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Consumer Preferences for Urban Farming Kits Across Residential Categories: Evidence from Hyderabad, Telangana, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The present study aimed to analyze consumer preferences for various attributes of urban farming kits and services and to compare these preferences across different residential categories in Hyderabad.

Study Design: A descriptive research design was used, combining exploratory and comparative analysis.

Place and Duration of Study: The study was conducted in residential areas of Hyderabad, Telangana, India, between April 2025 and June 2025.

Methodology: Data were collected from 120 households across four city zones using a structured questionnaire. Factor analysis was used to identify key preference dimensions, and variations were examined across gated communities, independent houses, and standalone apartments.

Results: Two main dimensions shaped consumer preferences: Kit Value and Flexibility (customization, eco-friendly features, digital support) and User Convenience (easy setup, low maintenance, reliable service). Preferences differed by housing type, gated communities valued premium and customizable options, standalone apartments prioritized ease of use, while independent houses showed a balanced outlook.

Conclusion: Consumer preferences for urban farming kits are shaped by residential settings, reflecting the influence of living environments on adoption choices. This highlights the need for differentiated product designs, targeted marketing approaches, and supportive urban policies to promote wider uptake of sustainable home-farming solutions tailored to diverse urban contexts.

Keywords: Consumer preference attributes; gated communities; independent houses; kit value & flexibility; standalone apartments; user convenience.

1. INTRODUCTION

Rapid urbanization is transforming global food systems, creating both challenges and opportunities for sustainable living. The United Nations projects that 68% of the world's population will reside in urban areas by 2050, up from 55% in 2018, while India's urban share is expected to exceed 40% by 2030 (United Nations, Department of Economic and Social Affairs, 2018). This demographic shift reduces cultivable land near cities, lengthens supply chains, increases food costs and carbon emissions, and amplifies dietary inequalities, with affluent groups consuming more processed foods while lower-income residents struggle to access fresh produce (Observer Research Foundation, 2023). Consequently, urban food insecurity is increasingly shaped by both spatial and socioeconomic pressures, highlighting the need for localized solutions such as urban farming. Consumer acceptance plays a crucial role in sustainability initiatives, as individuals tend to support measures that encourage sustainable choices rather than restrict personal freedom (Ammann et al., 2025).

Urban agriculture is emerging globally as a viable response, combining food production with environmental and social benefits. According to the FAO, over 800 million people are engaged in urban farming worldwide, from household gardens to commercial vertical farms. Various countries are integrating urban agriculture into national food security strategies. Singapore's "30 by 30" policy aims to produce 30% of its nutritional needs locally by 2030 through hydroponics, vertical farming, and rooftop cultivation. In China, urban planning incorporates greenhouses and rooftop farms, with projections suggesting urban agriculture could meet 15% of the nation's vegetable demand by 2030 (Acumen Research and Consulting, 2023). These examples indicate that urban farming is increasingly central to national strategies. Recent research emphasizes that technological and scientific support is essential to scale urban agriculture effectively, enhance crop yields and quality, optimize urban waste utilization, and deliver social and environmental benefits (O'Sullivan et al., 2019).

In India, the integration of urban farming into planning remains limited. National missions such as AMRUT 2.0 and the Smart Cities Mission promote green spaces but do not directly support food production, reflecting a policy gap (People's Resource Centre, 2024). Despite this, states and communities are implementing initiatives independently. Delhi contributes substantially to its own food supply, particularly in meat, milk, and vegetables. Kerala, Tamil Nadu, and Bihar encourage rooftop and household farming through subsidies, kits, and training programs, while Pune has experimented with community-driven urban agriculture. Broader adoption is constrained by land scarcity, water availability, pollution, and lack of institutional support (Down to Earth, 2022).

Hyderabad represents a more structured local example. India's first rooftop Urban Farming Centre was established on the CDMA building, promoting soil-free cultivation of vegetables, herbs, and medicinal plants while training women's self-help groups to improve household nutrition and livelihoods (Krishi Jagran, 2023). The Telangana Horticulture Department has identified nearly 60,000 square meters of potential rooftop farming space and has supported terrace cultivation since 2012 under the Rashtriya Krishi Vikas Yojana (Telangana Horticulture Department). At the household level, urban farming adapts to spatial constraints. Terrace and rooftop gardens provide fresh produce while reducing indoor temperatures and improving household food security (Bhat & Paschapur, 2020). Balcony and container gardening in apartments offers an affordable way to grow herbs and leafy vegetables and supports mental well-being through stress relief and mindfulness (Joshi et al., 2023). In high-density areas, vertical farming enables year-round production, though high initial costs limit adoption (Teoh et al., 2024). Hydroponics and aquaponics are gaining traction for efficient water use and soil-free cultivation, with private companies offering ready-to-use kits and training (Vaishnavi and Prashanth, 2023). Consumer attitudes toward hydroponically grown produce are influenced by perceptions of freshness, sustainability, quality, and socio-demographic factors, highlighting the need to align product design with consumer expectations (Talu, 2024). Community gardens further foster social cohesion, shared responsibility, and sustainability awareness (Tulane University School of Public Health and Tropical Medicine, 2024).

