Greenhouse Tomatoes Budgets and Other Economics

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MISSISSIPPI STATE UNIVERSITY
EXTENSION

Outlin
e

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

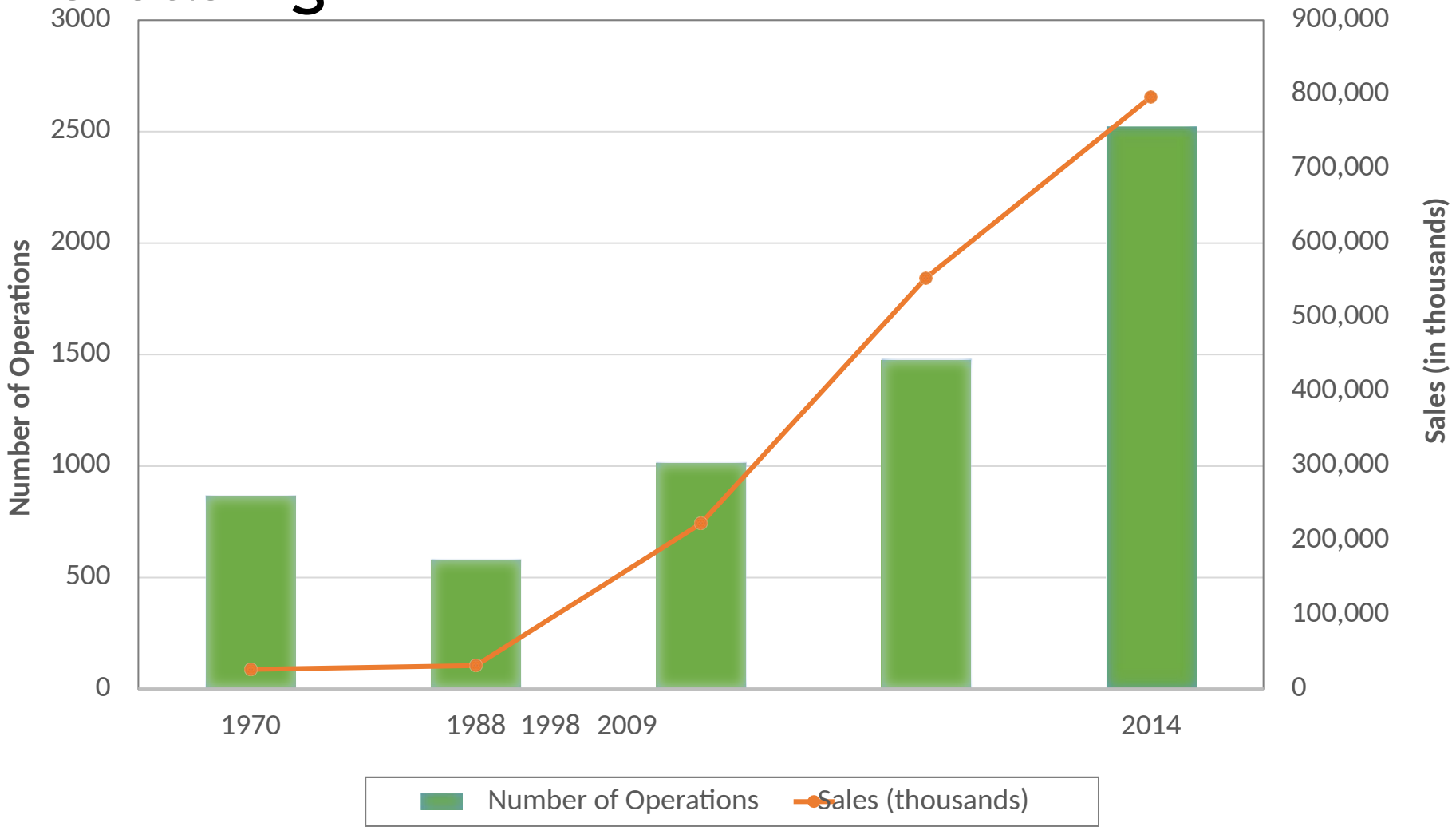
Greenhouse and hydroponics production

- 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.



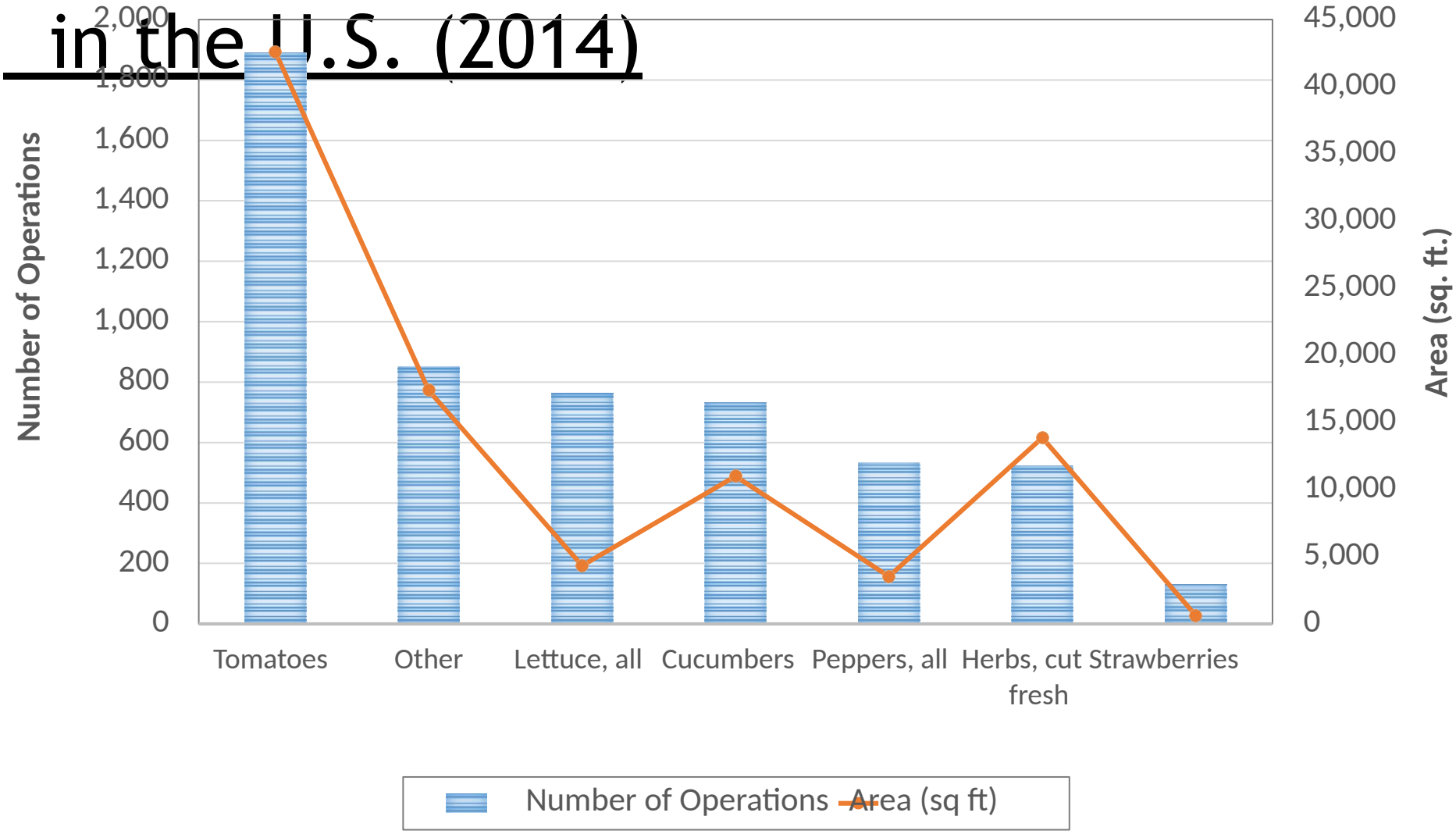



Greenhouse production area has been increasing



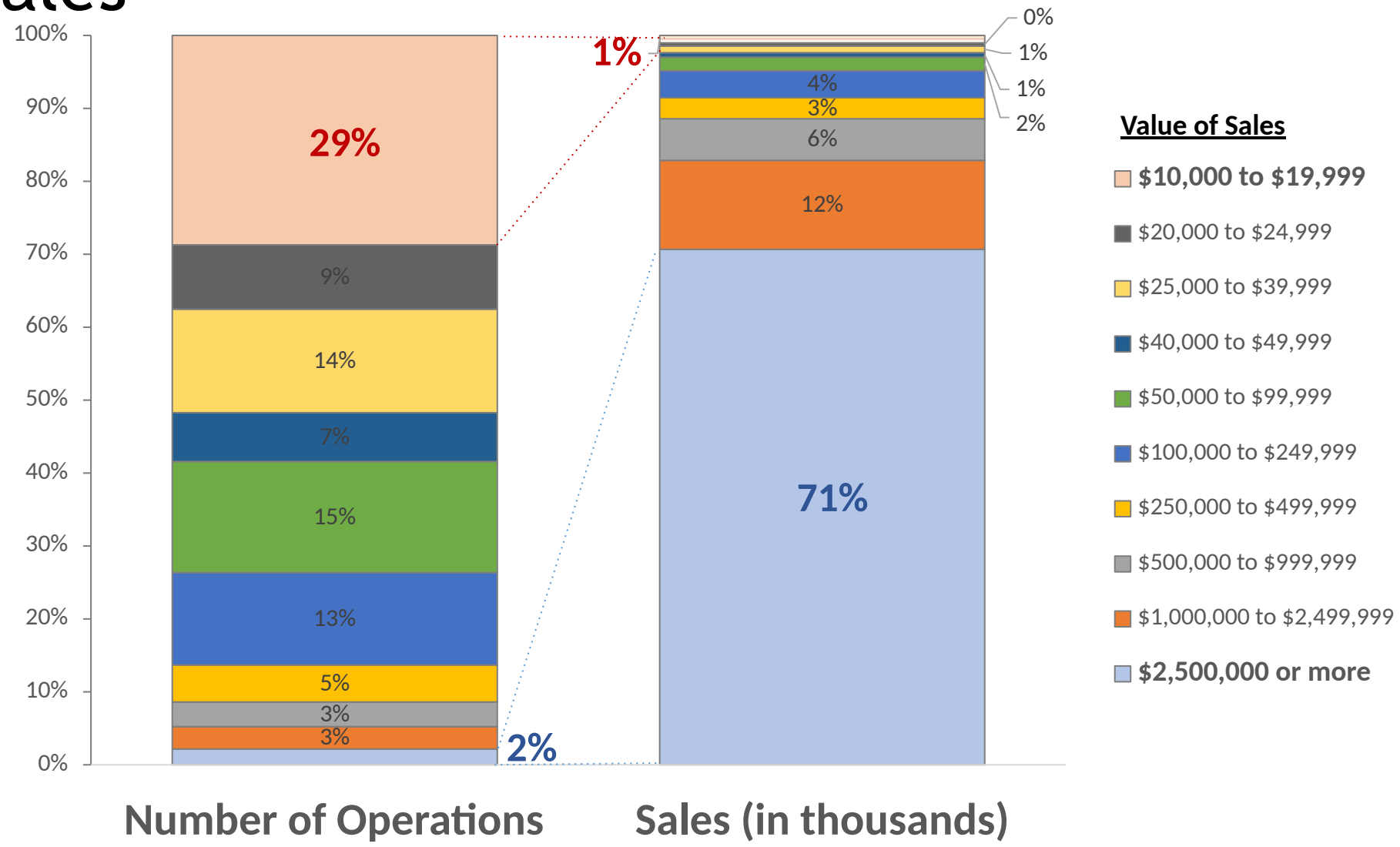
Source: 2012 Census of Agriculture. Census of Horticultural Specialties (2014)

Operations and area grown under Protection in the U.S. (2014)



Source: 2012 Census of Agriculture. Census of Horticultural Specialties (2014)

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

Type of Risk	Source	Greenhouse tomatoes	Field-grown tomatoes
Yield	Weather	Low	High
Price	Supply Demand	Relatively Low	High
Cost	Production inputs	High	Relatively low

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

Source: Asci, S., J.J. VanSickle, and D.J. Cantliffe. International Food and Agribusiness Management Review 17(2014).

