

Indoor Shrimp Production: Economics & Marketing

Kwamena Quagraine, Ph.D.

kquagrai@purdue.edu

Purdue University

INDOOR SHRIMP FARMING WORKSHOP
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Funding the Enterprise

- Be mindful of initial investments
 - Planning, designing, permitting fees
 - Capital acquisitions, constructions, etc.
 - Value/costs of existing or own assets to be used
- Funding sources
 - Equity funds – capital contributions from owner
 - Borrowed capital (loans) with interest
 - Grants
- Think of immediate, intermediate, and long term cash needs (startup, operating & cash flow).

Resources

- Water: Good ground water supply.
- Building:
 - Floor types & drainage
 - Insulation types ~ moisture barriers on walls and ceiling.
 - Water heater ~ types
 - Water Storage ~
 - Electrical Capacity ~
 - Back-up Generator ~

Requirements

- Recirculating Systems:
 - Production stages - 2 or 3?
 - Nursery system (1 or 2 phases)
 - Grow-out systems
- Pumps
- Solids Removal



Requirements

- Support Equipment:
 - Blowers ~
 - Heating System ~
 - Monitoring System ~
 - Feeding Equipment ~
 - Feed Storage ~ separate feed storage space (temperature controlled, insulated?)
 - Shrimp Handling Equipment ~ Nets, baskets, sorting equipment, graders
 - Lab Equipment ~ water quality kit, oxygen meter, microscope, assorted lab ware.

Advantages of Indoor Systems

- Efficient water use
- Small footprint
- Year round production
- Faster growth
- Lower disease rates
- Efficient feed use
- Lower feed requirements
- Better production management
- Higher yields
- Overall sustainability

Disadvantages of Indoor Systems

- High capital investment
- Technical operating complexity
- Power supply challenges
- Higher energy input
- Liner expense
- Disease risk
- Higher production costs

Shrimp Market Sizes

- The industry-wide standard is by count / lb.
 - “U/10” (under 10 count) - large, 10 & less weigh a lb
 - “61/70” shrimp (61-70 count), very small in size.
 - Shrimp industry - shrimp counts in the range of:
 - “21/25”
 - “26/30”
 - “31/35”
 - “36/40”



Recirculating Systems

- Phased production system usually produces higher overall survival rates & higher production per unit area than in single-phase grow out systems.
 - Production stages - 2 or 3?
 - Nursery system (1 or 2 phases)
 - Grow-out systems

Nursery System

- 1 or 2 –phase nursery system?
 - Grow post larvae (PLs) from 2 mg to as large as 3 - 6 g.
 - Bigger, stronger and uniform juveniles with better survival and a high potential for compensatory growth.
 - Flexibility in grow out production cycles (turnovers)
 - Reducing time to market size
 - Efficient use of resources – tanks, ponds, etc.
 - Improves health and disease management - more developed immune system

Nursery System

- Disadvantages
 - More infrastructure investments, e.g., higher construction costs
 - Higher operational costs
 - High labor requirements ~ a sensitive stage in the production process
 - Involves high stocking density and lower water exchange, which could results in higher organic loading, poor water quality & health risks.
 - Potential stress to juveniles due to more handling and movement, which increases disease susceptibility.
 - Properly trained personnel required for success.

Spreadsheet Models

- <https://ag.purdue.edu/agecon/Pages/Aquaculture-Budget.aspx>

Pacific White Shrimp (*Litopenaeus vannamei*)

- Indoor Shrimp “21-25” Count Example
- Indoor Shrimp “26-30” Count Example
- Indoor Shrimp “31-35” Count Example

Production Parameters - Example

- Renovating existing farm building / new construction
- 8-pool system, each with a capacity of 4,200 gallons. Complete package with pumps, aeration, biofloc settling system, etc.
- A 4,200 gallon capacity pool is equivalent to 15.9m³
- Support equipment and materials - water heater, water storage, emergency generator, purge tank, agitators, blowers, monitoring equipment, water quality test kits, and miscellaneous equipment (nets, scale, buckets, etc).

