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RED CHILI CONSUMERS IN PAKISTAN: IDENTIFYING SEGMENTS AND PREFERENCES AS A PRECURSOR OF COMPETITIVENESS AND STAKEHOLDERS' PERFORMANCE IN VALUE CHAINS

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ABSTRACT

Pakistan's Red Chili value chains hold significant potential for driving socio-economic growth. However, this potential cannot be realized without addressing the challenges relating to competitiveness and stakeholder performance. A major obstacle is the lack of insight into consumer preferences for red chilies. By understanding these preferences, value chain actors can enhance their competitiveness and performance, ultimately boosting the sector's growth. Thus, this study aimed to reveal the value preferences of different segments of red chili consumers in Pakistan. Data were collected through an intercept survey of 180 red chili consumers in three major cities of Pakistan, including Karachi, Lahore, and Faisalabad. Collected data were analyzed using descriptive statistics, hierarchical cluster analysis, Mean ANOVA, and post-hoc tests for identifying consumer segments and their value preferences. Using preferences for various attributes of red chilies, the study identified three consumer segments labeled as traditionalists (45.6%), quality seekers (38.6%), and safety and marketing-conscious (15.8%). The identified consumer segments differed significantly in their desired quality attributes, consumption and purchase preferences, and socioeconomic composition. To improve competitiveness and stakeholders' performance, the study findings urge private and public stakeholders to understand and respond to the preferences of different consumer segments. The Red Chili value chain actors are needed to upgrade and align their practices with consumer requirements. To this end, the related public sector institutions can facilitate the red chili value chain actors in accessing the technical and financial resources needed.

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INTRODUCTION

Consumer insights are preliminary steps towards value chain competitiveness and enhancing stakeholder performance in agri-value chains (Macharia et al., 2013). Thus, preference mapping of agricultural products and the corresponding production adds profitability to farm business (Quick et al., 2022). The additional advantages include minimal post-harvest losses and the retention of desirable attributes such as pungency, color, aroma, and size that are in demand. The red chili industry of Pakistan has enormous potential. This potential can fully be exploited if the production and post-harvest processing and management practices are aligned with the demand and market preference of the region and the export market(s) (Yogita et al., 2024).

It is assumed that activities in the red chili value chain are mainly driven by consumer preferences. All participants in the chain are increasingly driven by the demand for specific quality characteristics, including color, pungency, aroma, cleanliness, and the absence of any harmful contaminants. The level of farm practices determines the ability to deliver such qualities. Responsible and efficient land use, good agricultural practices, and proper post-harvest management practices, like efficient drying and storage, are pivotal to chili industry growth (Moyo et al., 2021). The demand for the produce increases if chilies are provided to the consumers after meeting the quality requirements. This, in turn, prompts farmers to increase the area under cultivation and improve methods of production (Stampa et al., 2020). In Pakistan, red chili (*Capsicum annuum* L.) is one of the most significant spice crops grown and consumed. For its pungency, color, and flavor, it is utilized in homes, restaurants, and the food processing industry. It is an important spice consumed fresh as well as in processed forms such as dry, powder, paste, or as a sauce (Arin, 2019). Farmers also acknowledge red chilies as a vital cash crop. Apart from domestic use, Pakistan exports dried and powdered chilies to China, the United Arab Emirates, Saudi Arabia, Malaysia, Indonesia, the United States, as well as to European markets including the UK, Germany, and the Netherlands (GoP, 2023).

In 2022-23, red chili was grown on an area of 48.7 thousand hectares with a production of 109615 tonnes, having an average yield of 35-50 maunds per acre. The red chilies grow well in warm, humid climates with an optimum temperature range between 25 °C and 30°C (Ahmad et al., 2024). It is mainly grown as a rain-fed crop and matures in 180-200 days (Arin, 2019). Although it can be grown in all types of soils, sandy and clay loams with proper drainage are best suited for its optimum cultivation, allowing it to be cultivated in different agroecological zones (Khan et al., 2020). It is grown in all provinces of Pakistan. However, Sindh is the leading red chili-producing province. It contributes around 88% to the total production, followed by Punjab (7%), Balochistan (4%), and Khyber Pukhtukhuwa (<1%) (GoP, 2023). In Sindh province, red chili is mainly produced in District Umerkot, Mirpurkhas, and Badin. The district, Umerkot, is famous for

cultivating red chilies because of its favorable agro-climatic conditions. It has also been described as Asia's largest red chili trading market (Khan et al., 2020).

The red chili industry in Pakistan consists of a complex chain of various actors and processes involving several stakeholders such as growers, input suppliers, brokers, traders, processors, retailers, and exporters. The red chili growers hand over their produce to the intermediaries existing in wholesale markets, including the commission agents, Beoparies, and the local wholesalers. The wholesale markets help in the distribution of chilies from growers to other markets (Harniati et al., 2023). The red chilies are also processed into powder, flakes, etc., and can also be dried during the processing stage. After processing, the processed red chili products are transported to different retail outlets such as supermarkets, departmental stores, weekly markets, or roadside shops to be sold to local consumers (Khan et al., 2020).

Various enablers, along with service providers, maintain operational support for value chains operating within the red chili industry. The value chains within the red chili industry receive support from three main categories of enablers and service providers: policymakers who formulate rules and guidelines, transportation or logistics service providers that ensure smooth commodity flows, and research extension services that provide technical assistance and innovative ideas to improve crop production and efficient post-harvest management. Financial services offered by institutions provide crucial support to farmers and other value chain actors who receive credit and other financial services from these financial institutions (Ahmad et al., 2024). Modernizing the red chili value chains has given rise to the emergence of numerous products and the introduction of additional features that add value to the products. Traders and Processors have tapped into the mainstream consumer trend and started looking at red chili as more than just a powder or a flake. It is the era of new products that follow trends, such as chili sauces, pastes, and oils, which customers choose with ever-changing preferences and requirements (Kazim et al., 2023).