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?

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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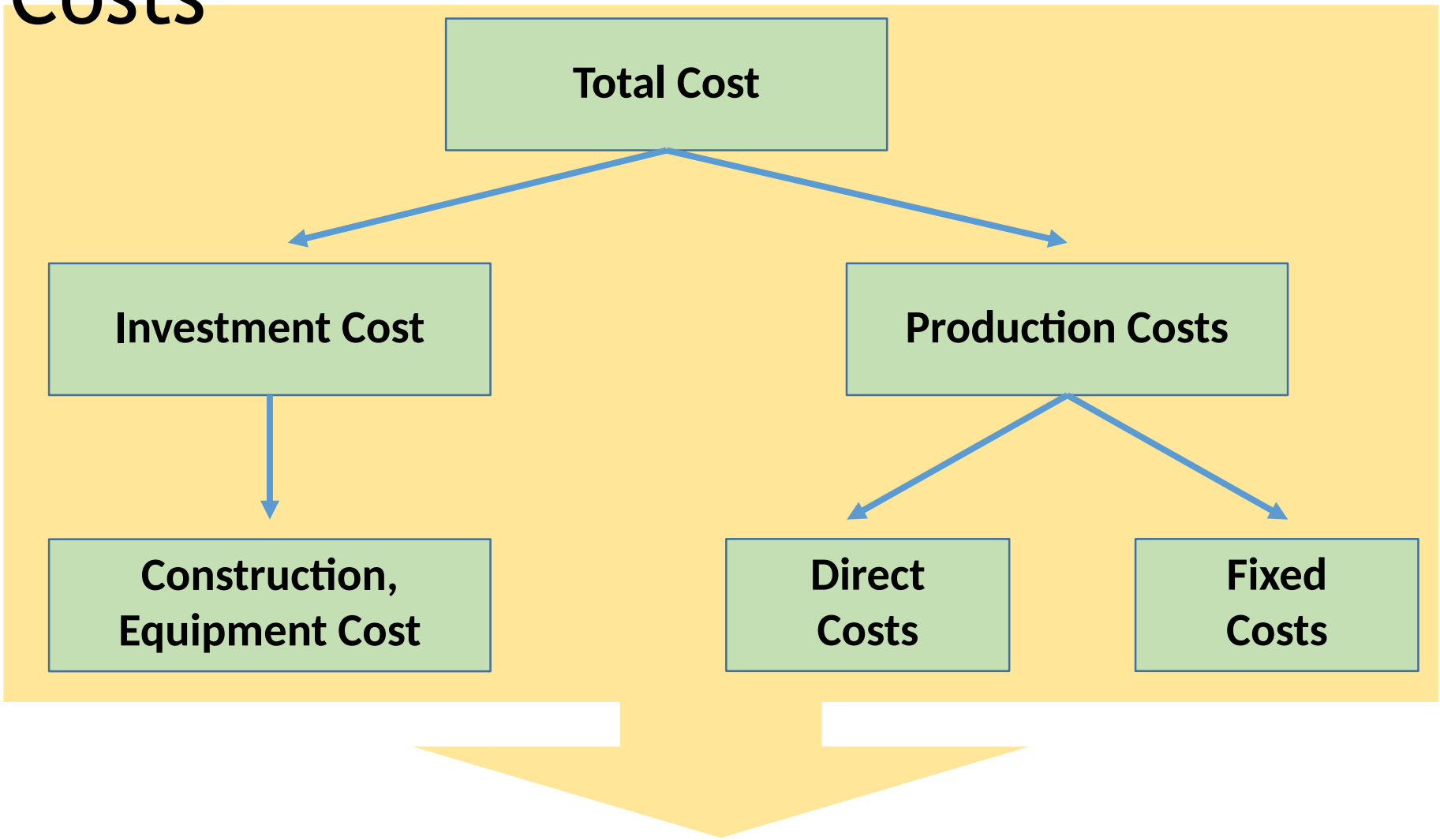
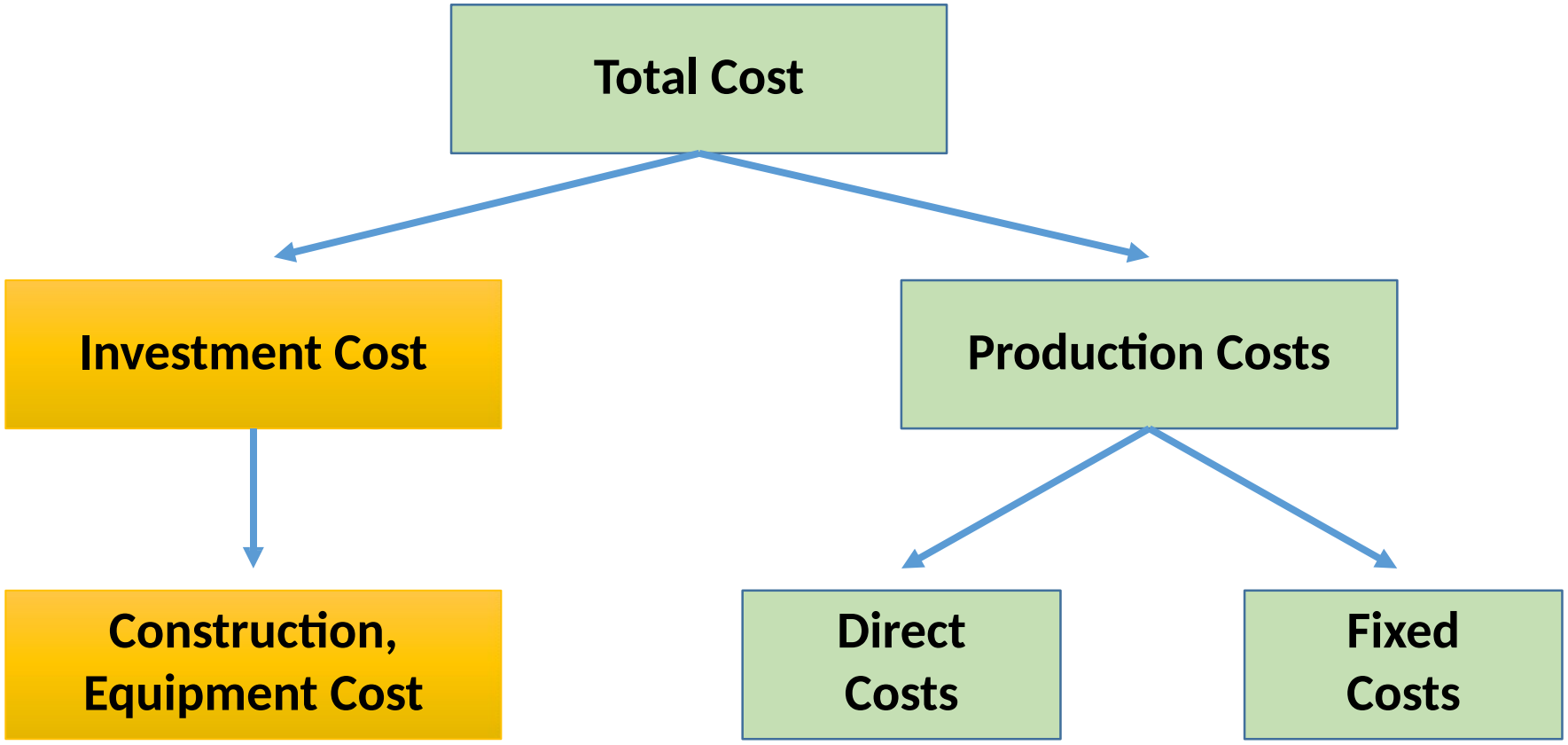
Greenhouse tomatoes: Costs



Depends on the structural design and cropping schedule

Greenhouse tomatoes: 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.

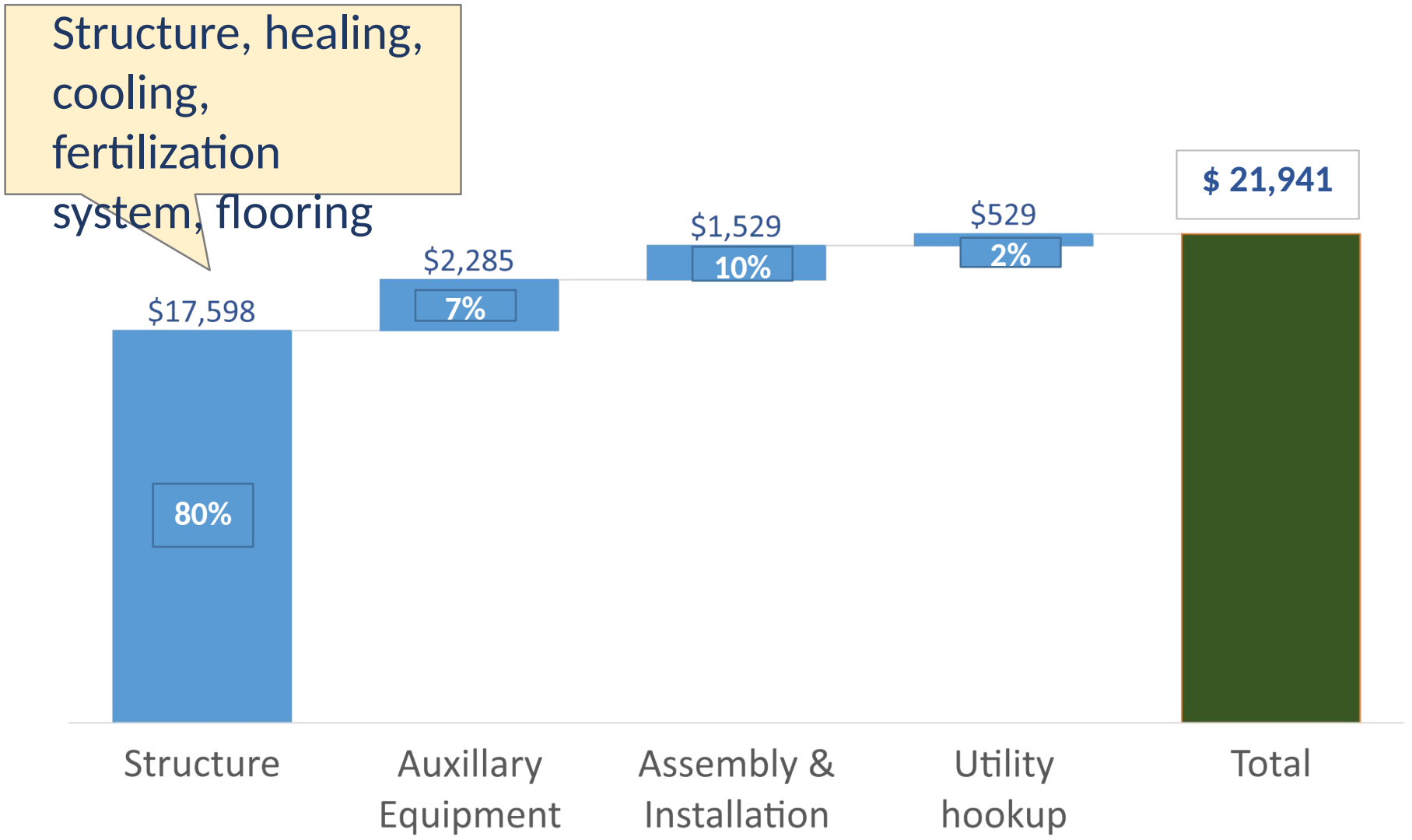
- Flooring
  - **Most common in MS**: round cloth, black plastic, and pea gravel for walkways
  - Other options: bare ground, wall-to wall gravel, concrete walkways, or wall-to-wall concrete.

