The Journal of Animal & Plant Sciences, 31(1): 2021, Page: 246-253
ISSN (print): 1018-7081; ISSN (online): 2309-8694

CONSUMER SEGMENTS AND VALUE PREFERENCES FOR TOMATOES IN PAKISTAN

H. Badar*, A. Rasool and M. Boye

Institute of Business Management Sciences, University of Agriculture, Faisalabad
*Corresponding Author's email: hammad.badar@uaf.edu.pk

ABSTRACT

The study identified value preferences of consumers at aggregate and segment level for suggesting upgrading measures to public and private stakeholders in tomato value chains in Pakistan. To this end, a consumer survey was conducted in three cities – Karachi, Lahore and Faisalabad. Using an interview schedule, data were collected through personal interviews of 275 tomato consumers at different retail outlets of vegetables. Results of the study revealed differences in consumption and purchase preferences of tomato consumers. Based on preferences for tomato quality attributes, hierarchical cluster analysis identified three segments labelled as rational, value seekers and indifferent consumers. While rational consumers preferred few basic quality attributes, the value seekers considered most of the quality attributes important in their purchase decisions. Indifferent consumers were concerned with merely using tomato as an essential ingredient for meal preparation. The study suggested that higher consumer value and returns can be captured through consumer driven improvements in production and marketing practices and collaboration and information sharing among chain participants. Relevant public-sector institutions are also required to incorporate consumer requirements in their policies and actions plans for the development of tomato value chains in Pakistan.

Key words: Value preferences, Consumer segments, Tomatoes, Cluster analysis, Value chains.

https://doi.org/10.36899/JAPS.2021.1.0211 *Published online August 26, 2020*

INTRODUCTION

Tomato is an important vegetable crop for consumers and growers in Pakistan. It is an essential kitchen item used in the preparation of food and is widely consumed in various forms such as salad, ketchup, sauce and paste. Due to important nutrients such as vitamin A and C, potassium and fiber, it is considered an important ingredient of a healthy and balanced diet (Ali *et al.*, 2017). In Pakistan, consumer demand for tomatoes is consistently rising due to population growth and changing consumption pattern and lifestyles (Tahir *et al.*, 2012). The per capita monthly consumption has risen from 0.34 kg in 2005-06 to 0.49 kg in 2015-16 (Government of Pakistan, 2010, 2019).

In Pakistan, tomato production is a source of income for substantial part of the rural community because it generates profits to growers and employment opportunities to rural labour (Tahir *et al.*, 2012). Growers' preference for growing tomato is rising in response to growing consumer demand and attention of the government on the development of horticulture sector, including vegetables. Resultantly, tomato production and area has experienced steady and sustained growth. From 2000-01 to 2017-18, the tomato production has more than doubled from 268.6 to 620.1 thousand tonnes and area expanded from 27.9 to 60.6 thousand hectares. (Government of Pakistan, 2019). Tomatoes are grown in all provinces of Pakistan. Like other horticultural produce, many intermediaries such as commission agents, wholesalers and retailers are involved in their flow from growers to consumers (Badar *et al.* 2019).

Consumer demand for tomatoes is expected to increase further due to rising income level, changes in consumer dietary preferences and growth in the fast-food industry (Tahir *et al.*, 2012). Growers and other value chain participants can earn more income by increasing tomato supplies for meeting this rising demand. However, this requires an understanding of what consumers value in consuming and purchasing tomatoes (Gunden and Thomas, 2012). This knowledge can help value chain actors in upgrading their practices for delivering consumer desired value. For providers of support services such as research and development institutions, the knowledge of consumer desired quality attributes is crucial not only for varietal improvement programs but also for extending market-driven support services to value chain actors.

In recent years, understanding of consumers' preference has become a key factor for success in the development of agri-food industries across the globe. Only knowing how much consumers like a product is not considered enough. Rather, it has become important to determine the reasons for their choices, which too have broadened. Nowadays, consumers exercise a high level of concern for quality, safety and marketing related attributes (Antoniou *et al.*, 2011). However, this is a challenging task for both sensory and marketing scientists to determine

consumer value preferences for fresh produce (Symoneaux *et al.*, 2012).

