

Foodprint Comparison of Local vs. Nonlocal Produce

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Abstract

The number of colleges and universities sourcing foods locally for consumption in dining halls is rapidly increasing as the local foods movement sweeps the nation's food distribution system. Virginia Tech has recently begun sourcing a portion of its produce from Kentland Farm, the institution's agricultural research farm, for use in its award-winning dining centers. Simultaneously, the university seeks to operate more sustainably, in part through a reduction in its carbon footprint. This study sought to determine the effects of local food procurement on Virginia Tech's carbon footprint as well as its dining centers' consumer-perceived food quality. In order to do so, the difference in carbon emissions associated with the transport of local (Kentland Farm) versus nonlocal broccoli to the university for the month of October was estimated, and a blind taste test of local (Blacksburg) versus nonlocal zucchini was used to determine differences in consumer-perceived quality characteristics. The Wilcoxon Sign-Rank test and the Likelihood Ratio were used to verify statistical significance at the $\alpha = .05$ level for the taste test questionnaire. The study revealed that during the month of October alone, sourcing broccoli from Kentland farm reduced the transport-related carbon dioxide emissions from 105,830.0 pounds to 258.3 pounds, a 99.8% reduction. Additionally, the substitution of local for nonlocal zucchini may improve quality, as taste test participants gave higher ratings to local zucchini for eight of the ten characteristics examined. The results of this study imply that sourcing broccoli and zucchini locally will help reduce Virginia Tech's carbon footprint and improve perceived quality, respectively.

Introduction

Climate neutrality and campus sustainability have become popular topics across institutions of higher learning across the United States, including at Virginia Tech¹⁻³. In June of 2008, Virginia Tech joined the Association for the Advancement of Sustainability in Higher Education, the first association of college and universities with the goal of helping institutions become leaders in the sustainability movement⁴. This association offers sustainability assessment tools to its members, such as the Sustainability Tracking, Assessment, and Rating System (STARS), a self-reporting program in which Virginia Tech can track its progress and compare itself to others. The university has also taken infrastructural measures to improve its sustainability, such as the creation of the Office of Sustainability and the development of the Climate Action Commitment and Sustainability Plan (VTCAC&SP) in April of 2009⁵.

Through the VTCAC&SP, the university completed a greenhouse gas emissions inventory to determine its carbon footprint, as well as put forth suggestions and plans for its reduction. One such plan concerned increasing the percentage of locally and sustainably produced food served in the dining halls on campus. The venue Farms & Fields in Owens Food Court presently serves only local and/or organic foods, and other dining halls are seeking to increase their usage of local foods⁶. According to Rachael Budowle (oral communication, May 2010), Sustainability Coordinator for dining services, dining services presently maintains approximately one acre at Kentland Farm, the university's agricultural research farm, for vegetable production for consumption in the dining halls.

The environmental impacts of eating locally have been widely analyzed in many settings^{1, 7, 8}, though the term for considering a food's environmental impact, a "foodprint"⁹, is relatively new. Many of these studies have focused on the specific impact of fossil fuels used in transport and have found that sourcing local foods results in fewer carbon dioxide emissions^{7, 10}. In one particular study, it was found that the final delivery of fruits of vegetables in the United States accounts for half of the transportation miles associated with its production¹¹. This final segment of transport was dominated by trucking, an

energy intensive shipping method, and thus reveals a critical point in which to reduce greenhouse gas emissions for this particular sector.

The vast majority of these studies have used the concept of food miles to guide their comparisons, which is simply the distance a food travels from origin to consumption point¹². Food miles can be accurately calculated to reflect the weight of food from each production point, called the Weighted Average Source Distance (WASD)¹³, as well as to account for multiple ingredients, known as the Weighted Total Source Distance (WTSD)¹². Further, the environmental impact can be measured in terms of carbon emissions using the formula for calculating the Weighted Average Emissions Ratio (WAER)¹⁴.

In addition to the environmental impacts of sourcing local foods, the differences in quality and consumer preferences must be addressed. The popularity and quality of the food served in Virginia Tech dining halls is well-known and often awarded, and its preservation is likely at the forefront of the dining services directors' concerns. It is critical that substitution of local foods is not detrimental to quality. Hedonic scales are useful tools in the determination of sensory quality and preference and have been widely used in fresh market vegetable surveys¹⁵.

Comparison of the emissions associated with the transport of broccoli from each source will verify that the use of local broccoli in Virginia Tech dining halls reduces carbon dioxide emissions and the subsequent carbon footprint of the university. Comparison of consumer-perceived quality characteristics will reveal preference for locally grown produce over nonlocal produce.

Materials and Methods

Carbon Dioxide Emissions

Design

Travel Routes

The quantity of carbon dioxide emitted from transport vehicles involved in the shipment of broccoli to the university, the shipping routes, as well as the type of vehicles utilized in each segment were identified. This was accomplished through correspondence with the university's food distributor

(Produce Source Partners), William E. Smith Trucking, Inc, and Virginia Tech's Dining Services Sustainability Coordinator Rachel Budowle. Distances were calculated using Google Maps, using the shortest routes traveled. The path taken from Mt. Airy, North Carolina, to Roanoke, Virginia was verified by phone by William E. Smith Trucking, Inc.

The mile calculation for nonlocal broccoli incorporated travel to the university and excluded the return trip made by the tractor trailer. This methodology was followed to ensure that only the emissions directly resulting from the transport of the broccoli were included in the calculation, as the tractor trailer would be transporting a different commodity on the return trip. Local broccoli mile calculations followed the route dictated by Budowle, beginning at Owens Hall, Blacksburg, VA 24060 and ending at the Southgate Food Processing Center, Blacksburg, VA 24060.

