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Exploring consumer preferences for fresh strawberries in Coimbatore district

Guhan Prasath KT[1], Moghana Lavanya S[1*], Mahendran K[2], Premavathi R[3] & Ashok Kumar G[4]

[1]Department of Agricultural and Rural Management, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

[2]Department of Agricultural and Rural Management, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

[3]Department of Agricultural Extension and Rural Sociology, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

[4]Department of Vegetable Science, Tamil Nadu Agricultural University, Coimbatore 641 003, Tamil Nadu, India

*Email: smoghana@tnau.ac.in

Abstract

Strawberries have achieved a dominant position in the worldwide fruit market due to its attractive appearance and pleasantly distinct flavour. The fruit is valued not only for its taste but also for its nutritional content, particularly its high vitamin C levels. The study was conducted in the Coimbatore district using purposive sampling to obtain primary data from 150 respondents, all of whom were frequent strawberry buyers. A questionnaire was framed to gather information on demographics, purchase frequency, quantity, expenditure and factors influencing consumer decision making when purchasing fresh strawberries. To analyse customer preferences, the following factors were chosen: price, berry size, freshness, origin, cultivation method and site of purchase. To ascertain the relative importance of various elements influencing consumer choices, conjoint analysis was employed. Six attributes with various levels were examined, yielding 216 potential combinations, which were condensed to 16 for practical evaluation. The variables were investigated to determine their impact on consumer preferences. The study analyzed the data using SPSS software, calculating utility estimates for each attribute and its levels. The findings revealed that price, freshness, and berry size were the most important factors that influenced consumer preferences, while the cultivation method had a relatively lower impact. This study sheds light on how these traits work together to influence local market consumers' choices for fresh strawberries.

Keywords

conjoint analysis; consumer preference; nutritional content; price; strawberry

Introduction

Strawberry (*Fragaria × ananassa* Duch.) is a popular hybrid plant from the Rosaceae family, known for its fruit (1). Strawberries are grown across the world. Strawberries have achieved a dominant position in the worldwide fruit market due to their attractive fruit and pleasantly distinct flavor. The fruit is valuable not just for its flavor, but also for its nutritional worth, as it is high in vitamin C (2). A 100 - g serving of strawberry contains 89 g of water, 0.07 g of protein, 0.5 g of fat, 8.4 g of carbohydrates and 59 mg of ascorbic acid (3). Strawberries are widely consumed, both fresh and in processed forms such as juice, jam, ice cream, chocolates and milkshakes. Many goods, including hand sanitizers, lip gloss, perfume and confectionary, have fake strawberry flavors and fragrances. Strawberry is a herbaceous fruit crop that can be easily cultivated in roof-top gardens, kitchen

gardens, pots and other containers. Strawberries are grown in both open and protected environments, with daytime temperatures ranging from 22 ^{0}C to 25 ^{0}C and nighttime temperatures between 7 ^{0}C and 13 ^{0}C (4). Variations in climatic conditions may result in poor yield or quality of the berry. Strawberries have the ability to yield the highest return in a short span of time when compared to other varieties of berries (5, 6). Strawberry production has recently gained popularity in India, with significant business units creating a number of agricultural-based units particularly geared at producing strawberries on a large scale (7). Strawberries are grown commercially in temperate, subtropical and tropical locations with high altitudes. Strawberry cultivation is a significant crop in Tamil Nadu, with the Nilgiris being the most important region, followed by Kodaikanal, Yercaud and Valparai (8). The state's various climates and altitudes provide a diversity of ecosystems suitable for strawberry production. The Nilgiris, famed for their warm climate and well-drained soil, are Tamil Nadu's best strawberry farming regions. Polyhouse agriculture has risen in adoption because it helps to alleviate adverse biotic and abiotic pressures, resulting in higher production quality and productivity (9). This strategy, combined with the utilization of innovative farming practices, has resulted in significantly increased strawberry production, establishing the Nilgiris as a vital player in both the domestic and international markets. Strawberry, among the many fruits accessible in the international market, has grown in popularity and generates a sizable profit in the production regions (10). Strawberries, an iconic fruit, contain a high concentration of phytochemicals (bioactive substances) and critical micronutrients and are frequently preferred by consumers due to their possible health advantages (11). Strawberries also remain in high demand in the culinary industry, where they are frequently utilized as flavouring agents and as a vital ingredient in the production of jam, juice and jellies (12). Consumer acceptability, expectations and preferences for high-quality fruits are all important factors to consider when managing fresh strawberry production, transportation and marketing (13). Today, consumers place a high value on various factors associated with nutritional content, sensory attributes and quality in fresh produce. Quality evaluation of strawberry fruits involves numerous critical characteristics, ranging from 'pre-harvest' to 'post-harvest' levels (from farm to table). Analysing consumer expectations is very much important for adopting suitable production practices (14). Strawberries, due to their delicate texture, are vulnerable to physical or mechanical damage, physiological degradation, texture loss and microbiological decomposition. Because most of the challenges experienced during various phases of strawberry processing (pre - or post-harvest) might influence consumers' preferences and purchasing behaviour, it is critical to identify the primary barriers in order to assist dependent farmers and industry (15).

