



Edamame

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Introduction

Edamame is the Japanese name for edible soybeans consumed at the green stage. Also referred to as vegetable soybeans, edamame is the same species as the oilseed soybeans (*Glycine max*) commonly grown in Kentucky. However, compared to commodity soybeans, edamame seeds are larger with a sweet, nutty flavor, and better human digestibility.

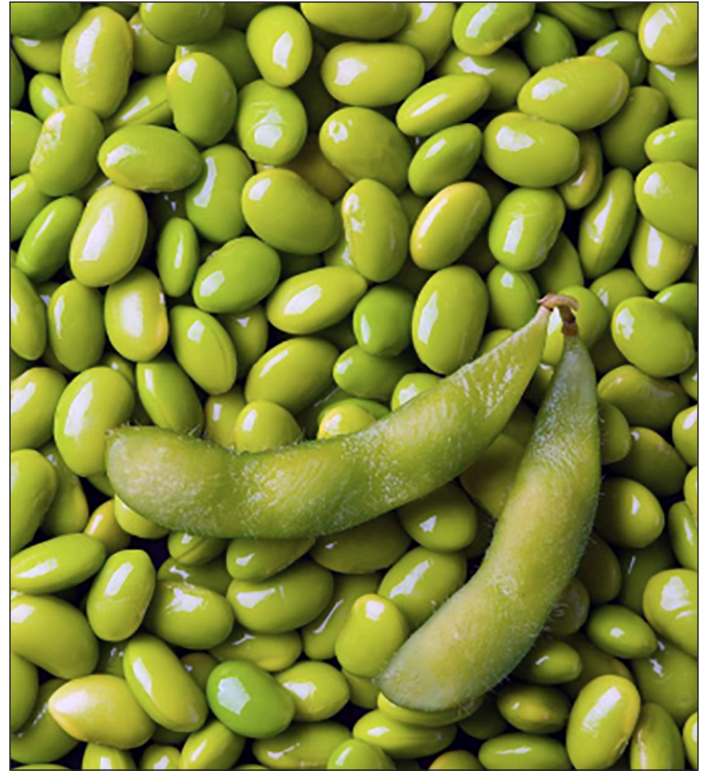
An important vegetable in Asia, edamame demand in the U.S. increased with the popularity of Asian cuisine. Additional interest in edamame stems from its reported health benefits. The green soybeans are very high in protein, particularly for a vegetable, and contain phytochemicals.

Marketing and Market Outlook

Marketing edamame is more closely related to marketing processing vegetables than conventional oilseeds. The current market for edamame in Kentucky is primarily associated with specialty produce and farmers markets located near population centers. Produce brokers have indicated that they are willing to handle uniformly packaged, high quality edamame.

Fresh edamame is marketed mainly at farmers markets. Fresh edamame can be marketed in the pod or bunched on the stalk, depending on the market channel, with farmers market and some ethnic market customers more interested in edamame on the stalk.

Frozen grocery and foodservice products are the main market for edamame. Frozen edamame is sold shelled, in the pod, or as part of value-added frozen foods. Most frozen edamame sold in the



U.S. until 2012 was imported from Asia, with some U.S. production on the West Coast and in Minnesota. In 2012, a company based in Mulberry, Arkansas opened an \$11 million processing facility and started freezing edamame for sale to retailers including Sam's Club. Production has continued, making Arkansas the U.S. leader in vegetable soybean production. As of 2019, there were no reports of large-scale, commercially viable edamame efforts in states east of the Mississippi.



Production Considerations

Cultivar selection

Edamame cultivars vary in terms of such characteristics as plant height, yield, seed size, seed flavor, and time to maturity.

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While seed may be sold with “days to harvest” information, edamame cultivars should be purchased based on “maturity group.” This designation (000 to X) for soybean cultivars identifies the production region (latitude) for maximum yield potential. Varieties best adapted to Kentucky are generally in Maturity Groups III, IV, and V, depending on the area of the state. Cultivars grown outside their adapted zone will not perform well because they will flower either too early or too late. Producers should determine which soybean maturity group(s) will perform best in their region and select cultivars accordingly. Other desirable, marketable qualities should be considered once the maturity group has been identified.