Pakistani red chili has earned an excellent reputation for its quality, flavor, and variety, and is in great demand abroad (Khan et al., 2020). The food processors capitalizing on this demand have developed a strong trade relationship, taking Pakistan to dominate the international market, as it stands as the sixth largest chili-producing country and supplies around 7.2% of the international market (FAOSTAT, 2023). Nowadays, Pakistani red chili, often hot chili, is a popular commodity in Asia, Europe, and North America (Kazim et al., 2023). However, hindering challenges like improper post-harvest management and quality assurance result in occurrences of aflatoxins in Pakistani red chili, which prevents them from being exported to global markets such as Europe (Sarwar and Khan, 2020). Poor post-harvest practices account for 10-12% of red chili losses (Khan et al., 2020). The traditional drying techniques, at times using open fields, expose chilies to dust, insects, and microbial contamination, lowering their quality and shelf life. As Pakistani chili exports lack modern drying and grading facilities, they are limited mainly to lower-value markets (Arin, 2019).

Hence, this study aims to determine consumer preferences and segments in Pakistan's red chili industry to promote competitiveness and improve stakeholder performance in the red chili value chains. It seeks to pinpoint what informs consumer behavior and drives market segments by distinguishing the primary determinants of consumer choice and demand. The study also assesses how these preferences impact value chain players and aims to provide actionable information to improve industry integration and enhance the competitiveness and performance of red chili value chains.

Contemporary marketing theory positions the consumer as the focal point and primary driver of all value chain activities (Kotler et al., 2021). Agri-food businesses are only profitable and sustainable when their approaches correspond with buyer expectations (Kanellos et al., 2024). For red chilies, qualities like freshness, pungency, colour, safety, and packaging influence purchasing decisions, as consumers will pay a premium for products that gratify their sensations and serve a perceived function (Maojie, 2023). Globalization, income increases, and lifestyle shifts have changed consumer value preferences (Broz, 2022). Food safety and quality awareness are now primary concerns (Okpala and Korzeniowska, 2023). In Pakistan, where adulteration is a major issue, consumers strongly prefer clean, hygienic, and safe chilies (Kazim et al., 2023). These preferences are shaped by socio-economic, cultural, and product-specific quality attributes (Ajetunmobi and Laobangdisa, 2024), with both intrinsic and extrinsic attributes being significant (Zanchini et al., 2025). Intrinsic attributes like color, pungency, size, and freshness are sometimes observable or determined upon consumption (Kefale et al., 2023). Extrinsic attributes, such as price, packaging, brand, and certifications, do not influence the physical product but rather the consumer's decision (Malekpour et al., 2022). Safety factors like cleanliness and freedom from contaminants also greatly shape preferences (Khaliq et al., 2023). In developing, fragmented markets like Pakistan's, ineffective grading, branding, and a lack of certification hinder access to premium markets (Kazim et al., 2023). Marketing features like packaging, fair pricing, and retailer cleanliness align closely with consumer value (Andriani and Nurtjahjadi, 2025). While the mid-level market has high demand, a lack of segmentation has left it unexploited (Pels and Sheth, 2021).

Much research has focused on segmentation for fruits and vegetables, but little has been done on spices, and chilies in particular. In Pakistan, where chilies are used as a necessary spice, identifying segments based on factors like pungency, color, contamination, price, and packaging would be of great value. However, a gap exists in the empirical understanding of how these attributes affect consumer segmentation in Pakistan's red chili market. Prior studies have not analyzed attribute-based preferences and consumer segmentation for spices. Addressing this gap will provide a clearer understanding of consumer heterogeneity and enable actionable insights for value chain members and policymakers.

Based on this gap, the current study undertakes an empirical investigation of consumer preferences and market segments for red chilies in Pakistan. By analyzing both intrinsic and extrinsic characteristics, it aims to produce actionable insights to help meet consumer demands and develop consumer-focused strategies, thereby identifying the role of consumer diversity in shaping the competitiveness and stakeholders' performance in the red chili value chain.

METHODOLOGY

A quantitative approach was used to understand consumer preferences for red chilies. Given the importance of local consumption and livelihoods for value chain actors,

understanding demand-side behavior was essential. Primary data was collected through a consumer survey in three prominent and highly populated cities—Karachi, Lahore, and Faisalabad—selected for their high consumption of spices.

Random sampling was employed, and data were collected via a structured survey from 180 consumers (70 from Karachi, 60 from Lahore, and 50 from Faisalabad) approached after purchasing red chilies from traditional and modern retail outlets. The sample size was justified by previous consumer segmentation studies (Sgroi et al., 2024) and deemed representative of urban chili users in Pakistan.

The questionnaire contained four sections: (1) consumption and purchase preferences, (2) relative importance of 13 intrinsic and extrinsic attributes on a 5-point Likert scale, (3) willingness to pay, and (4) demographic information. Participants from various retail outlets provided input on desired characteristics, including varietal traits, color, dryness, pungency, safety, price, and marketing attributes.

The questionnaire was pre-tested for clarity and improved for sequence and wording to enhance validity and reliability. Multi-item scales showed good internal consistency, with all constructs exceeding the 0.70 Cronbach's alpha threshold (Izah et al., 2023).

Data were analyzed using IBM SPSS 29. Descriptive statistics and frequency distributions assessed general habits. Cluster analysis using Ward's method with Squared Euclidean Distance segmented consumers by preferences (Gere, 2023). This approach was chosen for minimizing within-cluster variance and maximizing between-cluster differences (Gowda et al., 2025), making it suitable for exploratory segmentation (Backhaus et al., 2025). ANOVA, Kruskal–Wallis, and post-hoc tests compared cluster differences.

RESULTS AND DISCUSSION

The survey revealed the following results. Demographically, the study sample predominantly comprised males (92 percent). The small representation of females (8 percent) in the survey can be associated with the cultural norms in Pakistan, where females stay home and do household work instead of going shopping (Ahmad et al., 2024). More than half (61 percent) of respondents were aged below 40 years. Most (64 percent) of the respondents were married. Regarding family size, 40 percent had 5-6 family members, and 33 percent reported more than six members. Among them, 34 percent were graduates, and 21 percent had post-graduate qualifications. Most respondents (44 percent) reported an income level of less than or equal to 30,000 PKR. Table 1 contains the socio-economic characteristics of the consumers surveyed in three major cities of Pakistan, i.e., Karachi, Lahore, and Faisalabad.