Materials and Methods

Sampling and data collection

The survey was conducted in Coimbatore district. Purposive sampling was employed to target respondents who are regular strawberry buyers, as they provided the most relevant insights into consumer preferences. Consumers were surveyed to collect primary data regarding the buying behaviour of fresh strawberries. The survey was conducted in various retail outlets, such as supermarkets, farmer's markets, roadside vendors, in the Coimbatore district. The sample size was 150. The questionnaire comprised various questions covering multiple aspects, including demographical data, consumer preferences for strawberries and purchasing behaviour. The demographic questionnaire covered aspects, such as gender, age, regional origin, employment status, financial situation and size of the household (number of people residing under a single roof). Questions relevant to buying behaviour included the frequency of purchase of strawberries, place of purchase, quantity purchased per visit and the amount spent on strawberries each month.

Statistical Analysis

The conjoint measurement calculates the impact of individual attribute values on the overall value of a product.

This study employed conjoint analysis to provide choice information for each respondent. For retrieval decisions, the conjoint analysis results concluded with a general rating display (SPSS subfile summary) that applied to all respondents. The core model of conjoint analysis is systematically developed as follows

$$\mu \ (x)= \sum_{i=1}^{m} \square \sum_{j=1}^{k} \square \alpha_{ij} \ k_{it}$$

where,

μ (x) = the total utility of each combination of variables

if = utility (value used) from attribute to -i (i = 1, 2, 3, m) and level to -j * (j = 1, 2, 3, k)

k = the number of attribute levels i

m = the multitude of attributes

kij = 1 if level to j of i attribute occurred; 0 otherwise.

Consumer preferences for fresh Strawberries are influenced by both extrinsic and intrinsic attributes. Attributes used as criteria for evaluation in consumer decision-making refer to the features or aspects that consumers examine while categorizing and evaluating various products (17). Intrinsic characteristics are those that are unique to the product, such as sensory-related, chemical and physical properties; extrinsic attributes are details about the product such as brand, price, packing, health benefits and environmental claims, which are often detailed on product labels (18).

Conjoint analysis was used in this study for understanding consumers' preferences and to examine the impact of extrinsic and intrinsic factors on consumer behaviour when choosing fresh strawberries. The study aimed to identify consumer preferences by assessing six major attributes: price, berry size, freshness of the fruit, cultivation method, origin and place of purchase (19, 20). These characteristics were examined at multiple levels to fully capture customer preferences. Table 1 summarizes the qualities and their respective levels.

The study involved six attributes, each with multiple levels, resulting in a total of 216 possible attribute combinations (21). To simplify the decision-making process for respondents (e.g., informed consent or confidentiality of respondents), the orthogonal design function in SPSS was used to reduce complexity while maintaining statistical validity. The questionnaire was pre-tested on a small sample of 25

Table 1. Conjoint attributes and their level were selected for analysis.

S. No	Attributes	Attributes level
1	Price (Rs. / 200 g)	Low (Rs. 160 – Rs. 200) Medium (Rs. 201 – Rs. 240) High (> Rs. 240)
2	Berry size	Small Medium Large
3	Freshness	Very fresh (harvested today) Fresh (harvested within 2 days) Less fresh (harvested within a week)
4	Cultivation method	Organic Conventional
5	Origin	Local Other state
6	Place of purchase	Any retail outlet Directly from farm

respondents to validate its effectiveness and ensure clarity. Finally, consumers' preferences for fresh strawberries were evaluated using an optimized subset of 16 product characteristics, as outlined in Table 2.