Vehicle Selection, Fuel Efficiency, Carbon Dioxide Emissions

Correspondence with the trucking company verified the use of tractor trailers in the shipment of nonlocal broccoli, and a fuel efficiency approximation was made using the estimate referenced in the 10th Diesel Engine Emission Reductions Conference¹⁶. A 2004 GMC 2WD Safari Cargo Van was selected in accordance with information received from Budowle. Fuel efficiency was found using the Department of Energy's vehicle database¹⁷. The U.S. Energy Information Administration's Fuel Emission Factors table was utilized to determine carbon dioxide emissions by fuel type¹⁸.

Time Frame Selection

The nature of this research rendered it dependent upon the seasonality of the local broccoli. In Blacksburg, broccoli can be grown—and therefore supplied to the university—during the cool spring and fall months. Additionally, the university must be in regular session in order for the produce to reach students. To be in alignment with these parameters, October 1 – 30, inclusive, was elected as the time window. Thus, all shipments received at the Southgate Food Processing Center on October 1 through

October 30 were incorporated in this study. According to this limit, shipments that began prior to but were received on or after October 1 were also included.

To best imitate the schedule to be followed during the month of October 2010 as dictated by Budowle (written communication), the calculation of pounds carbon dioxide emitted per trip was multiplied by 2.5 (to reflect the 2-3 shipments per week) and then by 4.43 (to reflect the 4.43 weeks in the month of October).

Methodology

The formula for estimating the distance travelled and transport-related carbon dioxide emissions was adapted from the methodology developed by Annika Carrlson-Kanyama¹³ and the Life Cycles Project Society¹⁴:

$$Distance_{1a} (mi) + Distance_{2a} (mi) + Distance_{...} (mi) = Total Distance Travelled by Vehicle a$$

$$\underline{Total Distance Travelled}_a = Gallons Fuel Used Enroute_a$$

$$Fuel Efficiency_a (mi/gal)$$

$$Gallons Fuel Used Enroute_a \times Fuel Emissions Factor_a (lbs CO_2/gal fuel) = lbs CO_2 Emitted Enroute$$

Nine total deliveries of nonlocal broccoli were made to the university during the selected timeframe, thus to find the average distance travelled and pounds carbon dioxide emitted per shipment, the total distance travelled and pounds carbon dioxide emitted enroute per shipment were summed and divided by nine.

Consumer Taste Test

Design

The location of the single-blind taste test, the Blacksburg Farmers Market, was chosen based upon the assumption that most consumers (and potential participants) would have an inherent knowledge of produce quality and freshness. The taste test took place on two consecutive Wednesdays from 2 p.m. to 7 p.m., on which similar environmental conditions (temperature, weather) were experienced. The produce type (zucchini) was selected on the basis of seasonal and volume availability necessary to provide adequate sampling sizes to each participant and was purchased the morning of each test to ensure identical freshness between test dates. Upon purchase, the produce was immediately placed in refrigerated containers with code labels and then washed on site. The produce was cut to order in approximately two inch segments and placed in two separate and coded plastic cups. In between samples (local, nonlocal), the participants were asked to consume a piece of white bread and sip water to cleanse the palette. All testing was done in accordance with Institutional Review Board at Virginia Tech.

Methodology

The paper survey can be found in Appendix A and consisted of four sets of questions. The first set included demographic identifiers, such as age, sex, and enrollment status at Virginia Tech. The second set consisted of hedonic scales to measure consumer preference of overall outward appearance, outside color, overall internal appearance, seed content, inner flesh color, overall flavor, flavor intensity, bitterness, overall texture, and firmness. All questions were 7-point scales (dislike extremely = 1, dislike moderately = 2, dislike slightly = 3, neither like nor dislike = 4, like slightly = 5, like moderately = 6, like extremely = 7) except for the question pertaining to bitterness, which utilized a 5-point scale (extremely bitter = 1, moderately bitter = 2, slightly bitter = 3, somewhat bitter = 4, not bitter at all = 5). The second set of questions was repeated for sampling of the nonlocal zucchini. The fourth set of questions pertained to shopping habits, importance of local food, personal definition of “local”, percentage of food purchases locally grown or raised, and finally, preference of the zucchini sampled.

Statistical Analysis

SAS JMP software was used to complete the statistical analysis of the consumer taste test survey. Statistical significance at the $\alpha = .05$ level was verified using the Wilcoxon Sign-Rank test and the Likelihood Ratio.

Results

Carbon Dioxide Emissions

Investigation revealed that all nonlocal broccoli shipments originated at The Nunes Company, Inc. in Salinas, California. In general, the tractor trailer left Salinas for first Mt. Airy, North Carolina, then Roanoke, Virginia, to Produce Source Partners food distributors. Upon order from Virginia Tech dining services, the broccoli was transported to the Southgate Food Processing Center in Blacksburg, Virginia.

The cargo van utilized in the transport of local broccoli began at Owens Hall, Blacksburg, Virginia, traveled to Kentland Farms, Blacksburg, Virginia, then returned to the university campus to deliver the produce to the Southgate Food Processing Center. The local and a representative nonlocal shipment routes are depicted in Figure 1.

Tables 1 and 2 display the data used in the calculation of carbon dioxide emissions for nonlocal and local broccoli, respectively. The average distance traveled by nonlocal broccoli delivered to Virginia Tech during the month of October 2009 was 2786.0 miles ($SD \pm 0.5$). The total amount of carbon dioxide emitted as a result of this transport was 105,830.0 pounds. This averaged to approximately 11,758.9 pounds carbon dioxide ($SD \pm 2.1$) per shipment and 15.3 pounds carbon dioxide per pound of broccoli delivered.

The distance traveled per trip by the cargo van transporting the local broccoli was 19.1 miles. The amount of carbon dioxide emitted per trip was 23.2 pounds, which summed to 258.3 pounds of carbon dioxide given off during all transport occurring in the month of October. Per pound of broccoli, 0.04 pounds of carbon dioxide were emitted.