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

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).

Initial Capital Investment (2,301 sq. ft.)



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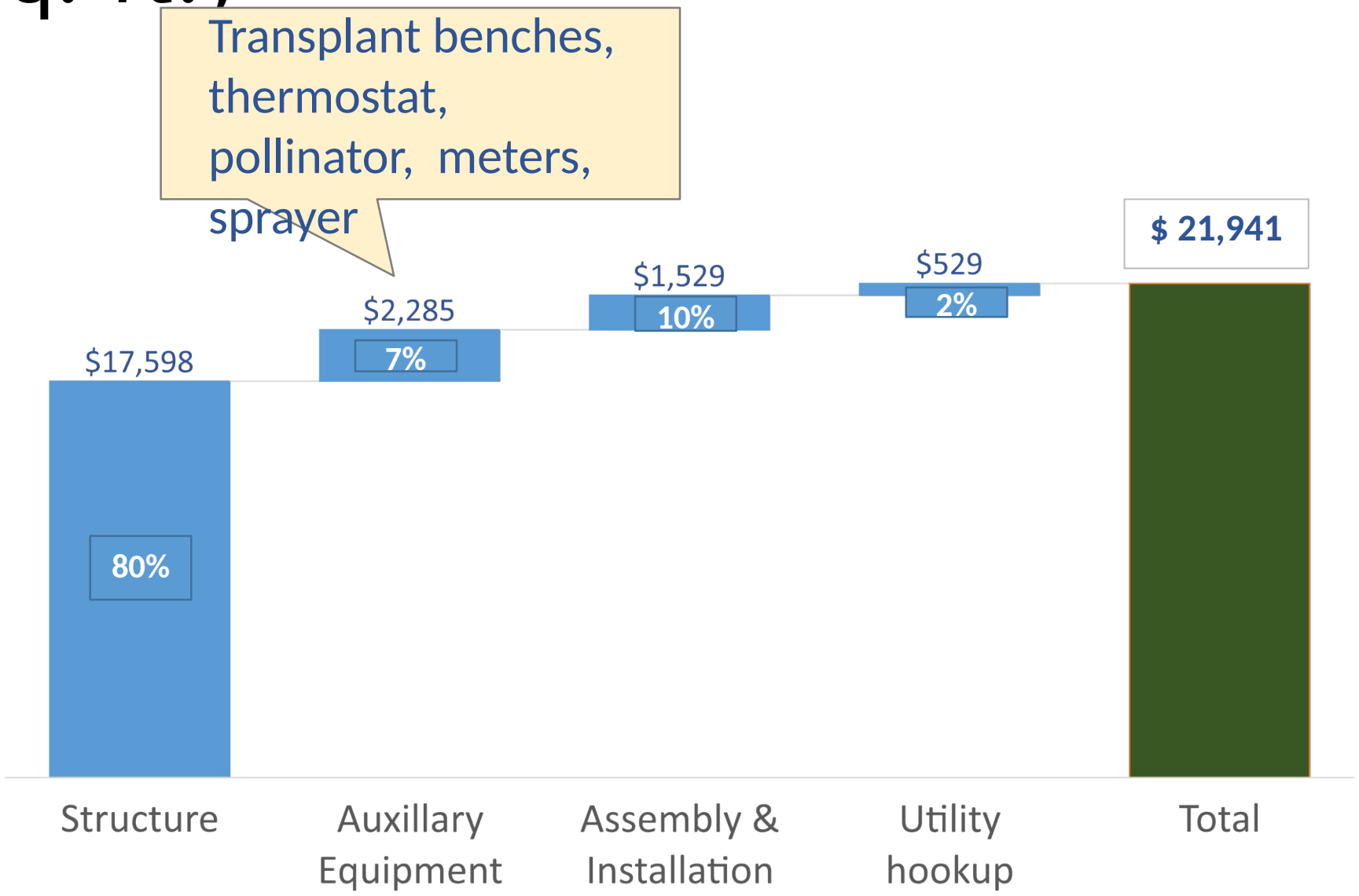

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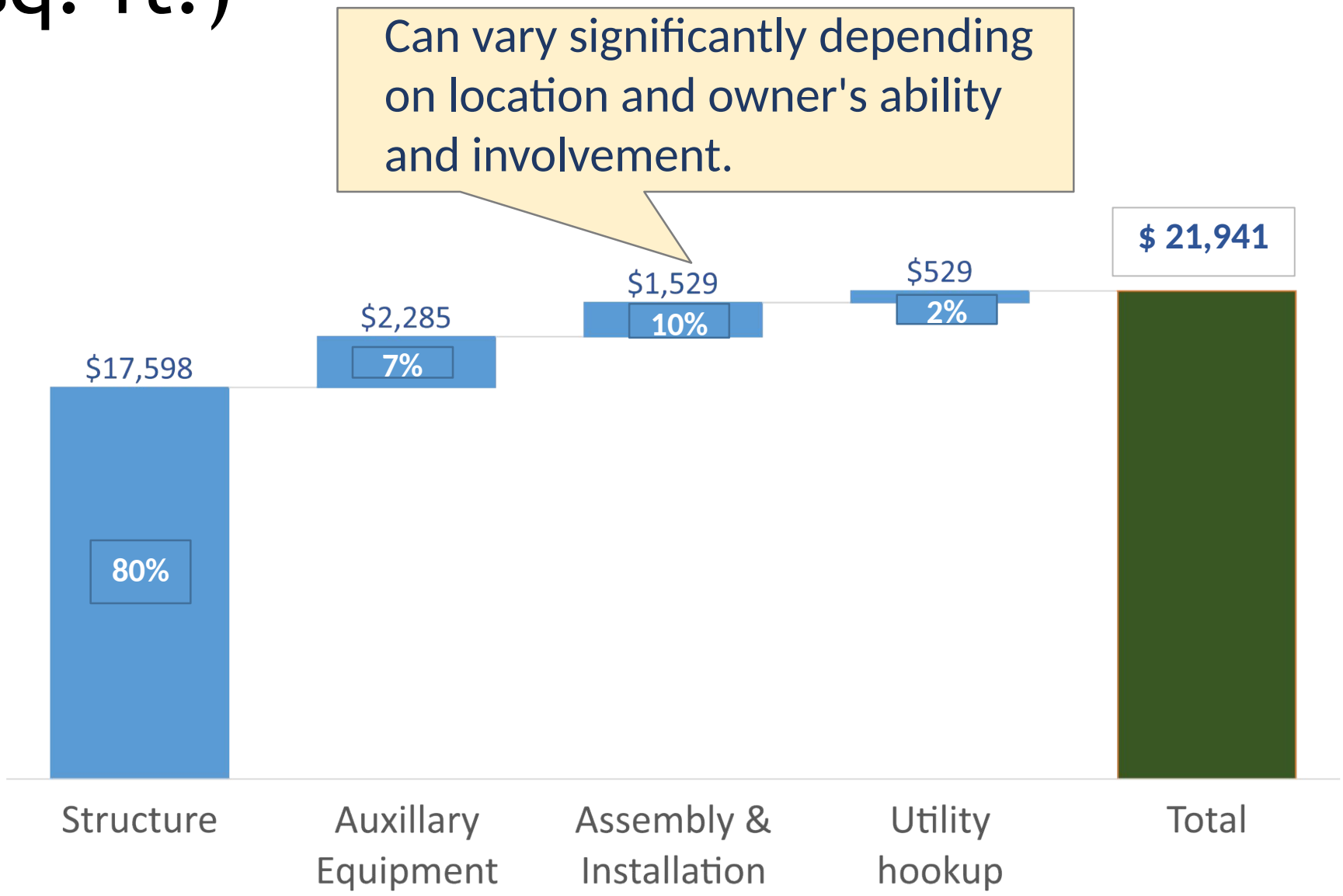