In Pakistan, a few studies have investigated consumer value preferences for fresh agricultural produce, l*et al*one tomatoes. Only Badar *et al.* (2015) and Yaseen *et al.* (2016) have identified consumer value preferences for mangoes. And, published consumer research on vegetables is unavailable. In case of tomatoes, the research conducted so far has focused on production aspects only and marketing-side specifically what consumer value in tomatoes remained neglected. Thus, this study was aimed at filling this knowledge gap by identifying consumer segments and their preferences for tomatoes in Pakistan. It is expected that the knowledge generated in this study can be helpful to public and private stakeholders in tomato value chains in aligning their activities with consumers' requirements.

MATERIALS AND METHODS

The study is exploratory in nature and based on primary data collected through a survey of tomato consumers in Karachi, Lahore and Faisalabad. Being the most populous, these cities are the major consumers of agricultural produce, including vegetables. The survey was conducted from March to May 2019. Convenient sampling technique was used to select survey respondents because majority consume and purchase tomatoes in routine. For this purpose, consumers buying tomatoes were intercepted randomly from traditional retailers such as street vendors, stallholders, shops, weekly markets and modern retailers including supermarkets and stores. They were interviewed face to face when they had purchased vegetables. Of 100 consumers interviewed from each city, the responses of 95 respondents from Karachi, 89 from Lahore, and 91 from Faisalabad were found adequate for data analysis and the remainder were discarded. Thus, the study sample comprised 275 respondents.

Data were collected through conducting face to face interviews of the respondents. For this purpose, an interview schedule was prepared from reviewing the relevant literature and holding brief discussions with few tomato consumers. The schedule had three sections. The first section captured tomato consumption and buying preferences. The second section gathered data on consumer importance ratings for twenty-four tomato quality attributes on a five-point scale (where 5=highly important, 1=not at all important). The third section contained questions for exploring the demographic profile of the respondents. Although the schedule was prepared in English, it was conducted in the local language Urdu for making it understandable for respondents.

Consumers' perception of quality is influenced by the intrinsic and extrinsic quality attributes or cues (Grunert, 2007). While intrinsic attributes further include search and experience, extrinsic attributes embrace food safety and marketing related attributes (Jiménez-Guerrero *et al.*, 2012). The study included six search (shape, peel color, large size, freshness, undamaged and unblemished), nine experience (firmness, aroma, ease of peeling, pulp color, sweet taste, ripeness, shelf-life, juiciness, and seed presence), three safety (cleanliness, pesticide and origin) and six marketing related attributes (price, retailer cleanliness, packaging, grading, certifications and information provision). Previous related studies helped in identifying these attributes (Adhikari *et al*., 2012; Alamanos *et al.*, 2013; Badar *et al.*, 2015; Martínez-Carrasco *et al.*, 2012; Moser *et al*., 2011; Stommel *et al*., 2005). Before administering in the field, the schedule was pre-tested with ten consumers in Faisalabad and improved in the light of consumer feedback.

Collected data were edited and coded for analysis in IBM SPSS Statistics-22. Descriptive statistics such as percentages, frequency distributions and cross tabulations were used to explore basic facts about consumption and buying preferences and demographic characteristics of respondents. For identification of consumer segments, hierarchical cluster analysis using Ward's Method with Squared Euclidean Distance was performed on consumer importance ratings data pertaining to tomato quality attributes. Cronbach's Alpha value 0.871, greater than 0.70 as suggested by Hair *et al.*, (2014), confirmed the scale reliability. Hierarchical cluster analysis is a widely used technique in segmentation literature on agri-food industries both in developed and developing countries (Adhikari *et al.*, 2012; Badar *et al.*, 2015; Kennedy *et al.*, 2008; Lê and Ledauphin, 2006; Macharia *et al.*, 2013).

