

New Crops in Kentucky: Edamame Soybeans Consumer Taste Panel

AEC-EXT 2001-15G
November 2001

Matt Ernst, Extension Associate

Introduction

Several Kentucky producers have explored commercial-scale production of edamame (green vegetable soybean) since 1996. Edamame production is currently limited to small-scale, fresh market production for the Owensboro/Evansville and Louisville markets. There are currently less than five acres of edamame produced in Kentucky for these markets. Based on University of Kentucky budget and demand estimates, the outlook for fresh edamame producer profitability is outstanding.

The objectives of this taste panel were 1) to measure consumer acceptance of a new vegetable crop; and 2) to begin to determine consumer use and willingness to pay for edamame. Financial support for this taste panel was provided from the New Crop Opportunities Center at the University of Kentucky. Several individuals also provided edamame product and assistance. They are acknowledged below and at the end of this paper.¹

Methodology

Panelists were recruited through advertisement of the taste panel at the University of Kentucky and through publicity at the Good Foods Co-op in Lexington, KY. Consumers were asked to evaluate three types of edamame beans: a frozen Kentucky bean (variety ISTNL 2027); a fresh Kentucky bean (commercial variety); and a frozen, in-pod bean (Seapoint Farms) obtained at a local retail store.

Both frozen beans were prepared in a microwave oven in the manner recommended on the commercial package (heat in water on high setting for 3-5 minutes). Fresh beans were also heated at the same setting, but for 30 seconds less than the frozen beans. Beans were prepared for the 58 panelists throughout the day in order to maintain fresh samples.

¹ This taste panel was conducted in cooperation with Sara McNulty, an Owensboro producer and promoter of Kentucky edamame who obtained SARE producer grant to promote edamame in western Kentucky during the 2001 season. Additional assistance was provided by Martha Lee, Daviess County extension agent for family and consumer science. Fresh edamame for this panel was provided by Linn and Carol Cassidy (Whitestone Organic Farm & Bakery) and Jack Trumbo (Shelby County soybean producer). Special thanks to Lester Wilson, Iowa State University Professor of Food Science, who reviewed the survey instrument and offered his suggestions before the taste panel was conducted.

Panelists were first asked to fill out information so that they could be compensated \$15 for their participation in this project. They were then asked to smell a sample of bean curd in order to define the term “beany” for use on the survey.

Panelists were then asked to evaluate the three in-pod samples of edamame. They were asked to individually rank the samples based on appearance, texture, flavor, and overall preference. They were also asked to rank these criteria in order of preference in relation to one another.

Finally, panelists were asked to evaluate two samples of a prepared salad dish, one sample prepared with and one sample prepared without edamame. The last questions of the survey involved a brief measurement of the willingness to pay for fresh and frozen edamame products and experience in eating soy and other edamame products.

Results

Panelists responded that the commercial frozen product was the most difficult to remove the pods from the beans, while the frozen Kentucky product was the easiest to remove the pods from. While only half the panelists had eaten edamame before, no panelist commented that the beans were exceptionally difficult to separate from the pod.

Overall, 65% panelists said they preferred the fresh Kentucky and frozen commercial products over the frozen Kentucky product. However, very few of the panelists (3.4%) “disliked extremely” or “disliked” the frozen Kentucky product when asked to evaluate it alone. This stands in contrast to the percentage of panelists who “disliked extremely” or “disliked” the fresh Kentucky edamame (5.2%) and the commercial frozen edamame (10.3%).

Table 1. Overall Preference (Number of Panelists Responding)

	Preferred First	Preferred Second	Preferred Third
<i>Frozen KY</i>	18	10	28
<i>Fresh KY</i>	17	30	10
<i>Frozen Commercial</i>	21	16	19
<i>No Response</i>	2	2	1

Flavor and texture were also evaluated by the panelists. These results are reported below in Table 2. The commercial frozen product was definitely ranked as the “least mushiest” while the frozen KY product was ranked as the “mushiest.” The panelists did not generally associate a “beany” flavor with the sampled edamame beans.

Table 2. Overall Flavor and Texture Rankings (Number of Panelists Responding)

	Mushiest	Second Mushiest	Least Mushiest	Beaniest	Second Beaniest	Least Beaniest
<i>Frozen KY</i>	44	7	6	22	10	21
<i>Fresh KY</i>	8	37	10	10	30	16
<i>Frozen Commercial</i>	4	10	40	23	13	18
<i>No Response</i>	2	4	2	3	5	3

The responses to the two samples of the salad made with and without edamame are inconclusive. People really enjoyed the salad, but its composition of it was too heterogeneous for them to notice the absence of edamame in the first sample (See recipe in Appendix 2).

Panelists were also asked some questions regarding their acceptance of edamame. While only half the panelists had experience in eating edamame, about three-fourths responded that they would be interested in the vegetable as an ingredient in soups and salads. There was also significant interest in other uses of edamame, summarized below in Table 3.

