


Ethnic crop consumption and marketing in the Eastern United States: Trends and prospects

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ABSTRACT

The population demographics of the eastern U.S has changed in recent years with an increase in immigrants, particularly of Asian and Hispanic origins. This trend motivated the identification of foods preferred by these ethnic communities in 16 states in the region and Washington, D.C., focusing on greens and herbs. Over 100 ethnic greens and herbs were identified as being preferred food choices, from which 40 were selected for further study, representing 10 crops important to four ethnicities: Asian Indian, Chinese, Mexican, and Puerto Rico. Bulletin board focus group and telephone survey participants responded to questions regarding their consumption in 2010. The relevant information was collected to assess retail sales for each crop for each of the four ethnic groups. Results demonstrated that the ethnic crop demand in the eastern U.S is significant, and the prospects for future growth are promising as the population of ethnic consumers in the region is projected to continue to grow.

1. Introduction

Since 1980, growers in the eastern U.S. have been profoundly challenged with profitability and subsequent farm viability due to highly volatile markets (Govindasamy et al. 2010). Eastern growers tend to operate on relatively small farms and face higher production costs. The commercial production prospects for specialty crops and catering to the ethnically diverse consumers in the eastern U.S. have progressed in the last decade (Bhugra et al. 1999; Tubene 2001; Mendonca et al. 2006; Arumugam et al. 2016). Population demographics are significantly changing with the increase of an ethnic population, which has been more pronounced in the East Coast region. As per the 2020 Census Bureau Reports, Hispanics and Asians remain the rapidly increasing minorities in the U.S. Between 2016 and 2060, the Hispanic population is projected to grow from 58 to 111 million, whereas the Asian population will increase from 18 to 37 million (Vespa et al. 2020). Beginning in 2030, net international migration is expected to be the main factor in population growth in the U.S. For instance, while the natural increase in population is projected to add one million people by 2030, net international migration will add 1.1 million people (Vespa et al. 2020).

According to a study of the multicultural economy by the University of Georgia Selig Center, the combined buying power of Asian Americans and Hispanic populations has dramatically increased since 2000, becoming the fastest-growing minority market in the country. In 2018, Asian-Americans contributed 6.2 percent, roughly \$1 trillion (Humphreys 2018), to the economy, an increase of 267 percent since the beginning of the millennium (Humphreys 2018), while Hispanics contributed about \$1,5 trillion, an increase of 212 percent, since 2000. The purchasing power of Hispanics increased to \$494 billion in 2000 and is projected to increase by more than \$1,924 trillion by 2023. The Asian buying power was estimated to be about \$276 billion in 2000 and is expected to increase to \$1,34 trillion by 2023 (Humphreys 2018). The fast growth of the ethnic population and their increasing purchasing power translates to substantial opportunities for the ethnic produce sector. Greens and herb growers in the region can take advantage of their proximity to densely populated areas where these groups often reside. However, ethnic consumers are often looking for produce with

specific attributes and flavors (Govindasamy et al. 2007; Park et al. 2007; Govindasamy et al. 2015).

Consumer food choices that result in nutritional patterns are considered important for achieving sustainability targets (Sciarappa et al. 2016). Food choice behaviors are linked to the social and economic appearance of identities, preferences, and cultural meanings and are an essential determinant of nutritional status and health. Food can be a sign of individual identity, group affiliation (Lindgren et al. 2018), and cultural identity (Bisogni et al. 2002). Consumers make food decisions based on psychological and cultural factors, as well as lifestyle and food trends (Fischler 1988; Asp 1999; Gilbert 2000). Recent food trends in the U.S. reflected more on "home-cooking" eating habits, with more whole/plain foods such as fruit, vegetables, cooking fat, grains, unsweetened milk, juice, and others; whereas, the trends also showed a negative preference for processed food groups such as fast-food meals and snacks (Monterrosa et al. 2020).

The food system is important in understanding the many factors that influence food choice at the individual level and the role of culture in driving those choices. For instance, there is an established linkage between food and culture (Piernas et al. 2014). This correlation drives an immigrant's integration into a new culture, like that of the U.S., while still maintaining their identity with their home country (Peñaloza 1994; Piernas et al. 2014; Arumugam et al. 2016). Evidence for the importance of these groups is further demonstrated by the fact that ethnic foods are categorized as specialty items, which have increased in value by 9.8 percent between 2016 and 2018, reaching \$148.7 billion in sales (Bojanic and Xu 2006). Thus, it would only be prudent for growers to assess their ability to meet the demand for ethnic food. Against this background, this paper has documented Hispanic and Asian consumers' consumption patterns and identified the most preferred ethnic greens and herbs in the eastern U.S.

2. Materials and Methods

This paper reviews the prospects for marketing ethnic greens and herbs to Asian and Hispanic consumers. These specific ethnic markets were chosen for their strong recent growth, which is predicted to continue (Humphreys 2018; Specialty Food Association 2019). The top two subgroups within each of these sections were i) Asian sub-groups (Chinese and Asian Indian) and ii) Hispanic sub-groups (Puerto Rican and Mexican). The geographical focus included Washington D.C. and 16 states along the East Coast region of the U.S.