The resulting dendrogram from cluster analysis helped in identifying three distinct clusters. The dendrogram shows fusion of clusters at all stages of the analysis. According to Everitt and Dunn, 2001, larger changes at any point between two fusion levels indicate the appropriate number of clusters. Cross tabulation, ANOVA, post-hoc tests with Bonferroni test, and the Kruskal-Wallis test further helped in profiling and comparing the identified clusters in terms of their consumption and buying preferences and demographic composition.

RESULTS AND DISCUSSION

The demographic profile of the respondents is presented in Table 1. The study sample comprised both male (47.6 per cent) and female (52.4 per cent). More than half (55.3 per cent) aged below 30 years. The families of nearly 73 per cent comprised 3 to 4 members. Most of them were graduates (36 per cent) or post-graduates (28 per cent). Regarding occupation, the sample was diverse. However, the public-sector employees and students were relatively common. Most of the respondents reported their monthly family income in the range from 25 to 75 thousand rupees.

Table 1. Demographic profile of respondents.

		(percentage)
Characteristics	**Category**	**Per cent**
Gender	Male	47.6
	Female	52.4
Age (years)	≤ 30	55.3
	31-40	21.1
	41-50	15.6
	51-60	7.3
	> 60	0.7
Marital status	Single	49.1
	Married	49.1
	Others (widows & divorced)	1.8
Family size (no.)	1-2	8.7
	3-4	72.7
	≥ 5	18.6
Education	No education	4.0
	Primary[1]	10.5
	Secondary[2]	9.8
	Intermediate[3]	11.7
	Graduate	36.0
	Pot-graduate	28.0
Occupation	Public-sector employees	25.8
	Private-sector employees	18.2
	Businessmen	10.0
	Retired persons	7.3
	Students	32.9
	Housewives	4.4
	Others	1.4
Family income (PKR/Month)	≤ 25,000	17.8
	25,001-50,000	37.1
	50,001-75,000	23.3
	75,001-100,000	13.1
	> 100,000	8.7

Note: [1]Grade 5 equivalent, [2]Grade 10 equivalent, [3]Grade 12 equivalent, [4]Pakistani Rupee (1USD = 155 PKR)

Tomato consumption preferences: The study finding revealed that consumers liked to consume tomatoes. According to the data in Table 2, more than 35 per cent to a great extent and 45.2 per cent somewhat liked tomatoes. A smaller percentage (3.6 per cent) not at all liked tomatoes. Consumers mainly liked tomatoes due to taste (46.9 per cent) and health benefits (41.5 per cent). They liked to consume tomatoes fresh as well as in processed forms. However, preference for fresh consumption was relatively higher (68.4 per cent) which can be attributed to use of tomatoes as an essential ingredient in the preparation of food. That is why, as can be noted from Table 2, more than half reported daily consumption of tomatoes. Regarding preferred consumption time, more than 70 per cent indicated lunch and nearly 22 per cent dinnertime. The study finding did not indicate higher consumption level of tomatoes as a vast majority reported their daily family consumption either below 100 or from 101 to 200 grams.

Table 2. Tomato consumption preferences.

		(percentage)
Consumption preference	**Categories**	**Per cent**
Extent of liking	Not at all	3.6
	Very little	15.6
	Somewhat	45.2
	To a great extent	35.6
Reasons for liking	Taste	46.9
	Good for health	41.5
	Easily available	6.9
	Others	4.7
Preferred consumption form	Fresh	68.4
	Processed	31.6
Consumption frequency	Daily	54.9
	Twice a week	22.9
	Thrice a week	16.7
	Fortnightly	5.5
Preferred consumption time	Breakfast	4.7
	Lunch	70.5
	Evening	2.9
	Dinner	21.9
Family consumption level (grams/day)	≤100	40.4
	101-200	40.0
	> 200	19.6

Tomato purchase preferences: Table 3 presents tomato purchase preferences of the surveyed respondents. Among them, thrice a week purchase of tomatoes was relatively more common. However, 26.5 per cent liked to purchase tomatoes daily and 24.7 per cent twice a week. Regarding purchase quantity, more than two-third preferred 1-2 kg and 25 per cent less than 1 kg in one shopping. The weekly expenditure on tomatoes of more than half was found above PKR 100. As is common in Pakistan, the respondents predominantly (92 per cent) preferred to purchase tomatoes from traditional retailers.