Production Parameters - Example

- Grow-out phase
 - Stocking rates from 300-500/m³; a stocking size of 1.3g is stocked at 450/m³, i.e., 7,200 PLs per tank/pool.
 - Stocking PLs of at least 3g.
- Production period varies by marketable size
- Production schedule assumes shrimp is harvested every other week
- Calculate average number of pools harvested every year per sizes

Production Parameters - Example

Parameters	“21/25” count	“26/30” count	“31/35” count	“21/25” count
Rearing period (weeks)	14	12	11	12
Frequency of harvest (pools/yr)	28	32	34	32
Stocking rate (PL//m ³)	450	450	450	450
Stocking size (g)	1.3	1.3	1.3	3.0
Feed conversion	1.4	1.4	1.3	1.4
Final weight (g)	20	16	14	22

	Unit	Cost / Unit (\$)	Quantity	Cost (\$)	% of Total cost
Sales Receipts	lb	16.00	6,222	99,557.31	
Variable Inputs:					
PL	#	0.10	201,600	20,160.00	24 ⁰ %
Feed Price	lb.	1.20	7,904	9,484.87	11%
Electricity	kw-hr.	0.06	9,333	560.01	1%
Hired Labor	Hour	10.00	1095	10,950.00	13%
Heating	year	8.00	560.64	4,485.12	5%
Chemicals	\$	100.00	8	800.00	1%
Insurance	%	148.51	12	1,782.10	2%
Loan + Interest	%			7,794.97	9%
Total Variable Costs (TVC)	\$			56,017.07	65.42%
Cost/lb				9.00	

	Unit	Cost / Unit (\$)	Quantity	Cost (\$)	% of Total cost
Fixed Inputs:					
Building	\$	4,500.00	0.03	150.00	0%
Complete Tank System	\$	46,800.00	0.10	4,680.00	5%
Water Heater	\$	4,230.00	0.10	423.00	0%
Water Storage	\$	2,340.00	0.10	234.00	0%
Emergency Generator	\$	4,050.00	0.07	270.00	0%
Purge Tank	\$	405.00	0.10	40.50	0%
Agitators	\$	4,320.00	0.20	864.00	1%
Blower	\$	3,060.00	0.20	612.00	1%
Monitoring Equipment	\$	675.00	0.20	135.00	0%
Water Quality Equipment	\$	4,636.80	0.20	927.36	1%
Fish Handling Equipment	\$	900.00	0.50	450.00	1%
Feed Storage	\$	450.00	0.20	90.00	0%
System Set-up labor	\$	5,120.00	1.00	5,120.00	6%
Miscellaneous equipment	\$	4,500.00	0.20	900.00	1%
Maintenance	\$	297.02	12.00	3,564.21	4%
Management	\$	928.80	12	11,145.60	13%
Total Fixed Costs				29,605.67	34.58%
Total Costs (TC)	\$			85,622.74	100.00%
Break-even price (BEP)	\$/lb			13.76	
Profit Above TVC	\$/lb			4.76	35%
Profit Above TC	\$/lb			2.24	16%