Table 3. Uses for Edamame Appealing to Panelists

	Number Interested	Percent
<i>As an ingredient in salads or as a salad topper</i>	47	81%
<i>As a soup ingredient</i>	43	74%
<i>As a stand-alone vegetable</i>	34	59%
<i>As a substitute for lima beans or other similar vegetables</i>	33	57%
<i>As a salted snack (like peanuts) to be consumed with your choice of beverage</i>	27	47%

Panelists indicated that they would be willing to pay more for a frozen, out-of-pod bean. Most panelists indicated they were willing to pay no more than \$2.50 for a pound of fresh product. This price is lower than the current price being paid (\$2.50-\$4.00 per pound) for the limited volume of fresh edamame sold in Kentucky.

Table 4. Greatest Amount Willing to Pay for One Pound of Edamame

Price Range	Number Willing to Pay for One Pound Fresh Edamame	Number Willing to Pay for One Pound Frozen, Shelled Edamame
<i>\$0.50-\$1.50</i>	20	8
<i>\$1.51-\$2.50</i>	26	24
<i>\$2.51-\$3.50</i>	8	18
<i>\$3.51-\$4.50</i>	0	6
<i>>\$4.50</i>	1	0
<i>No Response</i>	3	2

Conclusions and Implications for Edamame Market Development

Overall, panelists were enthusiastic about edamame. Very few “disliked” or “disliked extremely” any of the varieties tested. Many of the panelists who had not tasted edamame before inquired where they could buy this product. Several were interested in obtaining recipes utilizing edamame.

The difference between the price consumers are willing to pay for fresh edamame and the price being currently paid at farm markets indicates that fresh market prices will indeed decrease as supply increases. Budget estimates indicate that there is plenty of room for producer profits at retail prices of \$2.50 per pound, the maximum many panelists indicated they were willing to pay per pound of fresh edamame. Producers marketing locally should always bear in mind that they may adjust their asking price to what the market will support. The willingness to pay slightly more for a frozen product without pods indicates potential for edamame processing efforts.

There is a need for additional edamame variety development and testing in Kentucky. Efforts in post-harvest handling are also crucial to developing a fresh edamame industry. However, this early, cursory measure of consumer response to edamame continues to indicate outstanding potential for additional fresh market edamame development in Kentucky.

Additional consumer sensory work for edamame in Kentucky may involve both larger and smaller consumer panels, including trained panels. Consumer analysis of different varieties, as well as an evaluation of different cooking methods and processes, will be needed for more complete market development. Considerations for future consumer panels might include smaller focus group response, comparison of consumer response to different varieties, and evaluation of edamame in different kinds of prepared dishes.

Acknowledgments

Linn and Carol Cassedy, Whitestone Organic Farm, Bagdad, KY
Sally Ellis, Owensboro, KY
Martha Lee, Daviess County Extension, Owensboro, KY
Sara McNulty, Owensboro, KY
Jack Trumbo, Shelby County, KY
Lester Wilson, Iowa State University Department of Food Science, Ames, IA
University of Kentucky New Crop Opportunities Center

Reviewers: Sandra Bastin and Janet Tietzen (FCS); Betty King (Community Development).

University of Kentucky, Department of Agricultural Economics
400 Charles E. Barnhart Bldg., Lexington, KY 40546-0276

Phone: 859-257-5762, Fax: 859-323-1913

<http://www.uky.edu/Ag/AgEcon/>

Appendix 1

Raw Data Summary

Question 1: Which sample was the easiest to remove the pods from?

	<i>Number</i>	<i>Percent</i>
Frozen KY	33	56.9%
Fresh KY	9	15.5%
Commercial	8	13.8%
No difference	7	12.1%
No Response	1	1.7%

Question 2: Which sample was the hardest to remove pods from?

	<i>Number</i>	<i>Percent</i>
Frozen KY	7	12.1%
Fresh KY	16	27.6%
Commercial	29	50.0%
No difference	6	10.3%

Question 3: Frozen KY Texture

	<i>Number</i>	<i>Percent</i>
Very Mushy 0	0	0.0%
1	9	15.5%
2	8	13.8%
3	19	32.8%
Not Mushy at All 4	22	37.9%

Question 4: Frozen KY Flavor

	<i>Number</i>	<i>Percent</i>
Very Beany 0	3	5.2%
1	11	19.0%
2	11	19.0%
3	18	31.0%
Not Beany at All 4	15	25.9%

Question 5: Frozen KY Overall Rating

	<i>Number</i>	<i>Percent</i>
Extremely Disliked	1	1.7%
Disliked	1	1.7%
Neither liked nor disliked	14	24.1%
Liked	35	60.3%
Extremely Liked	7	12.1%

