastic       | sq ft       | 2304          | 0.06                     | 138.00                        | 8                            |
| Black plastic   | 6-mil               | sq ft       | 2304          | 0.06                     | 138.00                        | 8                            |
| Pea gravel  |                     | cu yd       | 7.5           | 9.00                     | 68.00                         | 8                            |
| Irrigation/fertigation  | drip system         | each        | 1             | 1,275.00                 | 1,275.00                      | 7                            |
| Bags (pine bark)  | prefilled           | each        | 135           | 1.30                     | 175.50                        | 2                            |
| <b>Subtotal greenhouse structure:</b>                           |                     |             |               |                          | <b>\$12,320.94</b>            |                              |
| <b>Machinery &amp; equipment</b>                                |                     |             |               |                          |                               |                              |
| Backpack sprayer  | pump type           | each        | 1             | \$100.00                 | \$100.00                      | 5                            |
| Thermostat  | single stage        | each        | 2             | 55.00                    | 110.00                        | 5                            |
| Respirator  |                     | each        | 1             | 75.00                    | 75.00                         | 5                            |
| Pollinator  |                     | each        | 1             | 110.00                   | 110.00                        | 5                            |
| Thermometer   | hi/lo type          | each        | 1             | 20.00                    | 20.00                         | 2                            |
| Transplant benches  | wood                | each        | 2             | 25.00                    | 50.00                         | 10                           |
| Meters  | EC                  | each        | 2             | 200.00                   | 400.00                        | 5                            |
|   | pH                  | each        | 2             | 150.00                   | 300.00                        | 5                            |
| Backup generator  | electric            | each        | 1             | 500.00                   | 500.00                        | 10                           |
| <b>Subtotal machinery &amp; equipment</b>                       |                     |             |               | <b>\$1,665.00</b>        |                               |                              |
| <b>Assembly and installation<sup>b</sup></b>                    |                     |             | hour          | 95                       | \$10.25                       | \$973.75                     |
| <b>Utility hookups (electrical, gas, and water)<sup>c</sup></b> |                     |             |               |                          | <b>\$375.00</b>               |                              |
| <b>Total</b>  |                     |             |               | <b>\$15,334.69</b>       |                               |                              |

<sup>a</sup> Land and site preparation was not included in the budget. This cost will vary, depending on location.

<sup>b</sup> Installation cost may vary significantly, depending on location and owner's ability and involvement.

<sup>c</sup> Cost may increase if water well is required for water supply and if you have to buy LP gas storage tanks.