Beyond food production, urban farming generates wider social and ecological benefits. It promotes recycling of organic waste, efficient water use, and pollution reduction, aligning with circular economy principles (Izawati et al., 2017). Gardening has also been associated with improved mental and physical health, providing psychological relief and a sense of purpose, benefits that were especially evident during the COVID-19 pandemic (Mladenović et al., 2017). Environmental advantages vary with methods used, with rooftop and low-tech systems generally showing positive impacts (Goldstein et al., 2016). By reducing packaging waste and lowering emissions from long-distance transportation, urban agriculture enhances sustainability and climate resilience, making it an attractive strategy for policymakers and private investors (Grebitus et al., 2020; The Business Research Company, 2025).

By combining modern technologies with community-based models, urban agriculture offers a pathway toward sustainable, inclusive, and resilient urban futures.

Objectives of the study:

1. To identify the determinants of consumer preferences for urban farming kits and services.
2. To assess differences in preferences across residential categories in Hyderabad.

2. MATERIALS AND METHODS

2.1 Data

Primary data for the study were collected in 2025 from four residential zones of Hyderabad - Charminar, LB Nagar, Kukatpally, and Serilingampally, to capture diverse urban settings and socio-economic backgrounds. A multistage purposive sampling method was used. From each zone, three areas were chosen purposively, giving a total of twelve areas. In each area, ten households were selected, resulting in a total sample of 120 households. The sample included residents from three different residential categories: gated communities, standalone apartments, and independent houses, ensuring representation across socio-economic levels.

A structured schedule was used to collect data on consumer preferences for urban farming kits and services. Respondents were asked to rate various attributes such as kit design, digital support, ease of use, maintenance requirements, eco-friendly materials, and aesthetic appeal using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).

2.2 Analytical Framework

To identify the underlying factors influencing consumer preferences, factor analysis was applied using SPSS. Before analysis, the adequacy of the data was tested using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity. Factor analysis helped group related attributes into common factors, reducing data complexity and revealing key dimensions of consumer preferences. Principal Component Analysis (PCA) with Varimax rotation was used to extract factors with eigenvalues greater than one, ensuring a robust solution. Variables with factor loadings above 0.50 were considered significant for inclusion in each factor.

To examine differences in preferences across residential categories, one-way Analysis of Variance (ANOVA) was conducted. The factor scores obtained from PCA were treated as dependent variables, while residential categories (gated communities, standalone apartments, independent houses) were considered independent variables. Post hoc analysis using Tukey's HSD test was employed to identify specific group differences. Descriptive statistics such as mean, standard deviation, and confidence intervals were computed prior to ANOVA to assess central tendencies and variability in consumer responses.

3. RESULTS AND DISCUSSION

3.1 Descriptive Statistics

The sample predominantly consisted of younger and early middle-aged individuals. About 45% of respondents were aged 25–34 years, followed by 22.5% in the 35–44 age group. Respondents under 25 years represented 16.7%, indicating engagement of younger consumers in urban farming. Only 2.5% were aged 45–54, and 13.3% were 55 and above, showing limited participation among older adults.

Education levels were high: 49.2% held postgraduate degrees or higher, 37.5% had undergraduate degrees, 10% completed diploma or intermediate courses, and 3.3% had schooling up to the 10th standard. No respondents reported having no formal education.

Occupationally, private sector employees formed the largest group (34.2%), followed by students (27.5%) and government employees (19.2%). Business owners accounted for 12.5%, and homemakers 6.7%. No retired participants were included.

Regarding family size, most households (70%) had 3–4 members, 21.7% had 5–6 members, while smaller (1–2 members) and larger households (>6 members) were less common. This indicates that medium-sized nuclear families represent the primary consumer segment for urban farming products in Hyderabad.

3.2 Consumer Preference Dimensions

Factor analysis was conducted to identify the underlying dimensions of consumer preferences for urban farming products. The data were suitable for analysis, with a Kaiser-Meyer-Olkin (KMO) value of 0.754 and a significant Bartlett's Test of Sphericity ($\chi^2(45) = 681.673$, $P < 0.001$). A scree plot (Fig. 2) was used to determine the number of factors to retain, showing a clear elbow at the second component and supporting the extraction of two factors, which together explained 63.65% of the total variance (Table 1).