Consumer Taste Test

Population Sample Statistics

The sample was primarily young, with the majority (42%) of participants being 18-24 years of age (N=98). Figure 2 displays the age distribution of the sample. 69% were female (N=97), and 45% were students at Virginia Tech (N=97). 46% indicated that having local foods in their diets is “Extremely Important,” 20% “Very Important,” 30% “Somewhat Important,” and 4% “Not Important” (N=100). The most popular (N=37) definition of “local” was between 50-75 miles, followed by 100-125 miles (N=29) (Figure 3).

Local and Nonlocal Comparison

The proportion of participants who preferred the local broccoli is .71 (N=98). Using the Likelihood Ratio test, it was found that it is significantly different than 0.5 (p-value <.0001) at the $\alpha = .05$ level, which represents no preference. Local broccoli had higher participant rating scores for all attributes except seed content. A higher score in the bitterness hedonic scale translates into a decreased perception of bitter flavor. Therefore, the local broccoli was also perceived as less bitter than the nonlocal. Statistically significant ($\alpha = .05$) differences in participant rating of color (p-value = .0004), overall internal appearance (p-value = .0301), overall flavor (p-value <.0001), intensity of flavor (p-value = .0086), overall texture (p-value <.0001), and firmness (p-value <.0001) were observed using the Wilcoxon Sign-Rank test. The mean differences in participant rating are displayed in Table 3.

Discussion

Implications

Virginia Tech’s quest for carbon neutrality aligns nicely with the local foods movement, which is concurrently gaining popularity not only in the town of Blacksburg but also at institutions of higher learning nationwide^{1, 2}. Every growing season, more people are choosing to “go local” by purchasing locally grown or raised products. The reasons for supporting local growers are numerous and varied: to obtain the freshest and highest quality produce, to support the local economy, to develop a connection to

place, and to lessen one's environmental impact associated with food production and distribution. The former and the latter motives guided the basis for this study.

According to the results, the usage of local broccoli will indeed reduce the university's carbon footprint relating to its procurement. A 99.8% reduction in carbon dioxide emissions resulting from transport during the month of October is realized upon this modification. Additionally, the study revealed that for every 4 ounce serving of nonlocal broccoli served in the dining halls, 3.8 pounds of carbon dioxide was emitted throughout its distribution compared to 0.009 pounds per identical serving of broccoli from Kentland Farm. With its 9,100 campus residents—all of whom are required to purchase a meal plan—the potential impact in Virginia Tech's dining halls is tremendous¹⁹.

The study also revealed the potential for increase in quality of zucchini when serving local in the dining halls. 101 participants were able to discern statistically significant ($\alpha = .05$) differences in color, overall internal appearance, overall flavor, flavor intensity, overall texture, and firmness between the local and nonlocal zucchinis sampled in a blind taste test. Local zucchini consistently earned higher ratings in every characteristic except seed content and was also perceived as less bitter (Table 3). The greatest differences in rating concerned overall texture and firmness, indicating that dining services would be able to positively influence the quality of zucchini served to students by sourcing it locally.

Limitations

The calculations for carbon dioxide emissions relied upon several assumptions, which introduce some limitations on its validity. First, it was assumed that the tractor trailer and cargo van utilized in transport would follow the shortest routes in miles as indicated by Google Maps. The actual routes were determined where possible. Also, any stops made during the trips are not reflected in the calculations. Therefore, these estimates are likely lower than the empirical emissions figures. Second, there exists some variability in fuel efficiency according to weather, speed, tire condition, and weight. Additionally, the fuel efficiency value for the tractor trailer reflects that of technology available in 2004 and not 2010. To parallel this limitation, a 2004 model of a GMC Safari cargo van was chosen for the local estimations.

Further, these emissions values do not take into account the fossil fuels used during other production points, such as tractor or fertilizer use. Data on this usage would offer a more complete comparison: perhaps more efficient field equipment used in nonlocal broccoli production offsets the additional miles required for transport.

The majority of the limitations pertaining to the taste test survey are related to the population sampled. The taste test took place solely at the Blacksburg Farmers market, and therefore the results only represent the preferences of people who shop at this location. Additional surveys at varying sites, such as a grocery store, would be necessary to offer a more complete picture of the average consumer. Further, additional zucchini samples could be taken from other local farms, as the local zucchini used in this study was purchased from a single farm to decrease variability between test dates. Moreover, although coding was used to disguise the origin of both zucchinis, the local zucchini was available for sale from the vendor stationed at the opposite end of the farmers market. The farmer was instructed to refrain from claiming ownership of the zucchini, but it is possible that a participant could try to identify the local zucchini based on appearance. This allows for an especially harmful limitation: bias.

Future Direction

Additional research on carbon emissions resulting from broccoli production stages is necessary in order to make a comprehensive comparison of local and nonlocal. Kentland Farm is also the origin of several other vegetables currently used in dining halls during the fall semester of 2010. These include tomatoes, cucumbers, zucchini, squash, and green beans. Further assessment of their respective foodprints would likely reveal similar results. Other areas in need of evaluation include student awareness and perception of local foods, cost analysis encompassing all aspects of production and distribution, nutrition analysis comparing local versus nonlocal, and infrastructural measures in place impeding the procurement of local foods in the dining halls.

This assessment of the effects of using local foods in Virginia Tech's dining halls illustrates the outcome of one of the initiatives currently in place as well as supports the development of future

programs. Virginia Tech prides itself on the diversity and quality of the foods served in its dining centers. This current trend in local food procurement undoubtedly supports this ideal while allowing more students to live consistently with their values.