The project team consulted advisory board members and used online focus group bulletin board sessions and telephone surveys to collect data from the target market. Focus group participants were selected at random from a recognized panel of participants managed by Survey Sampling International, LLC (Shelton, CT), a provider of sampling solutions for survey research. To participate in the bulletin board sessions, panelists clicked on a hyperlink at the bottom of the consent statement, directing them to the welcome screen. Each morning the moderator would email panelists reminding them to log in to the system, respond to new questions, and review and respond to other panelists' comments posted on the previous day. In total, of the 44 panelists who accessed the bulletin boards, 38 consumers completed the study: 11 in the "Chinese" ethnicity focus group

session, 10 in the "Asian Indian" session, nine in the "Mexican" session, and eight in the "Puerto Rican" session. During the sessions, participants responded to questions about their shopping habits, preferences, perceptions, and demographic characteristics. Bulletin board focus group responses were then used to construct a telephone survey of ethnic consumers.

A preliminary list of ethnic greens and herbs important to the four ethnic groups was compiled based on responses gathered from online focus group bulletin board session participants and informal market research. To determine which of these crops to incorporate in the telephone survey, a panel of marketing, crop specialists, and field/extension faculties reviewed the list of ethnic greens and herbs to eliminate those with existing production barriers that could impede their marketplace success and/or local production (Figure 1, Govindasamy et al. 2007). These data were then used to estimate ethnic consumers' buying behaviors, such as buying frequency, quantities of ethnic greens/herbs bought during each visit, and to estimate the overall market size of the top 10 greens/herbs consumed by respondents who identified with the four ethnicities.

A separate detailed survey for each ethnic group was developed based on input from all specialists and consumer representatives from each of the four groups. The crop list was further refined through a selection method based on expenditures, quantities, and appropriate production considerations for the local market demand and supply factors (Appendix I). A telephone survey of consumers residing in states along the East Coast region (Maryland, Massachusetts, Delaware, Florida, New Hampshire, Georgia, Maine, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Vermont, Virginia and Washington, D.C.) of the U.S. was conducted by Perceptive Marketing Research, Inc. (Gainesville, FL), a market research firm. The survey gathered information to assist small and medium farmers with a better understanding of consumer insights and factors that drive ethnic greens and herbs markets, specifically attitudes and behaviors of Asian Indian, Chinese, Mexican, and Puerto Rican consumers. Interviews were conducted using the computer-assisted telephone interviewing system (CATI) with interview times averaging between 20 and 23 minutes.

The survey was pre-tested and then launched from 11 May to 22 Oct. 2010, with a total of 7,678 leads to meet the required samples. Around 195 households refused to answer any questions, and 2,457 of them reported no answer. A total of 3,217 household calls were unsuccessful, 516 respondents were not available during initial and follow-up attempts, and 49 telephone call interviews were interrupted during the survey. A total of 1,244 responses were collected. Of these, 1,117 respondents qualified as they indicated they were responsible for at least half of the food shopping for the household (Chinese-276, Asian Indian-277, Puerto Ricans-284, and Mexicans-280). The remaining 127 respondents did not have a role in purchasing food items for the household, and their responses were removed from the data set (Chinese-21, Asian Indian-45, Puerto Ricans-37, and Mexicans-24). Detailed information, including price and quantity, was obtained to measure retail sales of each produce item based on information provided by ethnic respondents who purchased each particular item (Bernstein 2006; Govindasamy, et al. 2007).