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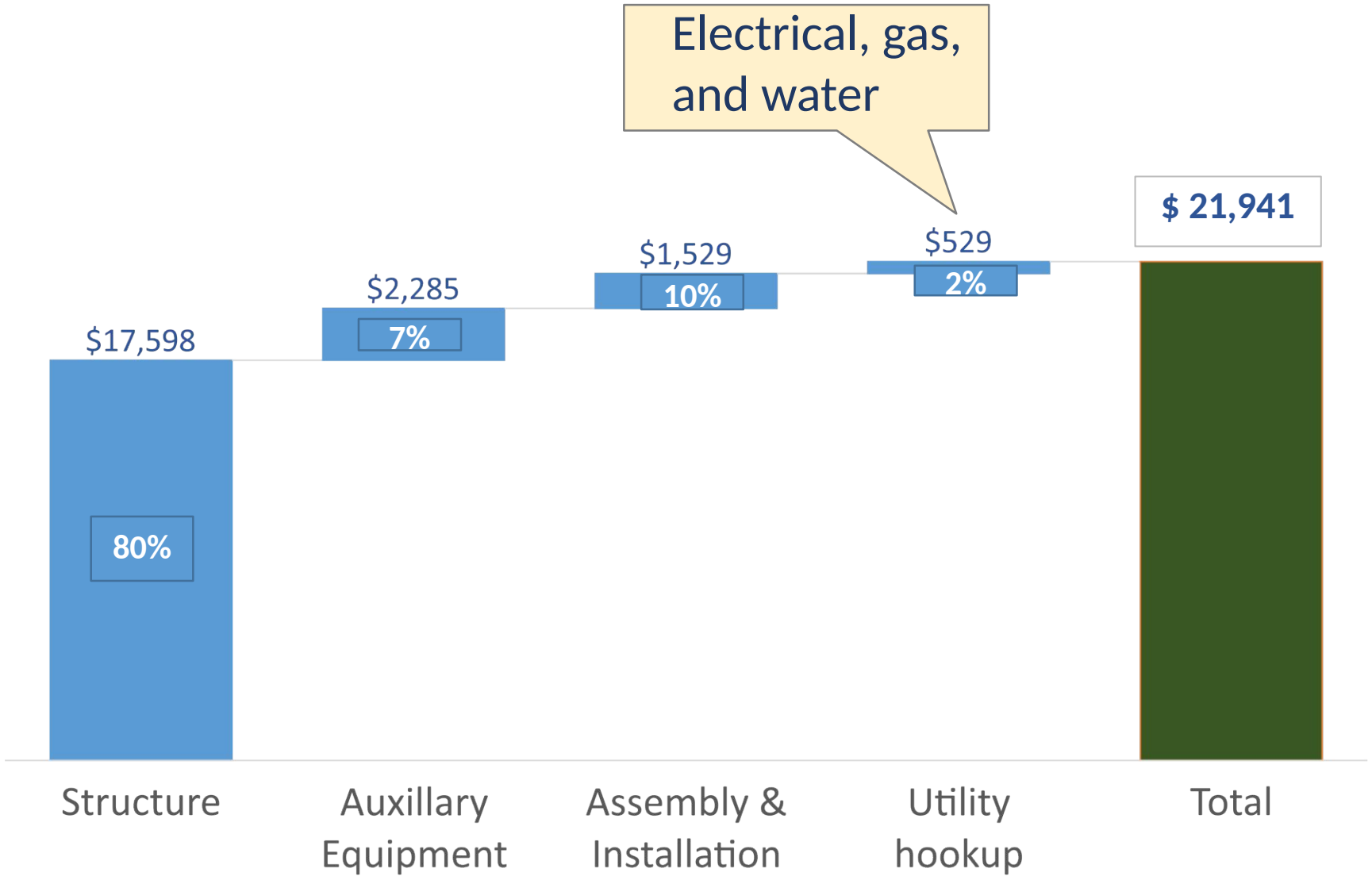


Initial Capital Investment

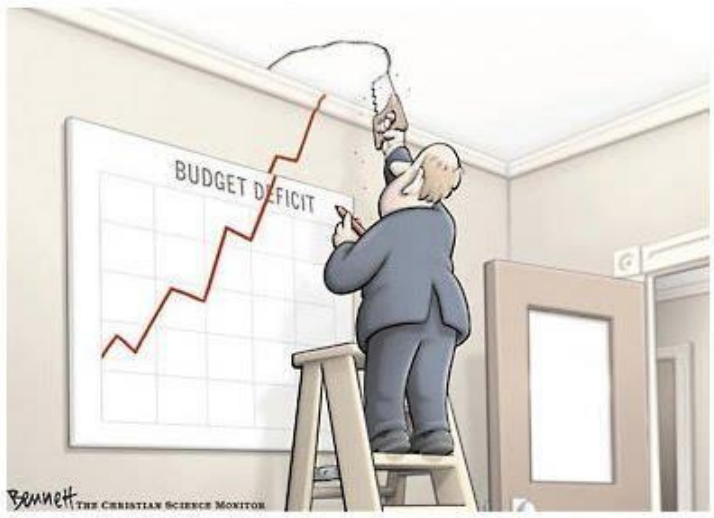
Quonset-type greenhouse
24’ x 96’
(2,304 sq. ft. or 0.05 acres)

$21,941
= $9.50 per ft^2

- 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.

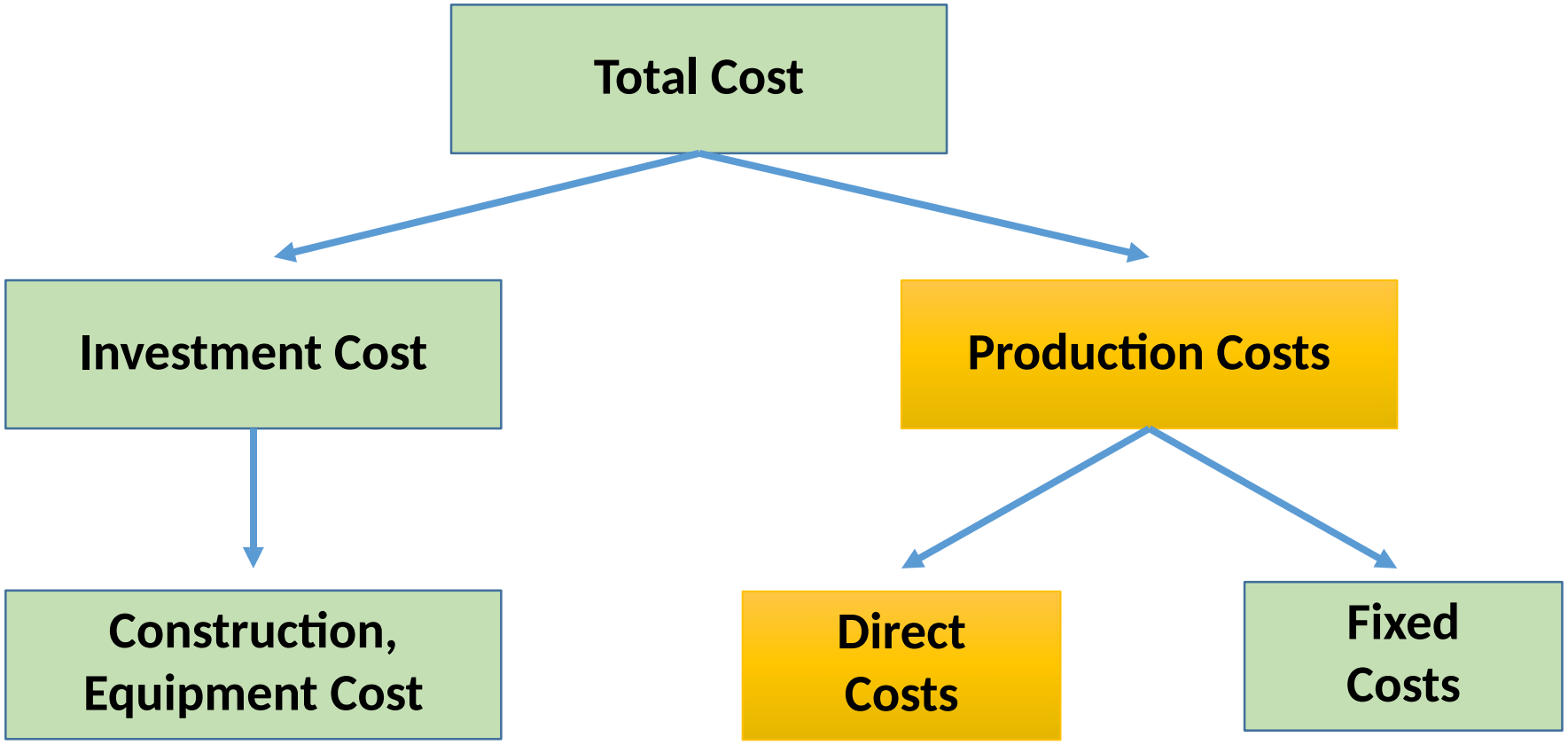


- Plan for contingencies
  - Include a contingency category in your budget
  - Estimated guess (some people use 10% of cost).

Considerations

- Sacrifice quality to keep costs low.
- Buy more greenhouse than you need.

Greenhouse tomatoes: Costs



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.)

	Spring Crop	Fall Crop	One Crop
Labor	1,544	1,207	2,466
Seed	261	261	261
Fertigation	430	404	798
Fungicide	162	114	244
Insecticide	39	27	59
Boxes	660	495	1,155
Other	168	140	209
	$ 3,265	**$ 2,648**	**$ 5,192**