**Table 2. Estimated annual ownership costs for greenhouse tomato production, Mississippi, 2005**

| <i>Item</i>                         | <i>Depreciation</i> | <i>Interest</i> | <i>Insurance<br/>and taxes</i> | <i>Total</i>   |
|-------------------------------------|---------------------|-----------------|--------------------------------|----------------|
| <b>Structure</b>                    |                     |                 |                                |                |
| Greenhouse frame                    | \$156               | \$110           | \$63                           | \$329          |
| End-wall framing package            | 6                   | 4               | 2                              | 12             |
| Aluminum personnel door             | 17                  | 6               | 3                              | 26             |
| 6-mil plastic                       | 173                 | 18              | 10                             | 201            |
| Base locking rail                   | 25                  | 18              | 10                             | 53             |
| Inflation kit                       | 6                   | 2               | 1                              | 9              |
| Heater system                       | 172                 | 60              | 34                             | 266            |
| Cooling fans                        | 252                 | 44              | 25                             | 321            |
| Cooling pads                        | 336                 | 35              | 20                             | 391            |
| Pump and plumbing                   | 125                 | 22              | 13                             | 160            |
| Inlet shutters                      | 142                 | 35              | 20                             | 197            |
| Electrical                          | 20                  | 14              | 8                              | 42             |
| Ground cover                        | 17                  | 5               | 3                              | 25             |
| Black plastic                       | 17                  | 5               | 3                              | 25             |
| Pea gravel                          | 8                   | 2               | 1                              | 11             |
| Irrigation/fertigation              | 182                 | 44              | 26                             | 252            |
| Bags (pine bark)                    | 88                  | 6               | 4                              | 98             |
| <b>Machinery &amp; equipment</b>    |                     |                 |                                |                |
| Backpack sprayer                    | \$20                | \$4             | \$2                            | \$26           |
| Thermostat                          | 22                  | 4               | 2                              | 28             |
| Respirator                          | 15                  | 3               | 1                              | 19             |
| Pollinator                          | 22                  | 4               | 2                              | 28             |
| Thermometer                         | 10                  | 0               | 0                              | 11             |
| Transplant benches                  | 5                   | 2               | 1                              | 8              |
| Meters                              | 140                 | 24              | 14                             | 178            |
| Backup generator                    | 50                  | 18              | 10                             | 78             |
| Total greenhouse & equipment        | \$2,026             | \$489           | \$279                          | \$2,794        |
| General overhead                    |                     |                 |                                |                |
| Heating                             |                     |                 |                                | 1,537          |
| Water                               |                     |                 |                                | 1,767          |
| Electricity                         |                     |                 |                                | 540            |
| Telephone                           |                     |                 |                                | 621            |
| Repairs and Maintenance             |                     |                 |                                | 326            |
| Lab fees                            |                     |                 |                                | 270            |
| <b>Total general overhead</b>       |                     |                 |                                | <b>\$3,415</b> |
| <b>Total annual ownership costs</b> |                     |                 |                                | <b>\$6,211</b> |

## Variable Costs

Variable costs are presented in Tables 3 and 4 for spring and fall crops of 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 for one greenhouse in Mississippi.

Input prices were from local and regional suppliers using current-year prices. Interest on operating capital

was charged at a rate of 8 percent on one-half of the total direct expense for each crop. Direct cost of producing a spring crop of tomatoes totaled \$2,112, as compared to \$1,721 for producing a fall crop of tomatoes.

Total production cost is the sum of direct costs for both crops plus annual ownership costs. The total estimated annual cost of producing two tomato crops (spring and fall) in a greenhouse (24 feet by 96 feet) is \$10,044 in Mississippi.