Figures and Tables

Figure 1. Representative Transport Routes of Local vs. Nonlocal Broccoli

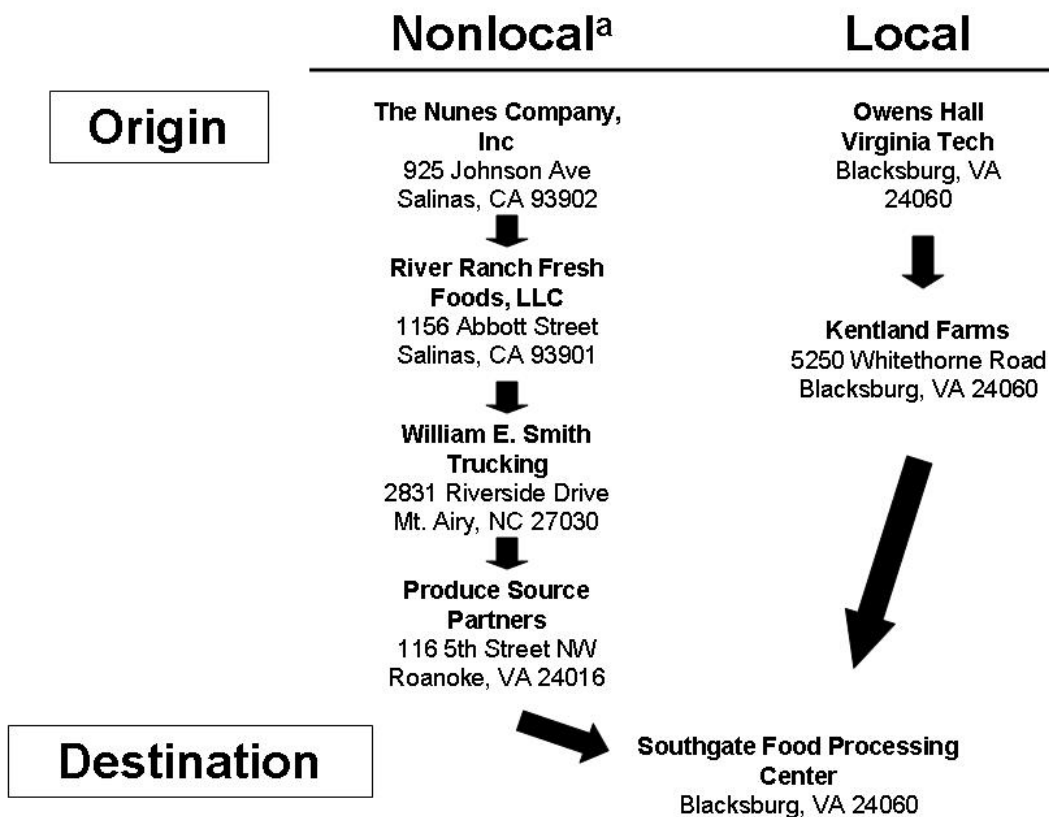


Figure 1. Representative transport routes of nonlocal vs. local broccoli.

^aShipment beginning September 28, 2010.

Table 1. Nonlocal Broccoli Transport Data

Table 1. Nonlocal Broccoli Transport Data. This table depicts the values used in calculating the carbon dioxide emissions associated with the transport of nonlocal broccoli to Virginia Tech. ^aValue from source 16. ^bValue from source 18.

Shipment Beginning:	Distance Travelled (mi)	Mode of Transport	Fuel Efficiency ^a (mpg)	Gallons Used in Transport	lbs CO2 Emitted per Gallon ^b	CO2 Emitted per Trip
September 28	2785.7	Tractor Trailer	5.3	525.6	22.37	11757.8
September 30	2786.6	Tractor Trailer	5.3	525.8	22.37	11761.6
October 2	2786.2	Tractor Trailer	5.3	525.7	22.37	11759.9
October 6	2786.3	Tractor Trailer	5.3	525.7	22.37	11760.3
October 12	2786.2	Tractor Trailer	5.3	525.7	22.37	11759.9
October 13	2786.2	Tractor Trailer	5.3	525.7	22.37	11759.9
October 19	2785.2	Tractor Trailer	5.3	525.5	22.37	11755.7
October 21	2786.1	Tractor Trailer	5.3	525.7	22.37	11759.4
October 26	2785.2	Tractor Trailer	5.3	525.5	22.37	11755.7

Table 2. Local Broccoli Transport Data

Table 2. Local Broccoli Transport Data. A hypothetical local broccoli shipment was designed to determine the carbon dioxide emissions associated with the transport of local broccoli to the Virginia Tech. ^aValue from source 17. ^bValue from source 18.

Distance Travelled (mi)	Mode of Transport	Fuel Efficiency^a (mpg)	Gallons Used In Transport	lbs CO2 Emitted per Gallon^b	lbs CO2 Emitted per Trip
19.1	2004 GMC Safari	16	1.2	19.54	23.3

Figure 2. Age Distribution of Participants

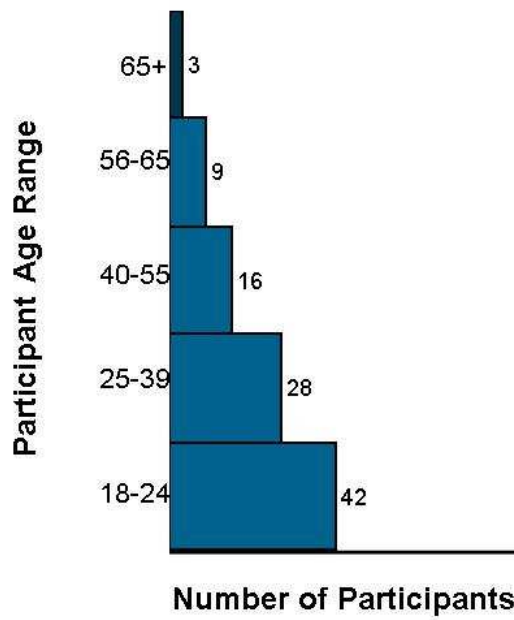


Figure 2. Age Distribution of Participants. The majority of the population was 18-39 years of age.

Figure 3. The Meaning of “Local.”

