Greenhouse Tomatoes Budgets and Other Economics

Elizabeth Canales
Assistant Extension Professor
Department of Agricultural Economics
Outline

- Introduction: Industry Overview
- Planning for a new Operation
- Greenhouse Tomato Budget and cost analysis
- Marketing Considerations
- Financial Considerations
Greenhouse and hydroponics production can be used for a variety of crop plants.

- Tomato is more common.
- Vegetables: cucumbers, peppers, lettuce, eggplant, spinach, melons, various herbs.
- Flowering crops.
- Fruits: strawberries and raspberries.
Greenhouse production area has been increasing.

Around 2% of the farms produce 71% of the sales.

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Advantages of greenhouse production

• Lower land requirements.

• Protection against weather.
  • Stable yields.

• Timely crop production.
  • Extend production period
  • Can control timing of supply for when fresh market prices are higher
  • Utilize labor available – complement other farm activities.

• Higher product quality.
  • Ripe product – better flavor.
Challenges of greenhouse production

• High initial investment.

• Labor requirements
  • Intense management - higher management skills
  • More management time required.

• Profitability is highly dependent on yield and market prices
  • Cost disadvantage when compared to field-grown tomatoes.

• Other: insect and diseases can spread more rapidly, smaller margin for error.

• It is a hard and risky business.
## Risk factors comparison: greenhouse and field-grown tomatoes

<table>
<thead>
<tr>
<th>Type of Risk</th>
<th>Source</th>
<th>Greenhouse tomatoes</th>
<th>Field-grown tomatoes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield</td>
<td>Weather</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Price</td>
<td>Supply Demand</td>
<td>Relatively Low</td>
<td>High</td>
</tr>
<tr>
<td>Cost</td>
<td>Production inputs</td>
<td>High</td>
<td>Relatively low</td>
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</table>

Note: Greenhouse producers need a price premium to remain competitive with field producers.

Before you start: Write a business plan

Why planning?
Road map: outline plan for managing your operation
- Identify long term vision, risks, action steps

Operations, organization, financing
- Resources available
  - Land, Capita, Labor availability

- Management
  - What skills do you need?
  - Do you need to hire additional labor?

- Do I have a market for my product?

- Loans & financing
  - How much money do we have and/or can we borrow?
Other considerations before getting started

• Understand how much time, work, skills and capital are required.

• Greenhouse tomatoes require more time and effort
  • Every-day care.

• Greenhouse production is more expensive than field production
  • Cost of structure, equipment and operation
  • Labor, Energy.

10-15 more labor and operating costs per unit of land in greenhouse production
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Greenhouse tomatoes: Costs

Total Cost

Investment Cost
- Construction, Equipment Cost

Production Costs
- Direct Costs
- Fixed Costs

Depends on the structural design and cropping schedule
Greenhouse tomatoes: Costs

Total Cost

Investment Cost
- Construction, Equipment Cost

Production Costs
- Direct Costs
- Fixed Costs
Initial Capital Investment

- Costs depend on materials and equipment used.

- **Common structure in MS:**
  - Polyethylene-covered Quonset-type structure
    - Least expensive.

- Other types of covering could be more expensive
  - e.g. acrylic sheets, polycarbonate plastic, and fiberglass.
Initial Capital Investment

• Frame
  • Factors: strength and useful life expectancy
  • Galvanized steel tubing and aluminum tubing are strong and economical materials.

• Flooring
  • Most common in MS: round cloth, black plastic, and pea gravel for walkways
  • Other options: bare ground, wall-to-wall gravel, concrete walkways, or wall-to-wall concrete.

• Automated equipment
  • Can be costly but reduces labor requirements.

• Water, electricity, and natural gas.
Initial Capital Investment - Budget assumptions

- **Structure type**: polyethylene-covered Quonset-type greenhouse
  - 24’ x 96’ (0.05 acres)
  - Double layers of plastic.

- **Irrigation**: Drip system.

- **Water and natural gas are available to the greenhouse**
  - If not available, these costs should be included (digging well, gas storage tanks).

- **Cost of land not included.**
Initial Capital Investment (2,301 sq. ft.)

Structure, healing, cooling, fertilization system, flooring

- Structure: $17,598 (80%)
- Auxiliary Equipment: $2,285 (7%)
- Assembly & Installation: $1,529 (10%)
- Utility hookup: $529 (2%)
- Total: $21,941
Initial Capital Investment (2,301 sq. ft.)