The findings revealed that red chili was a popular and widely consumed spice in Pakistan, mainly used to add aroma, flavor, and color to food. Consumers from all income groups reported consuming red chili in wholesome and processed forms. Figure 1 illustrates the consumption preference for red chili. Most of the respondents indicated a liking to a greater extent (40 percent). A smaller percentage (10 percent) showed dislikeliness for red chili. Taste (30 percent) and the ability to add spice to food (35 percent) emerged as the most common reasons for red chili consumption, which suggests that red chili is valued for its flavor and role in enhancing the taste of dishes. Regarding the consumption quantity, most consumers (40 percent) reported that they consumed up to 250g per month, followed by 251-500g (35 percent). Red chili powder was the most preferred form of consumption among respondents (60 percent), followed by chili flakes (20 percent).

Table 1. Socio-economic characteristics of surveyed consumers (%).

Attributes	Category	City (%)			Overall (%)
		Karachi	Lahore	Faisalabad	
Gender	Male	84	89	95	92
	Female	16	11	5	8
Age (Years)	Up to 30	32	24	26	28
	31-40	33	28	31	33
	41-50	23	27	24	26
	51-60	10	12	12	9
	Above 60	2	9	7	4
Marital Status	Single	23	20	20	36
	Married	77	80	80	64
Family Size (No.)	1-2	3	4	6	3
	3-4	23	20	23	20
	5-6	40	38	51	44
	>6	34	38	20	33
Education	No education	11	9	2	6
	Primary	3	10	6	8
	Secondary	11	12	15	16
	Intermediate	17	15	16	15
	Graduate	35	33	37	34
	Post-graduate	23	21	24	21
Family Income (PKR/Month)	≤ 30,000	36	40	39	44
	30,001-50,000	34	29	30	31
	>50,000	30	31	32	25

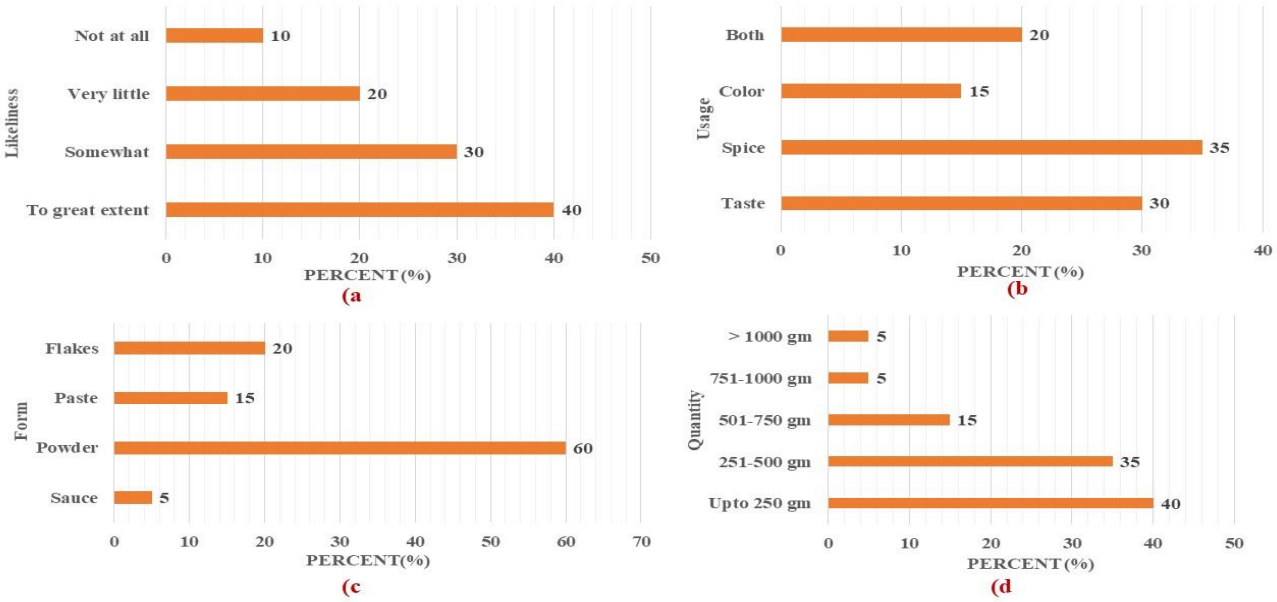

Figure 1. Red Chili consumption preference.

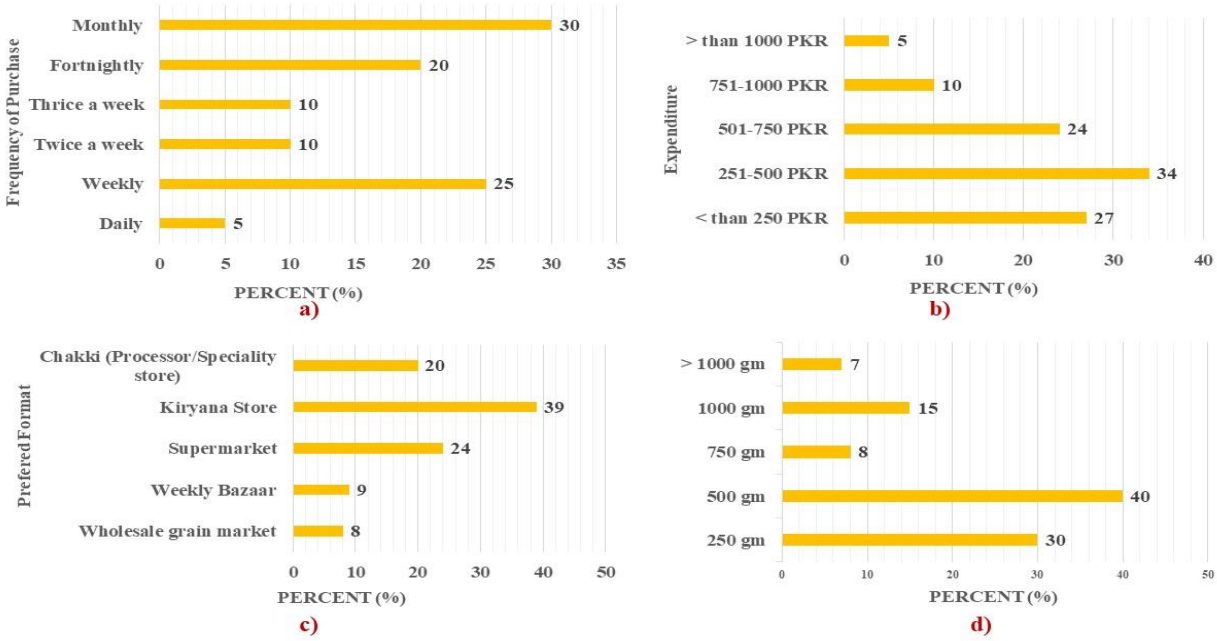

Figure 2. Red Chili purchase preferences.

