Pak. J. Agri. Sci., Vol. 57(3), 773-778 ; 2020
ISSN (Print) 0552-9034, ISSN (Online) 2076-0906
DOI: 10.21162/PAKJAS/20.9820
http://www.pakjas.com.pk

AN ASSESSMENT OF CONSUMER PREFERENCES FOR FRESH POTATOES IN PUNJAB, PAKISTAN

Hammad Badar[1,*], Zaryab Mohsin[1], Khalid Mushtaq[1], Burhan Ahmad[1], Mubashir Mehdi[1], Abdullah[2] and Azhar Rasool[1]

[1]Institute of Business Management Sciences, University of Agriculture, Faisalabad
[2]The PIDE School of Public Policy, Pakistan Institute of Development Economics, Islamabad
[*]Corresponding author's email: hammad.badar@uaf.edu.pk

Potato is an important vegetable in terms of domestic consumption and production in Pakistan. Despite increase in area and production, the potato industry performance is not up to its optimum level due to numerous production and marketing constraints. Inadequate knowledge of consumer preferences is one of them. Therefore, this study determined consumer preferences for fresh potatoes by collecting data from Lahore and Faisalabad cities through a survey of 250 potato consumers belonging to different social strata. Collected data were analyzed using descriptive statistical techniques and factor analysis in SPSS. Findings revealed that majority of consumers liked potato in cooked form and as fries due to its taste and health benefits. Consumers differed in their potato consumption and purchase preferences. Five factors identified as marketing, aesthetic, experience, genetic and appearance influenced their purchase decisions. These findings can help in bridging the quality perception gap among value chain participants, policymakers and consumers in Pakistan. The study suggested that the value chain participants should upgrade their practices for delivering desired value to consumers. Policy makers and related public sector institutions should provide necessary support services to them for increasing their profitability as well as satisfaction of potato consumers in Pakistan.

Keywords: Consumer preferences, factor analysis, potato value chain, quality attributes.

INTRODUCTION

Potato has emerged as an important vegetable crop in Pakistan for consumers as well as growers. After wheat and rice, it is widely consumed as a staple food in various forms such as cooked, boiled, fries, chips and snacks (Majeed and Muhammad, 2018). Overtime, per capita consumption of potatoes has risen to 14.4 kg in Pakistan (Government of Pakistan, 2019) mainly due to rising dietary preferences for fast food. It is also the cheapest source of carbohydrates, vitamins, minerals and proteins. Rapid expansion in the processing industry with the entry of several firms has also contributed in increasing consumption of potato products.

Growing consumer demand and rising government attention on horticulture sector development have significantly contributed in the expansion of potato area and production in Pakistan. The domestic production of potatoes has surged from 1665.7 thousand tons in 2000-01 to 4584.3 thousand tons in 2017-18 due to an increase in area from 101.5 to 193.4 thousand hectares and yield from 16.4 to 22.5 tons per hectare (Government of Pakistan, 2019). The increase in production has enabled Pakistan to export surplus potatoes mainly to Afghanistan, Sri-Lank, Oman and UAE. Although potatoes are grown in all provinces, its production is mainly concentrated in Punjab province (Majeed and Muhammad, 2018). Like other horticultural crops, numerous businesses such as farm suppliers, growers, village dealers, commission agents, processors, exporters and retailers are involved in potato value chains in Pakistan (Badar *et al*., 2019).

The potato crop has sizeable potential for expansion and can further contribute in the socio-economic development of the country. However, value chain participants face several production, harvesting and marketing related constraints that not only hinder optimal performance of the potato industry but also lower profitability of the value chain participants. An important underlying reason for these constraints is inadequate knowledge of consumers' preferences for horticultural crops including potatoes in Pakistan (Badar *et al*., 2015). Resultantly, the potato supplies of the value chain participants in markets fail to generate adequate consumer demand.