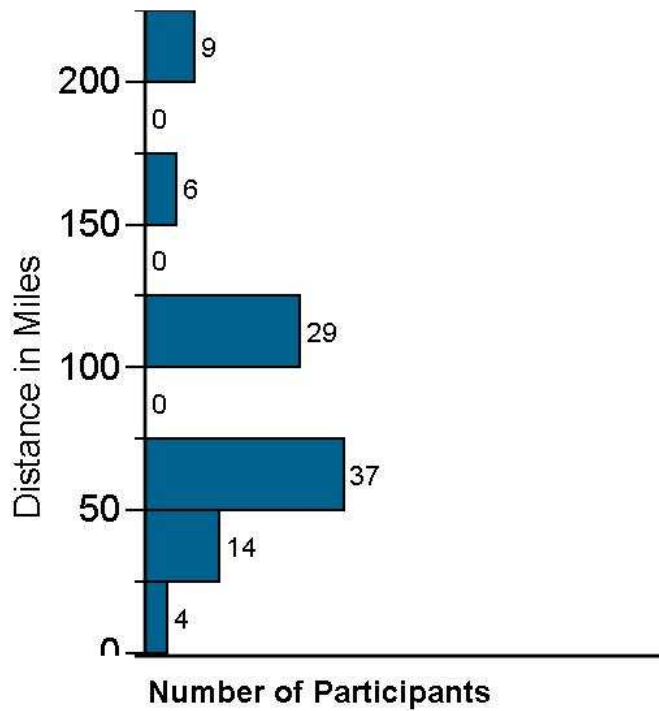


Figure 3. The Meaning of “Local.” Participants were prompted to indicate in miles their personal definition of “local.” The most popular definition was between 50 and 75 miles.

Table 3. Mean Difference in Participant Ratings of Various Attributes: Local vs. Nonlocal

Table 3. Mean Difference in Participant Ratings of Various Attributes: Local vs. Nonlocal. Local zucchini earned higher participant ratings in every quality characteristic except seed content. A higher score on the bitterness scale indicates a less bitter taste. Statistically significant ($\alpha = .05$) differences are marked with an asterisk.

Attribute	Mean Difference in Score: Local vs. Nonlocal
Overall Outward Appearance	+.24
Color	+.62*
Overall Internal Appearance	+.37*
Seed Content	-.24
Color of Inner Flesh	+.29
Overall Flavor	+.84*
Intensity of Flavor	+.51*
Bitterness	+.099
Overall Texture	+1.42*
Firmness	+1.55*

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Appendix A: Taste Test Questionnaire

Market Questionnaire
 Summer 2010
 Code Number:

The object of this survey is to measure your preference (like or dislike) of two produce items based on appearance, taste, and texture. One of these items is non-local, and one has been locally grown. Bread and water will be supplied between tasting. Gluten-free bread is available upon request. At the end of this survey, you will be asked to answer several questions about your food shopping habits in regards to local foods as well. The estimated time to complete this survey is 10 – 20 minutes. You may stop taking this survey at any point in time.

P. Pre-Survey Questions

P.1 What is your age?
 Tech?

- a. 18 – 24
- b. 25 – 39
- c. 40 – 55
- d. 55 – 65
- e. 65

P.2 What is your gender?

- a. Female
- b. Male
- c. I prefer not to answer.

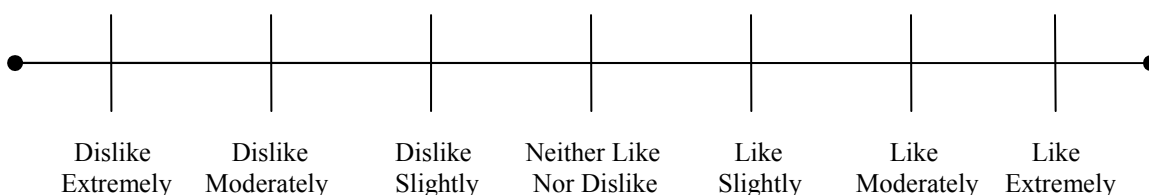
P.3 Are you a student at Virginia Tech?

- a. Yes
- b. No

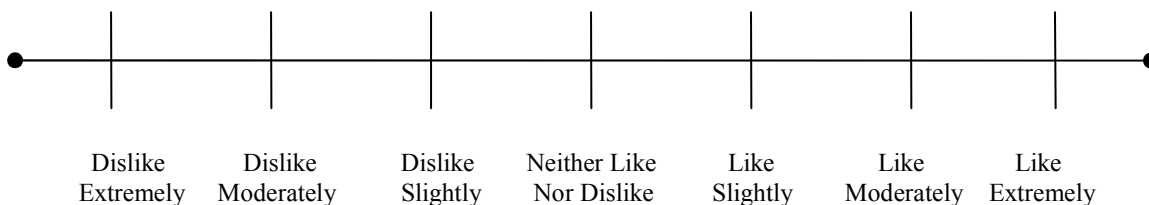
INSTRUCTIONS: Please direct your attention to the produce item in the cup labeled [S3J4V].

1. External Appearance (2 questions):

1.1 Please rate the overall outward appearance of the item by making an X over the opinion that is most like your own:



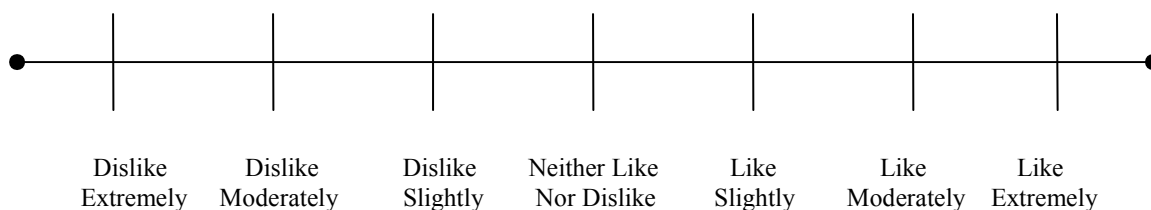
1.2 Please rate the color by making an X over the opinion that is most like your own:



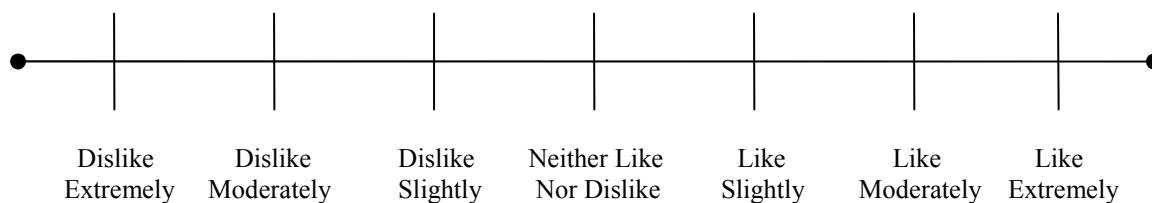
2. Internal Appearance (3 questions):

INSTRUCTIONS: Please use the knife to carefully cut the vegetable into 4 segments of the same size.