- Structure: $17,598 (80%)
- Auxiliary Equipment: $2,285 (7%)
- Assembly & Installation: $1,529 (10%)
- Utility hookup: $529 (2%)

Total: $21,941

Transplant benches, thermostat, pollinator, meters, sprayer
Initial Capital Investment (2,301 sq. ft.)

Can vary significantly depending on location and owner's ability and involvement.
Initial Capital Investment (2,301 sq. ft.)

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<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
<th>Amount</th>
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<tr>
<td>Structure</td>
<td>80%</td>
<td>$17,598</td>
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<tr>
<td>Auxiliary Equipment</td>
<td>7%</td>
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<td>Assembly &amp; Installation</td>
<td>10%</td>
<td>$1,529</td>
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<td>Utility hookup</td>
<td>2%</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$21,941</strong></td>
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</table>
Initial Capital Investment

Quonset-type greenhouse
24’ x 96’
(2,304 sq. ft. or 0.05 acres)

$21,941
= $9.50 per ft²

- Greenhouse structure accounts for 80% of the cost
  - Structure, healing, cooling, fertilization system, flooring
- Auxiliary equipment accounts for 10% of the cost
  - Transplant benches, thermostat, pollinator, meters, sprayer
Plan for an adequate amount of contingency

• Costs are often underestimated
  • Costs can exceed the budget during execution.

• Plan for contingencies
  • Include a contingency category in your budget
  • Estimated guess (some people use 10% of cost).
Considerations

• Sacrifice quality to keep costs low.

• Buy more greenhouse than you need.
Greenhouse tomatoes: Costs

Total Cost

- Investment Cost
  - Construction, Equipment Cost
- Production Costs
  - Direct Costs
  - Fixed Costs
There are two principal growing systems

• One-crop per year system (mid-Sept to mid-June)

• Two crops per year
  • Spring crop
  • Fall crop

  Preferred system in Mississippi (and mid-south)
## Direct costs (2,301 sq. ft.)

<table>
<thead>
<tr>
<th></th>
<th>Spring Crop</th>
<th>Fall Crop</th>
<th>One Crop</th>
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<tr>
<td>Labor</td>
<td>1,544</td>
<td>1,207</td>
<td>2,466</td>
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<td>Seed</td>
<td>261</td>
<td>261</td>
<td>261</td>
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<tr>
<td>Fertigation</td>
<td>430</td>
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<td>Fungicide</td>
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<td>114</td>
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<td>Insecticide</td>
<td>39</td>
<td>27</td>
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<tr>
<td>Boxes</td>
<td>660</td>
<td>495</td>
<td>1,155</td>
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<tr>
<td>Other</td>
<td>168</td>
<td>140</td>
<td>209</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$ 3,265</strong></td>
<td><strong>$ 2,648</strong></td>
<td><strong>$ 5,192</strong></td>
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</table>

**Expected Yields**
- Spring Crop: 8,000 lbs.
- Fall Crop: 6,000 lbs.
- One Crop: 14,000 lbs.
Direct Costs

• Labor accounts for approximately 50% of the variable costs.

• Labor (~50% cost)
  • Potting
  • Watering
  • Transplanting
  • Pollination
  • Pruning
  • Harvest
  • Grade/pack

• Automatization can help reduce labor.
Labor requirements – Spring Crop

Total 145 hours
Labor requirements – Fall Crop

Total 114 hours

- Harvest
- Grade/pack
- Pruning
- Pollination
- Misc.
- Stringing
- Watering
- Potting
- Transplanting
- Seeding

Number of Hours

- Jul
- Aug
- Sept
- Oct
- Nov
- Dec

Number of Hours: 0 to 40

Month: July to December
Labor requirements – One Crop

Total 232 hours
Labor Requirements (hours)

Spring Crop

Fall Crop

One Crop
# Greenhouse tomatoes: Costs

<table>
<thead>
<tr>
<th></th>
<th>Total Cost</th>
<th>Production Costs</th>
<th>Fixed Costs</th>
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<tr>
<td><strong>Investment Cost</strong></td>
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<td><strong>Construction, Equipment Cost</strong></td>
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<td><strong>Direct Costs</strong></td>
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### Annual Ownership Costs

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<td>Depreciation</td>
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<td>Interest</td>
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<td>Insurance and taxes</td>
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<tr>
<td><strong>Total ownership costs</strong></td>
<td><strong>$ 3,570</strong></td>
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### Overhead expenses:

- Heating, water, electricity, telephone, lab fees, repair and maintenance: **$ 3,272**

**Total fixed cost**: **$ 6,843**

- Ownership or Indirect costs would exist even if production was zero.
- Overhead expenses – they do not change in relation to the activity of the greenhouse.
- Other costs that should be included are mortgage, rent, marketing expenses.
Cost analysis

Is the project worth the cost?
• Money, time, etc.