At the same time, choice parameters of consumers for fresh produce have considerably increased due to changes in income level and lifestyle (Yaseen *et al*., 2016). Nowadays, consumers not only look for tangible quality attributes such as size, flavor and price but also attach importance to intangible marketing and food safety related attributes (Akkerman *et al*., 2010; Badar *et al*., 2015). They are willing to pay premium price only when desired quality attributes are delivered to them. According to Chamhuri and Batt (2015) consumers ultimately decide quality attributes required in food they consume. Thus, an in-depth understanding of what

influence consumer preferences is considered essential for the development of agri-food industries across the globe (Bond *et al*., 2008; Montouto-Grana *et al*., 2012).

Yet, published literature pertaining to consumer research on fresh produce is rare in developing countries. Pakistan is a typical example where research largely focused on production aspects in past and consumers preferences have not been explored particularly for horticultural crops. Only Badar *et al*. (2015) and Yaseen *et al*. (2016) explored consumer value preferences for mangoes. No research work has been conducted on consumer preferences for vegetables including potatoes. Thus, this study was aimed at filling this knowledge gap by determining consumers' preferences for potatoes and factors influencing them in Pakistan. It is expected that finding can be useful for both public and private stakeholders in aligning potato value chain practices with consumer-desired value.

MATERIALS AND METHODS

The study is based on primary data collected through a survey of potato consumers in Lahore and Faisalabad cities of Pakistan. Being the most populous, major part of vegetables supplies is consumed in these cities. Drawing 125 respondents each from both the cities through convenient sampling technique, the study sample comprised of 250 respondents in total. The respondents were intercepted whey they had finished buying vegetables on retail outlets at different locations. The retail outlets included both traditional retailers such as roadside shops and street venders and modern retailers such as modern stores and supermarkets. From each retail outlet, 10 to 15 willing respondents were interviewed.

Data were collected through personal interviews of respondents. For this purpose, a questionnaire was developed from reviewing the related literature (Stommel *et al*., 2005; Lê *et al*., 2006; Martínez-Carrasco *et al*., 2012; Alamanos *et al*., 2013). The questionnaire contained three sections. The first section sought information on consumption and purchase preferences. While the third section inquired socio-economic characteristics of the respondents, the second section contained eighteen potato quality attributes on a five-point scale (where 5 = highly important and 1 = not at all important). The scale intended to measure the importance consumers attached to these quality attributes in their purchase decisions.

The attributes were drawn from the relevant literature and finalized in consultation with relevant experts and few consumers. These attributes included shape, large size, freshness, variety, undamaged, unblemished, firmness, and dryness, ease of peeling, sweet taste, ripeness, cleanliness, pesticide free, price, retailer's cleanliness, packaging, grading and certification. The questionnaire was pretested with ten consumers and improved accordingly before proceeding for survey. Although questionnaire was prepared in English, the interviews of consumers were conducted in local languages such as Urdu and Punjabi for capturing an insightful response. Collected data were then coded and shifted to software SPSS (Statistical Package for Social Sciences) for analysis. Descriptive analysis including frequency distribution, percentages, means and cross tabulation helped in exploring basic patterns in data. Using principal component analysis with varimax method, factor analysis was applied on data pertaining to 18 potato quality attributes on a five-point scale. Factor analysis is a data reduction technique used for extracting few factors from several underlying factors (Hair*et al*., 2010).

The principal component analysis (PCA) groups highly correlated variables together and thus brings simplification to analysis. According to Leech *et al.* (2014), the PCA reduces several variables to a smaller set of underlying factors and summarizes the essential information contained in the original variables. Varimax rotation transforms the components into factors that are more clearly interpretable. The identified factors were labeled according the characteristics of underlying factors.

The recommended sample size for factor analysis varies considerably. Malhotra and Birks (2007), however, suggest that the sample must have at least five respondents per item in a construct. Since 18 potato quality attributes were included in the study, a sample comprising 90 respondents was sufficient for fulfilling the requirement. However, the study sample comprised 250 respondents and was greater than the factor analysis requirement.