Factor 1, labeled "Kit Value and Flexibility," included attributes such as digital support (0.856), modular/customizable design (0.852), organic seeds and compost (0.804), aesthetically appealing design (0.735), expandable components (0.721), eco-friendly materials (0.705), and high-quality features (0.590).

Factor 2, labeled "User Convenience," comprised minimal effort and maintenance (0.922), easy setup (0.878), and reliable customer service (0.646). These results indicate that consumer evaluation is guided by a balance between functionality, premium features, and usability, providing insights for kit design and targeted marketing (Table 2).

3.3 Differences in Consumer Preferences across Residential Categories

Descriptive statistics illustrated in Fig. 1, indicated that gated community residents reported the highest mean scores for Kit Value and Flexibility (0.61), compared to independent houses (–0.30) and standalone apartments (–0.30). For User Convenience, gated communities scored 0.41, standalone apartments 0.34, and independent houses 0.07.

One-way ANOVA confirmed significant differences across residential categories. Kit

Value and Flexibility showed highly significant variation ($F(2,117) = 13.55$, $P < 0.001$), and User Convenience also differed significantly ($F(2,117) = 6.55$, $P = 0.002$) (Table 3).

Tukey HSD post hoc analysis revealed that gated community residents scored significantly higher for Kit Value and Flexibility than independent houses (mean difference = 0.918, $P < 0.001$) and standalone apartments (mean difference = 0.914, $P < 0.001$), while no significant difference was found between independent houses and standalone apartments ($P = 1.000$). For User Convenience, standalone apartment residents scored higher than gated community residents (mean difference = 0.763, $P = 0.002$). Differences between other groups were not statistically significant (Table 4).

The study demonstrates that residential context significantly shapes consumer priorities for urban agriculture products. Gated community residents tend to value premium features, modularity, and eco-friendly components, reflecting higher disposable income and a preference for customizable solutions. In contrast, apartment residents prioritize ease of use, low maintenance, and convenience, likely due to space constraints and time limitations. Independent house residents show moderate interest in both dimensions, bridging the preferences observed in other residential types.

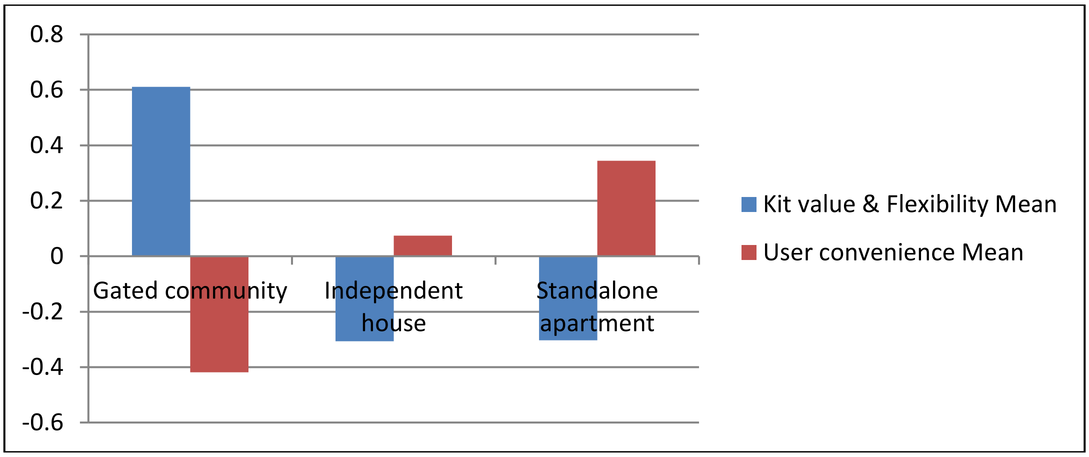

Fig. 1. Mean Scores of Consumer Preferences for Kit Value and Flexibility and User Convenience Across Residential Categories