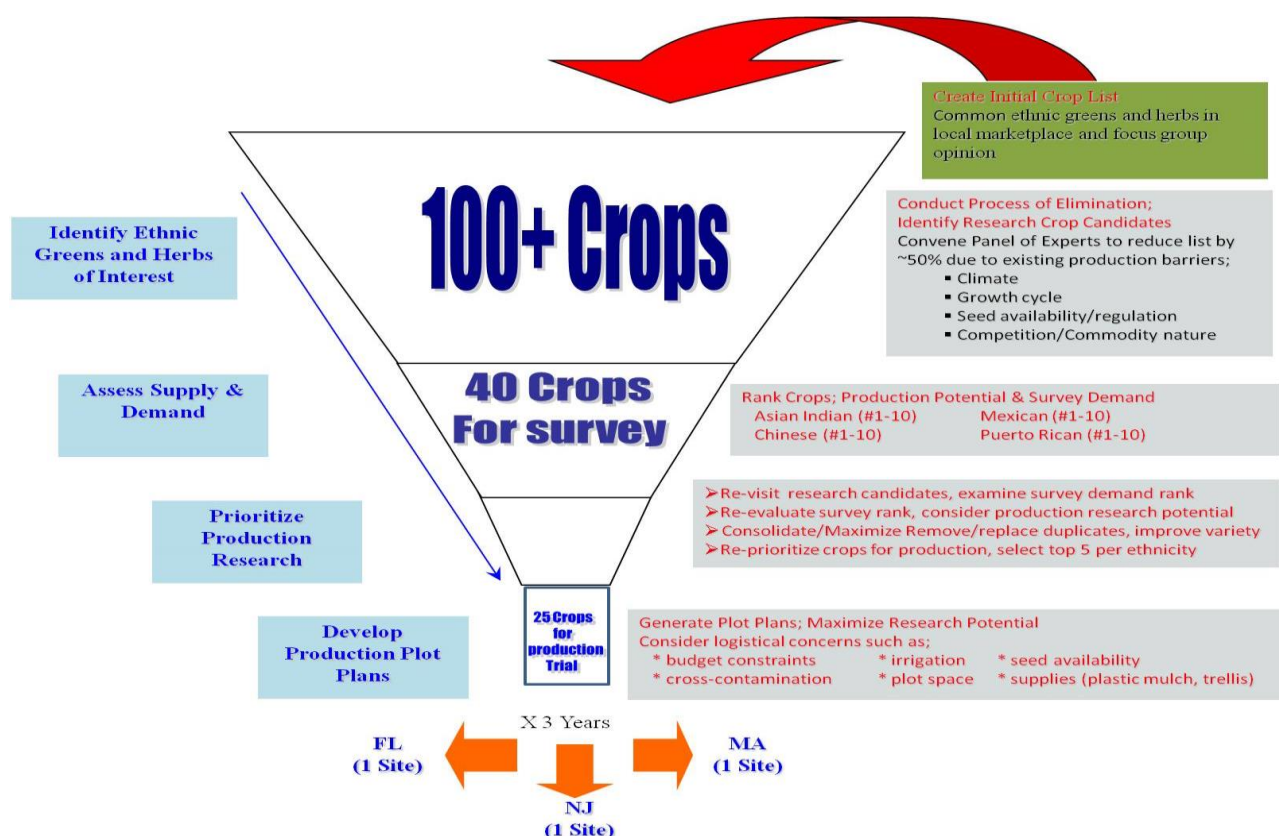


Figure 1. Ethnic Greens and Herbs Selection Process - Govindasamy et al. (2007).

2.1. Two-way contingency and chi-square independence test for ethnic consumer clusters

A cluster analysis including a two-way contingency table and Chi-square independence tests for four ethnic groups were performed. The Chi-square independence test tested whether two variables are associated. In the case of the state variable, our hypotheses were:

- H_0 : Ethnic consumer clusters are not associated.
- H_1 : Ethnic consumer clusters are associated.

The Chi-square independence test compares the observed frequencies with the expected frequencies Equation (1) is the test statistic used for this comparison. **E** represents the expected, whereas **O** refers to observed frequencies. Equation (2) was used to estimate **E**.

$$\chi^2 = \sum (O - E)^2 / E \tag{1}$$

$$E = (Row\ total \times Column\ total) / n \tag{2}$$

The two-way contingency table shows the distribution of the data in each group, which allows us to compare the difference in the levels in the categorical variables in each group. Based on the two-way contingency table, Chi-square tests were derived to test if each of the variables is associated with the response variable [39, 40]

3. Results

Among Asian Indians who responded (Table 1), Radish Greens, Turmeric, and Fenugreek were the top three most popular items purchased, with 74, 73, and 72% of the respondents purchasing these three ethnic crops, respectively. In addition, more than half of the respondents purchased Indian Sorrel Spinach. In contrast, 10% or less of Asian Indians purchased Indian Sorrel and Amaranth (Purple). Regarding purchasing frequency, Asian Indian participants bought most ethnic greens and herbs regularly, one to five times per month routinely with Radish Greens being the most purchased item, 38% of these respondents bought the item regularly and 36% purchased it seasonally.

Of those who purchased Fenugreek, 40% purchased it routinely and 33% purchased it seasonally (Table 2).

Among Chinese respondents (Table 3), Shanghai Bok Choy was the most frequently purchased green/herb of the 10 presented to participants, with 86% of participants indicating that they purchased the item. Both Chinese Broccoli and Spinach were purchased by 72% of these participants.

Among the respondents who purchased Shanghai Bok Choy, 72% bought this crop regularly, and the remaining 14% indicated that they bought it seasonally. Fifty-five percent of Chinese regularly purchased Chinese Broccoli and Spinach (Table 4).

For Mexican respondents (Table 5), ethnic green/herb purchases were widely distributed. Relative to the other items, Roselle was purchased the most, with 51% of Mexicans doing so. Slightly less than half, 48, of Mexicans purchased Purslane, and 44% purchased Epazote.

As Table 6 shows, among the respondents who purchased Roselle (referring to the leaves rather than the more common calyx of hibiscus), 30% of them purchased this item regularly. Of the 48% of Mexicans who purchased Purslane, 23% did so regularly, and 24% did so seasonally. For the 44% who bought Epazote, 25% did so regularly, and 19% on a seasonal basis.

Lettuce was the most popular ethnic green/herb among Puerto Rican participants, purchased by 95% of these participants

(Table 7). Slightly fewer, 88%, of Puerto Ricans purchased Culantro, and 72% purchased Garlic Chives.

Among the 95% of respondents who purchased Lettuce, 82% purchased it regularly and 13% of them bought it seasonally (Table 8). The percentage of those who bought Culantro and Garlic chives regularly was lower, 71 and 56%, respectively.

Table 1. Top 10 greens and herbs bought by Asian Indian respondents

Crops	Asian Indian			
	Ethnic Greens and Herbs Purchasing Behavior			
	Yes		No	
	Number	Percent	Number	Percent
Radish Greens (n= 277)	205	74%	72	26%
Turmeric (n= 277)	203	73%	74	27%
Fenugreek (n= 276)	199	72%	77	28%
Indian Sorrel Spinach (n= 275)	163	59%	112	40%
Amaranth (Green) (n= 277)	60	22%	217	78%
Nightshade (n= 277)	50	18%	227	82%
Purslane/Veradolga (n= 277)	35	13%	242	87%
Amaranth (Purple) (n= 277)	29	10%	248	90%
Indian Sorrel (n= 275)	19	7%	256	92%

Note: Percentage calculated based on a total of 277 respondents and the total below 100% indicates non-response.