RESULTS AND DISCUSSION

***Demographic profile of respondents*:** The demographic profile of respondents is presented in Table 1. The study sample comprised of both male (52.1 percent) and female (47.9 percent). More than half aged below 30 years and were married. Majority were graduates (34 percent) and postgraduates (33.2 percent). Greater presence of highly educated respondents can be attributed to relatively higher level of education in the selected cities. In terms of occupation, private-sector employees 22.7 percent, public-sector employees 16 percent and students 36.1 percent were common. Regarding monthly family income, the study sample had representation from all income categories. However, more than 60 percent reported their monthly income below fifty thousand.

***Consumption preferences*:** The study findings revealed differences in potato consumption preferences. The major consumption forms included fully cooked, processed chips, mashed and fries. However, fully cooked and fries appeared as the most preferred form as pointed out by 50.9 and 31.5 percent, respectively. As can be seen from Table 2, half of respondents reported consuming 2 to 3 and nearly 22 percent a single potato at one time. Results of the study indicate higher

consumption frequency of potatoes as nearly one-third reported daily and another one-third twice a week consumption of potatoes.

Table 1. Demographic profile of respondents(percentage)

Characteristic	Category	City		Overall
		Faisalabad	Lahore	
Gender	Male	38.7	67.3	52.1
	Female	61.3	32.7	47.9
Age (years)	Up to 20	5.6	22.1	13.4
	21 to 30	48.8	38.1	43.7
	31 to 40	24.0	14.2	19.3
	41 to 50	10.4	10.6	10.5
	51 to 60	8.0	12.4	10.2
	Above 60	3.2	2.6	2.9
Marital Status	Single	47.2	49.6	48.3
	Married	50.4	50.4	50.4
	Other	2.4	-	1.3
Education	No formal education	0.8	2.7	1.7
	Primary school	1.6	11.5	6.3
	Secondary school	6.4	12.4	9.2
	Intermediate	16.8	14.2	15.5
	Graduates	29.6	38.8	34.0
	Post-graduates	44.8	20.4	33.2
Occupation	Public-sector employees	16.0	15.9	16.0
	Private-sector employees	19.2	26.5	22.7
	Businessmen	7.2	12.4	1.7
	Retired persons	4.0	0.9	2.5
	Students	36.8	35.4	36.1
	Housewives	16.8	7.1	12.2
	Others	-	1.8	0.8
Family Income (PKR/month)	Up to 25,000	26.4	31.0	28.6
	25,001 - 50,000	27.2	38.1	32.4
	50,001 - 75,000	20.0	15.0	17.6
	75,001 - 100,000	16.0	11.5	13.9
	Over 100,000	10.4	4.4	7.6

*(1 USD=157 PKR)

Table 2. Potato consumption preferences(percentage)

Consumption preference	Categories	City		
		Faisalabad	Lahore	Overall
Preferred form	Fully cooked	44.0	58.8	50.9
	Potato chips	18.4	11.5	15.1
	Mashed	2.4	3.6	2.6
	Fries	35.2	26.5	31.5
Level (pieces at one time)	<1	12.8	31.0	21.4
	2-3	55.2	46.0	50.9
	4-5	17.6	15.9	16.8
	>5	14.4	7.1	10.9
Frequency	Daily	28.6	35.4	31.9
	Twice a week	28.6	37.2	32.4
	Thrice a week	24.4	14.2	19.7
	Fortnightly	14.4	8.8	11.8
	Monthly	4.4	4.4	4.2

Purchase preferences: Table 3 presents potato purchase preferences of consumers. Nearly half reported buying 2 to 3 kg and another 33.6 percent 4 to 5 kg potatoes in one buying. Regarding weekly expenditure on potatoes, more than half reported up to PKR 100 and 27.3 percent between PKR 101 to 200. In Pakistan, both traditional and modern retailers sell vegetables including potatoes. Although modern retailers such as supermarket and stores are rapidly gaining popularly, traditional retailers such as street vendors and roadsides shops still dominate in Pakistan (Ghani, 2005). The study findings also revealed the same as more than 70 percent reported buying potatoes from traditional retailers such as street vendors, roadside stallholders and open market. Less than 30 percent preferred modern retailers including supermarkets, stores and specialty shops for buying potatoes.