Segments of tomato consumers: Consumers vary in their preference for products including agricultural produce. Based on similarity in preferences, however, they can be grouped into clusters or segments (Bond *et al.*, 2008). By aligning their products with preferences of target segments, value chain actors can effectively fulfil consumer needs and earn more profits (Kotler and Keller, 2012; Pieniak *et al.*, 2010). The study employed hierarchical cluster analysis for identifying clusters (segments) of tomato consumers in Pakistan. Based on preferences for tomato quality attributes, three consumer

clusters (segments) were identified and labelled as rational, value seekers and indifferent consumers. Except for shape, these clusters differed in their preferences for all quality attributes (Table 4).

Table 3. Tomato purchase preferences

(percentage).

Purchase Preference	Categories	Per cent
Purchase frequency	Daily	26.5
	Twice a week	24.7
	Thrice a week	41.5
	Weekly	4.0
	Fortnightly	2.2
	Monthly	1.1
Purchase quantity (Kg/shopping)	< 1	25.1
	1-2	66.5
	> 2	8.4
Weekly expenditures (PKR)	≤ 50	26.9
	51-100	17.5
	101-150	28.4
	> 150	27.3
Preferred retailers	Traditional	92.0
	Modern	8.0

Cluster-1 was the largest cluster comprising 63.2 per cent respondents. The cluster was named rational consumers because of their higher importance rating to few basic quality attributes. In search attributes, they considered freshness, undamaged, and unblemished relatively more important. In case of experience attribute, this segment attached more importance to sweat taste and shelf life. For this cluster, cleanliness in safety attributes and price, retailer cleanliness, packing and certification in marketing attributes had more importance.

Cluster-2 was the smallest comprising 17.45 per cent members. Since this cluster considered all quality attributes important in their purchase decisions, it was labelled value seekers. Compared to other two clusters, the importance ratings of this cluster for all search, experience, safety and marketing attributes were high. Their preference ratings indicate that members of this seeks maximum value for the money spent on tomatoes. Adhikari *et al*. (2012) also found a similar high value discerning consumers' segment in Nepal who preferred to purchase premium quality tomatoes.

Cluster-3 comprising 19.28 per cent members was identified as indifferent consumers because their mean importance ratings for tomato quality attributes was not high. This indicates that this cluster is merely concerned with using tomato as an essential ingredient for meal preparation (Table 4). Brečić *et al*. (2017) and Kovačić *et al*. (2010) also identified similar consumer segments who did not care about most of the quality attributes of fresh produce.

The results of post-hoc test revealed comparative consumption (Table 5) and purchase preferences (Table 6) among identified clusters. The three clusters did not statistically differ from each other in consumption frequency and family consumption level. However, statistically significant results indicate that three clusters differed in their preferred consumption time and form. Nearly three-fourth of rational and value seekers preferred launch time consumption. Comparatively, a lower percentage (52.8 per cent) of indifferent consumers preferred launch time. Among them, 34 per cent also liked to consume tomatoes along with dinner.

Except for weekly expenditure on tomatoes, the results of the study did not indicate statistically significant differences in purchase preferences of three clusters. Regarding purchase frequency, quantity and preferred retailers, the proportionate distribution of consumers in various categories was almost the same. A smaller percentage of indifferent consumers spent more than PRK 150 on the purchase of tomatoes. However, nearly 34 per cent rational and 25 per cent value seekers reported their weekly expenditure more than PKR 150.

In terms of socio-economic characteristics, the three clusters significantly differed in marital status and family income levels. Regarding gender, age, education and family size, the differences among clusters were found insignificant (Table 7). Alamanos *et al*. (2013) also did not find a statistically significant difference in gender composition among different segments of Greek tomato consumers. Compared to value seekers and indifferent consumers, a greater percentage of rational consumers were single. The indifferent consumers mostly had lower income levels and a smaller percentage of them had more than PKR 75 thousand. Value seekers relatively had higher family incomes compared to rational and indifferent consumers.