The findings in Figure 2 depict consumers' purchase preferences for red chili. About the price range, 34 percent reported buying red chili at 500 PKR, and only 10 percent bought worth over 1,000 PKR or more. Regarding purchase frequency, about 30 percent of respondents reported buying once a month. While fortnightly and weekly purchasers were 20 percent and 25 percent. Regarding spending, around 34 percent were willing to spend 251-500 PKR, and traditional shops such as Kiryana stores (39 percent) were the most preferred purchase places, followed by supermarkets (24 percent) and specialty stores (20 percent). In contrast, weekly bazaar (9 percent) and wholesale markets (8 percent) were the least preferred. Most respondents (40 percent) reported 500g as the preferred quantity to be bought, followed by 250g (30 percent) and 1000g, with figures of 7 percent.

Consumer segmentation findings provide valuable insights for agricultural industry development (Funk et al., 2021) and reveal diverse consumer preferences reflecting population socio-economic diversity (Rana et al., 2023). These findings validate that food purchasing habits are guided by socio-demographic factors, price sensitivity, and quality perception (Defta et al., 2025). Similar spice and agro-food market insights show that diverse consumer segments enable producers and marketers to tailor offerings and enhance competitive advantage (Macharia et al., 2013; Rai et al., 2023). Value chain actors can improve competitiveness and performance through better market positioning and targeted approaches. Thus, market segmentation allows farmers, traders, and retailers to align business strategies with consumer needs, while policymakers can advocate for quality management, certification, and effective marketing campaigns (Purwanegara et al., 2021).

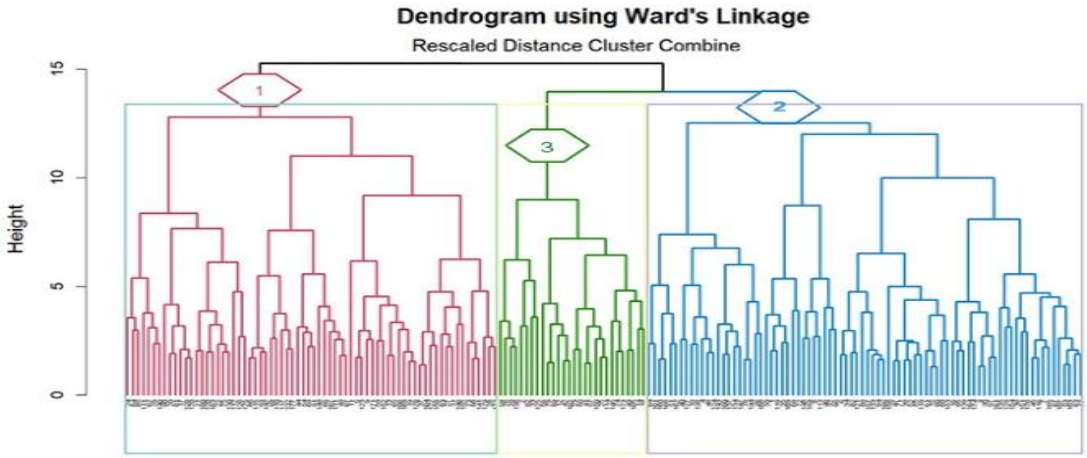

Figure 3. Dendrogram of clusters by cases, using ward linkage.

A hierarchical cluster analysis employing Ward's approach with Squared Euclidean Distance helped uncover consumer segments of red chili. This method divides customers into discrete subgroups based on shared preferences by analyzing attributes (Gassler et al., 2023). Based on their preferences for different attributes, the resulting Dendrogram revealed the existence of three distinct segments of consumers of red chili (Figure 3). The changes in distance between clusters as they merged during the study helped to identify the number of clusters (Ran et al., 2021). The ANOVA test results and post-hoc means separation using Fisher's least significant difference (LSD) test showed significant differences among the three groups for every quality attribute (Table 2). The Kruskal-Wallis test showed statistically significant differences in socioeconomic characteristics, consumption, buying preferences, and levels of red chili consumption among the respondents in the three clusters. These groups also differed significantly in purchase quantities, retailer preferences, and consumption levels (Table 3). There were notable differences among the three groups in socioeconomic attributes regarding income and education levels. These results aligned with Stadlmayr et al. (2023), who found no significant changes in consumption behavior related to tropical fruit based on gender.

Cluster 1

Cluster 1 (38.6%), value seekers, equally valued intrinsic and extrinsic attributes, including safety, price, and sensory experience. They preferred bright red chilies with high dryness, strong pungency, and hotness, indicating strong visual and taste preferences. These consumers cared about cleanliness and chemical-free attributes and were willing to pay extra for superior quality, regularly purchasing large quantities from reputable retailers. This aligns with Adhikari et al. (2012), who noted that food safety issues can be addressed through consumer awareness, with growing markets for safe, hygienic foods. The cluster represented diverse demographics, prioritizing quality and affordability, consistent with research showing rising safety concerns motivate purchase intention for certified, uncontaminated products (Ngo et al., 2023). For producers and traders, this presents lucrative potential for product differentiation based on safety and quality, while regulators can tighten certification processes to address these consumer needs (Ngo et al., 2023).

Table 2. Cluster comparison based on red Chili attributes – ANOVA.