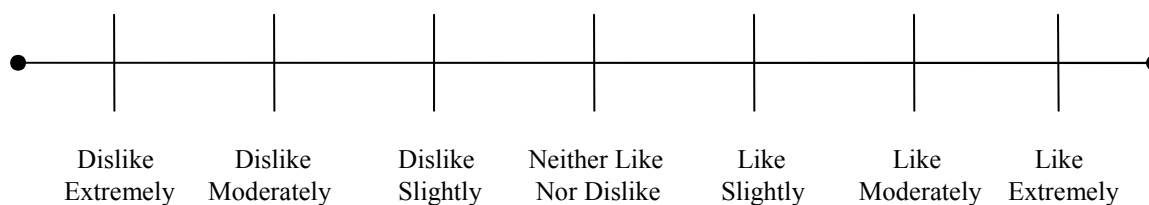
2.1 Please rate the overall internal appearance by making an X over the opinion that is most like your own:



2.2 Please rate the seed content by making an X over the opinion that is most like your own:



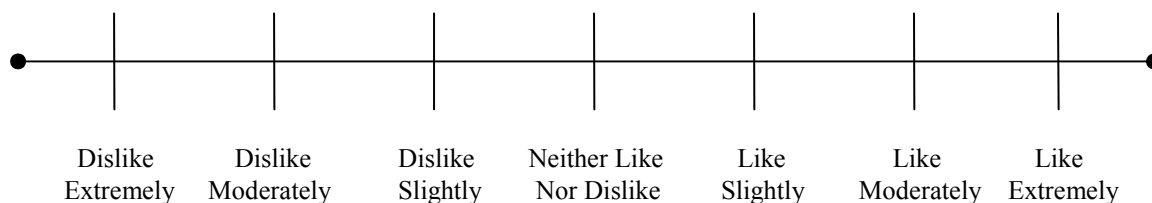
2.3 Please rate the color of the inner flesh by making an X over the opinion that is most like your own:



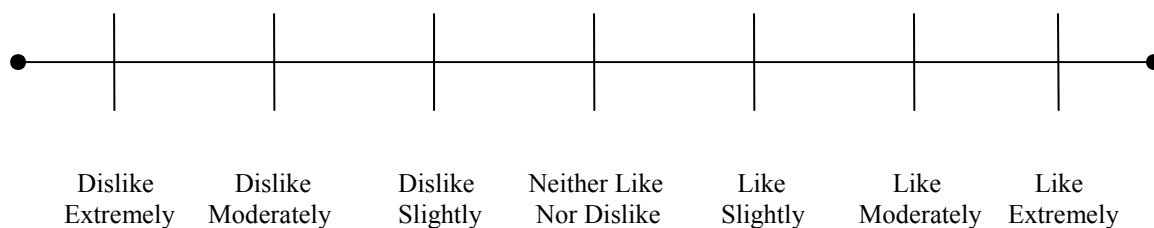
3. Flavor (3 questions):

INSTRUCTIONS: Please eat one of the segments. If it is too large, cut the segment in half and then proceed.

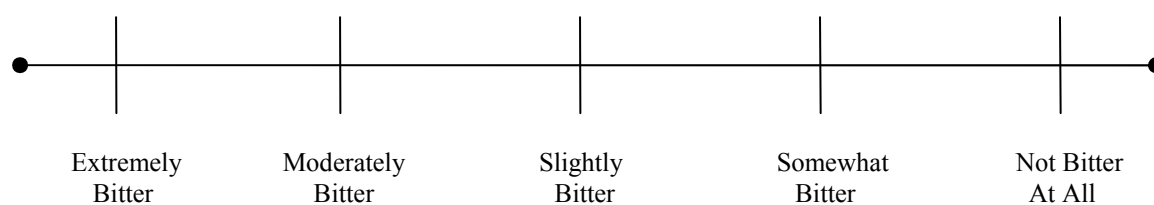
3.1 Please rate the overall flavor by making an X over the opinion that is most like your own:



3.2 Please rate the intensity of the flavor by making an X over the opinion that is most like your own:



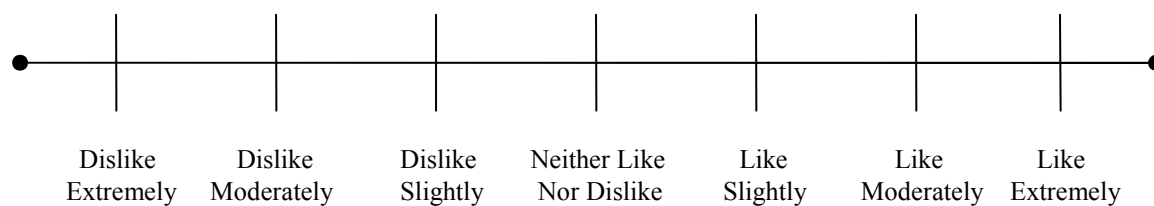
3.3 Please rate the bitterness of this item by making an X along this scale:



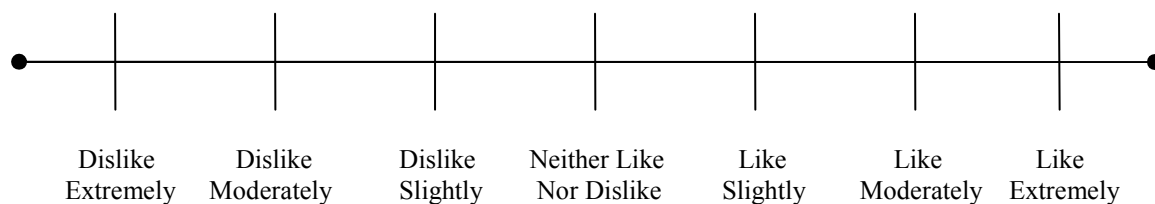
4. Texture (2 questions):

INSTRUCTIONS: You will now be evaluating the item based on its texture. Please eat another segment.