Table 4. Cluster comparison based on tomato quality Attributes-ANOVA.

Category	Attributes Type	Attribute	Cluster-1 *Rational (n=174)*	Cluter-2 *Value seekers (n=48)*	Cluster-3 *Indifferent (n=53)*	F-Value	P-Value
Intrinsic Factors	Search	Shape	3.76[a]	3.90[a]	3.81[a]	0.708	0.494
		Peel color	3.89[a]	4.25[b]	3.62[c]	11.038	0.000[**]
		Large size	3.86[a]	4.15[b]	3.55[c]	9.594	0.000[**]
		Freshness	4.20[a]	4.63[b]	3.81[c]	14.915	0.000[**]
		Undamaged	4.13[a]	4.85[b]	3.68[c]	46.629	0.000[**]
		Unblemished	4.09[a]	4.60[b]	3.47[c]	39.321	0.000[**]
		Firmness	3.87[a]	4.67[b]	3.66[c]	39.288	0.000[**]
	Experience	Aroma	3.82[a]	4.35[b]	3.55[c]	20.191	0.000[**]
		Ease of peeling	3.86[a]	4.42[b]	3.36[c]	36.001	0.000[**]
		Pulp color	3.92[a]	4.58[b]	3.66[c]	29.495	0.000[**]
		Sweet taste	4.02[a]	4.54[b]	3.32[c]	58.582	0.000[**]
		Ripeness	3.99[a]	4.56[b]	3.47[c]	38.094	0.000[**]
		Shelf-life	4.03[a]	4.71[b]	3.38[c]	64.502	0.000[**]
		Juiciness	3.93[a]	4.75[b]	3.43[c]	63.831	0.000[**]
		Seed presence	3.94[a]	4.42[b]	3.42[c]	32.334	0.000[**]
Extrinsic Factors	Safety	Cleanliness	4.10[a]	4.75[b]	3.43[c]	54.012	0.000[**]
		Pesticides free	3.97[a]	4.81[b]	3.34[c]	73.214	0.000[**]
		Origin	3.94[a]	4.77[b]	3.42[c]	64.495	0.000[**]
		Price	4.00[a]	4.54[b]	3.60[c]	27.152	0.000[**]
	Marketing	Retailer cleanliness	4.02[a]	4.44[b]	3.28[c]	49.889	0.000[**]
		Packing	4.03[a]	4.42[b]	3.25[c]	49.113	0.000[**]
		Grading	3.93[a]	4.35[b]	3.28[c]	42.290	0.000[**]
		Certifications	4.00[a]	4.25[b]	3.17[c]	53.823	0.000[**]
		Information provision	3.95[a]	4.04[a]	3.36[b]	21.982	0.000[**]

Note: Alphabets in superscript indicate results of Post-Hoc Tests (Bonferroni test) in terms of multiple comparisons. The same letters in each column in a row indicate that clusters (with same letter) against that specific attribute are not significantly different at α=0.05. Whereas, different letters imply statistically significant differences among/between clusters. [**]Highly significant (α ≤0.01) and [*]Significant (α ≤0.05).

Table 5. Cluster comparison- consumption preferences.

Consumption preference	Category	Cluster-1 *Rational* (n=174)	Cluster-2 *Value seekers* (n=48)	Cluster-3 *Indifferent* (n=53)	Mean Rank	χ^2	*p* value
Consumption frequency	Daily	55.7	52.1	54.7	138.71[a]	0.167	0.920
	Twice a week	19.0	29.2	30.2	139.40[b]		
	Thrice a week	20.1	12.5	9.4	134.41[c]		
	Fortnightly	5.2	6.2	5.7			
Preferred consumption time	Breakfast	4.0	6.2	5.7	134.46[a]	6.893	0.032[*]
	Lunch	74.7	75.0	52.8	128.64[b]		
	Evening	1.7	2.1	7.5	158.11[c]		
	Dinner	19.5	16.7	34.0			
Preferred consumption form	Fresh	61.5	77.1	83.0	147.45[a]	10.708	0.005[**]
	Processed	38.5	22.9	17.0	126.01[b]		
					117.85[c]		
Family consumption level (grams/day)	≤100	40.2	43.8	37.7	138.07[a]	0.015	0.993
	101-200	40.2	33.3	45.3	136.95[b]		
	> 200	19.6	22.9	17.0	138.73[c]		

[a]Rational, [b]Value seekers, [c]Indifferent,[**]Highly significant (α ≤0.01) and [*]Significant (α ≤0.05)

Table 6. Cluster comparison- purchase preferences.