Question 6: Fresh KY Texture

	<i>Number</i>	<i>Percent</i>
Very Mushy 0	0	0.0%
1	1	1.7%
2	4	6.9%
3	16	27.6%
Not Mushy at All	37	63.8%

Question 7: Fresh KY Flavor

	<i>Number</i>	<i>Percent</i>
Very Beany 0	1	1.7%
1	11	19.0%
2	18	31.0%
3	16	27.6%
Not Beany at All 4	12	20.7%

Question 8: Fresh KY Overall

	<i>Number</i>	<i>Percent</i>
Extremely Disliked	0	0.0%
Disliked	3	5.2%
Neither liked nor disliked	13	22.4%
Liked	30	51.7%
Extremely Liked	12	20.7%

Question 9: Commercial Texture

	<i>Number</i>	<i>Percent</i>
Very Mushy 0	0	0.0%
1	0	0.0%
2	7	12.1%
3	10	17.2%
Not Mushy at All	40	69.0%
No Response	1	1.7%

Question 10: Commercial Flavor

	<i>Number</i>	<i>Percent</i>
Very Beany 0	9	15.5%
1	7	12.1%
2	20	34.5%
3	12	20.7%
Not Beany at All 4	10	17.2%

Question 11: Commercial Overall

	<i>Number</i>	<i>Percent</i>
Extremely Disliked	0	0.0%
Disliked	6	10.3%
Neither liked nor disliked	17	29.3%
Liked	24	41.4%
Extremely Liked	11	19.0%

Question 12: Overall Texture Ranking

	Mushiest		Second Mushiest		Least Mushiest	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
Frozen KY	44	76%	7	12%	6	10%
Fresh KY	8	14%	37	64%	10	17%
Frozen Commercial	4	7%	10	17%	40	69%
No Response	2	3%	4	7%	2	3%

Question 13: Overall Flavor Ranking

	Beaniest		Second Beaniest		Least Beaniest	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
Frozen KY	22	38%	10	17%	21	36%
Fresh KY	10	17%	30	52%	16	28%
Frozen Commercial	23	40%	13	22%	18	31%
No Response	3	5%	5	9%	3	5%

Question 14: Overall Preference Rating

	Liked the Most		Liked Second		Liked the Least	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
Frozen KY	18	31.0%	10	17.2%	28	48.3%
Fresh KY	17	29.3%	30	51.7%	10	17.2%
Frozen Commercial	21	36.2%	16	27.6%	19	32.8%
No Response	2	3.4%	2	3.4%	1	1.7%

Question 15: Notice Any Taste Differences Between Dishes

	<i>Number</i>	<i>Percent</i>
Yes	43	74.1%
No	15	25.9%

Question 16: Which Dish Did You Prefer?

	<i>Number</i>	<i>Percent</i>
207--Without Edamame	9	15.5%
305--With Edamame	30	51.7%
No Preference	19	32.8%

Question 17: Which of the following uses appeals to you?

	<i>Number</i>	<i>Percent</i>
As an ingredient in salads or as a salad topper	47	81%
As a substitute for lima beans or other similar vegetables	33	57%
As a salted snack (like peanuts) to be consumed with your choice of beverage	27	47%
As a stand-alone vegetable	34	59%
As a soup ingredient	43	74%

Question 18: The most I would pay for 1 pound of these beans:

	Fresh in the pod		Shelled and frozen	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
\$0.50-\$1.50	20	34.5%	8	13.8%
\$1.51-\$2.50	26	44.8%	24	41.4%
\$2.51-\$3.50	8	13.8%	18	31.0%
\$3.51-\$4.50	0	0.0%	6	10.3%
>\$4.50	1	1.7%	0	0.0%
No Response	3	5.2%	2	3.4%

Question 19: Familiarity with soy products

	<i>Number</i>	<i>Percent</i>
I eat soy products regularly (more than 3 times per week)	10	17.2%
I eat soy products frequently (1-3 times per week)	12	20.7%
I eat soy products occasionally (1-3 times per month)	16	27.6%
I rarely eat soy products (less than once per month)	18	31.0%
No Response	2	3.4%

Question 20: Familiarity with Edamame

	<i>Number</i>	<i>Percent</i>
I eat edamame soybeans often (more than once a month)	4	6.9%
I eat edamame soybeans occasionally (about once a month)	9	15.5%
I have tried edamame soybeans before, but do not eat them regularly	14	24.1%
I have never eaten edamame soybeans before	29	50.0%
No Response	2	3.4%

Appendix 2

Salad Recipe

5-A-Day Salad

2 cups Gala apples, unpeeled and chopped (about 2)
1/2 cup golden raisins
2 cups broccoli florets, broken
2 ribs celery, chopped
1 cup red or white seedless grapes, halved
1/2 cup cashews, broken
1 cup edamame soybeans, cooked and shelled

Dressing:

1 clove garlic, chopped
1 tablespoon chopped red onion
1/3 cup red wine vinegar
1/4 cup sugar
1 teaspoon salt
1 teaspoon prepared mustard
1 tablespoon celery seed
1 cup soy oil

Mix together salad ingredients (except cashews and soybeans) and refrigerate. When ready to serve, add dressing and mix. Top with cashews and soybeans. *Serves 15.*

Calories – 223
Fat – 18 g.
Sat. Fat – 3 g.
CHO – 16 g.
Calcium – 42 mg.