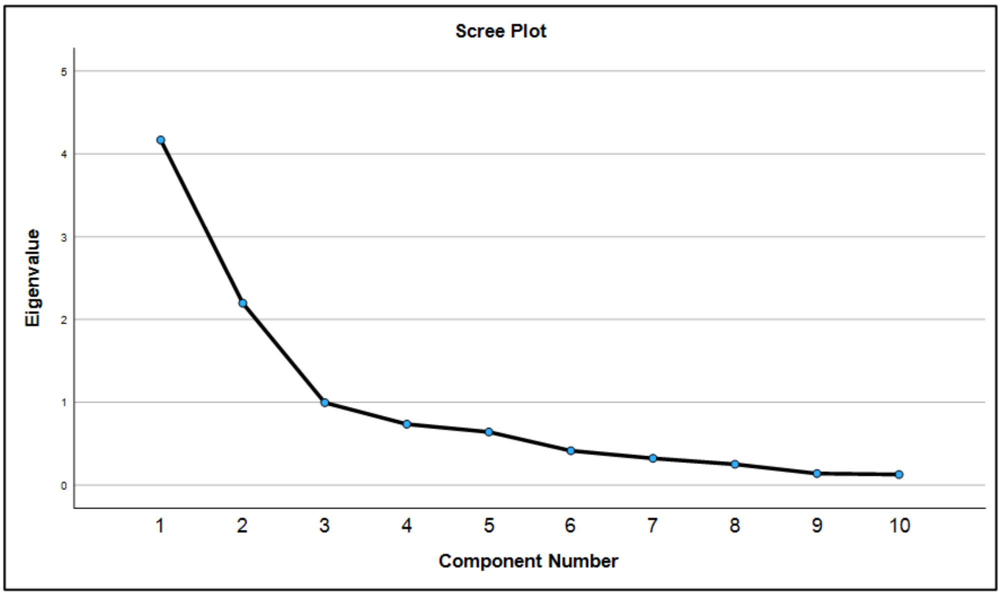

Fig. 2. Scree plot for Factor analysis

Table 1. Total variance explained of consumer preference attributes

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	4.168	41.678	41.678	4.168	41.678	41.678	4.024	40.240	40.240
2	2.197	21.974	63.652	2.197	21.974	63.652	2.341	23.412	63.652
3	.996	9.960	73.612						
4	.736	7.363	80.976						
5	.642	6.421	87.396						
6	.415	4.153	91.550						
7	.324	3.237	94.787						
8	.252	2.523	97.310						
9	.140	1.403	98.713						
10	.129	1.287	100.000						

Table 2 Rotated Component Matrix of consumer preference attributes

Variable	Component	
	1	2
Digital support	.856	
Modular or customizabe design	.852	
Organic seeds and compost	.804	-.142
Aesthetically appealing	.735	
Expandable components	.721	.306
Eco-friendly materials	.705	-.306
High quality features	.590	-.290
Minimal effort and maintenance		.922
Easy setup		.878
Reliable customer service		.646

Table 3. One-way ANOVA Results for Consumer Preferences across Residential Categories

		Sum of Squares	df	Mean Square	F	Sig.
Factor 1 Kit Value & Flexibility	Between Groups	22.38	2	11.19	13.55	<.001
	Within Groups	96.61	117	.826		
	Total	119.00	119			
Factor 2 User Convenience	Between Groups	11.98	2	5.99	6.55	.002
	Within Groups	107.01	117	.915		
	Total	119.00	119			

Table 4. Post Hoc Multiple Comparisons Identifying Group Differences in Consumer Preferences by Residential Category (RC)

Dependent Variable	(I) RC	(J) RC	Mean Difference (I-J)	Std. Error	Sig.	95 per cent Confidence Interval	
						Lower Bound	Upper Bound
Factor 1 Kit Value & Flexibility	1	2	.918*	.203	<.001	.435	1.400
		3	.914*	.203	<.001	.431	1.396
	2	1	-.918*	.203	<.001	-1.400	-.435
		3	-.004	.203	1.000	-.486	.478
	3	1	-.914*	.203	<.001	-1.396	-.431
		2	.004	.203	1.000	-.478	.486

Dependent Variable	(I) RC	(J) RC	Mean Difference (I-J)	Std. Error	Sig.	95 per cent Confidence Interval	
						Lower Bound	Upper Bound
Factor 2 User Convenience	1	2	-.493	.213	.059	-1.001	.0143
		3	-.763*	.213	.002	-1.270	-.255
	2	1	.493	.213	.059	-.014	1.001
		3	-.269	.213	.419	-.777	.237
	3	1	.763*	.213	.002	.255	1.270
		2	.269	.213	.419	-.237	.777

**. The mean difference is significant at the 0.05 level.*

These patterns suggest that consumer preferences in urban agriculture are influenced by housing type and lifestyle factors. The findings suggest opportunities for service providers to develop compact, user-friendly kits for apartment dwellers, while offering premium, feature-rich products for gated community households. Residentially targeted marketing and product design strategies can ensure that offerings meet diverse consumer needs, fostering greater adoption and satisfaction.

4. CONCLUSION

This study underscores the role of residential context in shaping consumer preferences for urban agriculture products in Hyderabad. The findings provide actionable insights for service providers: product design and marketing strategies should be tailored to housing types, balancing functionality, sustainability, and ease of use. By aligning offerings with the specific needs of urban households, providers can enhance engagement, adoption, and satisfaction with urban agriculture initiatives. Overall, the study contributes to understanding consumer behavior in urban agriculture and supports the development of targeted interventions to promote sustainable food practices in urban settings.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

The author(s) hereby declare that NO generative AI technologies, such as Large Language Models (ChatGPT, Copilot, etc.) or text-to-image generators, have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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