Purchase preference	Category	Cluster-1 *Rational* (n=174)	Cluster-2 *Value seekers* (n=48)	Cluster-3 *Indifferent* (n=53)	Mean Rank	χ^2	*p* value
Purchase frequency	Daily	26.4	25.0	28.3	140.25[a]	0.431	0.806
	Twice a week	24.7	27.1	22.6	134.78[b]		
	Thrice a week	38.5	45.8	47.2	133.53[c]		
	Weekly	5.7	2.1	-			
	Fortnightly	2.9	-	1.9			
	Monthly	1.7	-	-			
Purchase quantity (Kg/shopping)	< 1	24.1	27.1	26.4	138.28[a]	2.385	0.303
	1-2	68.4	72.9	54.7	126.88[b]		
	> 2	7.5	-	18.9	147.15[c]		
Weekly expenditures	≤ 50	24.1	29.2	34.0	147.37[a]	8.450	0.015[*]
	51-100	16.1	20.8	18.9	131.33[b]		
	101-150	25.9	25.0	39.6	113.27[c]		
	> 150	33.9	25.0	7.5			
Preferred retailers	Traditional	94.3	85.4	90.6	134.90[a]	4.159	0.125
	Modern	5.7	14.6	9.4	147.05[b]		
					139.97[c]		

[a]*Rational,* [b]*Value seekers,* [c]*Indifferent,*[**]*Highly significant (α ≤0.01) and* [*]*Significant (α ≤0.05)*

Table 7. Cluster Comparison – socio-economic composition.

Characteristic	Category	Cluster-1 *Rational (n=174)*	Cluster-2 *Value seekers (n=48)*	Cluster-3 *Indifferent (n=53)*	Mean Rank	χ^2	*p* value
Gender	Male	46.0	56.2	45.3	140.28[a]	1.731	0.421
	Female	54.0	43.8	54.7	126.16 [b]		
					141.24[c]		
Age (years)	≤ 20	12.1	14.6	5.7	133.46[a]	1.735	0.420
	21-30	56.0	35.4	45.3	144.73[b]		
	31-40	20.1	18.8	26.4	146.81[c]		
	41-50	15.5	20.8	11.3			
	51-60	5.7	10.4	9.4			
	> 60	0.6	-	1.9			
Marital status	Single	54.0	39.6	41.5	130.47[a]	5.728	0.05
	Married	45.4	54.2	56.6	153.94[b]		
	Others	0.6	6.2	1.9	148.28[c]		
Family size (no.)	1-2	8.6	14.6	3.8	135.76[a]	1.970	0.373
	3-4	74.7	64.6	73.6	142.26[b]		
	≥ 5	16.7	20.8	22.6	132.77[c]		
Education	No education	2.9	4.2	7.5	145.74[a]	4.022	0.134
	Primary[1]	9.2	6.2	18.9	125.39[b]		
	Secondary[2]	8.6	18.8	5.7	126.26[c]		
	Intermediate[3]	13.2	10.4	7.5			
	Graduation	33.9	43.8	35.8			
	Post-graduation	32.2	16.7	24.5			
Family income (PKR/Month)	≤ 25,000	17.8	10.4	24.5	137.62[a]	6.199	0.045[*]
	25,001-50,000	36.2	37.5	39.6	158.57[b]		
	50,001-75,000	25.3	16.7	22.6	120.60[c]		
	75,001-100,000	13.8	18.8	5.7			
	> 100,000	6.9	16.7	7.5			

[a]*Rational,* [b]*Value seekers,* [c]*Indifferent,*[**]*Highly significant (α ≤0.01) and* [*]*Significant (α ≤0.05),*

Conclusions and Implications: The study findings have revealed value preferences of tomato consumers in Pakistan both at aggregate and segment level in Pakistan. The study findings can help growers and other value chain actors in improving the quality attributes and marketability of their tomatoes. From the findings, it can be concluded that a gradual transformation is taking place in value preferences of consumers in Pakistan. In their purchase decisions, they also now attach importance to extrinsic attributes (food safety and marketing) in addition to intrinsic (search and experience) attributes.