Table 3. Potato purchase preferences(percentage)

Purchase preference	Categories	City		Overall
		Faisalabad	Lahore	
Quantity (kg)	<1	11.2	15.0	13.0
	2-3	46.4	50.5	48.4
	4-5	33.6	33.6	33.6
	>5	8.8	0.9	5.0
Weekly expenditure (PKR)	Up to 100	50.4	53.1	51.7
	101 to 200	24.0	31.0	27.3
	201 to 300	12.0	9.7	10.9
	301 to 400	4.0	3.5	3.8
	401 to 500	9.6	2.7	6.3
Preferred retailers	Street vendors	43.2	39.8	41.6
	Roadside stallholders	14.4	15.9	15.1
	Open market	16.0	15.0	15.5
	Supermarket	22.4	12.4	19.8
	Specialty shops	4.0	16.9	8.0

***Factors influencing purchase preferences*:** For value chain optimization, identification of consumer desired quality attributes is considered very important. Yet, this identification is challenging in consumer studies because numerous attributes are used for defining food quality. Among 18 quality attributes identified in this study, relative higher mean scores indicated that consumer attached more importance to damage free (4.39), freshness (4.38), retailer cleanliness (4.38), unblemished (4.34), pesticide free (4.22) and price (4.15). Though mean scores for remaining attributes were found relatively lower, consumer also attached importance to these attributes (Figure 1).

For extraction of meaningful factors from 18 quality attributes, the study employed factor analysis. The suitability of data for factor analysis was confirmed with Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity (Table 4). The KMO measure 0.81, higher than the minimum suggested value 0.5, indicated sample adequacy for factor analysis(Allen and Bennett, 2010; Leech*et al*., 2014). The significant Bartlett's test value further showed appropriateness of the data for factor analysis (Table

4). The Cronbach alpha value of the 18 potato quality attributes was found 0.828, which confirmed the internal consistency of the scale used because the value was greater than the minimum required value 0.60 suggested by Hair *et al*. (2010).

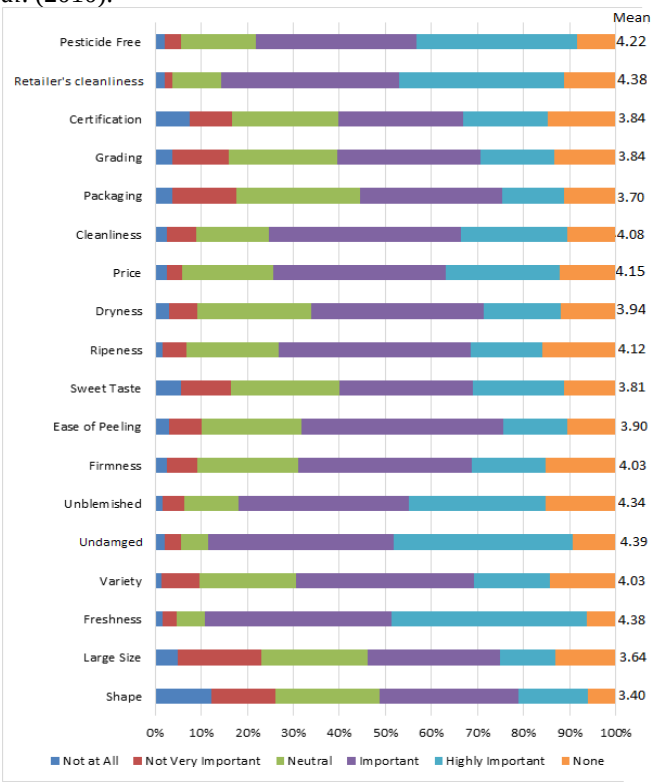

Figure 1. Importance ratings of potato quality attributes

Table 4. KMO and Bartlett's tests

Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy	0.81
Bartlett's Test of Sphericity Approx. Chi-Square	1128.01
DF	153.00
Sig.	0.00