Expected Yields	**8,000 lbs.**	**6,000 lbs.**	**14,000 lbs.**

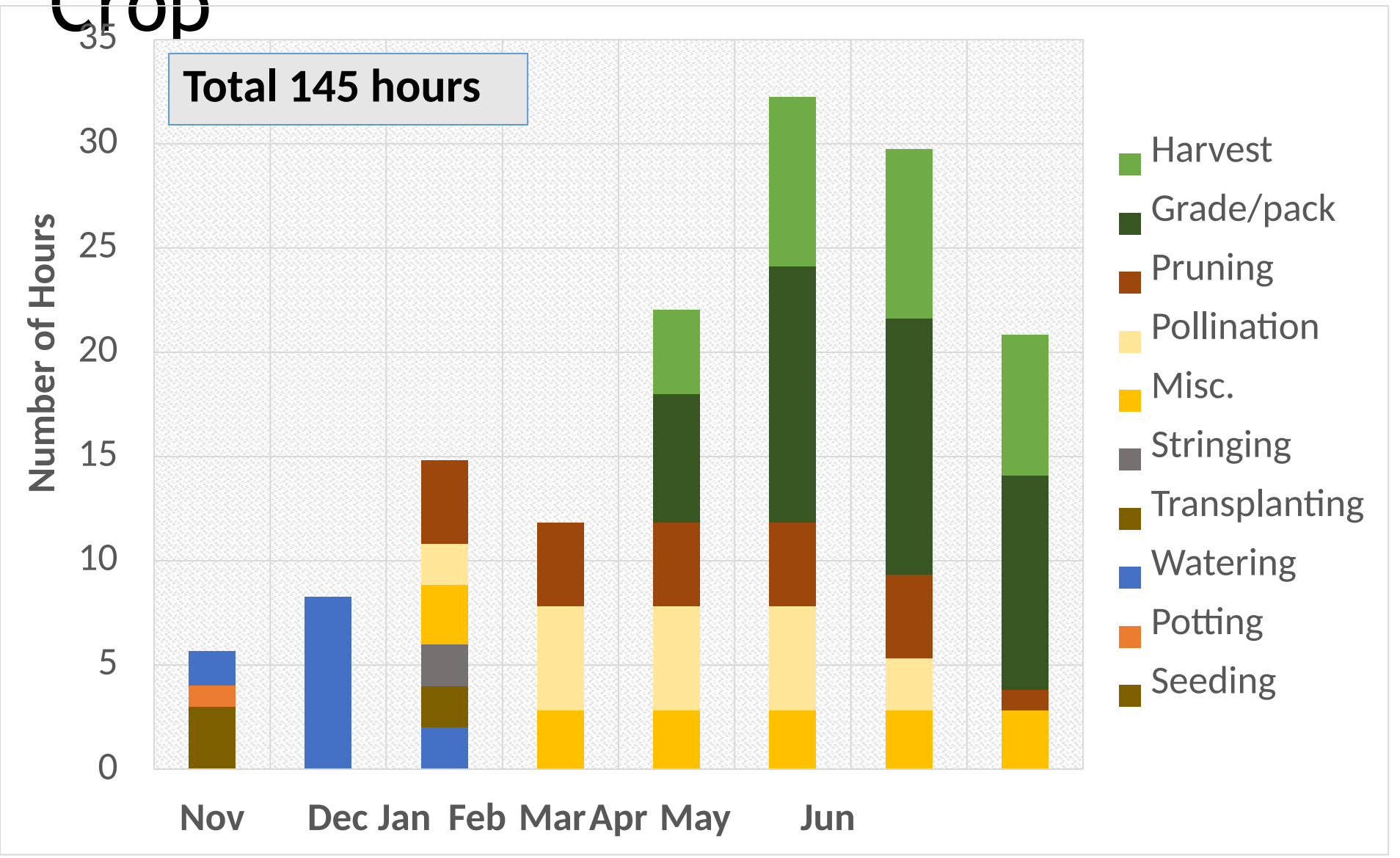
Direct Costs

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

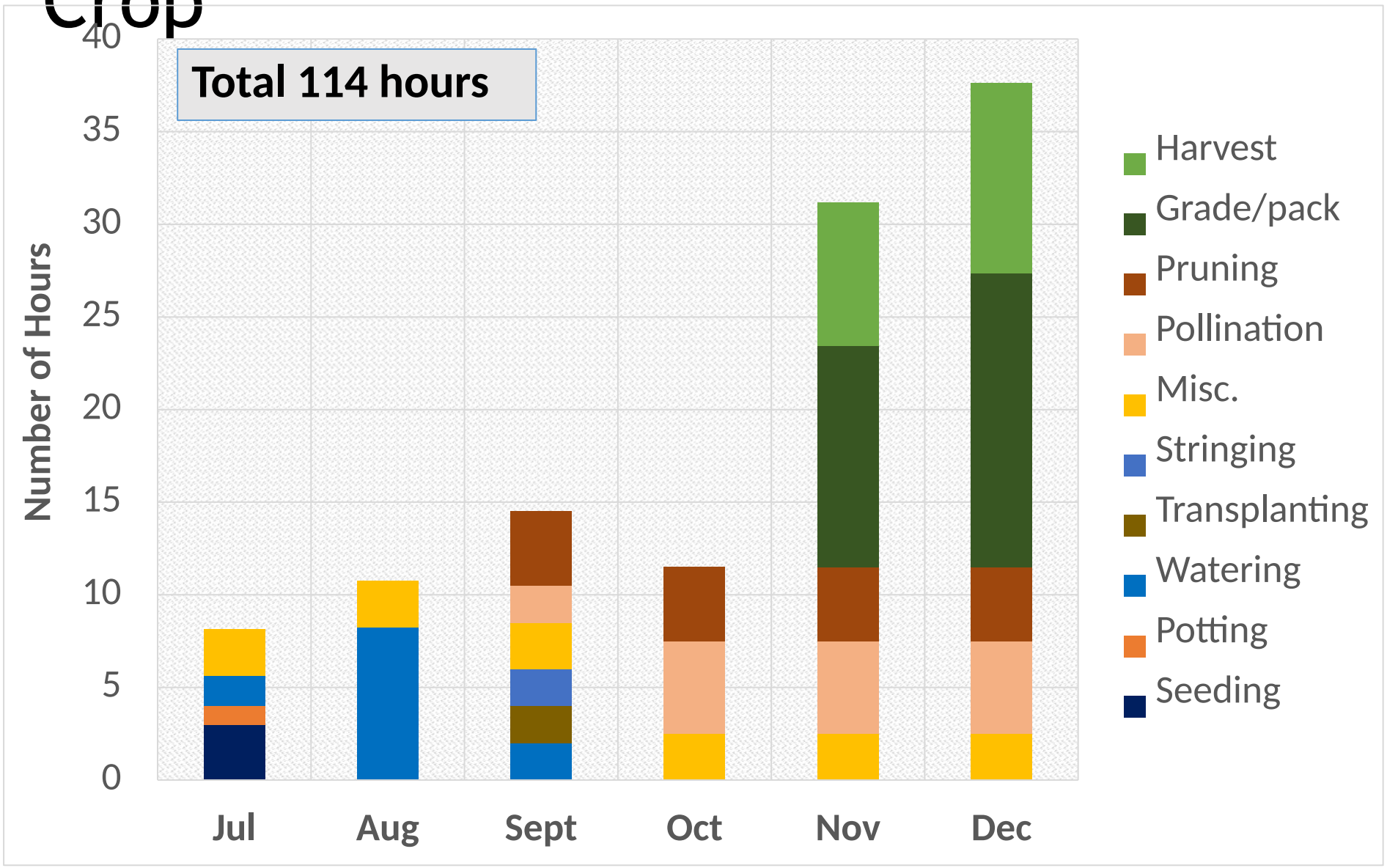
- Labor (~50% cost)
  - Potting
  - Watering
  - Transplanting
  - Pollination
  - Pruning
  - Harvest
  - Grade/pack