The study identified three consumer clusters – rational, value seekers and indifferent consumers who had distinct differences in their consumption and purchase preferences and demographic composition. Existence of these segments provide an opportunity to value chain actors for earning more income by aligning their production and marketing practices with requirement of different consumer segments (Heuvel *et al.*, 2007). They should lay more focus on delivering fresh, undamaged, unblemished tomatoes with longer shelf life to rational consumers. Efforts should be made to deliver premium quality to value seekers because they desire value for their money. There is also need to create awareness among indifferent consumers on dietary importance of safe and good quality vegetables.

Individually, value chain participants may not be able to deliver consumer desired value. However, as suggested by Soosay *et al.*, 2012, strong collaborative relationships, commitment and mutual information sharing can greatly help them in addressing needs of different consumer segments. The findings can lend support to policy makers in framing polices for the development of vegetables sector because public sector policies cannot achieve desired goals without being consistent with consumer requirements (Alamanos *et al.*, 2013; Campbell-Gibbons, 2011). Relevant public-sector institutions are also required to consider consumer preferences in their advisory, extension, research and development programs.

The study may have few limitations. Although the sample size is adequate for statistical techniques, it may be limited from the viewpoint of its generalization on larger population. Furthermore, some of the respondents may be just buyers and not actual consumers of tomatoes. Another limitation may be that the study might not have captured all the quality attributes. Future research studies can address these limitations. The studies with larger sample sizes may improve the generalization of the findings. In addition to attribute-based segmentation, a comparison of value preferences of consumers in different cities can greatly help value chain participants in delivering their produce accordingly.

REFERENCES

Adhikari, R.P., R. Collins, and X. Sun. (2012). Segmenting consumers to inform agri-food value chain development in Nepal. Int. Food Agribus. Manag. Rev. 15(4): 93-114.

Alamanos, E., M. Bourlakis, and I. Tzimitra-Kalogianni. (2013). Segmenting Greek tomato consumers: policy and marketing insights towards a healthy diet. Brit. Food J. 115(4): 488-507.

Ali, Q., M. Ashfaq, and M.T.I. Khan. (2017). An economic analysis of off-season tomato production in Punjab. J. Anim. Plant Sci. 27(1): 294-301.

Antoniou, P.H., C.E. Levitt and C. Schreihans. (2011). Managing value chain strategy. J. Manag. Mark. Res. 9:1-11.

Badar, H., A. Ariyawardana, and R. Collins. (2015). Capturing consumer preferences for value chain improvements in the mango industry of Pakistan. Int. Food Agribus. Manag. Rev. 18(3): 131-148.

Badar, H., A. Ariyawardana, and R. Collins. (2019). Dynamics of mango value chain in Pakistan. Pak. J. Agr. Sci. 56(2): 523-530.

Bond, C.A., D. Thilmany, and J.K. Bond. (2008). Understanding consumer interest in product and process-based attributes for fresh produce. Agribusiness. 24(2): 231-252.

Brečić, R., Ž. Mesić and M. Cerjak. (2017). Importance of intrinsic and extrinsic quality food characteristics by different consumer segments. Brit. Food J. 119(4):845-862.

Campbell-Gibbons, H. (2011). Securing a sustainable British horticulture industry. Nutrition Bulletin. 36(4): 443-448.

Everitt, B.S. and G. Dunn. (2001). Applied Multivariate Analysis. John Wiley & Sons Ltd., The United Kingdom.