• Examine all the costs involved
  • Tangible and intangible costs
  • Initial capital investment and operating costs.

• What is the potential income?
  • Is income greater than cost?

• What is the payback period of your project?
  • Amount of time it will take to recover the costs of your initial investment.
## Returns above total expenses (including depreciation, interest and taxes)

### Spring Crop

<table>
<thead>
<tr>
<th>Yield(lb)</th>
<th>0.75</th>
<th>0.90</th>
<th>1.05</th>
<th>1.20</th>
<th>1.35</th>
<th>1.50</th>
<th>1.65</th>
<th>1.80</th>
<th>1.95</th>
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<td>(3,565)</td>
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<td>(1,165)</td>
<td>(565)</td>
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<td>35</td>
<td>755</td>
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<td>(1,405)</td>
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Returns above total expenses (including depreciation, interest and taxes)

Fall Crop

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<td>(1,540)</td>
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</table>
## Returns above total expenses (including depreciation, interest and taxes)

**One Crop**

<table>
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<tr>
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## Summary of costs and break-even

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<th>One crop</th>
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<td><strong>Direct cost</strong></td>
<td>3,265</td>
<td>2,648</td>
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<td><strong>Fixed and Overhead Cost</strong></td>
<td>3,900</td>
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<td><strong>Total Cost</strong></td>
<td>$7,165</td>
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<td><strong>Cost per ft²</strong></td>
<td>$3.11</td>
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<td><strong>Yield per ft²</strong></td>
<td>3.47 lbs.</td>
<td>2.60 lbs.</td>
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<td><strong>Price needed to breakeven</strong></td>
<td>$0.90</td>
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<td>$0.86</td>
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Payback period

- Initial investment = $21,941

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<th>3 years</th>
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<th>7 years</th>
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<td>Profit required</td>
<td>$ 7,314</td>
<td>$ 4,388</td>
<td>$ 3,134</td>
<td>$ 2,194</td>
<td>$ 1,828</td>
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- How fast do you want to recover your investment?
## Payback - One Crop

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<th>Price ($/lb)</th>
<th>0.75</th>
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Outline

- Introduction: Industry Overview
- Planning for a new Operation
- Greenhouse Tomato Budget and cost analysis
- Marketing Considerations
- Financial Considerations
Marketing plan

• Market analysis
  • Trends
  • Market demographics
  • Competition

• Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis
  • Is there a market potential?

• Marketing strategy
Trends: Tomato industry

• Steadily increase in consumption
  • 4<sup>th</sup> most consumed vegetable

• Greenhouse tomatoes enjoy price premiums
  • Preference for greenhouse tomatoes (taste)
  • Consumer willingness to pay more for a high quality product
  • Growth in supply puts pressure on prices.

• Trade plays an important role
  • Greenhouse tomatoes account for approx. 40% of imports
Market trends: Fruit and vegetable consumption

• Fresh vegetables growth: +8%

✓ Fast food establishments: more salads and fruit offerings.

✓ Diet and health issues.

✓ Local food systems programs
  Consumers’ interest in food origin.

Source: 2015 Study on America’s Consumption of Fruit & Vegetables.
Market trends: increasing interest in local foods

• Local foods - represents a small share but it is increasing
  • Locally grown
  • Direct-to-consumer marketing
  • Farm-to-table
  • Farm-to-school
  • Locally sourced products.

• Greenhouse production benefit – eating local year-round.

• Growing demand for fresh, healthy, transparent products, organic, sustainably grown products.
Importance of local market channels

• Good alternative for small farms
  • Not always easy for local farmers to access larger-volume marketing channels.
  • Farmers’ markets, CSA’s, and roadside stands.

• High price per unit - small sale volumes.

• Can combine with sales to foodservice, institutions and retail food markets
  • Increase cash flow and production scale.

• It can be a profitable niche for some
  • Generally, no need for GAP/GDP or other certifications.
Strategy: Market channel selection

- Wholesale
- Grocery stores
- Retail Market
- Restaurants
- Food Hub
- Farmers market
- CSA (Community Supported Agriculture)
- Farm stand

- MarketMaker
  https://foodmarketmaker.com/

Source: Graph taken from Cornell Cooperative Extension of Tompkins County. Guide to Marketing Channel Selection.
Strategy: Market channel selection

• Sales and volumes
  • Greenhouse tomatoes are harvested riper than field-grown tomatoes (more perishable)
    • Shippers and buyers must be located in advance.