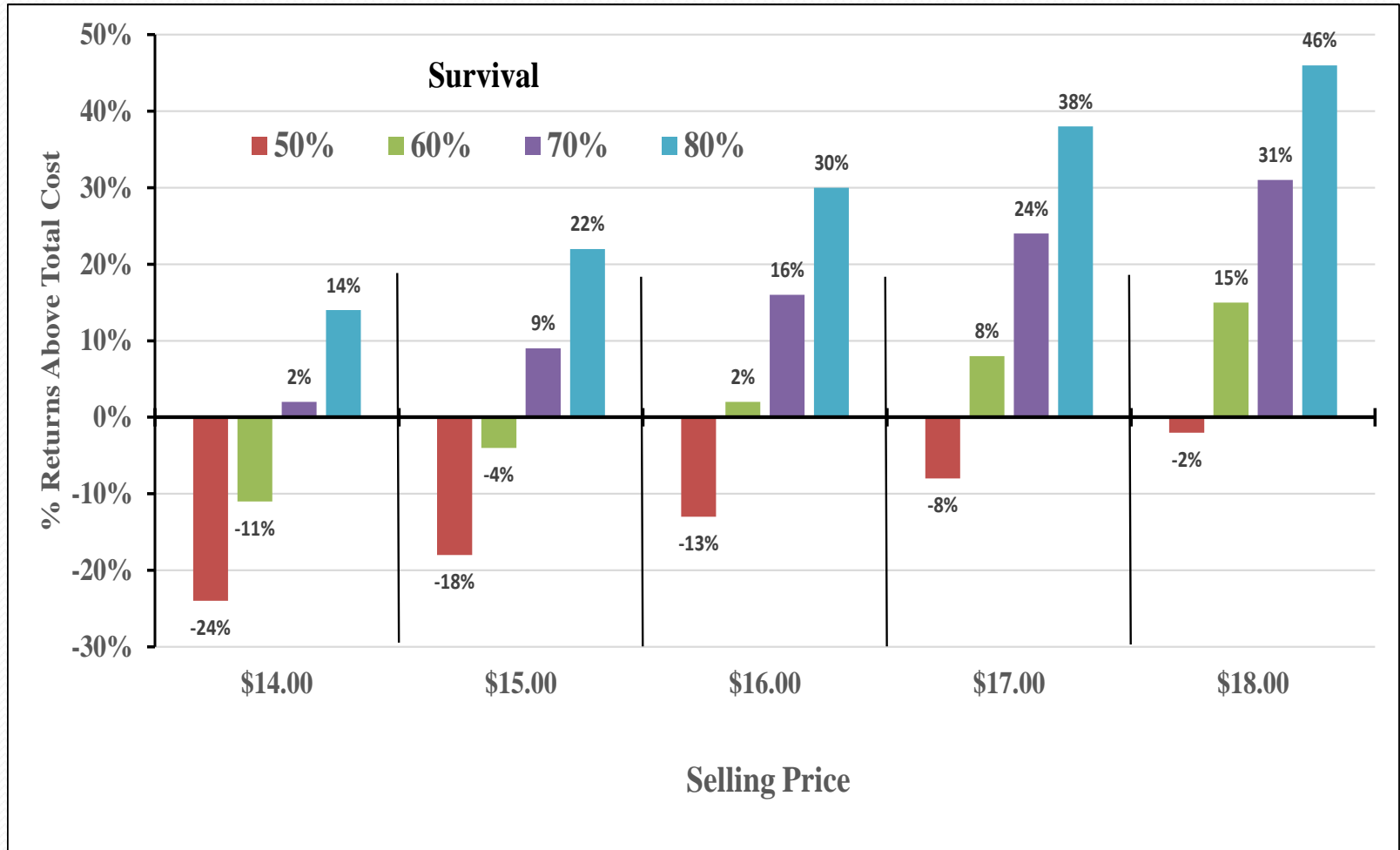
Profitability

- Breakeven price is \$13.76/lb - price point where the sale price covers total cost (both fixed and variable)
- Profit is obtained with selling price higher than \$13.76.
- Aquaculture is a high-risk industry, so target at least 15% profit margin.
- Controllable factors
 - Management – Stocking size, densities, survival, feeding, water quality, etc
- Less Controllable factors
 - Input costs, input supply, prices