Site selection and planting

Edible soybeans do well in deep or moderately deep, well-drained, fertile soils. Gently sloping land where flooding, run-off and erosion are minimal is also recommended. Because available vegetable soybean varieties are not resistant to soybean cyst nematode, fields known to have high populations of soybean cyst nematode should be avoided.



Until harvest, edamame production is similar to that of traditional grain soybeans. Seeds require a soil that is warm, moist and free of weeds. The optimum planting period in Kentucky is from early May to mid-June, when soil temperatures have reached the 65°F minimum necessary for rapid emergence. The larger seed size of edamame soybean varieties may contribute to emergence problems. Because of the larger seed size, green edible soybeans may require changes in planter plate size or planting technique. Kentucky producers have also successfully started edamame in greenhouses for field transplanting.

If edamame is being grown in a field with a history of soybean production, it is generally not necessary to inoculate seed with a nitrogen-fixing bacterium; however, in non-soybean fields, the seed should be inoculated with the *Rhizobium* strain recommended for soybeans. Alternately, the crop’s nitrogen needs can be met with supplemental fertilizer.

Pest management

The range of disease and insect pests affecting edamame is similar to those affecting grain soybeans. Because edamame is harvested when green, growers will be able to avoid many of the late-season problems that occur on traditional soybeans. Early season diseases, such as seed decay, seedling blights and root rots will reduce stands but are generally more problematic in wet, poorly drained soils. Foliar diseases and insects typically occur at low levels and do not significantly reduce yields. Pesticides registered for grain soybeans are generally not cleared for use on soybeans harvested as a vegetable crop; however, each product label should be examined to determine this. Weeds can be challenging; however, cultivars that germinate uniformly and grow tall to shade out weeds will have an advantage. Growers in Kentucky often use mechanical and hand cultivation for weed control. The edamame industry in Arkansas has sought state-specific permission to use some pesticides in vegetable soybean production. Fewer herbicides are available for edamame than for field soybeans, and edamame is sensitive to many pre-emergent herbicides.

Harvest and storage

Edamame is generally hand-harvested on small farms, as traditional bean harvesters may be too expensive for a limited planting of this crop. Individual pods may be harvested in the field or cut plants can be removed to another location for harvest. Alternately, plants cut at the soil line can be marketed with pods intact. Larger acreages can be mechanically harvested.

Pods are ready for harvest when they are close to full size and pods are bright green. Once pods show any yellowing, quality will be unacceptable. The seeds should also be completely green. Vegetable soybeans have a very short harvest window of only a few days. Immediate post-harvest cooling is essential to maintain product freshness for market. It is recommended that Kentucky growers harvest edamame early in the morning hours when pods are cool. This will help the pods keep longer and reduce the amount of field

heat that must be removed after harvest. Cooling may be accomplished using forced air, vacuum or hydrocooling.

Fresh edamame does not store well. Growers can expect that harvested beans will retain flavor and appearance for approximately one week when properly stored. Ongoing research involving postharvest keeping quality of edamame has focused on specialized films for packaging. Seeds within pods or shelled can be frozen after blanching.

Labor requirements

Kentucky growers have effectively used careful hand picking, grading and field packing to harvest the crop and prepare it for market. An unskilled, supervised worker should be able to harvest, grade, pack and transport at least one box (25 pounds) of edamame per hour. A yield of 6,000 to 10,000 pounds per acre can be expected. Marketing the whole plant (bunched on the stalk) requires the least amount of time and labor. A modified green bean picker is used to harvest edamame for processing large quantities.

Economic Considerations

Fresh edamame is a niche product in Kentucky. Basic information about varieties, production practices, and harvest technique is still needed. Budget estimates indicate a greater likelihood for edamame profitability in either direct-marketed, hand-harvested plots of an acre or less, or larger plots wholesaled directly to a frozen foods packer.