Table 2. Asian Indians purchasing behavior of ethnic greens and herbs

Crops	Asian Indian					
	Ethnic Greens and Herbs Purchasing Frequency					
	Routinely		Seasonal		Total	
	Number	Percent	Number	Percent	Number	Percent
Radish Greens (n= 277)	106	38%	99	36%	205	74%
Turmeric (n= 277)	133	48%	70	25%	203	73%
Fenugreek (n= 276)	110	40%	90	33%	200	72%
Indian Sorrel Spinach (n= 275)	107	39%	56	20%	163	59%
Amaranth (Green) (n= 277)	28	10%	32	12%	60	22%
Nightshade (n= 277)	15	5%	35	13%	50	18%
Malabar Spinach (n= 277)	15	5%	31	11%	46	16%
Purslane/Veradolga (n= 277)	17	6%	18	7%	35	13%
Amaranth (Purple) (n= 277)	16	6%	13	5%	29	11%
Indian Sorrel (n= 275)	8	3%	11	4%	19	7%

Note: Percentage calculated based on a total of 277 respondents and the total below 100% indicates non-response.

Table 3. Top 10 greens and herbs bought by Chinese respondents

Crops	Chinese			
	Ethnic Greens and Herbs Purchasing Behavior			
	Yes		No	
	Number	Percent	Number	Percent
Shanghai Bok Choy (n= 276)	238	86%	38	14%
Spinach (n= 276)	200	72%	76	28%
Chinese Broccoli (n= 276)	199	72%	77	28%
Sugar Pea tops/bean (n= 276)	114	41%	162	59%
Chives & Flowers (n= 276)	108	39%	168	61%
Garland Chrysanthemum (n= 276)	85	31%	191	69%
Yen Choy (n= 276)	78	28%	198	72%
Malabar Spinach (n= 276)	56	20%	220	80%
Potherb Mustard (n= 276)	47	17%	229	83%
Lycium Leaf (n= 276)	20	7%	256	93%

Note: Percentage calculated based on a total of 276 respondents.

Table 4. Chinese respondents purchasing behavior of ethnic greens and herbs

Crops	Chinese					
	Ethnic Greens and Herbs Purchasing Frequency					
	Routinely		Seasonal		Total	
	Number	Percent	Number	Percent	Number	Percent
Shanghai Bok Choy (n= 276)	198	72%	40	14%	238	86%
Spinach (n= 276)	152	55%	48	17%	200	72%
Chinese Broccoli (n= 276)	151	55%	48	17%	199	72%
Sugar Pea tops/bean (n= 276)	76	28%	38	14%	114	41%
Chives & Flowers (n= 276)	66	24%	42	15%	108	39%
Garland Chrysanthemum (n= 276)	30	11%	55	20%	85	31%
Yen Choy (n= 276)	51	18%	27	10%	78	28%
Malabar Spinach (n= 276)	39	14%	17	6%	56	20%
Potherb Mustard (n= 276)	29	11%	18	7%	47	17%
Lycium Leaf (n= 276)	10	4%	10	4%	20	7%

Note: Percentage calculated based on a total of 276 respondents and the total below 100% indicates non-response.

Table 5. Top 10 greens and herbs bought by Mexican respondents

Crops	Mexican			
	Ethnic Greens and Herbs Purchasing Behavior			
	Yes		No	
	Number	Percent	Number	Percent
Roselle (n= 280)	143	51%	137	49%
Purslane/Verdolaga (n= 280)	133	48%	147	53%
Epazote (n= 280)	123	44%	157	56%
Swiss Chard (n= 280)	104	37%	176	63%
Vine Vegetables (n= 280)	94	34%	186	66%
Lambsquarter (n= 280)	85	30%	195	70%
Lippia (n= 280)	65	23%	215	77%
Papalo (n= 280)	60	21%	220	79%
Amaranth (n= 280)	34	12%	246	88%
Lemon Verbena (n= 280)	21	8%	259	93%

Note: Percentage calculated based on a total of 280 respondents.

Table 6. Mexican respondents purchasing behavior of ethnic greens and herbs

Crops	Mexican					
	Ethnic Greens and Herbs Purchasing Frequency					
	Routinely		Seasonal		Total	
	Number	Percent	Number	Percent	Number	Percent
Roselle (n= 280)	84	30%	59	21%	143	51%
Vine Vegetables (n= 280)	84	30%	10	4%	94	34%
Epazote (n= 280)	71	25%	52	19%	123	44%
Purslane/Verdolaga (n= 280)	65	23%	68	24%	133	48%
Swiss Chard (n= 280)	41	15%	63	23%	104	37%
Lambsquarter (n= 280)	36	13%	49	18%	85	30%
Lippia (n= 280)	36	13%	29	10%	65	23%
Papalo (n= 280)	25	9%	35	13%	60	21%
Amaranth (n= 280)	18	6%	16	6%	34	12%
Lemon Verbena (n= 280)	14	5%	7	3%	21	8%

Note: Percentage calculated based on a total of 280 respondents and the total below 100% indicates non-response.