4.1 Please rate the overall texture by making an X over the opinion that is most like your own:



4.2 Please rate the firmness by making an X over the opinion that is most like your own:

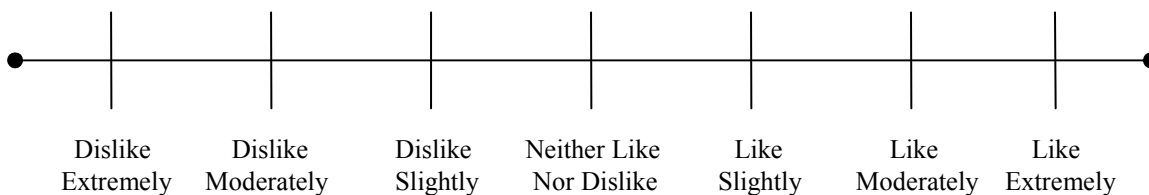


You are now finished with the first produce item. You may eat the remaining segments. Afterwards, eat one piece of bread and drink as much water as desired. If you have a gluten allergy, please raise your hand and gluten-free bread will be provided. After you are finished, please continue to the next page.

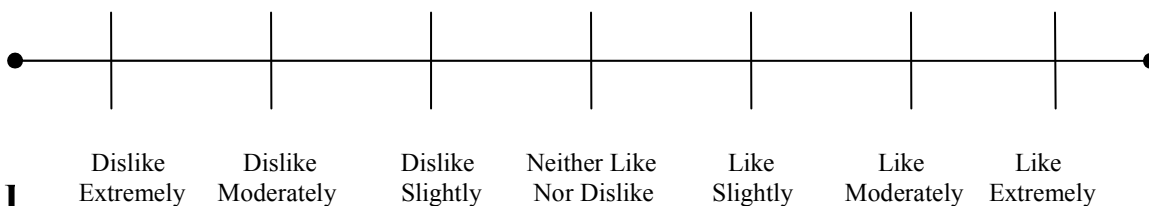
Please direct your attention to the produce item in the cup labeled [B3T82].

1. External Appearance (2 questions):

1.1 Please rate the overall outward appearance of the item by making an X over the opinion that is most like your own:



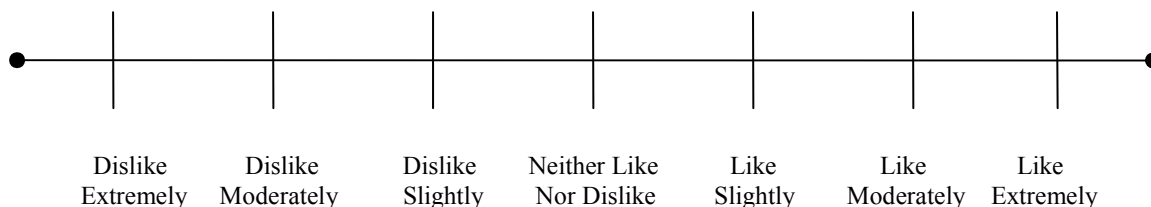
1.2 Please rate the color by making an X over the opinion that is most like your own:



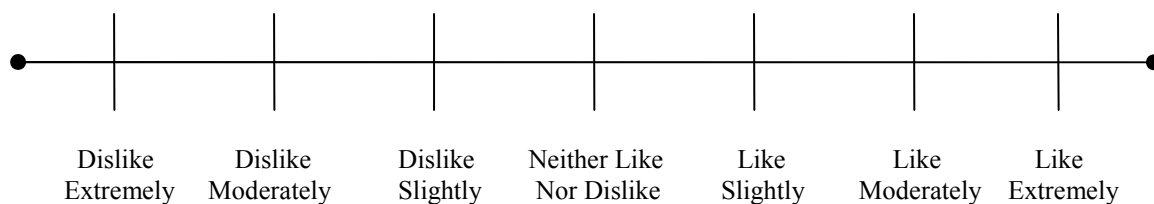
2.1

INSTRUCTIONS: Please use the knife to carefully cut the vegetable into 4 segments of the same size.

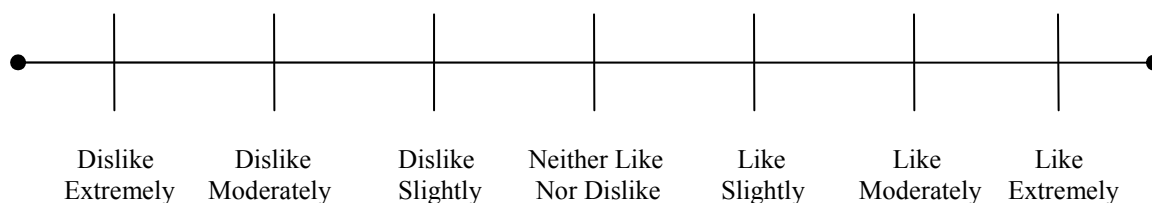
2.1 Please rate the overall internal appearance by making an X over the opinion that is most like your own:



2.2 Please rate the seed content by making an X over the opinion that is most like your own:



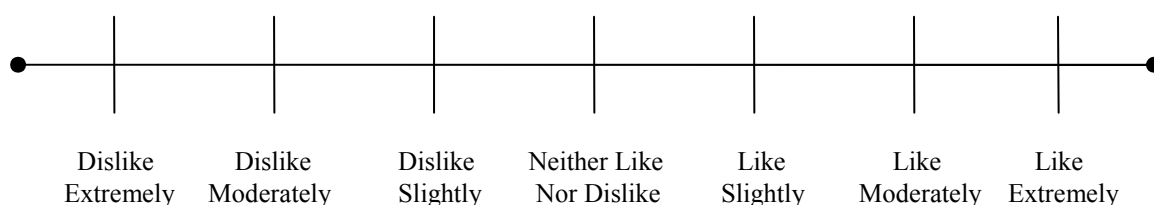
2.3 Please rate the color of the inner flesh by making an X over the opinion that is most like your own:



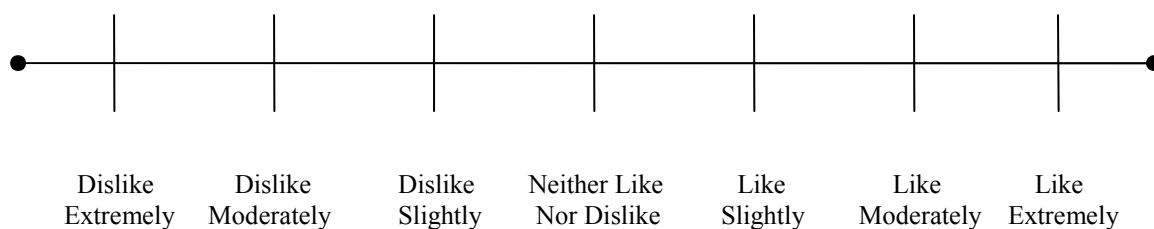
3. Flavor (3 questions):

INSTRUCTIONS: Please eat one of the segments. If it is too large, cut the segment in half and then proceed.

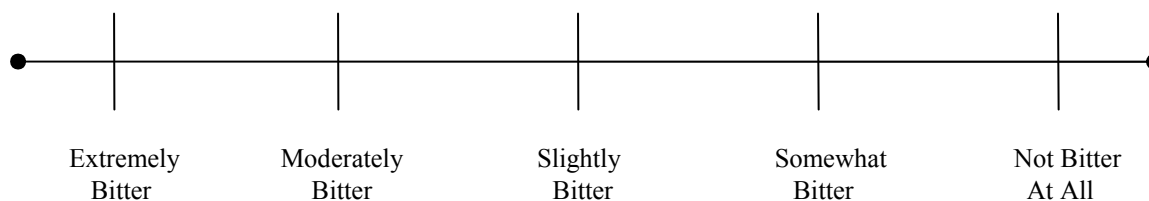
3.1 Please rate the overall flavor by making an X over the opinion that is most like your own:



3.2 Please rate the intensity of the flavor by making an X over the opinion that is most like your own:



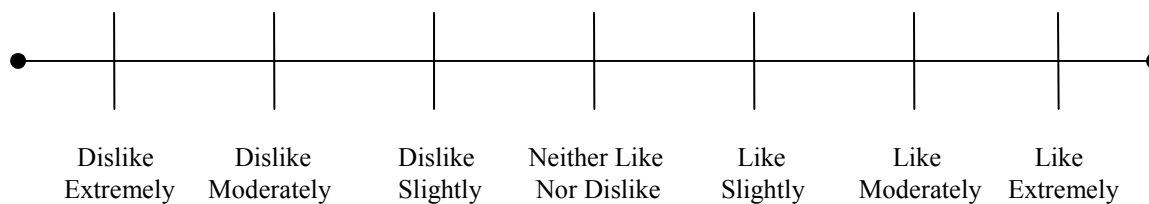
3.3 Please rate the bitterness of this item by making an X along this scale:



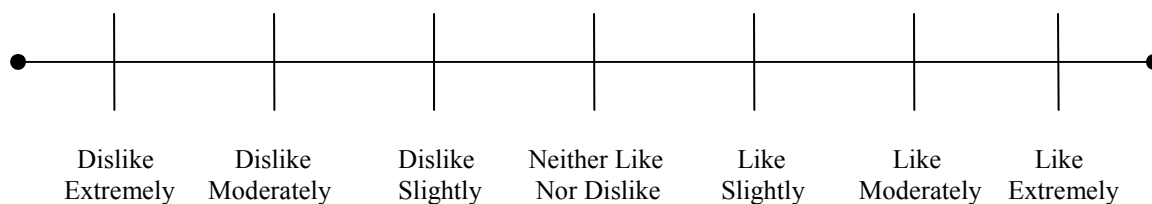
4. Texture (2 questions):

INSTRUCTIONS: You will now be evaluating the item based on its texture. Please eat another segment.

4.1 Please rate the overall texture by making an X over the opinion that is most like your own:



4.2 Please rate the firmness by making an X over the opinion that is most like your own:



5. Shopping Habits (5 questions):

5.1 Please identify your role in food shopping for yourself and/or your family or household:

- a. I am the primary food shopper.
- b. I share the responsibility of food shopping with a significant other, friend, or roommate.
- c. I do not shop for the food eaten at home.

5.2 How important to you is it to have locally grown or raised foods in your diet?

- a. Extremely important
- b. Very important
- c. Somewhat important
- d. Not important

5.3 What is your definition of “local” regarding food?

- a. Within 200 miles
- b. Within 150 miles
- c. Within 100 miles
- d. Within 50 miles
- e. Within 25 miles
- f. Within 10 miles
- g. Other _____

5.4 Please estimate the percentage of your food purchases that are locally grown or raised:

_____ %

5.5 Which produce item do you prefer?

- a. **S3J4V**
- b. **B3T82**

Thank you for completing this survey.

You are free to leave, and may take the remainder of the produce items with you.