- Automatization can help

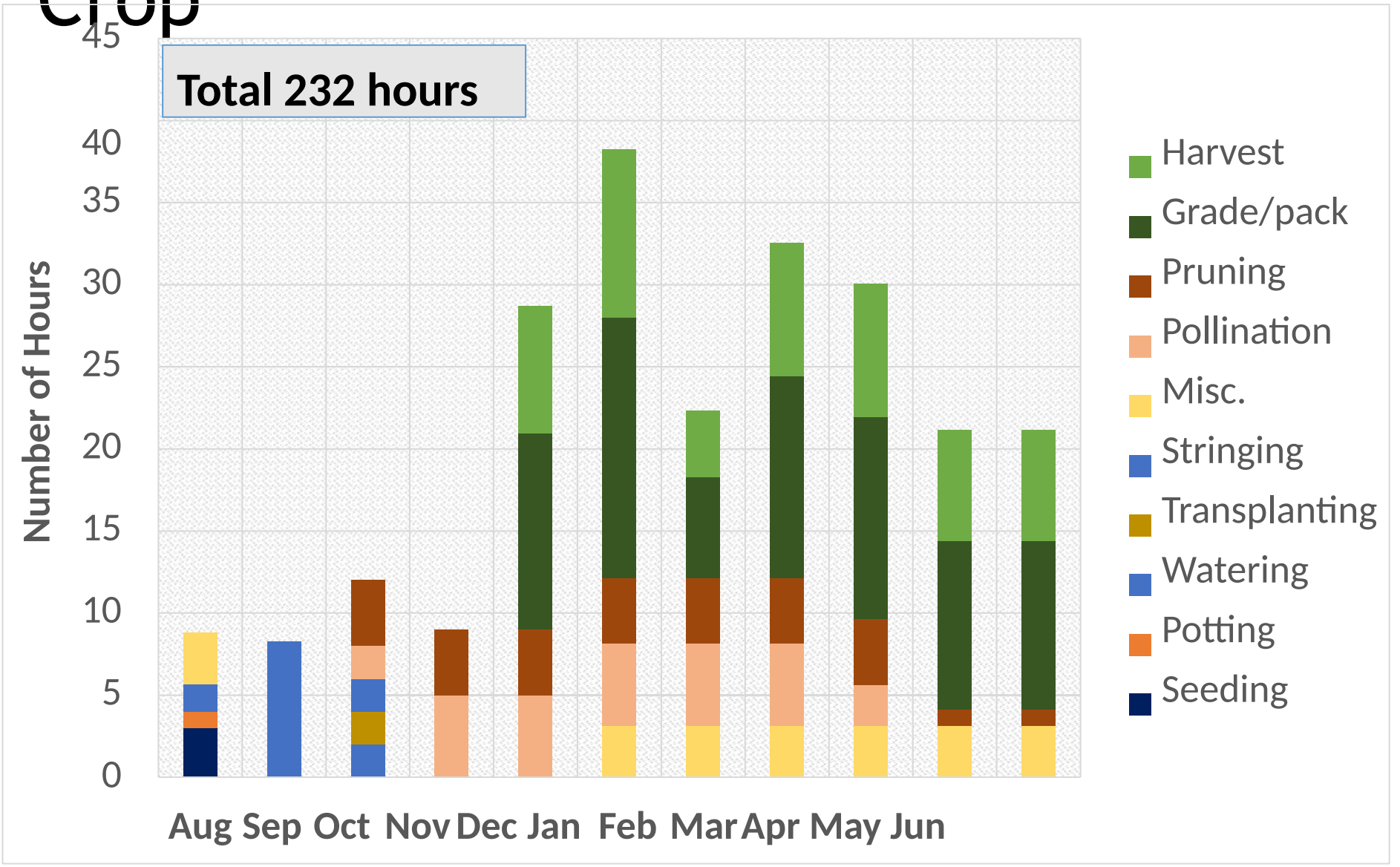
Labor requirements - Spring Crop



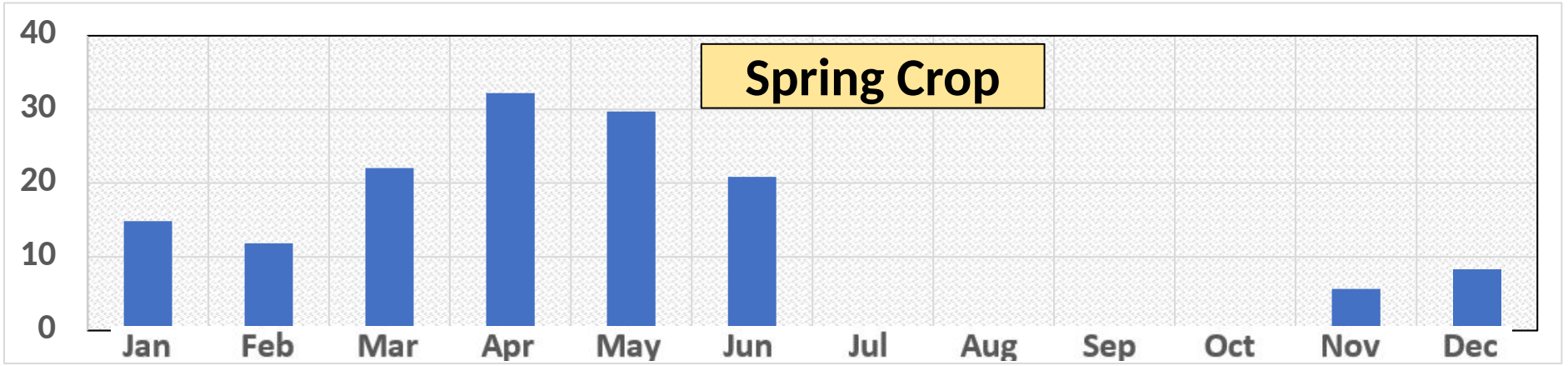
Labor requirements - Fall Crop

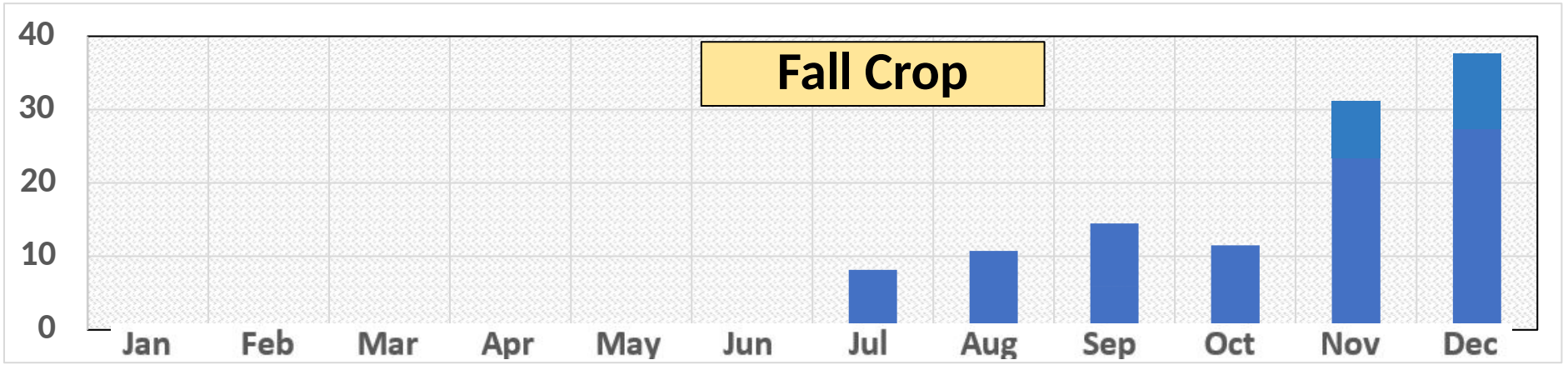


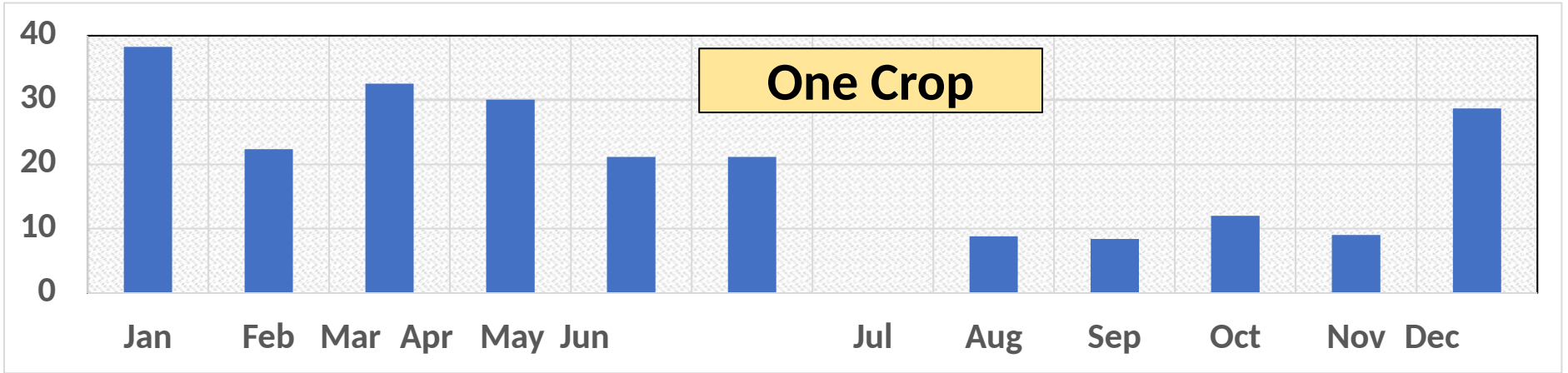
Labor requirements - One Crop



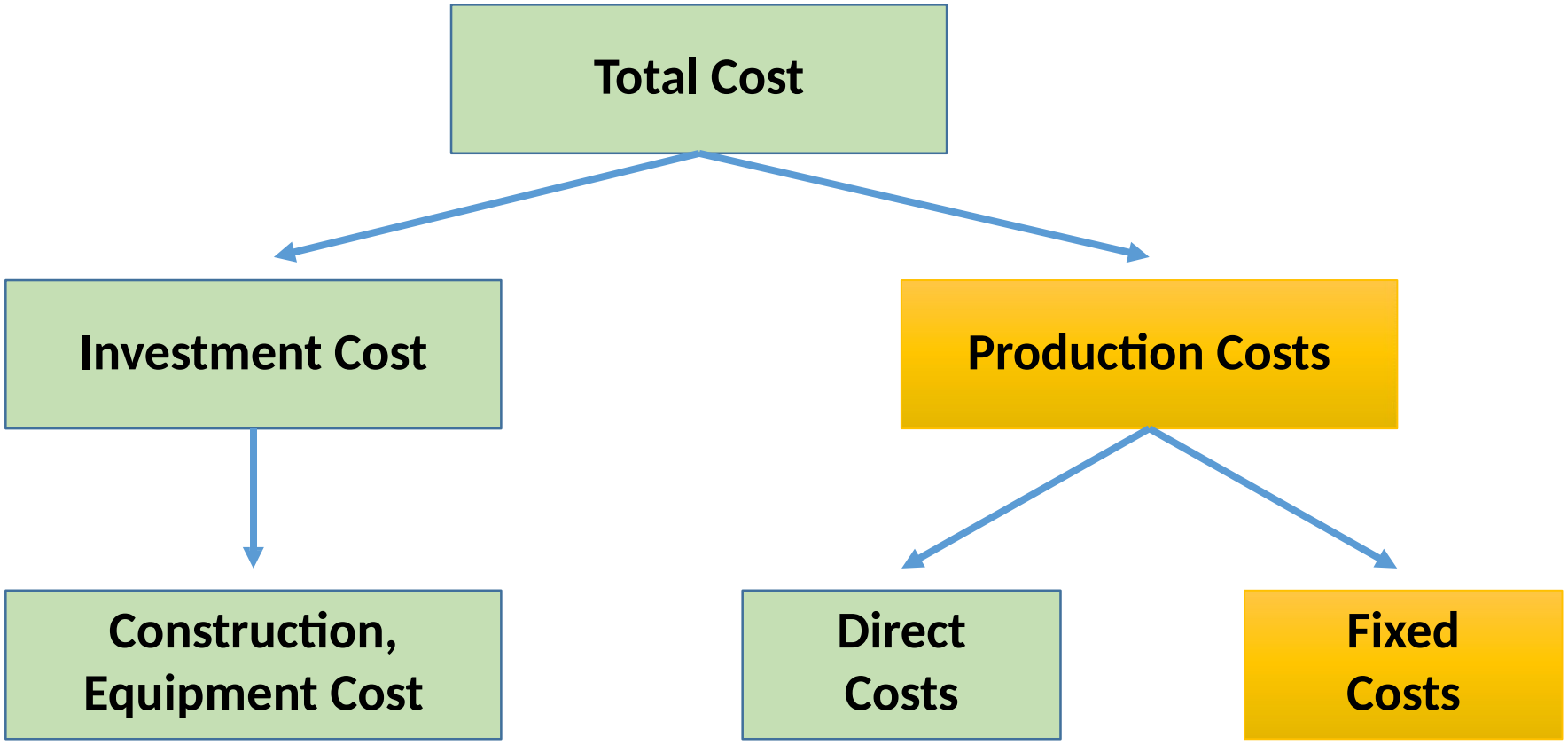
Labor Requirements (hours)







Greenhouse tomatoes: Costs



Fixed Costs (2,301 sq. ft.)

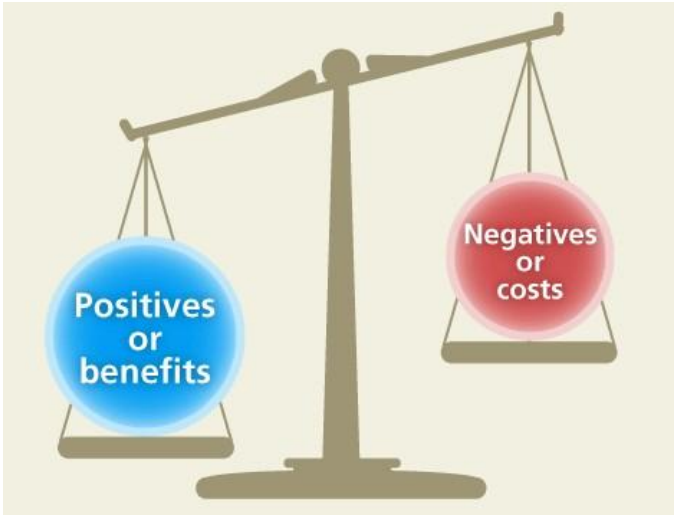
Annual Ownership Costs	
Depreciation	2,6702
Interest	510
Insurance and taxes	389
	$ 3,570
Overhead expenses:	
Heating, water, electricity, telephone, lab fees, repair and maintenance	**$ 3,272**
Total fixed cost	**$ 6,843**

- 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

	Price($/lb)										
Yield(lb)	**0.75**	**0.90**	**1.05**	**1.20**	**1.35**	**1.50**	**1.65**	**1.80**	**1.95**	**2.10**	**2.25**
4,000	(4,165)	(3,565)	(2,965)	(2,365)	(1,765)	(1,165)	(565)	35	635	1,235	1,835
4,800	(3,565)	(2,845)	(2,125)	(1,405)	(685)	35	755	1,475	2,195	2,915	3,635
5,600	(2,965)	(2,125)	(1,285)	(445)	395	1,235	2,075	2,915	3,755	4,595	5,435
6,400	(2,365)	(1,405)	(445)	515	1,475	2,435	3,395	4,355	5,315	6,275	7,235
7,200	(1,765)	(685)	395	1,475	2,555	3,635	4,715	5,795	6,875	7,955	9,035
8,000	(1,165)	35	1,235	2,435	3,635	4,835	6,035	7,235	8,435	9,635	10,835
8,800	(565)	755	2,075	3,395	4,715	6,035	7,355	8,675	9,995	11,315	12,635
9,600	35	1,475	2,915	4,355	5,795	7,235	8,675	10,115	11,555	12,995	14,435
10,400	635	2,195	3,755	5,315	6,875	8,435	9,995	11,555	13,115	14,675	16,235
11,200	1,235	2,915	4,595	6,275	7,955	9,635	11,315	12,995	14,675	16,355	18,035
12,000	1,835	3,635	5,435	7,235	9,035	10,835	12,635	14,435	16,235	18,035	19,835

Returns above total expenses (including depreciation, interest and taxes)
Fall Crop