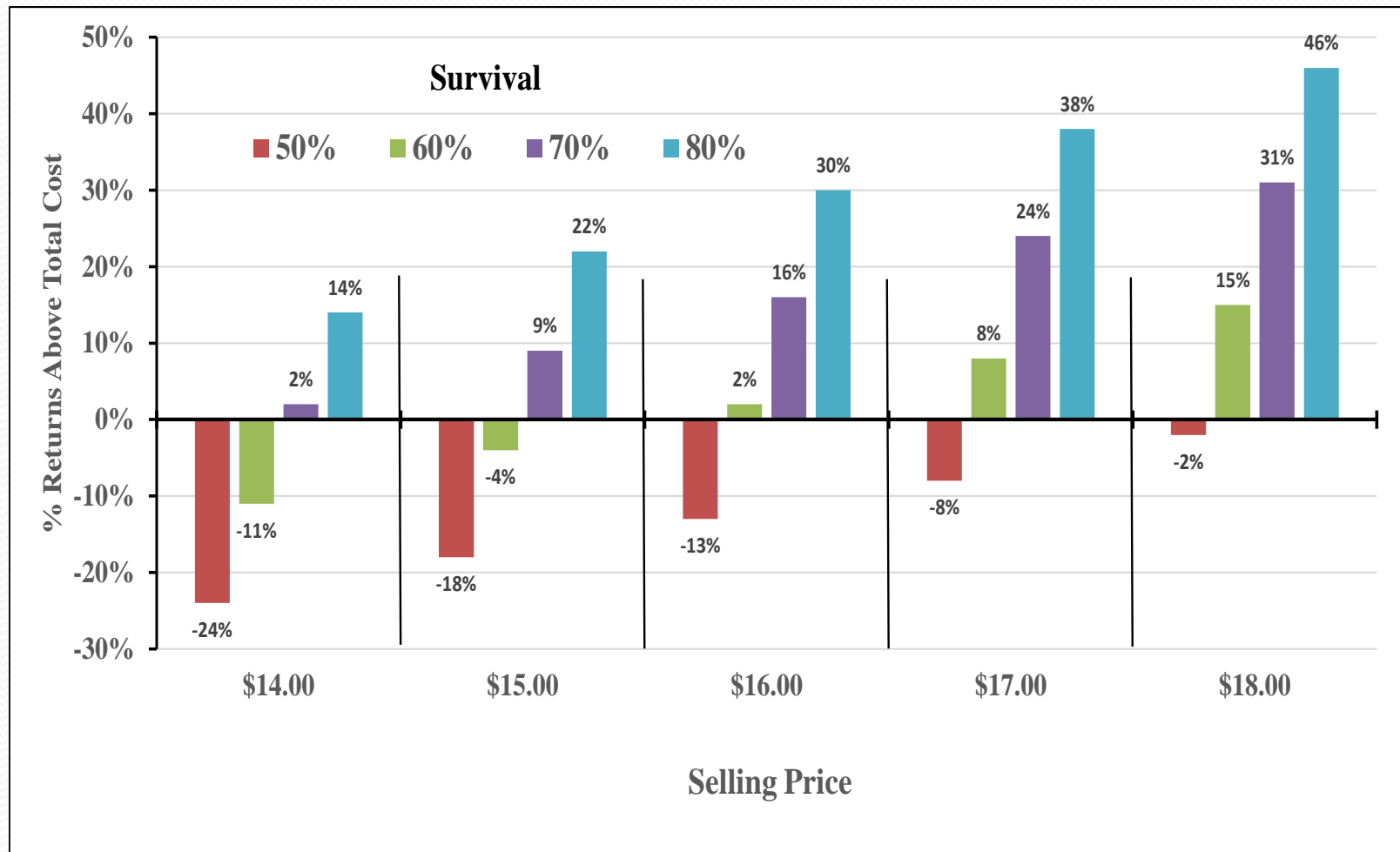
Sensitivity Analysis

- Variables that significantly affect profitability are survival rate (or mortality) and selling price
- Scenario analysis of profit margin with a range of selling prices and survival rates.
 - survival rates of 50% – 80%
 - selling price from \$12.00 – \$18.00