Table 7. Top 10 greens and herbs bought by Puerto Rican respondents

Crops	Puerto Rican			
	Ethnic Greens and Herbs Purchasing Behavior			
	Yes		No	
	Number	Percent	Number	Percent
Lettuce/Lechuga (n= 284)	271	95%	13	5%
Culantro (n= 284)	251	88%	33	12%
Garlic Chives (n= 284)	204	72%	80	28%
Spanish Oregano (n= 284)	135	48%	149	52%
Wild Garlic (n= 284)	62	22%	222	78%
Lemon Balm (n= 284)	37	13%	247	87%
Lambsquarter (n= 284)	30	11%	254	89%
Purslane (n= 284)	30	11%	254	89%
Dandelion greens (n= 284)	27	10%	257	90%
Tarragon (n= 284)	12	4%	272	96%

Note: Percentage calculated based on a total of 284 respondents.

Table 8. Puerto Rican respondents purchasing behavior of ethnic greens and herbs

Crops	Puerto Rican					
	Ethnic Greens and Herbs Purchasing Frequency					
	Routinely		Seasonal		Total	
	Number	Percent	Number	Percent	Number	Percent
Lettuce/Lechuga (n= 284)	234	82%	37	13%	271	95%
Culantro (n= 284)	203	71%	48	17%	251	88%
Garlic Chives (n= 284)	159	56%	45	16%	204	72%
Spanish Oregano (n= 284)	93	33%	42	15%	135	48%
Wild Garlic (n= 284)	49	17%	13	5%	62	22%
Lambsquarter (n= 284)	21	7%	9	3%	30	11%
Lemon Balm (n= 284)	19	7%	18	6%	37	13%
Purslane (n= 284)	17	6%	13	5%	30	11%
Dandelion greens (n= 284)	17	6%	10	4%	27	10%
Tarragon (n= 284)	9	3%	3	1%	12	4%

Note: Percentage calculated based on a total of 284 respondents and the total below 100% indicates non-response.

The average number of times that participants shopped for ethnic greens and herbs was 4.2 times per month, but this varied by ethnic group (Table 9). Asian Indians shopped 3.7 times per month, while the number of visits was higher for the other three ethnic groups: 4.7 times for Chinese, 4.2 times for Mexicans, and 3.8 times for Puerto Ricans. The expenditure for ethnic greens and herbs were summarized for each ethnic group: \$24 expenditures for Asian Indians, \$25,70 for Chinese, \$23 for Mexicans, and \$22,70 for Puerto Ricans. Asian Indians spent over \$100 on ethnic greens and herbs monthly. Meanwhile, the other three subgroups spent around \$79 to \$86,70 on ethnic green and herbs per month. However, for total produce expenditure per month, \$142,9 to \$210,90 were spent among these four ethnicities. On average, around \$42,90 were spent on the 10 crops, which were selected by a systematic process. Respondents lived within approximately 8 miles of ethnic markets.

As can be seen in Table 10, on average, Puerto Ricans lived at the current location for 17.94 years; similarly, the Chinese have lived 13.7 years at the current location. For Asian Indians, the living period was slightly shorter at 11.13 years while 9.71 years for Puerto Ricans. Household sizes were similar among these

four ethnic groups. On average, 3.7 members lived in one family among all ethnicities, 3.6 members within Asian Indian families on average, 3.4 for Chinese, 4.9 for Mexicans, and 3 for Puerto Ricans. On average, the number of household members under 17 years of age was 1.2 for all four ethnic groups. Mexicans had the highest number of members under 17 years old compared to the other three groups.

3.1. Ethnic greens and herbs consumer clusters

Figure 2 depicts the dendrogram for cluster analysis. From the dendrogram, it is unclear how many clusters are appropriate, as data could be segmented into two, three, or four distinct groups. It can be cut at 2, 3, or 4 clusters. To decide the optimal number of clusters, we created an elbow plot, as shown in Figure 3.

The optimal number of clusters was identified by using Eigenvalues (above 1), as shown in Figure 3 which clearly suggests a four-cluster solution for further analysis, one for each of the four ethnic groups.

Table 9. Average visits, expenditures on greens and herbs, proximity and family size by ethnicity

Household Average Figures	Ethnicity				All Ethnicities
	Asian Indian	Chinese	Mexican	Puerto Rican	
Visits to an Ethnic Market in a Month (Number)	3.71	4.73	4.23	3.81	4.22
Ethnic Greens/Herbs Expenditure per visit	\$24,04	\$25,70	\$23,00	\$22,67	\$23,88
Expenditures on Ethnic Greens/Herbs per Month	\$111,97	\$86,72	\$84,57	\$79,02	\$86,85
Total Produce Expenditure per Month	\$179,76	\$210,90	\$142,85	\$169,77	\$174,55
Total 10 Crops Expenditures per Month	\$41,73	\$42,54	\$44,12	\$43,37	\$42,93
Proximity to the Nearest Ethnic Grocery Store (Miles)	12.75	11.57	3.39	4.63	8.11
Average Household Size (Number)	3.57	3.41	4.91	3.00	3.73

Table 10. Average household size, years at the residence, and age ranges of residents

Average Figures	Ethnicity				All Ethnicities
	Asian Indian	Chinese	Mexican	Puerto Rican	
Average Number Years Living at Current Location (Number)	11.13	13.69	9.71	17.94	13.13
Average Number of People in a Household Age 17 Years or Younger (Number)	1.01	0.92	2.00	0.89	1.21