	Price($/lb)										
Yield (lb)	**0.75**	**0.90**	**1.05**	**1.20**	**1.35**	**1.50**	**1.65**	**1.80**	**1.95**	**2.10**	**2.25**
3,000	(3,340)	(2,890)	(2,440)	(1,990)	(1,540)	(1,090)	(640)	(190)	260	710	1,160
3,600	(2,890)	(2,350)	(1,810)	(1,270)	(730)	(190)	350	890	1,430	1,970	2,510
4,200	(2,440)	(1,810)	(1,180)	(550)	80	710	1,340	1,970	2,600	3,230	3,860
4,800	(1,990)	(1,270)	(550)	170	890	1,610	2,330	3,050	3,770	4,490	5,210
5,400	(1,540)	(730)	80	890	1,700	2,510	3,320	4,130	4,940	5,750	6,560
6,000	(1,090)	(190)	710	1,610	2,510	3,410	4,310	5,210	6,110	7,010	7,910
6,600	(640)	350	1,340	2,330	3,320	4,310	5,300	6,290	7,280	8,270	9,260
7,200	(190)	890	1,970	3,050	4,130	5,210	6,290	7,370	8,450	9,530	10,610
7,800	260	1,430	2,600	3,770	4,940	6,110	7,280	8,450	9,620	10,790	11,960
8,400	710	1,970	3,230	4,490	5,750	7,010	8,270	9,530	10,790	12,050	13,310
9,000	1,160	2,510	3,860	5,210	6,560	7,910	9,260	10,610	11,960	13,310	14,660

Returns above total expenses (including depreciation, interest and taxes)
One Crop

	Price($/lb)										
Yield(lb)	**0.75**	**0.90**	**1.05**	**1.20**	**1.35**	**1.50**	**1.65**	**1.80**	**1.95**	**2.10**	**2.25**
7,000	(6,810)	(5,760)	(4,710)	(3,660)	(2,610)	(1,560)	(510)	540	1,590	2,640	3,690
8,400	(5,760)	(4,500)	(3,240)	(1,980)	(720)	540	1,800	3,060	4,320	5,580	6,840
9,800	(4,710)	(3,240)	(1,770)	(300)	1,170	2,640	4,110	5,580	7,050	8,520	9,990
11,200	(3,660)	(1,980)	(300)	1,380	3,060	4,740	6,420	8,100	9,780	11,460	13,140
12,600	(2,610)	(720)	1,170	3,060	4,950	6,840	8,730	10,620	12,510	14,400	16,290
14,000	(1,560)	540	2,640	4,740	6,840	8,940	11,040	13,140	15,240	17,340	19,440
15,400	(510)	1,800	4,110	6,420	8,730	11,040	13,350	15,660	17,970	20,280	22,590
16,800	540	3,060	5,580	8,100	10,620	13,140	15,660	18,180	20,700	23,220	25,740
18,200	1,590	4,320	7,050	9,780	12,510	15,240	17,970	20,700	23,430	26,160	28,890
19,600	2,640	5,580	8,520	11,460	14,400	17,340	20,280	23,220	26,160	29,100	32,040
21,000	3,690	6,840	9,990	13,140	16,290	19,440	22,590	25,740	28,890	32,040	35,190

Summary of costs and break-even

	Spring Crop	Fall Crop	One crop
Direct cost	3,265	2,648	5,192
Fixed and Overhead Cost	3,900	2,942	6,843
Total Cost	**$ 7,165**	**$ 5,590**	**$ 12,034**
Cost per ft^2	$ 3.11	$ 2.43	$ 5.22
Yield per ft^2	3.47 lbs.	2.60 lbs.	6.08 lbs.
Price needed to breakeven	**$0.90**	**$0.93**	**$0.86**

Payback period

- Initial investment = **$21,941**

	Payback period				
	3 years	**5 years**	**7 years**	**10 years**	**12 years**
Profit required	$ 7,314	$ 4,388	$ 3,134	$ 2,194	$ 1,828

- How fast do you want to recover your investment?

Payback - One Crop

	Price($/lb)										
Yield (lb)	**0.75**	**0.90**	**1.05**	**1.20**	**1.35**	**1.50**	**1.65**	**1.80**	**1.95**	**2.10**	**2.25**
7,000	-31%	-26%	-21%	-17%	-12%	-7%	-2%	2%	7%	12%	17%
8,400	-26%	-21%	-15%	-9%	-3%	2%	8%	14%	20%	25%	31%
9,800	-21%	-15%	-8%	-1%	5%	12%	19%	25%	32%	39%	46%
11,200	-17%	-9%	-1%	6%	14%	22%	29%	37%	45%	52%	60%
12,600	-12%	-3%	5%	14%	23%	31%	40%	48%	57%	66%	74%
14,000	-7%	2%	12%	22%	31%	41%	50%	60%	69%	79%	89%
15,400	-2%	8%	19%	29%	40%	50%	61%	71%	82%	92%	103%
16,800	2%	14%	25%	37%	48%	60%	71%	83%	94%	106%	117%
18,200	7%	20%	32%	45%	57%	69%	82%	94%	107%	119%	132%
19,600	12%	25%	39%	52%	66%	79%	92%	106%	119%	133%	146%
21,000	17%	31%	46%	60%	74%	89%	103%	117%	132%	146%	160%

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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
  - 4th 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.

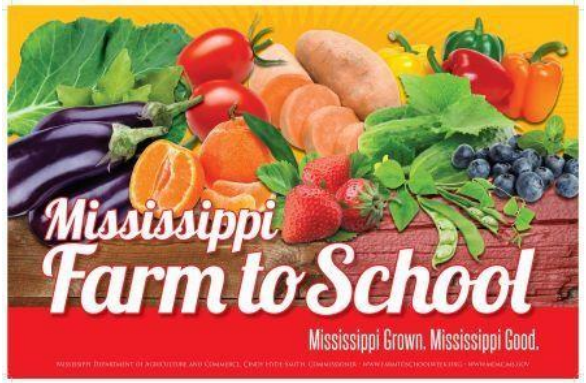
- Local food systems programs

  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

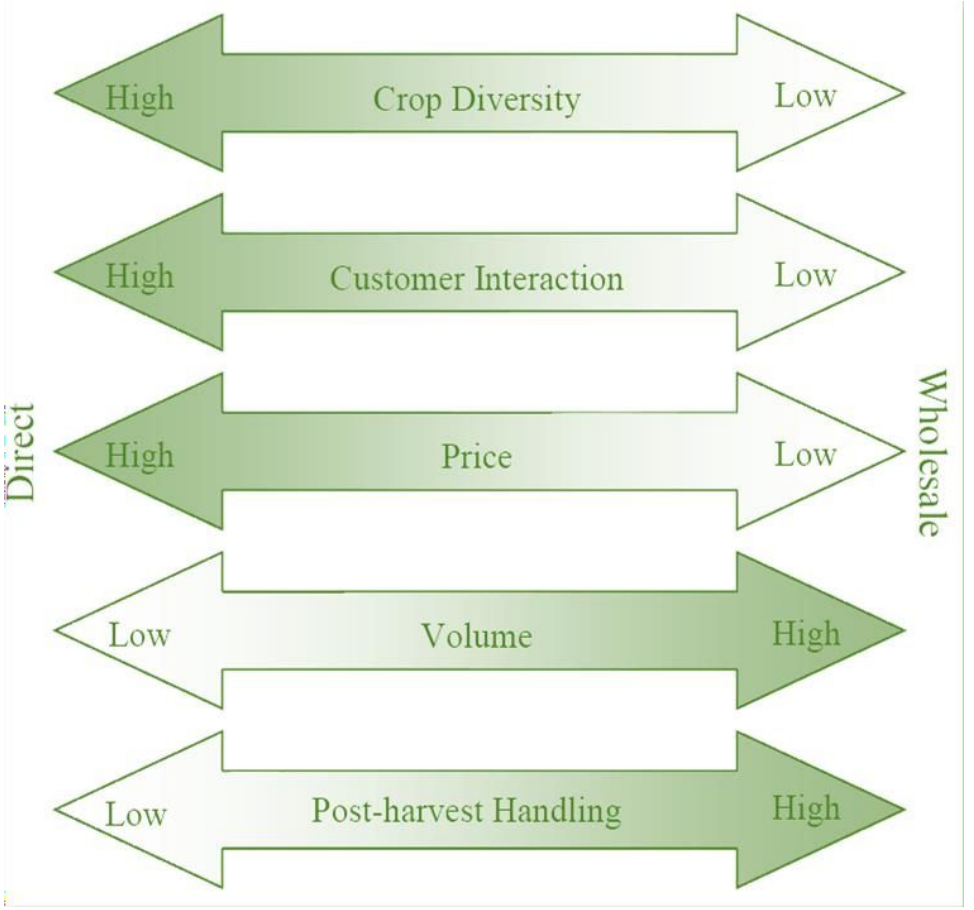
- Good alternative for small farms
  - Not always easy for local farmers to access larger-volume marketing channels.
  - Farmers' markets, CSA's, and roadside stands.
- High price per unit - small sale volumes.
- Can combine with sales to foodservice, institutions and retail food markets
  - Increase 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

Strategy: Market channel selection

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

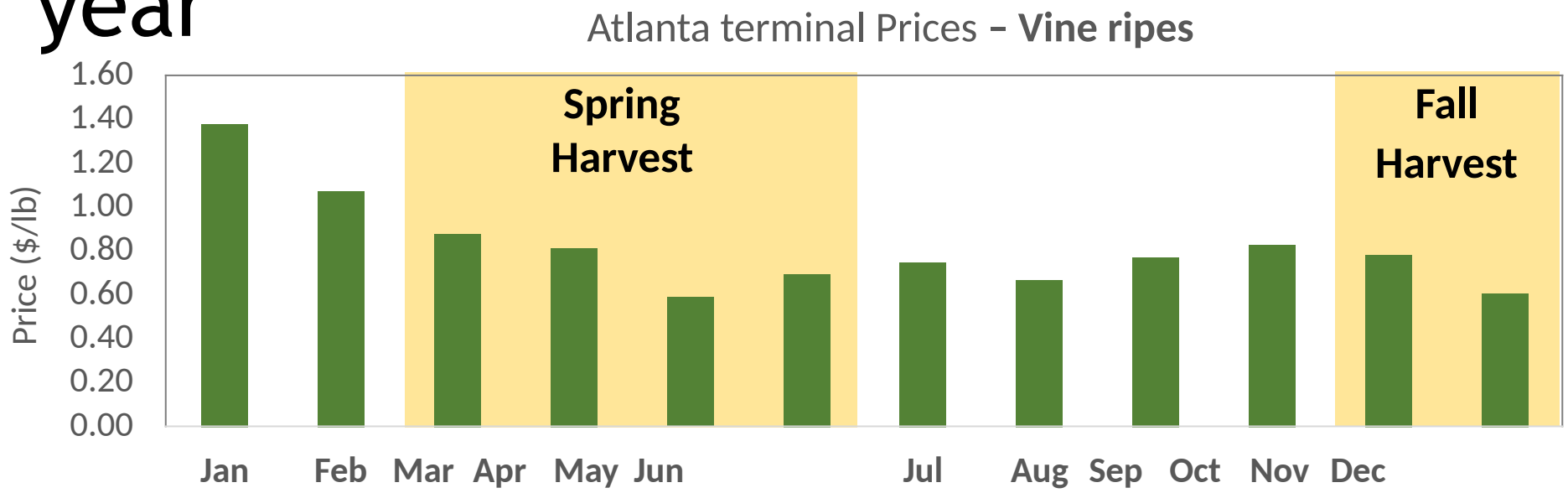
- Evaluate channels based on performance:
  - Weekly sales
  - Costs
  - Labor requirements
  - Risks
  - Profits
  - Personal goals