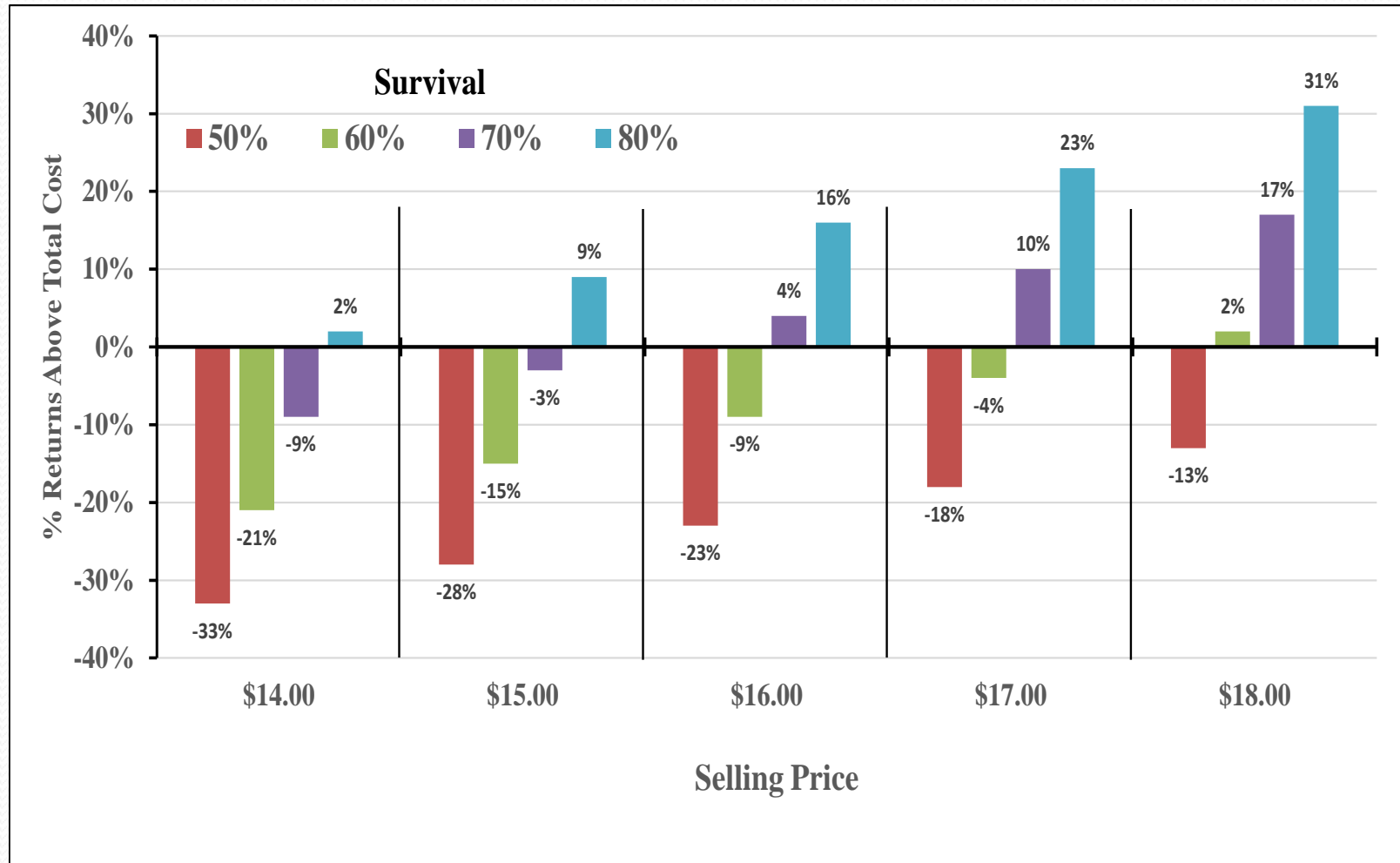
% profit for "21/25" Count (1.3g, 14wk)



% profit for "21/25" Count (3g, 12wk)



% profit for "26/30" Count



% profit for "31/35" Count



Take aways

1. Indoor production of Pacific White shrimp is profitable when grown to larger sizes.
2. The additional value of weight gain for large shrimp is more than the additional cost incurred in producing it.
 - Returns on larger sizes far outweigh the cost of producing them.
3. Farmers should consider stocking larger PLs of at least 3g to obtain larger shrimp within a shorter rearing period.