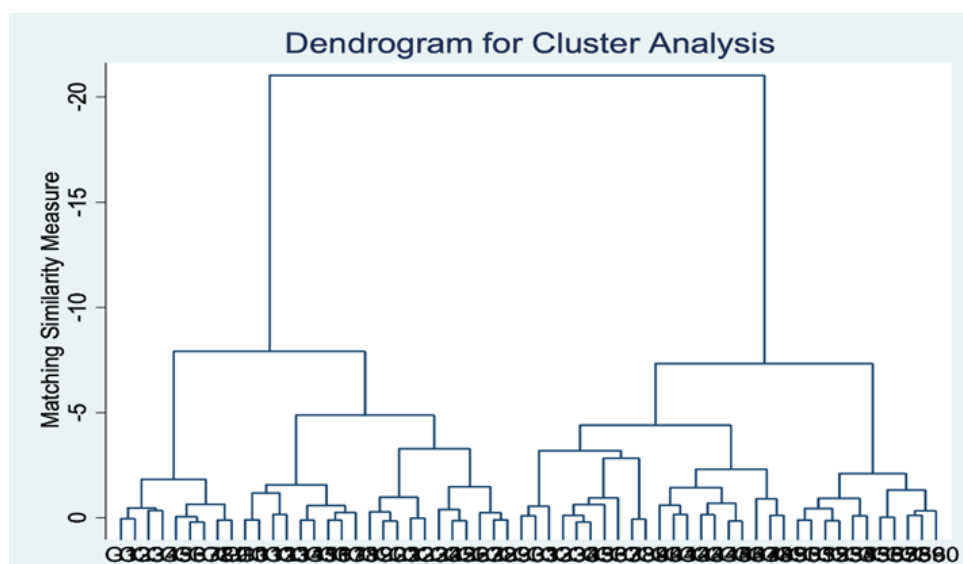


Figure 2. Dendrogram of cluster analysis.

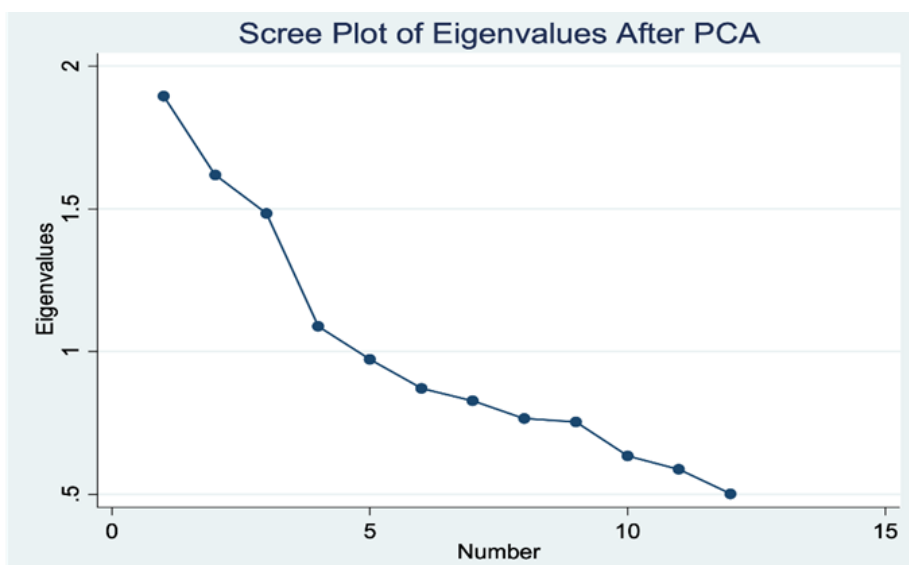


Figure 3. Elbow plot of the optimal number of clusters.

Table 11 contains variables that tested statistically significant. The variables include retail outlet options, green & herbs attributes, consumer preference/support, age, education, family income, gender, and marital status associated with the market segments derived from cluster analysis.

Table 12 shows the summary of consumer profiles, with all four ethnicities, studied showing basic consistencies in terms of greens and herbs purchases. For instance, most Asians frequently purchased greens and herbs from ethnic grocery stores, whereas Hispanics prefer American grocery stores. The freshness and quality are consistently deemed the most important by the sample respondents in each group. Hispanic respondents indicated that price is an important factor in their purchasing decision. Most purchasers in each ethnic group were willing to purchase ethnic greens and herbs, which were locally and organically grown. In addition, the Indian ethnic group reported that they were willing

to buy ethnic greens and herbs to support local farmers. The predominant age group that preferred greens and herbs was 36 to 65 years of age for Asian Indians, Chinese, and Puerto Ricans; however, most young Mexicans were willing to buy greens and herbs.

Most of the Mexican and Puerto Rican respondents had up to 2 years of college education, while a majority of Asian Indian and Chinese respondents had a postgraduate degree. More Asian Indian and Chinese respondents had annual household incomes between \$60,000-\$100,000, while the two Hispanic groups had annual household incomes of less than \$59,999. Pertaining to gender and marital status, the target market for all four ethnic groups was more likely to be female and married; however, Mexican and Puerto Rican participants were also likely to be single.