Attribute Nature	Attribute type	Attribute	Cluster 1 (N=70)	Cluster 2 (N=83)	Cluster 3 (N=27)	F-Value	P-Value
Intrinsic	Search	Variety	3.30^{a}	3.76^{b}	3.36^{a}	1.117	0.03*
		Color	4.60^{a}	4.35^{b}	3.91^{c}	3.023	0.00**
		Dryness	4.50^{a}	4.24^{b}	4.00^{c}	21.69	0.05*
	Experience	Pungency	4.70^{a}	4.53^{b}	4.27^{b}	13.74	0.02*
		Hotness	4.40^{a}	4.12^{a}	4.09^{b}	7.39	0.00**
		Nutritional value	3.90^{a}	3.24^{b}	3.73^{b}	15.76	0.00**
Extrinsic	Safety	Cleanliness	4.80^{a}	4.76^{a}	4.18^{b}	5.873	0.00**
		Chemical free	4.40^{a}	4.76^{b}	4.27^{a}	2.756	0.03*
	Marketing	Price	4.60^{a}	4.00^{b}	3.55^{c}	14.42	0.01*
		Retailers' cleanliness	3.90^{a}	4.71^{b}	3.91^{a}	34.16	0.02*
		Branding	3.60^{a}	3.94^{b}	3.00^{c}	12.286	0.117
		Packaging	3.80^{a}	3.94^{a}	3.09^{b}	42.519	0.00**
		Certification	3.60^{a}	3.88^{b}	3.15^{c}	31.876	0.00**

Note: Superscripts a, b c indicate results of Post-Hoc Tests (Fisher's least significance difference LSD test). The same letters in each column in a row indicate that clusters against that specific attribute are not significantly different at α=0.05, **Significant (α ≤0.01), and *Significant (α ≤0.05).

Cluster 2

Cluster 2 (45.6%), Traditional Consumers, seek affordable chilies with familiar attributes. Unlike other clusters, they are unconcerned with visual attributes like color and dryness, prefer milder flavors with low pungency and hotness, and care less about nutritional benefits. Safety and hygiene are not concerns in their buying decisions, as they value cleanliness, chemical-free products, and certification less. They also value branding and packaging much less than other clusters, indicating minimal marketing influence. These consumers show substantial price sensitivity, with affordability as their primary consideration. They prioritize essential qualities like taste and price over premium features, demonstrating a traditional, cost-conscious attitude. Demographically, this group tends to be older (51-65 years) with established purchasing habits, lower to moderate education levels, and larger family sizes. Their focus is on cost-effective, everyday household use. Costa Filho et al. (2021) observed similar patterns of brand indifference but strong traditional market loyalty among low-income consumers. Maintaining low prices and consistent quality is crucial for retaining this sizable customer base (Vuong et al., 2024). Government intervention could improve market hygiene and clarity to establish trust (Berg, 2022).

Cluster 3

Cluster 3 (15.8%) represents safety and marketing-conscious consumers who prioritize extrinsic values like brand, packaging, certification, and cleanliness over moderate intrinsic attributes like dryness, pungency, and hotness. They are not highly concerned with nutritional benefits but focus on cleanliness, chemical-free products, and marketing attributes. While price-sensitive, they will pay a premium for products meeting their hygiene and branding expectations, seeking value rather than luxury. Demographically, this cluster consists of educated, middle and upper-class individuals who prefer modern retailers, purchasing small to medium quantities (250–750 grams) of red chili powder, flakes, or sauces for convenience and reliability. Their consumption behavior shows a practical balance between affordability and expected quality and safety standards.

This study corroborates Bravo et al. (2024), confirming that branding and certification serve as safety assurances for contemporary consumers. For marketers and retailers, this growing segment values innovative packaging, traceability, and brand reliability, highlighting key investment areas to enhance stakeholder competitiveness and performance (Chisoro and Roberts, 2021). The key differences across these clusters highlight distinct consumer priorities. Cluster 1 consumers seek high-quality, safe products while balancing price considerations; Cluster 2 consumers prioritize premium branding, hygiene, and packaging over price; and Cluster 3 consumers are highly budget-conscious, focusing on affordability while placing minimal importance on branding and packaging.

There were notable differences among the three groups in socio-economic attributes regarding income, education. Along with income and education (Table 4).

Table 3. Cluster comparison: consumption and purchase patterns.

Preference	Categories	Cluster 1	Cluster 2	Cluster 3	Chi-Squared Value	p-value
		(N=70)	(N=83)	(N=27)		
Consumption in a Month	Up to 250g	27.6	35.3	27.3		
	251-500g	42.4	35.3	45.5		
	501-750g	6.5	11.8	15.1		
	751-1000g	3.5	11.8	3.1	4.327	0.00**
	Above 1000g	20	5.8	9.0		
Preferred Form	Powder	63.4	70.6	68.4		
	Chili flakes	23.8	17.6	18.2		
	Sauce	1.8	5.9	9.1	7.747	.257
	Other	11	5.9	4.3		
Purchase Quantity	250g	15.3	11.8	15.2		
	500g	18.2	11.8	14.2		
	750g	60.3	52.9	54.5		
	1000g	4.1	17.6	7.6	5.194	0.01*
	>than 1000g	2.1	5.9	8.5		
Expenditure in PKR	less than 250	20.9	17.6	11.1		
	250-500	50.7	35.3	45.4		
	501-750	22.3	17.6	27.3		
	751-1000	3.6	25.2	7.1	7.661	.467
	>than 1000	2.5	4.3	9.1		
Preferred retailer	Karyana store	68.2	58.8	76.8		
	Chakki	7.3	17.6	9.1		
	Supermarket	11.3	11.8	8.6	4.845	0.03*
	Weekly market	3.2	5.9	3.2		
	Wholesale grain market	10.0	5.9	2.3		

**Significant (α ≤0.01), and *Significant (α ≤0.05).

Table 4. Cluster comparison: socio-economic comparison.