Initial investments include land preparation and purchase of seed. The main costs involved in production are harvesting and post-harvest handling. While hand harvest is the most viable technique for small-scale production, it raises harvest costs.

Machine harvest using a green bean picker is necessary for commercial wholesale production. Contract prices for edamame for freezing are not made public, but returns from edamame production for freezing are estimated in the same range as returns from specialty and organic soybeans. The experience in Arkansas shows large-scale edamame production may be a good way for conventional soybean producers to diversify production, if a processing plant is located nearby.

Total expenses per acre for hand-harvested edamame, including annual fixed costs, could range from \$8,500 to \$12,000, with labor as the greatest expense. Profitability is dependent on price and market channel, with potential returns ranging from a negative \$2,000 to a positive \$2,200 per acre (return to land and management) for the fresh, wholesale market. Mechanical harvest with a modified green bean picker for the direct local market could raise potential returns to the \$4,000 level per acre. While edamame could be a profitable niche crop in the direct marketing mix, large-scale production of edamame using hand harvest for the fresh market is not likely to be widely feasible due to profitability risk.

In 2011, UK researchers generated estimates for break-even edamame prices for production on a 200-acre organic farm. Production assumed mechanical harvest, and an edamame price of \$0.37 per pound was determined to be necessary to switch from organic soybean to organic edamame production under a conventional tillage plan. The researchers noted that marketing and production risks could also affect the necessary break-even price for edamame in an organic production system.

Selected Resources

- Edamame Vegetable Soybean (Washington State University) <http://agsyst.wsu.edu/edamhome.html>
- Edamame (Washington State University, Oregon State University, University of Idaho, 2018) <https://pubs.extension.wsu.edu/edamame>
- Production and Economic Considerations for Fresh Market Edamame in Southwest Virginia (Virginia Cooperative Extension Publication AAEC-188P, 2019) <https://vtechworks.lib.vt.edu/bitstream/handle/10919/93366/AAEC-188.pdf?sequence=1&isAllowed=y>
- Edamame: Costs, Revenues and Profitability (Virginia Tech, 2019) <https://www.pubs.ext.vt.edu/AAEC/AAEC-189/AAEC-189.html>
- Edamame Cultivar Report – 2012 (USDA-ARS and Department of Crop Sciences, University of Illinois) https://www2.ag.purdue.edu/hla/fruitveg/MidWestTrialReports/2012/02-01_Williams_Edamame.pdf
- Williams, M.M. 2015. Phenomorphological characterization of vegetable soybean germplasm

- lines for commercial production. Crop Sci. 55:1274-1279. https://www.researchgate.net/publication/273899307_Phenomorphological_Characterization_of_Vegetable_Soybean_Germplasm_Lines_for_Commercial_Production
- Mechanical Harvesting of Edamame (University of Kentucky, 2010) http://www.uky.edu/ccd/sites/www.uky.edu/ccd/files/edamame_mechanical_harvest.pdf
 - Production System for Extending the Harvest Time Frame of Fresh-Market Edamame in Kentucky (University of Kentucky, 2009) http://www.uky.edu/ccd/sites/www.uky.edu/ccd/files/edamame_extend_harvest.pdf
 - Edamame: A Nutritious Vegetable Crop (Purdue University, 2002) <http://www.hort.purdue.edu/newcrop/ncnu02/v5-432.html>
 - Edamame: Vegetable Soybeans (ATTRA, 2006) <https://attra.ncat.org/attra-pub/summaries/summary.php?pub=28>

- Estimating the Economic Viability of a New Crop Alternative for the U.S. Organic Market: Edamame – A Vegetable Soybean (University of Kentucky, 2011) <https://ideas.repec.org/p/ags/aeaa11/103709.html>
- How to Grow Edamame: Planting Guidelines (Wannamaker Seeds) <http://www.wannamakerseeds.com/plantingguidelines.html>

Commercial websites listed in the resources are provided for information purposes only and their inclusion does not represent an endorsement of the company or its products by the University of Kentucky.

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*Reviewed by Todd Pfeiffer, University of Kentucky professor, and Joshua Knight, UK Senior Extension Associate
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