Table 11. Contingency Table and Chi-Square Independence Test of Ethnic Consumer Clusters

Particulars	CLUSTER					Chi-Square
	Indian (n= 277)	Chinese (n= 276)	Mexican (n= 280)	Puerto Rican (n= 284)	Total (n= 1117)	P-Value
A. Retail outlets (Yes / No) #						
American grocery stores	14%	10%	20%	19%	63%	0.000***
Ethnic grocery stores	24%	24%	22%	19%	88%	0.000***
Community farmers' market	12%	5%	10%	9%	36%	0.000***
On-farm markets or roadside stands	4%	2%	7%	6%	19%	0.000***
Pick your own farms	2%	2%	4%	3%	10%	0.009***
B. Green & Herbs Attributes (Yes / No) #						
Availability	15%	14%	17%	16%	62%	0.156 NA
Freshness	24%	24%	22%	23%	93%	0.000***
Quality	24%	24%	22%	24%	93%	0.000***
Price	12%	13%	20%	20%	66%	0.000***
Packaging	7%	4%	14%	12%	38%	0.000***
Information on the package	10%	5%	13%	15%	43%	0.000***
C. Preference /support (Yes / No)#						
Locally grown	23%	22%	20%	23%	88%	0.000***
Organically grown	20%	17%	19%	19%	75%	0.027**
Genetically modified	4%	4%	7%	5%	19%	0.000***
Labeled according to country of origin	16%	16%	17%	16%	65%	0.939NA
New herbs & greens	16%	15%	15%	11%	56%	0.000***
Support local farmer	13%	8%	12%	11%	44%	0.000***
D. Age Range						
Less than 35 years	7%	4%	14%	6%	29%	0.000***
36-65 years	16%	18%	11%	15%	60%	
Over 65 years	2%	2%	0%	5%	10%	
E. Education						
Up to 2 Years of college	5%	8%	25%	23%	60%	0.000***
4 Years college degree	8%	7%	0%	2%	18%	
Postgraduate degree	12%	10%	0%	1%	23%	
F. Annual Household Income						
Less than \$59,999	7%	8%	27%	25%	66%	0.000***
\$60,000-\$100,000	9%	11%	1%	2%	23%	
Over \$100,000	7%	4%	0%	0%	11%	
G. Gender						
Female	14%	16%	18%	18%	66%	0.000***
Male	11%	9%	7%	7%	34%	
H. Marital Status						
Married	22%	20%	16%	9%	67%	0.000***
Single	2%	3%	5%	9%	18%	
Divorced	0%	1%	0%	3%	4%	
Widower	0%	1%	0%	2%	4%	
Other	0%	1%	3%	2%	7%	

Note: # denotes multiple responses * Significant at 10%, **significant at 5% and ***significant at 1%.

Table 12. Profile of Ethnic Greens and Herbs Consumer Clusters

Particulars	Asians		Hispanic	
	Indian	Chinese	Mexican	Puerto Rican
Retail outlets	Ethnic grocery stores	Ethnic grocery stores	American grocery stores	American grocery stores Ethnic grocery stores
Green & Herbs Attributes	Freshness and Quality	Freshness and Quality	Freshness, Quality and Price	Freshness, Quality and Price
Preference/support	Locally Grown and Organically Grown and Support Local Farmer	Locally Grown and Organically Grown	Locally Grown and Organically Grown	Locally Grown and Organically Grown
Age Range	Mid-age (36-65 Years old)	Mid-age (36-65 Years old)	Youngest (Less than 35 Years old)	Mid-age (36-65 Years old)
Education	Postgraduate degree	Postgraduate degree	Up to 2 Years College Degree	Up to 2 Years College Degree
Annual Household Income	\$60,000-\$100,000	\$60,000-\$100,000	Less than \$59,999	Less than \$59,999
Gender	Female	Female	Female	Female
Marital Status	Married	Married	Married & Single	Married & Single

5. Discussion

This study investigated preferences for ethnic greens and herbs among Asian Indians, Chinese, Mexicans, and Puerto Ricans who reside along the East Coast region of the U.S., as determined by using online focus group bulletin board sessions and telephone surveys. The geographical focus included Washington D.C. and 16 states from the East Coast region of the US.

Ethnic consumers are often looking for produce with specific attributes and flavors (Bhugra 1999; Arumugam et al. 2016; Lindgren 2018). For instance, Radish Greens, Turmeric, Fenugreek, and Indian Sorrel Spinach were the most popular items purchased by Asian Indians who participated in the study. However, 10% or less of them purchased Indian Sorrel and Amaranth (Purple). These greens and herbs are often used by Asian Indians as food ingredients as well as in medicinal applications, (Hillier et al. 2011; Banerjee et al. 2015). Among Chinese respondents, Shanghai Bok Choy, Chinese Broccoli, and Spinach were the most important green/herbs based on purchase amounts. Again, though they are used as ingredients in meals, these greens and herbs have been used to improve cognitive performance in elderly subjects (Sarkar et al 2015; Monterrosa et al. 2020).

Mexican respondents purchased a wider array of greens and herbs compared to the other three groups. Relative to the other items, Roselle, Purslane, and Epazote were the most purchased greens/herbs. These items have also been used to prevent a wide range of health-related problems (Nurk et al. 2010; Da-Costa-Rocha et al. 2014; Thomsen et al. 2016; Dhakal and Khadka 2021). Lettuce, Culantro, and Garlic Chives were the foremost popular ethnic greens/herbs among Puerto Rican participants. Consumption of these greens and herbs has continued to grow due to the consumers' interest in the role of food in keeping and improving human well-being (Valerino-Perea et al. 2019; Vadiveloo et al. 2020).