Government of Pakistan. (2010). Agricultural Statistics of Pakistan 2008-09. Ministry of Food and Agriculture (Economic wing), Islamabad.

Government of Pakistan. (2019). Agricultural Statistics of Pakistan 2017-18. Ministry of National Food Security and Research (Economic wing), Islamabad.

Grunert, K.G. (2007). How consumer perceive food quality. In L. Frewer & H. v. Trijp (Eds.), Understanding of Consumer of Food Products. Woodhead Publishing Ltd., Cambridge, England.

Gunden, C. and T. Thomas. (2012). Assessing consumer attitudes towards fresh fruit and vegetable attributes. J. Food. Agr. Env. 10(2): 85-88.

Hair, J.F., W.C. Black, B.J. Babin, and R.E. Anderson. (2014). Multivariate Data Analysis. Pearson Education, USA.

Heuvel, T.v.d., H.v. Trijp, C.v. Woerkum, R.J. Renes, and B. Gremmen. (2007). Linking product offering to

consumer needs; inclusion of credence attributes and the influences of product features. Food Qual. Pref. 18(2): 296-304.

Jiménez-Guerrero, J.F., J.C. Gázquez-Abad, R. Huertas-García, and J.A. Mondéjar-Jiménez. (2012). Estimating consumer preferences for extrinsic and intrinsic attributes of vegetables: a study of German consumers. Span. J. Agr. Res. 10(3): 539-551.

Kennedy, J., M. Worosz, E.C. Todd, and M.K. Lapinski. (2008). Segmentation of US consumers based on food safety attitudes. Brit. Food J. 110(7): 691-705.

Kotler, P. and K.L. Keller. (2012). Marketing Management. Pearson Education, USA

Kovačić, D., M. Cerjak, J. Markovina and R. Črep. 2010. Psychographic segmentation of the Zagreb apple market. J. Food Prod. Mark. 16(3):293-308.

Lê, S. and S. Ledauphin. (2006). You like tomato, I like tomato: Segmentation of consumers with missing values. Food Qual. Pref. 17(3-4): 228-233.

Macharia, J., R. Collins, and T. Sun. (2013). Value-based consumer segmentation: the key to sustainable agri-food chains. Brit. Food J. 115(9): 1313-1328.

Martínez-Carrasco, L., M. Brugarolas, A. Martínez-Poveda, J.J. Ruiz, and S. García-Martínez. (2012). Modelling perceived quality of tomato by structural equation analysis. Brit. Food J. 114(10): 1414 - 1431.

Moser, R., R. Raffaelli, and D. Thilmany-McFadden. (2011). Consumer preferences for fruit and vegetables with credence-based attributes: a review. Int. Food Agribus. Manag. Rev. 14(2): 121-142.

Pieniak, Z., W. Verbeke, S.O. Olsen, K.B. Hansen, and K. Brunsø. (2010). Health-related attitudes as a basis for segmenting European fish consumers. Food Pol. 35(5): 448-455.

Soosay, C.A., A. Fearne and B. Dent. (2012). Sustainable value chain analysis: a case study of Oxford landing, from 'vine to dine'. Supply Chain Manag.: An Int. J. 17(1): 68-77.

Stommel, J. Abbott, J.A. Saftner, R.A. Camp, and M.J. (2005). Sensory and objective quality attributes of beta-carotene and lycopene-rich tomato fruit. J. Amer. Soc. Hort. Sci. 130: 244-251.

Symoneaux, R., M.V. Galmarini and E. Mehinagic. (2012). Comment analysis of consumer's likes and dislikes as an alternative tool to preference mapping. A case study on apples. Food Qual. Pref., 24(1):59-66.

Tahir, A., H. Shah, M. Sharif, W. Akhtar, and N. Akmal. (2012). An overiew of tomato economy of Pakistan: comparative analysis. Pak. J. Agri. Res. 25(4): 288-294.

Yaseen, A., M. Mehdi, S. Somogyi and B. Ahmad. 2016. Consumer preference to pay a price premium for quality attributes in Pakistani grown mangoes. Pak. J. Com. Soc. Sci. 10(3):615-637.