Table 5 presents the total variance explained in terms of initial Eigen value and extraction and rotation sums of squared loadings for all possible factors. The Eigen values explains the amount of variance accounted for by each factor and are ordered from highest to lowest (Allen and Bennett, 2010). As can be observed from Table 5, the first factor explains 26.714 percent variance as much as in five quality attributes. According to Kaiser criterion factors with Eigen values greater than one are retained and remainder are dropped (Maskey *et al.*, 2018)). Thus, as depicted in Table 5, first five factors with Eigen value greater than one were retained as the major factors influencing consumers purchase preferences for potatoes. The extraction and rotation sums of squared loadings provide further information about the factors retained and the amount of variance contributed by them (Allen and Bennett, 2010).

The rotated component matrix presented in Table 6 shows how various potato quality attributes are loaded on five factors/components. Based on the 18 quality attributes, the identified factors were labeled as marketing, aesthetic, experience, genetic and appearance factors. These factors included the contribution all quality attributes expect cleanliness, price and pesticide free which had lower factor

Table 5. Total variance explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	4.808	26.714	26.714	4.808	26.714	26.714	2.713	15.070	15.070
2	1.703	9.462	36.176	1.703	9.462	36.176	2.137	11.873	26.943
3	1.455	8.082	44.258	1.455	8.082	44.258	1.883	10.460	37.403
4	1.181	6.560	50.819	1.181	6.560	50.819	1.772	9.847	47.249
5	1.041	5.783	56.601	1.041	5.783	56.601	1.683	9.352	56.601
6	0.951	5.282	61.883						
7	0.879	4.883	66.766						
8	0.858	4.766	71.532						
9	0.700	3.890	75.422						
10	0.668	3.713	79.135						
11	0.604	3.357	82.492						
12	0.593	3.292	85.784						
13	0.521	2.893	88.677						
14	0.482	2.676	91.353						
15	0.466	2.589	93.942						
16	0.437	2.426	96.368						
17	0.362	2.010	98.378						
18	0.292	1.622	100.00						

loadings – the coefficients ranging from -1 to 1 indicate how much a factor explains a variable (Hair *et al*., 2010).

Table 6. Rotated component matrix

Attributes	Component				
	1	2	3	4	5
Certification	0.801				
Grading	0.736				
Packing	0.701				
Retailers cleanliness	0.636				
Undamaged		0.708			
Freshness		0.693			
Unblemished		0.672			
Ease of peeling			0.743		
Sweet taste			0.613		
Ripeness			0.613		
Variety				0.715	
Firmness				0.692	
Shape					0.771
Large size					0.636
Dryness					0.559

The first factor was labeled 'marketing factor' because of the underlying four quality attributes certification, grading, packaging and retailer cleanliness with factors loadings 0.801, 0.736, 0.701 and 0.636, respectively. The potato quality attributes such as undamaged, freshness and unblemished constituted 'aesthetic factor' because they attract customers by reflecting produce beauty. The factor loadings for undamaged was 0.708, freshness 0.693 and unblemished 0.672. The third factor identified as 'experience factors' included ease of peeling, sweet taste and ripeness which consumers can experience through touching or tasting the produce. The factor loadings of three contributing factors were 0.743, 0.613 and 0.613, respectively. The fourth factor comprised of two attributes i.e. variety (0.715) and firmness (0.692) which can be associated with genetics and hence labeled 'genetic factor'. The fifth factor was named 'appearance' because of underlying quality attributes shape, large size and dryness with loadings 0.771, 0.636 and 0.559, respectively.