Characteristic	Categories	Cluster 1	Cluster 2	Cluster 3	Chi-Squared Value	P-value
		(N=70)	(N=83)	(N=27)		
Gender	Male	42.3	52.9	54.5	1.649	0.438
	Female	57.7	47.1	45.5		
Age (in Years)	up to 30	9.0	35.3	27.30	4.575	0.334

	31-50	71	52.9	54.50		
	Above	20.0	11.8	18.20		
Education	Primary	20.0	12.6	5.6	16.458	0.036*
	Matric	10.0	14.2	5.4		
	Intermediate	10.0	15.0	16.30		
	Graduate	10.0	28.8	18.20		
	Post-graduate	50.0	29.4	54.50		
Marital Status	Single	12.2	23.5	9.10	3.275	0.194
	Married	87.8	76.5	90.90		
Family Size (No.)	up to 5	60.0	58.8	36.40	1.647	0.439
	6-10	40.0	41.2	63.60		
Occupation	Govt. Servant	10.0	5.90	30.2	14.197	0.077*
	Private Servant	30.2	29.4	27.30		
	Businessman	28.0	17.6	18.20		
	Student	4.0	17.6	6.1		
	Housewife	28.0	29.5	18.20		
Family Income (PKR)	<25,000	9.7	8.4	11.3	13.958	0.00**
	25,001-50,000	20.6	17.3	15.7		
	50,001-75,000	25.5	21.9	24.8		
	75,001-100,000	31.4	28.6	15.3		
	>100,000	12.8	23.8	32.9		

**Significant (α ≤0.01), and *Significant (α ≤0.05).

Most consumers showed willingness to pay extra for premium attributes, with over half willing to pay 10-50% more for certification (75%), packaging (70%), and branding (65%), though some declined any premium. These results support the consumer value approach proposed by Macharia et al. (2013) and Truelove et al. (2023), where stakeholders collaborate to segment consumers and deliver desired value. The findings offer practical implications: farmers can implement GAP modules to produce safer chilies for Clusters 1 and 3; traders and processors can invest in cleaning, drying, grading, and packaging systems; traditional retailers can maintain price competitiveness; and policymakers can facilitate certification, traceability, and consumer education. These implications align with research advocating consumer feedback integration into value chain management to enhance competitiveness and stakeholder performance (Ganeshkumar et al., 2023). Most consumers showed willingness to pay extra for premium attributes, with over one half willing to pay 10-50% more for certification (75%), Packaging (70%) and Branding (65%) (Figure 4).

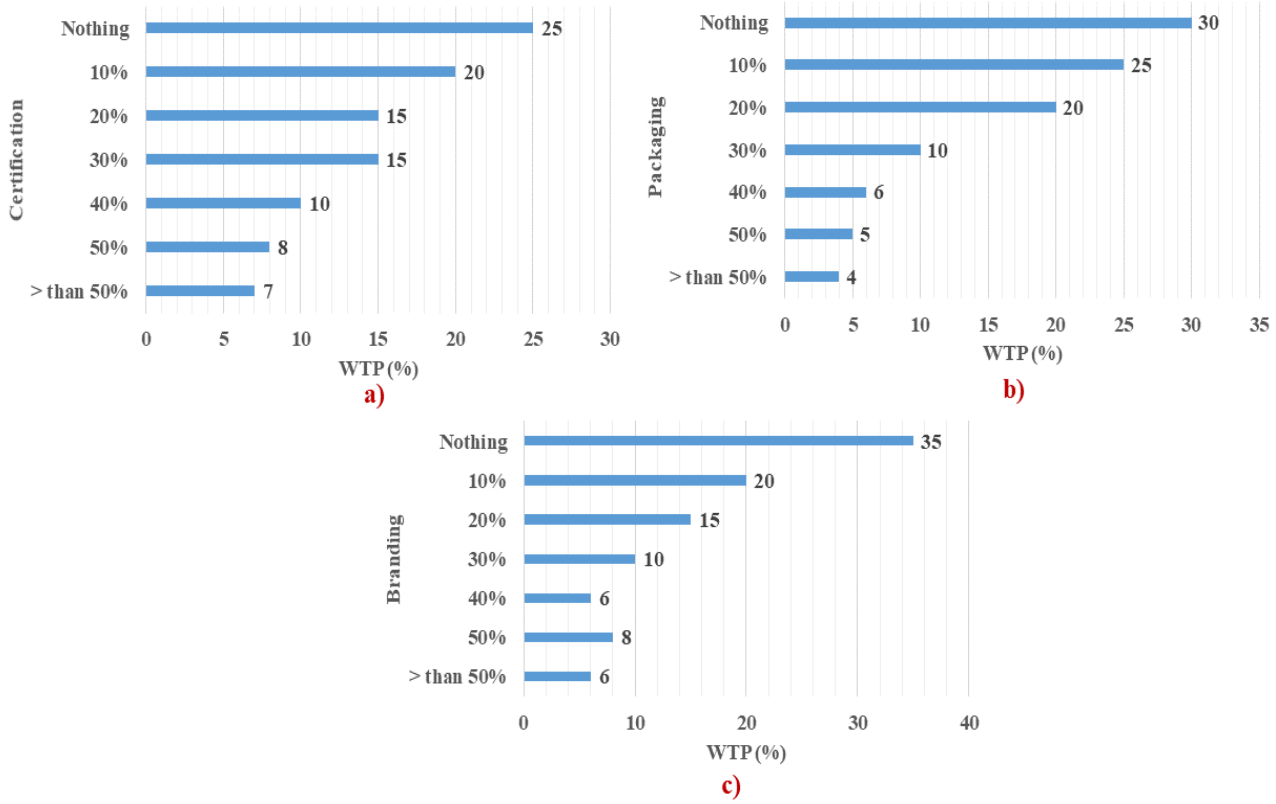

Figure 4. Willingness to pay (WTP) for premium attributes.

CONCLUSIONS AND POLICY IMPLICATIONS

The results highlight evolving consumer preferences in Pakistan's red chili industry, revealing the importance placed on safety, hygiene, branding, and packaging alongside essential attributes like price, pungency, and color. The distinct consumer groups demonstrate potential profit opportunities for value chain actors. Implementing Good Agricultural Practices (GAP) and proper post-harvest practices like drying and packaging significantly enhance product quality. The lack of modern processing methods contributes to contamination, hindering stakeholder performance and competitiveness. Extension services should expand beyond production practices to include post-harvest management and marketing guidance.

Adulteration and pricing malpractices have eroded consumer trust in the retail sector. Traditional retailers require assistance in improving selling practices and cost-effectiveness to maintain competitiveness alongside modern retailers, who need to address price sensitivity and ensure quality availability.