Appendix 3

Survey Instrument

Thank You for volunteering for this consumer panel! Before we begin the taste panel, we would like to help you establish a reference point for some of your responses in the panel. Before you is a container with a food sample in it.

Please smell the sample.

Thanks! That smell/taste is described as “beany.” You will need to respond to some questions referencing that smell in the panel.

Please check how you heard about this test:

_____ Through information distributed by Good Foods Co-Op

_____ Through information distributed at UK

_____ Through information distributed elsewhere

Thanks! Now proceed to the test kitchen, where we’ll begin the taste panel.

Enumeration Code _____

Please rinse your mouth with water before beginning to sample.

Before you are three samples labeled 596, 982, and 753.

PLEASE REMOVE THE PODS FROM EACH SAMPLE AND LEAVE THE BEANS ON THE PLATE WHILE ANSWERING THE NEXT TWO QUESTIONS:

Which sample was the easiest to remove the pods from? (Please circle one)

596 982 753 No difference

Which sample was the hardest to remove the pods from? (Please circle one)

596 982 753 No difference

NOW, EAT HALF OF SAMPLE 596

Indicate the **texture (mouth feel)** of sample 596 by checking the appropriate box on the scale below:

Sample 596

“very mushy”

“not mushy at all”

Indicate the **flavor** of sample 596 by checking the appropriate box in the scale below. Use your memory of the “beany” smell from the sample in the previous room:

Sample 596

“very beany”

“not beany at all”

Indicate an **overall rating** for sample 596:

extremely disliked

disliked

neither liked nor disliked

liked

extremely liked

Please write any additional comments about sample 596 below:

PLEASE RINSE YOUR MOUTH WITH WATER
NOW, EAT HALF OF SAMPLE 982

Indicate the **texture (mouth feel)** of sample 982 by checking the appropriate box on the scale below:

Sample 982

“very mushy”

“not mushy at all”

Indicate the **flavor** of sample 982 by checking the appropriate box in the scale below. Use your memory of the “beany” smell from the sample in the previous room:

Sample 982

“very beany”

“not beany at all”

Indicate an **overall rating** for sample 982:

extremely disliked

disliked

neither liked nor disliked

liked

extremely liked

Please write any additional comments about sample 982 below:

PLEASE RINSE YOUR MOUTH WITH WATER
NOW, EAT HALF OF SAMPLE 753

Indicate the **texture (mouth feel)** of sample 753 by checking the appropriate box on the scale below:

Sample 753

“very mushy”

“not mushy at all”

Indicate the **flavor** of sample 753 by checking the appropriate box in the scale below. Use your memory of the “beany” smell from the sample in the previous room:

Sample 753

“very beany”

“not beany at all”

Indicate an **overall rating** for sample 753:

extremely disliked

disliked

neither liked nor disliked

liked

extremely liked

Please write any additional comments about sample 753 below:

Now, please answer these questions:

Which of the following uses for the first three samples of these beans appeal to you? (Check as many as apply)

- As an ingredient in salads or as a salad topper
- As a substitute for lima beans or other similar vegetables
- As a salted snack (like peanuts) to be consumed with your choice of beverage
- As a stand-alone vegetable
- As a soup ingredient

The **most** I would pay for 1 pound of these beans **fresh in the pod** is (circle one price range):

\$0.50 - \$1.50 \$1.51-2.50 \$2.51-3.50 \$3.51-4.50 more than \$4.50

The **most** I would pay for 1 pound of these beans **shelled and frozen** is (circle one price range):

\$0.50 - \$1.50 \$1.51-\$2.50 \$2.51 – \$3.50 \$3.51-\$4.50 more than \$4.50

Which of these statements best describes you? (check one)

- I eat soy products regularly (more than 3 times per week)
- I eat soy products frequently (1-3 times per week)
- I eat soy products occasionally (1-3 times per month)
- I rarely eat soy products (less than once per month)

Which of these statements best describes you? (check one)

- I eat edamame soybeans often (more than once a month)
- I eat edamame soybeans occasionally (about once a month)
- I have tried edamame soybeans before, but do not eat them regularly
- I have never eaten edamame soybeans before.

Educational programs of the Kentucky Cooperative Extension Service serve all people regardless of race, color, age, sex, religion, disability, or national origin.