

Edamame: Costs, Revenues, and Profitability

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Introduction

As Asian-inspired foods gain popularity in the United States, and margins for agricultural products shrink, an increasing number of farmers are considering growing edamame. Edamame refers to immature soybeans that are grown and marketed as a specialty vegetable crop. They are typically sold as individual pods or as beans. Edamame are known for their high nutritional value and are gaining traction among high-income, health-conscious American consumers. They have long been popular in East Asian countries, and Asian suppliers are having trouble keeping up with renewed demand from North America and fast-growing Asian countries. Thus, there is an opportunity for growers in Virginia to get involved with this high-value crop.

Researchers from the School of Plant and Environmental Sciences and the Department Agricultural and Applied Economics at Virginia Tech recently analyzed the production and profitability potential of edamame sold in both pod and bean form. Both product forms are harvested from the same field, as only 20-25% of edamame is suitable for pod marketing. The enterprise budgets for hand-harvesting and mechanical harvest can be found in the appendix of this publication.

When hand-harvesting edamame, labor is the largest part of the cost structure. The 2018 Virginia Adverse Effect Wage Rate of \$11.46 per hour was used for budgeting in this publication (Department of Labor 2017). Labor accounts for about 62% of the total cost of pod production (fig. 1) based on initial VCE cost assumptions when edamame is hand-harvested. The majority of labor is expended during the harvest and postharvest handling phases, regardless of whether the crop is hand- or mechanically harvested, with preharvest labor being almost negligible. Under hand-harvesting, edamame production is not profitable.



Figure 1: A pie chart showing the top five expenses as a proportion of cost mix for hand-harvested edamame pod production.

Mechanical harvest enjoys lower labor costs (only about 28% of total costs) but loses a significant amount of yield to pod damage and bruising (Born 2006). Born estimated 24% yield destruction when using a commercial bean mower, although the VCE budgets use a more optimistic 20%. If harvest damage is less than 20%, mechanical harvest is profitable. However, the equipment needed to efficiently harvest edamame needs to be imported, or green bean harvesters — more common in Virginia — can be modified to harvest edamame (Miles 2000).

Harvest damage is due mainly to the mechanics of harvest (Ernst and Woods, 2001). Currently, most commercial edamame varieties are relatively short, bushy plants with a significant number of pods near the ground. Edamame pods are also more susceptible to damage than grain soybeans due to their immaturity. The harvester damages the portion of pods nearest the ground. Hand-harvesting takes longer but allows the pods to be handled more gently, resulting in less damage to the crop. Manual-harvesting also allows the field to be harvested multiple times because plants and pods mature at slightly different rates (compared to harvesting the whole field at once with a machine). Due to the time-dependent, labor-intensive nature of the crop, having affordable labor available at a moment's notice during the harvest season is a must. The interplay between harvest damage and labor costs can easily make or break an edamame operation. Where edamame can be incorporated into a cropping system that fully utilizes labor across the season, returns on labor will improve.

It is worth pointing out that while labor costs must be accounted for, they either accrue to the operators (in the case of individual or family operations without hired labor) or represent an actual cost of hired labor that contributes to a return to owner management and risk (which most people know simply as profit).

Other costs have less of a defining impact on edamame profitability, especially if the farm is already engaged in marketing fresh, high-value crops. Pods and beans must both be refrigerated between harvest and retail. A charge for land must also be accounted for, but land's agricultural rental rate is low compared to the top five expenses. Land rents in the budget can be selected in the VCE budgets using a drop-down menu, and they are drawn from 2017 USDA survey data on land rental rates (Groover and Bruce 2017). Irrigated rates were used where possible, although such data was not available for all localities.

So why does edamame matter to Virginia? It provides farmers with a potentially profitable crop alternative. Since edamame has relatively low startup costs, it is less capital-intensive. Edamame is a legume that can enrich the soil via nitrogen fixation and can be used to break up pest cycles (Halich and Kindred, 2015). Edamame are well-suited for farmers who are already engaged in producing fresh-market crops, who have established market channels that are receptive to

edamame along with their other produce, and who can incorporate edamame into their cropping system to best utilize land and labor across the growing season. Once varieties with desirable height are developed to optimize mechanical harvest, the crop may become even more profitable for Virginia producers.

References

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Appendix

Table A1: Enterprise budget for hand-harvested edamame.