This study emphasizes consumer-focused strategies for improving Pakistan's chili industry and addresses scarce literature on consumer segmentation in developing agribusiness markets. Distinctively, it combines intrinsic and extrinsic attributes with safety and marketing factors in a comprehensive behavioral model.

Study limitations include data collection from three urban cities, which may not represent rural consumer perspectives, and potential self-reporting bias. Future research should expand geographic scope, employ longitudinal designs to track behavioral changes, and utilize multiple methods. Additional studies could examine food safety impacts through branding, certification, and traceability, plus technology's role in enhancing consumer trust and loyalty within red chili value chains.

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REFERENCES

Adhikari, R.P., Collins, R., Sun, X., 2012. Segmenting consumers to inform agrifood value chain development in Nepal. Int. Food Agribus. Manag. Rev. 15, 93–114.

Ahmad, B., Mehdi, M., Adhikari, R., Raza, M.H., Iqbal, M.A., Petersen, E., 2024. Unlocking inclusive competitive value chains of chickpeas in Punjab, Pakistan: a walking the chain approach to identify barriers, opportunities, and options. Agric. Sci. J. 197–212.

Ajetunmobi, O.A., Laobangdisa, S., 2024. The Effect of Cultural and Socio-economics Factors on Consumer Perception. Consum. Perceptions Food 23–44.

Andriani, Y.D., Nurtjahjadi, E., 2025. The Effect of Product Quality and Price Perception on Repurchase Intention of ABC Chili Sauce Products in Bandung City. Am. J. Econ. Manag. Bus. 4, 1713–1724.

Arin, S., 2019. Scenario of chilli production and hindrances faced by the growers of Sindh province of Pakistan. Mod. Concepts Dev. Agron. 4, 436–442.

Backhaus, K., Erichson, B., Gensler, S., Weiber, R., Weiber, T., 2025. Cluster analysis, in: Multivariate analysis: an application-oriented introduction. Springer, pp. 461–538. https://doi.org/10.1007/978-3-658-47931-2_8.

Berg, L., 2022. The importance of consumer authorities for the production and maintenance of trust and social capital in consumer markets. J. Consum. Policy 45, 537–559.

Bravo, I., Colamatteo, I., Balzano, S., Cappelli, L., Iannucci, E., 2024. Consumer behaviour regarding certified food. Sustainability 16, 3757.

Broz, M., 2022. Economic Development and Its Influence on Food Innovation and Consumption Trends. J. Policy Options 5, 8–14.

Chisoro-Dube, S., Roberts, S., 2021. Innovation and inclusion in South Africa's citrus industry. Innov. Incl. Agro-Processing Work. 1–51. https://www.competition.org.za/s/Final-SA-Citrus-Working-Paper_October-2021.pdf.

Costa Filho, M.C., Falcao, R.P.Q., Motta, P.C. de M., 2021. Brand loyalty among low-income consumers? Qual. Mark. Res. An Int. J. 24, 260–280.

Defta, N., Barbu, A., Ion, V.A., Pogurschi, E.N., Osman, A., Cune, L.-C., Bădulescu, L.A., 2025. Exploring the relationship between socio-demographic factors and consumers' perception of food promotions in Romania. Foods 14, 599.

FAOSTAT, 2023. Crop production statistics—Pakistan. Retrieved from http://www.fao.org/faostat/en/#data/QC.

Funk, A., Sütterlin, B., Siegrist, M., 2021. Consumer segmentation based on stated environmentally-friendly behavior in the food domain. Sustain. Prod. Consum. 25, 173–186.

Ganeshkumar, C., Jena, S.K., Sivakumar, A., Nambirajan, T., 2023. Artificial intelligence in agricultural value chain: review and future directions. J. Agribus. Dev. Emerg. Econ. 13, 379–398.

Gassler, B., Faesel, C.K., Moeser, A., 2023. Toward a differentiated understanding of the effect of Nutri-Score nutrition labeling on healthier food choices. Agribusiness 39, 28–50.

Gere, A., 2023. Recommendations for validating hierarchical clustering in consumer sensory projects. Curr. Res. Food Sci. 6, 100522.

GoP, 2023. Ministry of National Food Security and Research (MNFSR). Fruit, Vegetables and Condiments Statistics of Pakistan 2022-23. Govt. of Pakistan, Islamabad, Pakistan.

Gowda, K.H., Amarananjundeswara, H., Fakrudin, B., Vasudeva, K.R., Doddabasappa, B., Kattegoudar, J., 2025. Biochemical Characterization, Sensory Evaluation, Instrumental Colour Profiling and Selection of Nutritional-Rich Genotypes through Hierarchical Cluster Analysis, Multivariate Analysis and Multi-trait Genotype Ideotype– Distance Index in Potato (*Solanum tuberosum* L.). Potato Res. 1–37. https://link.springer.com/article/10.1007/s11540-025-09852-2.

Harniati R.K., de Vries, J.R., Klerkx, L., Turner, J.A., 2023. The enabling and constraining connections between trust and digitalisation in incumbent value chains. Technol. Forecast. Soc. Change 186, 122175.

Izah, S.C., Sylva, L., Hait, M., 2023. Cronbach's alpha: A cornerstone in ensuring reliability and validity in environmental health assessment. ES Energy Environ. 23, 1057.

Kanellos, N., Karountzos, P., Giannakopoulos, N.T., Terzi, M.C., Sakas, D.P., 2024. Digital marketing strategies and profitability in the agri-food industry: Resource Efficiency and Value Chains. Sustain. 16, 14.

Kazim, R.R., 2023. National Spice Summit 2023: National Foods Limited leads the way for red chili ecosystem development. Retrieved from: https://customnews.pk/2023/12/20/national-spice-summit-2023-national-foods-limited-leads-the-way-for-red-chili-ecosystem-development/.

Kefale, B., Delele, M.A., Fanta, S.W., Mekonnen Abate, S., 2023. Nutritional, physicochemical, functional, and textural properties of red pepper (*Capsicum annuum* L.), red onion (Allium cepa), Ginger (*Zingiber officinale*), and garlic (*Allium sativum*): Main ingredients for the preparation of spicy foods in Ethiopia. J. Food Qual. 2023, 3916692.