**Table 3. Estimated resource use and direct costs for spring tomato crop for greenhouse production, Mississippi, 2005**

| <i>Operation/operating unit</i> | <i>Month</i> | <i>Unit/size</i> | <i>Quantity</i> | <i>Cost/unit</i> | <i>Total cost</i> |
|---------------------------------|--------------|------------------|-----------------|------------------|-------------------|
| Labor (potting)                 | November     | hour             | 1.00            | \$6.56           | \$6.56            |
| Potting mix                     | November     | 3 cu ft          | 1.00            | 9.25             | 9.25              |
| Seeding trays                   | November     | each             | 9.00            | 0.5              | 4.50              |
| Transplant cell packs           | November     | each, 72 ct.     | 9.00            | 0.35             | 3.15              |
| Labor (seeding)                 | November     | hour             | 3.00            | 6.56             | 19.68             |
| Seed                            | November     | each             | 600.00          | 0.2              | 120.00            |
| Labor (watering)                | November     | hour             | 1.65            | 6.56             | 10.82             |
| Fertilizer                      | November     | pound            | 0.708           | 1                | 0.71              |
| Electricity                     | November     | day              | 7.00            | 0.5              | 3.50              |
| Labor (watering)                | December     | hour             | 8.25            | 6.56             | 54.12             |
| Fertilizer                      | December     | pound            | 3.54            | 1                | 3.54              |
| Electricity                     | December     | day              | 35.00           | 0.5              | 17.50             |
| Labor (watering)                | January      | hour             | 2.00            | 6.56             | 13.12             |
| Labor (transplanting)           | January      | hour             | 2.00            | 6.56             | 13.12             |
| Labor (pollination)             | January      | hour             | 2.00            | 6.56             | 13.12             |
| Labor (pruning)                 | January      | hour             | 4.00            | 6.56             | 26.24             |
| Fungicide                       | January      | can              | 4.00            | 3.5              | 14.00             |
| Insecticide                     | January      | ounce            | 9.00            | 0.44             | 3.96              |
| Labor (stringing)               | January      | hour             | 2.00            | 6.56             | 13.12             |
| Twine                           | January      | bundle           | 0.50            | 24               | 12.00             |
| Clips                           | January      | box              | 0.50            | 60               | 30.00             |
| Labor (pollination)             | February     | hour             | 5.00            | 6.56             | 32.80             |
| Labor (pruning)                 | February     | hour             | 4.00            | 6.56             | 26.24             |
| Fungicide                       | February     | can              | 8.00            | 3.5              | 28.00             |
| Insecticide                     | February     | ounce            | 12.00           | 0.44             | 5.28              |
| Labor (pollination)             | March        | hour             | 5.00            | 6.56             | 32.80             |
| Labor (pruning)                 | March        | hour             | 4.00            | 6.56             | 26.24             |
| Fungicide                       | March        | can              | 10.00           | 3.5              | 35.00             |
| Insecticide                     | March        | ounce            | 15.00           | 0.44             | 6.60              |
| Labor (harvest)                 | March        | hour             | 4.05            | 6.56             | 26.57             |
| Labor (grade/pack)              | March        | hour             | 6.15            | 6.56             | 40.34             |
| Labor (pollination)             | April        | hour             | 5.00            | 6.56             | 32.80             |
| Labor (pruning)                 | April        | hour             | 4.00            | 6.56             | 26.24             |
| Fungicide                       | April        | can              | 8.00            | 3.5              | 28.00             |
| Insecticide                     | April        | ounce            | 12.00           | 0.44             | 5.28              |
| Labor (harvest)                 | April        | hour             | 8.10            | 6.56             | 53.14             |

|                                      |              |             |        |        |                   |
|--------------------------------------|--------------|-------------|--------|--------|-------------------|
| Labor (grade/pack)                   | April        | hour        | 12.30  | 6.56   | 80.69             |
| Labor (pollination)                  | May          | hour        | 2.50   | 6.56   | 16.40             |
| Labor (pruning)                      | May          | hour        | 4.00   | 6.56   | 26.24             |
| Fungicide                            | May          | can         | 8.00   | 3.5    | 28.00             |
| Insecticide                          | May          | ounce       | 12.00  | 0.44   | 5.28              |
| Labor (harvest)                      | May          | hour        | 8.10   | 6.56   | 53.14             |
| Labor (grade/pack)                   | May          | hour        | 12.30  | 6.56   | 80.69             |
| Labor (pruning)                      | June         | hour        | 1.00   | 6.56   | 6.56              |
| Fungicide                            | June         | can         | 2.00   | 3.5    | 7.00              |
| Insecticide                          | June         | ounce       | 6.00   | 0.44   | 2.64              |
| Labor (harvest)                      | June         | hour        | 6.75   | 6.56   | 44.28             |
| Labor (grade/pack)                   | June         | hour        | 10.25  | 6.56   | 67.24             |
| Labor (misc.)                        | Jan. - June  | hour        | 13.00  | 6.56   | 85.28             |
| Pollinator                           | Jan. - May   | application | 0.50   | 22     | 11.00             |
| Back pack sprayer                    | Jan. - June  | application | 0.50   | 11.28  | 5.64              |
| Fertigation                          | Jan. - May   | application | 1.00   | 300.48 | 300.48            |
| Boxes                                | April - June | each        | 375.00 | 1.1    | 412.50            |
| <b>Subtotal</b>                      |              |             |        |        | <b>\$2,030.40</b> |
| <b>Interest on operating capital</b> |              |             |        |        | <b>\$81.22</b>    |
| <b>Total direct costs</b>            |              |             |        |        | <b>\$2,111.62</b> |