		Quantity	Unit	Price/unit	Total
		Gross Receipts			
Fresh Edamame Pods		1875	lb	\$ 0.75	\$ 1,406.25
Fresh Edamame Beans		5625	lb	\$ 0.50	\$ 2,812.50
Total Gross Receipts					\$ 4,218.75
		Preharvest Costs			
Seed	Foodgrade seed	50	lb	\$ 1.00	\$ 50.00
Fertilizer	15-5-80				\$ 43.65
Herbicides (Pre-emergent)	First Rate	0.6	oz	\$ 38.50	\$ 23.10
	Metalachlor	1.7	pt	\$ 4.38	\$ 7.45
Machinery Variable Costs	Fuel	10.8	gal	\$ 1.75	\$ 18.90
	Labor	3.4	hr	\$ 11.46	\$ 38.96
Total Preharvest Costs					\$ 182.06
		Harvest and Marketing Costs			
Harvest Labor					
	Tractor Operator Labor	3.11	hr	\$ 11.46	\$ 35.64
	Tractor Fuel	11.99	gal	\$ 1.75	\$ 20.98
Postharvest Handling					
	Special Labor	416	hr	\$ 11.46	\$ 4,767.36
	Packaging	7500	lb	\$ 0.10	\$ 750.00
Marketing Charge	10% of Gross Receipts				\$ 421.88
Variable Refrigeration Cost	1 acre			\$ 450.00	\$ 450.00
Harvest Damage Risk	5% of Gross Receipts				\$ 210.94
Total Harvest and Marketing Costs					\$ 6,656.80
Total Variable Costs					\$ 6,838.86
Return Above Variable Costs					\$ (2,620.11)
Breakeven Price (Variable)					\$ 0.89
		Fixed Costs			
Land Rent					
	County	State Average	1 acre	\$ 105.00	\$ 105.00
Machinery and Equipment			1 acre	\$ 19.80	\$ 19.80
General Overhead		3% of Variable Costs			\$ 205.17
Refrigeration			1 acre	\$ 657.00	\$ 657.00
Total Fixed Costs					\$ 881.97
Total Costs					\$ 7,720.82
Returns to Land, Capital, and Management					\$ (3,502.07)
Breakeven price			lb		\$ 1.03

Table A2: Enterprise budget for mechanically harvested edamame.

		Quantity	Unit	Price/unit	Total	
					Acres	1
					Wage Rate	\$ 11.46
Gross Receipts						
Fresh Edamame Pods		1500	lb	\$ 0.75	\$ 1,125.00	
Fresh Edamame Beans		6000	lb	\$ 0.50	\$ 3,000.00	
Total Gross Receipts					\$ 4,125.00	
Preharvest Costs						
Seed	Foodgrade seed	50	lb	\$ 1.00	\$ 50.00	
Fertilizer	15-5-80				\$ 43.65	
Herbicides (Pre-emergent)	First Rate	0.6	oz	\$ 38.50	\$ 23.10	
	Metalachlor	1.7	pt	\$ 4.38	\$ 7.45	
Machinery Variable Costs	Fuel	10.8	gal	\$ 1.75	\$ 18.90	
Labor	Spot spray for weeds	3.4	hr	\$ 11.46	\$ 38.96	
Total Preharvest Costs					\$ 182.06	
Harvest and Marketing Costs						
Harvest Labor	Tractor Operator Labor	10.36	hr	\$ 11.46	\$ 118.73	
	Tractor Fuel	39.98	gal	\$ 1.75	\$ 69.97	
Postharvest Handling	Special Labor	20	hr	\$ 11.46	\$ 229.20	
	Packaging	7500	lb	\$ 0.10	\$ 750.00	
Marketing Charge		10%	of Gross Receipts		\$ 412.50	
Variable Refrigeration Cost		1	acre	\$ 450.00	\$ 450.00	
Harvest Damage Risk		20%	of Gross Receipts		\$ 825.00	
Total Harvest and Marketing Costs					\$ 2,855.39	
Total Variable Costs					\$ 3,037.45	
Return Above Variable Costs					\$ 1,087.55	
Breakeven Price (Variable)					\$ 0.38	
Fixed Costs						
Land Rent	County	State Average	1	acre	\$ 105.00	\$ 105.00
Machinery and Equipment			1	acre	\$ 61.72	\$ 61.72
General Overhead			8%	of Variable Costs		\$ 243.00
Refrigeration			1	acre	\$ 657.00	\$ 657.00
Total Fixed Costs					\$ 961.72	
Total Costs					\$ 3,999.17	
Returns to Land, Capital, and Management					\$ 125.83	
Breakeven price					\$ 0.53	

Notes: Highlighted areas are estimates based on experimental data from Virginia Tech's Kentland Farms. Tractor Operator Labor, Fuel, and Machinery and Equipment costs are estimates based on the 2015 Mississippi State Fresh Market, Snap Bean Enterprise Budgets.