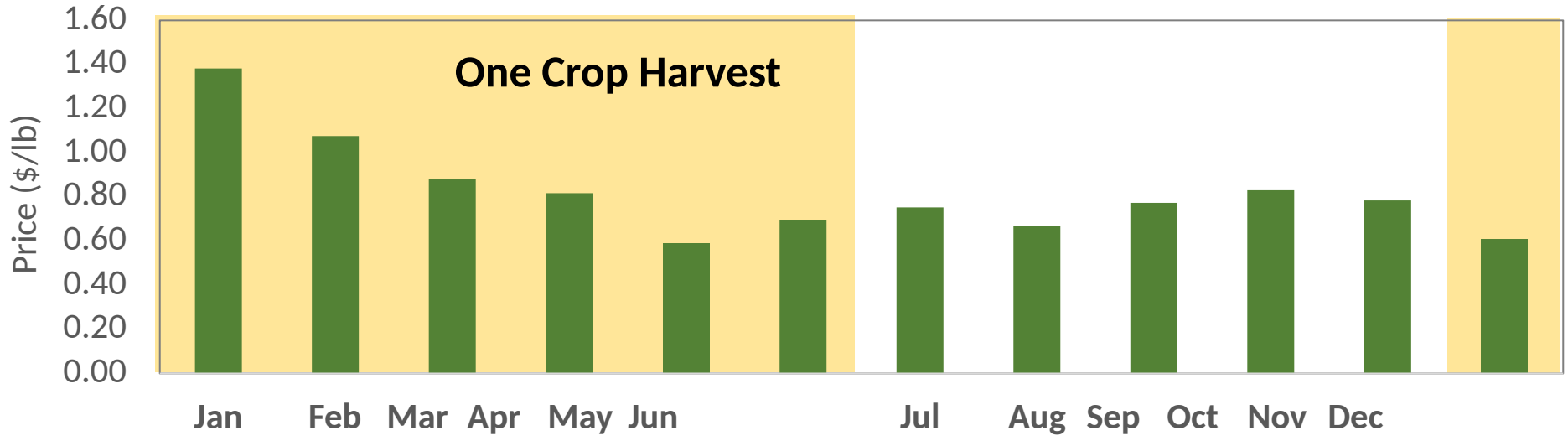
Multiple channel strategy

Strategy: Pricing

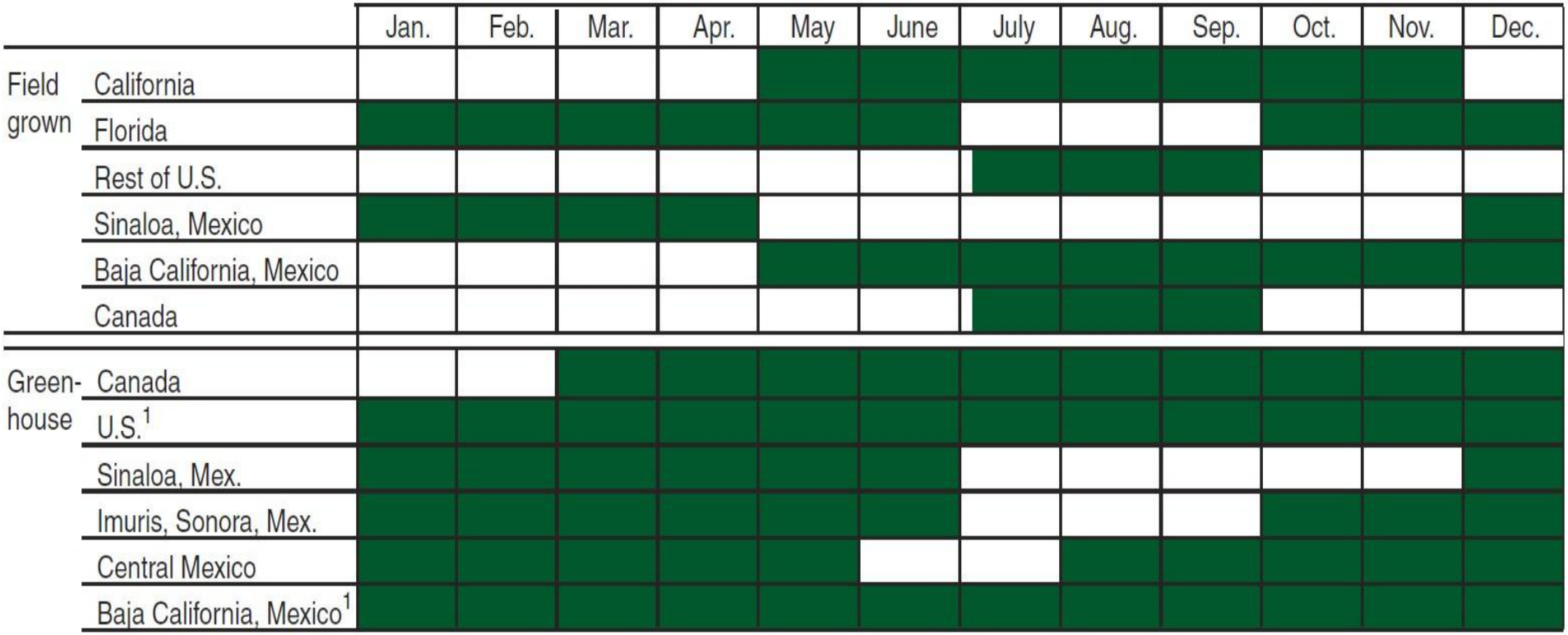
- Setting the right price - know your production cost!
  - Include marketing costs.
  - Price should offer a sustainable rate of return on investment
- Price premium = higher quality, attractive product
  - Production costs and product quality are higher compared with field production:
  - Quality of competitors.
- Research the market ahead of time
  - Reference Price: Wholesale Terminal Produce Prices,

Tomato prices vary throughout the year





Tomatoes shipping seasons by region



[1]Many 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

Outlin
e

- 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.

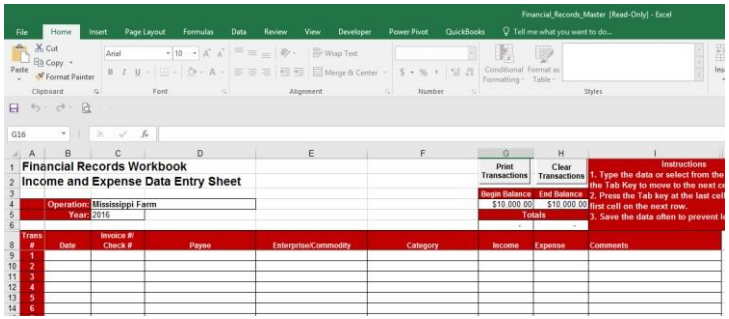
- **Production/Cultural records**
  - Field size, crop, land preparation, inputs used, irrigation, pesticide use
  - Harvest date, amount and quality of product harvested
  - How can we improve production?

- Key to make informed decisions
  - Investment decisions
  - Producing or buying decision

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



intuit Quicken

intuit QuickBooks

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:

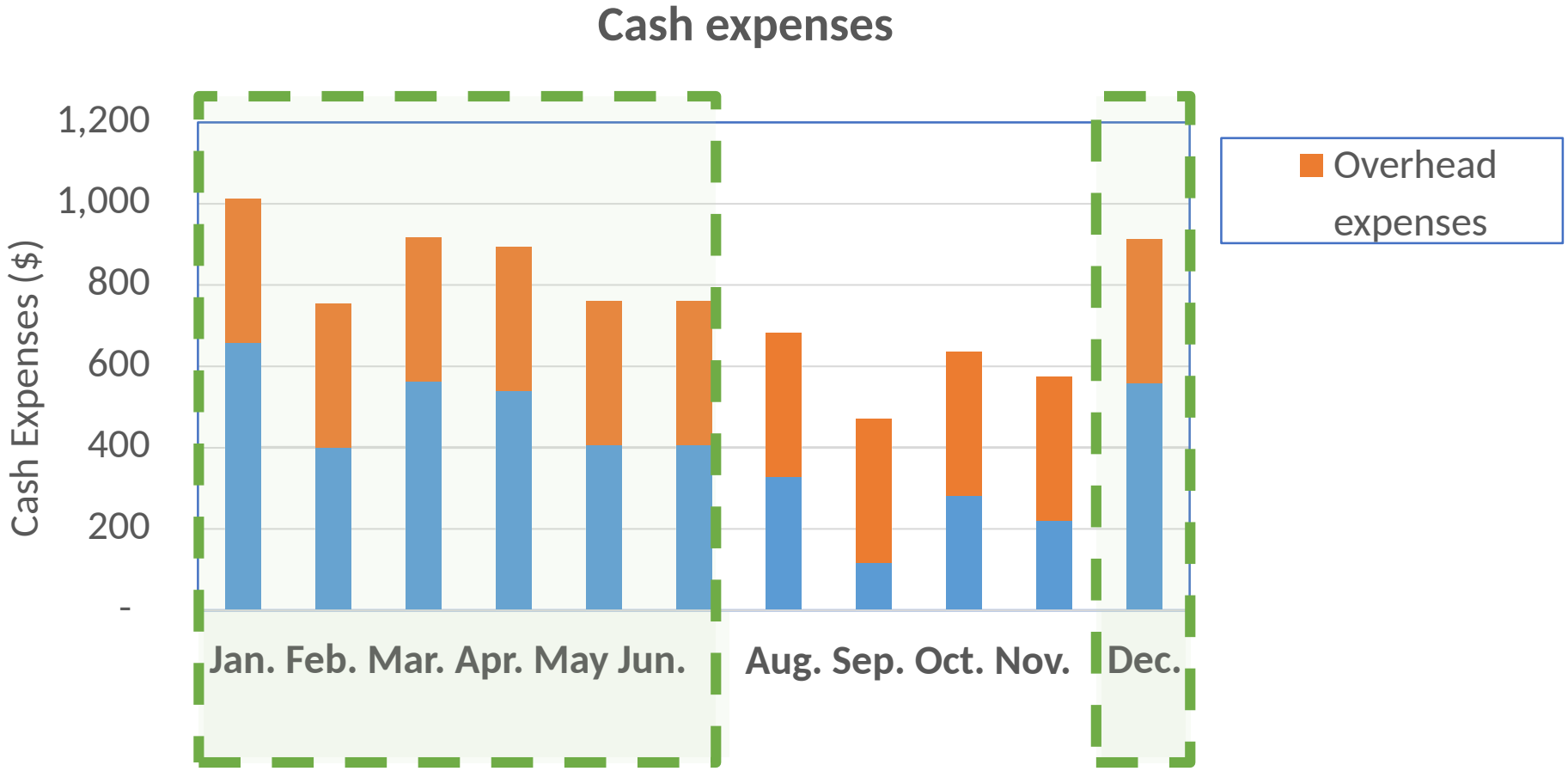
- **Balance sheet**: tells us the farm's financial position
  - Is our net worth growing over time?

    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



Note: Overhead expenses in this graph exclude depreciation.

Harvest = cash sales

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!

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