There appear to be differences between ethnic groups regarding where they purchase food for their household. One study reported that Hispanic households purchased most of their food products from grocery stores, while Asian households chose to shop for food at wholesale markets/stores (Da-Costa-Rocha et al. 2014). Wholesale stores and supermarkets offer a wider variety of grocery items including cereals, pulses and fruits, vegetables, and bulk produce.

A family's socioeconomic and demographic characteristics are known to influence food purchasing behaviors, nutritional quality, and health outcomes (Valerino-Perea et al. 2019). In our study, respondents traveled about 8 miles to reach grocery stores, however, few studies show that using the nearby grocery store in terms of distance to shopping for healthier options is flawed (Ragaert et al. 2004 and Drewnowski et al. 2012) as households usually do not shop at the grocery store that is closest to them (Ledoux and Vojnovic 2013 and Sohi et al. 2014). However, this situation persists based on actual food budget expenditure data. Our results revealed that the average ethnic group expenditure per visit was \$24 for Asian Indians, \$25,70 for Chinese, \$23 for Mexicans, and \$22,70 for Puerto Ricans. The total produce expenditure per month, \$142,90 to \$210,90 was spent among these four ethnicities. On average, around \$42,90 were spent on the 10 crops which were selected by a systematic process. The expenditure at stores also depends on the presence of a child in the family, ownership of a personal vehicle, education, employment, and marital status (Da-Costa-Rocha et al. 2014). In rural areas, food expenditure was highest at convenience stores, while families with access to personal vehicles were more likely to purchase foods at wholesale locations (Da-Costa-Rocha et al. 2014). Food movements are built on multiple values that address how to grow, transport, source or buy and cook foods. Some values encompass ethical and moral reasons, which create a strong emotional connection with consumers (Da-Costa-Rocha et al. 2014).

6. Conclusions

This study revealed that the preferences for ethnic produce are different among ethnic groups. Consumers make food decisions based on cultural background and lifestyle. Specifically, food safety, wider variety, affordable price, freshness, and quality of the ethnic greens and herbs are important factors that impact purchasing (Lang 2010). This study revealed that participants purchased a wide variety of ethnic greens and herbs and that growing and providing more species/varieties could entice consumers to visit markets to buy these items, which could benefit retailers as well as growers (Lang 2010; Simon et al. 2012; Lee et al. 2014).

The ethnic grocery store/market distance and choices of fresh ethnic produce may facilitate consumers to purchase ethnic items. Since distance is one of the important factors, the grocery store providing ethnic greens and herbs should be located near

the neighborhood, which provides each ethnic group a greater opportunity to buy ethnic produce. Furthermore, developing market intelligence can assist growers in tailoring their products and promotional activities to better meet the needs of the ethnic greens and herbs purchaser, allowing these consumers to be able to purchase authentic ethnic produce from local farms, which will enable them to satisfy their social as well as community needs. The ethnic consumer profile cluster for all four ethnicities showed basic consistencies in terms of purchasing greens and herbs. The overall study results will help stakeholders discover potential changes in ethnic markets that could be beneficial to increasing the farm operational profit of small and medium-sized growers in the region. Further, the researchers need to explore the field-level production trials of more ethnic greens and herbs to introduce new produce in specific market segments.

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Appendix 1: Common and scientific names of ethnic vegetables and herbs listed in this study

Common Name	Scientific Name	Common Name	Scientific name
Amaranth (Purple)	<i>Amaranthus tricolor</i>	Lycium leaf	<i>Lycium chinense</i>
Amaranth (Green)/Yen Choy	<i>Amaranthus</i> spp.	Malabar spinach	<i>Basella alba</i> "Rubra"
Swiss Chard	<i>Beta vulgaris cicla</i>	Nightshade	<i>Solanum nigrum</i>
Chinese broccoli	<i>Brassica oleracea</i> var. <i>alboglabra</i>	Papalo	<i>Porophyllum ruderale</i>
Chives & flowers	<i>Allium schoenoprasum</i>	Potherb mustard/Mizuna	<i>Brassica rapa</i> var. <i>laciniifolia</i>
Culantro	<i>Eryngium foetidum</i>	Purslane/Verdolaga	<i>Portulaca oleracea</i>
Dandelion greens	<i>Taraxacum officinale</i>	Radish greens	<i>Raphanus sativas</i>
Epazote	<i>Chenopodium ambrosioides</i>	Roselle/Indian sorrel	<i>Hibiscus sabdariffa</i>
Fenugreek	<i>Trigonella foenum-graecum</i>	Shanghai bok hoy	<i>Brassica rapa</i> var. <i>chinensis</i>
Garland chrysanthemum	<i>Chrysanthemum coronarium</i>	Spanish oregano	<i>Plectranthus amboinicus</i>
Garlic chives	<i>Allium tuberosum</i>	Spinach	<i>Spinacea oleracea</i>
Indian sorrel spinach	<i>Rumex vesicarius</i> spp.	Sugar Pea tops/bean	<i>Pisum sativum</i>
Lambsquarter	<i>Chenopodium album</i>	Tarragon	<i>Artemisia dracunculus</i>
Lemon balm	<i>Melissa officinalis</i>	Turmeric	<i>Curcuma longa</i>
Lemon verbena	<i>Aloysia triphylla</i>	Vine vegetables	<i>Cucurbita</i> spp.
Lettuce/Lechuga	<i>Lactuca sativa</i>	Wild garlic	<i>Allium vineale</i>
Lippia	<i>Lippia graveolens</i>		