Khaliq, A., Ahsan, S., Chughtai, M.F.J., Liaqat, A., Mehmood, T., Sameed, N., Saeed, K., Rahman, S.J.U., 2023. Food Hazards and Their Risk Management, in: Food Microbial and Molecular Biology. Apple Academic Press, pp. 99–130.

Khan, A., Ali, M., Yasin, A., 2020. Chili cluster feasibility and transformation study. In: Mubarik, A. (ed.), Cluster Development Based Agriculture Transformation Plan Vision-2025. Project No. 131(434) PC/AGR/CDBAT-120/2018. Planning Commission of Pakistan, Islamabad, Pakistan, and Centre for Agriculture and Biosciences International (CABI), Rawalpindi, Pakistan.

Kotler, P., Keller, K.L. Chernev, A., 2021. Marketing Management; Pearson Education: Saddle River, NJ, USA.

Macharia, J., Collins, R., Sun, T., 2013. Value-based consumer segmentation: the key to sustainable agri-food chains. Br. Food J. 115, 1313–1328.

Malekpour, M., Yazdani, M., Rezvani, H., 2022. Investigating the relationship between intrinsic and extrinsic product attributes with customer satisfaction: implications for food products. Br. Food J. 124, 578–598.

Maojie, Z., 2023. The impact of anchor characteristics on consumers' willingness to pay a premium for food—an empirical study. Front. Nutr. 10, 1240503.

Moyo, M., Ssali, R., Namanda, S., Nakitto, M., Dery, E.K., Akansake, D., Adjebeng-Danquah, J., van Etten, J., de Sousa, K., Lindqvist-Kreuze, H., 2021. Consumer preference testing of boiled sweetpotato using crowdsourced citizen science in Ghana and Uganda. Front. Sustain. Food Syst. 5, 620363.

Ngo, H.M., Liu, R., Moritaka, M., Fukuda, S., 2023. Determinants of consumer intention to purchase food with safety certifications in emerging markets: evidence from Vietnam. J. Agribus. Dev. Emerg. Econ. 13, 243–259.

Okpala, C.O.R., Korzeniowska, M., 2023. Understanding the relevance of quality management in agro-food product industry: From ethical considerations to assuring food hygiene quality safety standards and its associated processes. Food Rev. Int. 39, 1879–1952.

Pels, J., Sheth, J.N., 2021. Serving the invisible poor: Segmenting the market. J. Glob. Mark. 34, 270–281.

Purwanegara, M.S., Kusumawati, N., Ekawati, R.H., Hudrasyah, H., Cirella, G.T., 2021. Synchronizing Agricultural Trade Regulations: Case Study from Subang Regency, in: Human Settlements: Urbanization, Smart Sector Development, and Future Outlook. Springer, pp. 155–176. https://doi.org/10.1007/978-981-16-4031-5_9.

Quick, V., Errickson, L., Bastian, G., Chang, G., Davis, S., Capece, A., Schoolman, E., 2022. Preserving farm freshness: Consumer preferences for local value-added products at urban farmers markets. J. Agric. Food Syst. Community Dev. 11, 113–134.

Rai, S., Wai, P.P., Koirala, P., Bromage, S., Nirmal, N.P., Pandiselvam, R., Nor-Khaizura, M.A.R., Mehta, N.K., 2023. Food product quality, environmental and personal characteristics affecting consumer perception toward food. Front. Sustain. Food Syst. 7, 1222760.

Ran, X., Zhou, X., Lei, M., Tepsan, W., Deng, W., 2021. A novel k-means clustering algorithm with a noise algorithm for capturing urban hotspots. Appl. Sci. 11, 11202.

Rana, A.W., Gill, S., Akram, I., 2023. Policy framework for contract farming: An alternate to Aarthi system in Pakistan. International Food Policy Research Institute (IFPRI), Washington, US. https://cgspace.cgiar.org/items/fd2ecc8f-43a8-4c73-98f7-fec3a487a1b4.

Sarwar, A., Khan, S.A., 2020. Implementation of Best Practices to Ensure Aflatoxin Controlled Chilli Production from Post Harvesting to Customer in Developing Country. J. Educ. Manag. Soc. Sci. 1, 24–32.

Sgroi, F., Sciortino, C., Baviera-Puig, A., Modica, F., 2024. Analyzing consumer trends in functional foods: A cluster analysis approach. J. Agric. Food Res. 15, 101041.

Stadlmayr, B., Trübswasser, U., McMullin, S., Karanja, A., Wurzinger, M., Hundscheid, L., Riefler, P., Lemke, S., Brouwer, I.D., Sommer, I., 2023. Factors affecting fruit and vegetable consumption and purchase behavior of adults in sub-Saharan Africa: A rapid review. Front. Nutr. 10, 1113013.

Stampa, E., Schipmann-Schwarze, C., Hamm, U., 2020. Consumer perceptions, preferences, and behavior regarding pasture-raised livestock products: A review. Food Qual. Prefer. 82, 103872.

Truelove, R.N., Lellyett, S.C., Issaka, A.I., Huda, S., 2023. Agricultural value chains in developing economies: a theoretical framework, in: Sustainable Food Value Chain Development: Perspectives from Developing and Emerging Economies. Springer, pp. 107–152. https://doi.org/10.1007/978-981-19-6454-1_6.

Vuong, T.K., Lam, T.N., Bui, H.M., 2024. Sustainable Consumer Behaviour in the Fast-Moving Consumer Goods Sector: Moderating Role of Competitive Intensity in Green Marketing. Bus. Strateg. Dev. 7, e70047.

Yogita, R.J., Prajapati, C.S., Roy, S., Abrol, P., Khan Chand, A.K., Darbha, S., 2024. Extension strategies to promote post-harvest management and value addition: A review. Horticulture 50, 321-336.

Zanchini, R., Spina, D., De Pascale, A., Lanfranchi, M., Giannetto, C., D'Amico, M., Di Vita, G., 2025. Shaping consumer preferences for sweet peppers: exploring the role of social, environmental, and sensory attributes in the era of health consciousness and local sourcing. Agric. Food Econ. 13, 42.