**Table 4. Estimated resource use and direct costs for fall tomato crop for greenhouse production, Mississippi, 2005**

| Operation/operating unit | Month     | Unit/size   | Quantity | Cost/unit | Total cost |
|--------------------------|-----------|-------------|----------|-----------|------------|
| Labor (potting)          | July      | hour        | 1.00     | \$6.56    | \$6.56     |
| Potting mix              | July      | 3 cut ft    | 1.00     | 9.25      | 9.25       |
| Seeding trays            | July      | each        | 9.00     | 0.5       | 4.50       |
| Transplant cell packs    | July      | each, 72 ct | 9.00     | 0.35      | 3.15       |
| Labor (seeding)          | July      | hour        | 3.00     | 6.56      | 19.68      |
| Seed                     | July      | each        | 600.00   | 0.2       | 120.00     |
| Labor (watering)         | July      | hour        | 1.65     | 6.56      | 10.82      |
| Fertilizer               | July      | pound       | 0.708    | 1         | 0.71       |
| Electricity              | July      | day         | 7.00     | 0.5       | 3.50       |
| Labor (watering)         | August    | hour        | 8.25     | 6.56      | 54.12      |
| Fertilizer               | August    | pound       | 3.54     | 1         | 3.54       |
| Electricity              | August    | day         | 35       | 0.5       | 17.50      |
| Labor (watering)         | September | hour        | 2.00     | 6.56      | 13.12      |
| Labor (transplanting)    | September | hour        | 2.00     | 6.56      | 13.12      |
| Labor (pollination)      | September | hour        | 2.00     | 6.56      | 13.12      |
| Labor (pruning)          | September | hour        | 4.00     | 6.56      | 26.24      |
| Fungicide                | September | can         | 4.00     | 3.5       | 14.00      |
| Insecticide              | September | ounce       | 9.00     | 0.44      | 3.96       |
| Labor (stringing)        | September | hour        | 2.00     | 6.56      | 13.12      |
| Twine                    | September | bundle      | 0.50     | 24        | 12.00      |
| Clips                    | September | box         | 0.50     | 60        | 30.00      |
| Labor (pollination)      | October   | hour        | 5.00     | 6.56      | 32.80      |

|                     |                  |             |        |        |        |
|---------------------|------------------|-------------|--------|--------|--------|
| Labor (pruning)     | October          | hour        | 4.00   | 6.56   | 26.24  |
| Fungicide           | October          | can         | 8.00   | 3.5    | 28.00  |
| Insecticide         | October          | ounce       | 12.00  | 0.44   | 5.28   |
| Labor (pollination) | November         | hour        | 5.00   | 6.56   | 32.80  |
| Labor (pruning)     | November         | hour        | 4.00   | 6.56   | 26.24  |
| Fungicide           | November         | can         | 10.00  | 3.5    | 35.00  |
| Labor(harvest)      | November         | hour        | 7.74   | 6.56   | 50.77  |
| Labor (grade/pack)  | November         | hour        | 11.954 | 6.56   | 78.42  |
| Insecticide         | November         | ounce       | 15.00  | 0.44   | 6.60   |
| Labor (pollination) | December         | hour        | 5.00   | 6.56   | 32.80  |
| Labor (pruning)     | December         | hour        | 4.00   | 6.56   | 26.24  |
| Labor (harvest)     | December         | hour        | 10.26  | 6.56   | 67.31  |
| Labor (grade/pack)  | December         | hour        | 15.846 | 6.56   | 103.95 |
| Fungicide           | December         | can         | 8.00   | 3.5    | 28.00  |
| Insecticide         | December         | ounce       | 12.00  | 0.44   | 5.28   |
| Labor (misc.)       | July - December  | hour        | 13.00  | 6.56   | 85.28  |
| Pollinator          | July - December  | application | 0.50   | 22     | 11.00  |
| Back pack sprayer   | July - December  | application | 0.50   | 11.28  | 5.64   |
| Fertigation         | Sept. - December |             | 1.00   | 300.48 | 300.48 |
| Boxes               | Oct. - December  | each        | 250.00 | 1.1    | 275.00 |

**Subtotal**

\$1,655.14

**Interest on operating capital**

\$66.21

**Total direct costs**

\$1,721.35



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