• Risks
  • Low volume sales, high labor, marketing costs, consistency of quality, competition, customer turnout, low price.

• Labor requirements
  • Time devoted to washing and packing vs time devoted to sales and marketing.

• Other costs
  • Membership fees
  • Certifications (Good Agricultural Practices – GAP)
  • Packing materials
  • Delivery costs
Strategy: Market channel selection

• It is important for greenhouse tomato growers to establish marketing channels before beginning production.
  • Do not enter the industry if you do not know where you will sell.

• Evaluate channels based on performance:
  • Weekly sales
  • Costs
  • Labor requirements
  • Risks
  • Profits
  • Personal goals

⇒ Multiple channel strategy
Strategy: Pricing

• Setting the right price - know your production cost!
  • Include marketing costs.
  • Price should offer a sustainable rate of return on investment

• Price premium = higher quality, attractive product
  • Production costs and product quality are higher compared with field production:
  • Quality of competitors.

• Research the market ahead of time
  • Reference Price: Wholesale Terminal Produce Prices, daily: [https://www.marketnews.usda.gov](https://www.marketnews.usda.gov)
Tomato prices vary throughout the year

Atlanta terminal Prices – Vine ripes

Spring Harvest

One Crop Harvest

Fall Harvest
Tomatoes shipping seasons by region

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¹Many U.S. and Baja California, Mexico, greenhouse industry locations do not produce year-round, but there is year-round production in the aggregate.

**Source:** Graph taken from the U.S. Department of Agriculture, Agricultural Marketing Service; estimates by Cook and Calvin. Available at: [http://ageconsearch.umn.edu/bitstream/7244/2/er050002.pdf](http://ageconsearch.umn.edu/bitstream/7244/2/er050002.pdf)
Outline

- Introduction: Industry Overview
- Planning for a new Operation
- Greenhouse Tomato Budget and cost analysis
- Marketing Considerations
- Financial Considerations
Financial planning

• What are our capital needs?
  • Equipment
  • Infrastructure
  • Short vs Long term

• How much money do we have and/or can we borrow?

• Recordkeeping

• Financial Analysis
  • Enterprise analysis
  • Financial statements
Keep records for more than just taxes!
Keeping detailed farm records is important!

• Records of day to day transactions  
  • Don’t rely on your memory!

• Financial records:  
  • Income: Money received from fruits and vegetable sales  
  • Expenses: Money paid for inputs and services  
  • Assets: All your physical and monetary values  
  • Liabilities: Money you owe.

• Production/Cultural records  
  • Field size, crop, land preparation, inputs used, irrigation, pesticide use  
  • Harvest date, amount and quality of product harvested  
  • How can we improve production?

• Key to make informed decisions  
  • Investment decisions  
  • Producing or buying decision  
  • Helps to evaluate performance.
Systems for record keeping

- **Hand-written**
  - Ledger or books
  - Have to do your own calculations

- **Computer**
  - Excel based spreadsheets
  - Quicken: Track income and expenses
  - QuickBooks: Track income, expenses, assets, liabilities and owner’s equity
Enterprise analysis

• Budget for each enterprise
  • E.g. individual crop activity

• How profitable is each crop/enterprise?
  • In what crops are you making money?

• Breakeven analysis/Risk analysis
  • Yield necessary to cover all costs or price necessary to cover all costs – what if scenarios.

• Compare enterprises based on their profitability and resources needed (e.g. labor, skills, capital)
Financial analysis

**Financial statements:**

- **Balance sheet:** tells us the farm’s financial position
  - Is our net worth growing over time?
    - **Assets – liabilities = Net worth**

- **Income statements** (profit and loss statement)
  - Simply income minus expenses
  - Is the operation profitable?

- **Cash flow statements**
  - Cash inflows and outflows
  - Yearly and monthly
  - Helps to identify times of the year when we have cash shortages
Net cash flow

Cash expenses

Note: Overhead expenses in this graph exclude depreciation.
Remember...

• Maintaining good records is essential
  • Production and financial
  • Key to developing useful budgets

• Estimate costs and returns (budget) for each of your enterprises.

• Keeping farm and personal finances separate is a good practice.

• Use enterprise budgets to inform your decisions.
THANK YOU!

Elizabeth Canales
Phone: (662) 325-2516
Elizabeth.canales@msstate.edu