With minor variations in underlyig factors and labelling, the factors explored in this study resemebled those identified by Chamhuri and Batt (2015) in influencing potato purchase decisions of consumers in Malaysia. Cheng*et al*. (2000) also described appearance as an influential factor in potato purchase decisions of consumers in New England market. The marketing factor identified in the study contains some underlying factors such as packing which Karadas*et al*. (2017) also found influencing potato purchase behaviors and preferences of consumers in Turkey.

Conclusions: The study findings highlight potato as a major vegetable consumed widely in fresh and processed forms in Pakistan. The study identified marketing, aesthetic, experience, appearance and genetic factors influencing consumers in their purchase decisions. These findings can help in bridging the quality perception gap among value chain participants, policy makers and consumers. To increase their profits, value chain participants need to upgrade their practices so that their produce is aligned with consumer requirements. Value chain participants should respond to quality attributes consumers consider important in their purchase decisions.

At different value chain stages, emphasis should be laid on upgrading those activities that add value on marketing, aesthetic, experience and appearance attributes. The downstream value chain participants particularly retailers should focus on grading, packaging and cleanliness for delivering desired value to consumers. Many quality issues can arise due to lack of coordination and information sharing among value chain participants. By developing collaborative relationships, value chain participants can address these issues and deliver good quality fresh produce to consumers. Relevant public-sector institutions can provide them needed support which may include extension, advisory and credit services. Research institutions should also endeavor to inculcate consumer desired attributes in their varietal development process.

REFERENCES

Akkerman, R., P. Farahani and M. Grunow. 2010. Quality, safety and sustainability in food distribution: A review of quantitative operations management approaches and challenges. OR Spect.32:863-904.

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

Allen, P.J. and K. Bennett. 2010. PASW Statistics by SPSS: A Practical Guide - Version 18.0. Cengage Learning, Australia.

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.18:131-148.

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

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

Chamhuri, N. and P.J. Batt. 2015. Factors influencing consumer's decision to purchase fresh potatoes in Malaysia. In: P. J. Batt (ed.), Acta Hortic. 1103:101-108.

Cheng, H., S. Peavey and A.S. Kezis. 2000. An analysis of factors that influence the purchasing decision for fresh

potoatoes: A study of consumers in a New England market. J. Mkt. Theo. Prac. 8:46-54.

Ghani, J.A. 2005. Consolidation in Pakistan's retail sector. Asian J. Manag. Cases2:137-161.

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

Hair, J.F., W. Black, B.J. Babin and R.E. Anderson. 2010. Multivariate Data Dnalysis. Prentice Hall Higher Education, USA.

Karadas, K., A.M. Kumlay, E. Eyduran and A.K. Gursoy. 2017. Identification of potato purchasing behaviours and preferences of consumers by means of robust factor analysis. Scientific Papers Series Manag., Eco., Eng. Agri. Rural Dev.17:193-196.

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

Leech, N.L., K.C. Barrett and G.A. Morgan. 2014. IBM SPSS for Intermediate Statistics: Use and Interpretation. Routledge, New York, USA.

Majeed, A. and Z. Muhammad. 2018. Potato production in Pakistan: challenges and prospective management strategies - a review. Pak. J. Bot. 50:2077-2084.

Malhotra, N.K. and D.F. Birks. 2007. Marketing Research: An Applied Approach. Pearson Education, USA.

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. British Food J.114:1414 - 1431.

Maskey, R., J. Fei and H.-O. Nguyen. 2018. Use of exploratory factor analysis in maritime research. The Asian J. of Ship. Logist. 34:91-111.

Montouto-Grana, M., S. Cabanas-Arias, S. Porto-Fojo, M.L. Va´zquez-Ode´riz and M.A. Romero-Rodr´ıguez. 2012. Sensory characteristics and consumer acceptance and purchase intention toward fresh-cut potatoes. J. Food Sci.71:540-546.

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.

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.10:615-637.

[Received 12 Nov 2019: Accepted 07 March 2020: Published (online) 08 June 2020]