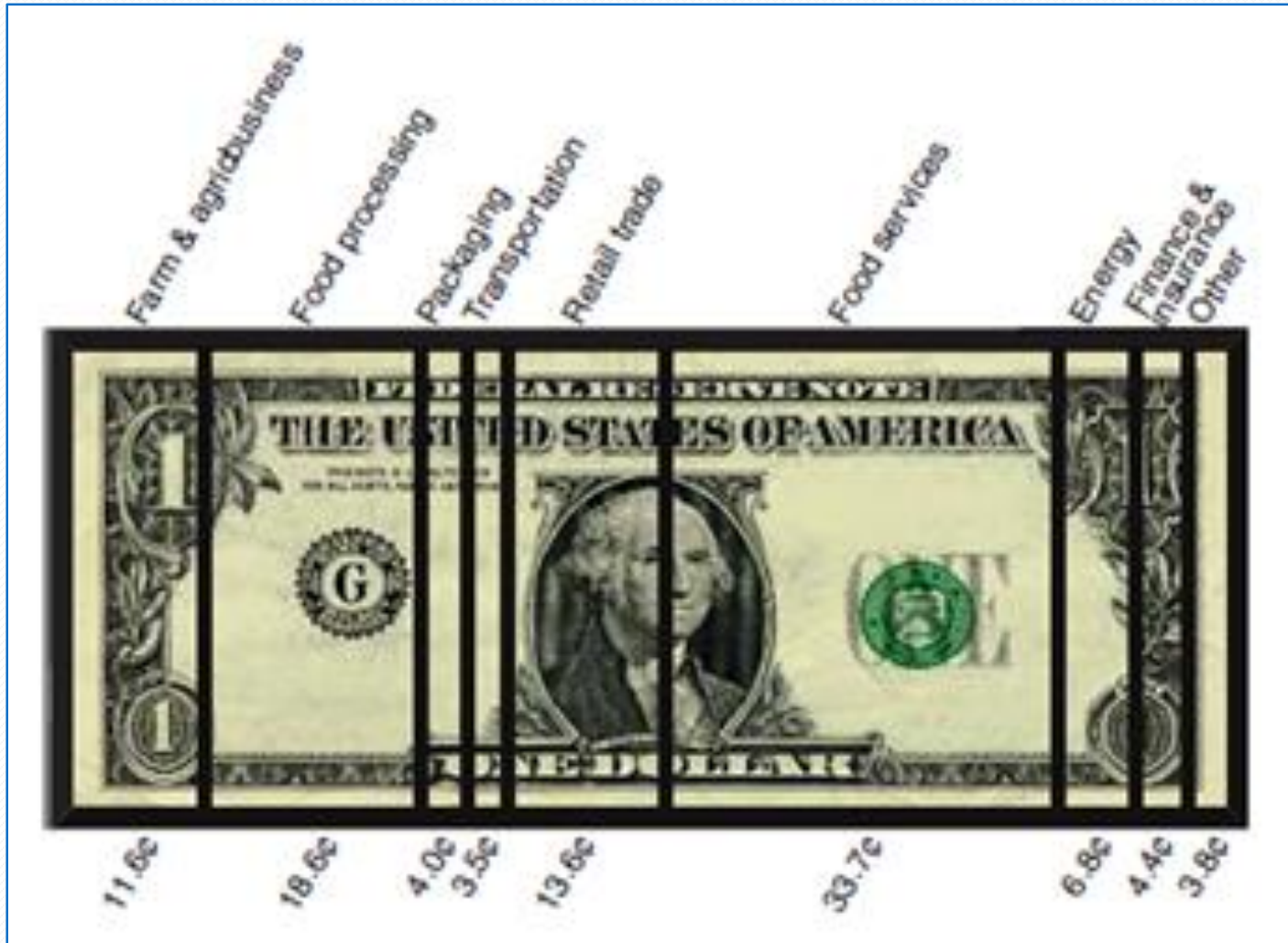
Take aways

4. Small size shrimp involves less time to produce, but the high turnover requires more production, resources, and therefore higher cost.
5. Good and efficient farm management practices are needed to minimize mortality.
6. Marketing strategies are essential to obtain premiums to assure profitability.

Marketing

- Possible market outlets
 - Market store, farmers' market, CSA, food hubs, aggregators, local grocers & restaurateurs, etc.
- Location, location, location!
- Direct marketing – locally produced

2011 Food Dollar











THANKS

QUESTIONS