Results and Discussion

Conjoint analysis is a multivariate technique used to determine consumer's preferences when provided with a choice of products. It evaluates the utility or value that customers assign to specific product traits or attributes (22). This method enables researchers and organizations to gain a better understanding of

how various attributes and their combinations influence consumer preferences and decision-making processes (23).

Table 3 shows that the correlation coefficient (0.991) indicates a nearly perfect positive linear relationship, suggesting that the selected variables strongly align with consumer preferences for fresh strawberries. The high value indicates that as one variable increases, so does the other, demonstrating a virtually perfect positive linear relationship. Kendall's Tau is a rank-based correlation coefficient that assesses the magnitude and direction of a monotonic relationship between two variables. A value of 0.874 denotes a very strong positive monotonic correlation between the variables under consideration. The high

Table 2. Different combinations of orthogonal design output.

Sl.No	Price	Size	Freshness	Cultivation	Origin	Place of Purchase
1	Medium	Small	Less fresh	Conventional	Local	Any retail outlet
2	High	Large	Very fresh	Conventional	Other state	Any retail outlet
3	Low	Small	Less Fresh	Organic	Other state	Any retail outlet
4	High	Small	Very Fresh	Organic	Local	Directly from farm
5	High	Medium	Very Fresh	Organic	Local	Any retail outlet
6	High	Small	Fresh	Organic	Local	Any retail outlet
7	Medium	Small	Very fresh	Conventional	Local	Directly from farm
8	Low	Large	Very fresh	Conventional	Local	Any retail outlet
9	Low	Small	Very fresh	Organic	Other state	Directly from farm
10	Medium	Large	Fresh	Organic	Other state	Directly from farm
11	Low	Medium	Fresh	Conventional	Local	Directly from farm
12	Medium	Medium	Very fresh	Organic	Other state	Any retail outlet
13	High	Medium	Less fresh	Conventional	Other state	Directly from farm
14	High	Small	Very fresh	Conventional	Other state	Directly from farm
15	High	Large	Less fresh	Organic	Local	Directly from farm
16	High	Small	Fresh	Conventional	Other state	Any retail outlet

Table 3. Part worth Utility of Selected Attributes.

Attributes	Attributes level	Utility estimate	Std. Error
Price (Rs. / 200 g)	Low (Rs. 160 – Rs. 200)	1.152	0.37
	Medium (Rs. 201 – Rs. 240)	0.657	0.37
	High (> Rs. 240)	-1.809	0.315
Berry size	Small	-0.497	0.315
	Medium	-0.457	0.37
	Large	0.954	0.37
Freshness	Very fresh (harvested today)	1.479	0.315
	Fresh (harvested within 2 days)	0.099	0.37
	Less fresh (harvested within a week)	-1.578	0.37
Cultivation Method	Organic	0.031	0.237
	Conventional	-0.019	0.237
Origin	Local	0.346	0.237
	Other state	-0.231	0.237
Place of purchase	Any retail outlet	0.206	0.237
	Directly from farm	-0.357	0.237
(Constant)		8.707	0.273
Correlations		**Value**	**Sig.**
	Pearson's R	0.961	<.001
	Kendall's	0.874	<.001

number indicates a significant tendency for the variables to move in the same direction.

Price

Fig. 1 depicts the part-worth utility value associates with the price of fresh strawberry (Rs./200 g) at three levels: low (Rs. 160-Rs. 200), medium (Rs. 201-Rs. 240) and high (> Rs. 240). The lowest price level has the maximum utility value of 1.152, indicating that strawberries are particularly preferred by consumers when the price of a fresh strawberry ranges between Rs. 160/200 g and Rs. 200/200 g. Price is the first consideration for customers when buying fresh strawberries. The medium price range (Rs. 201-Rs. 240) has a part-worth utility value of 0.657, indicating that this level positively influences customer choices, but to a lesser extent. The high price level (> Rs. 240) has a negative utility estimate of -1.0809, indicating that consumers are less likely to purchase strawberries at a high price.
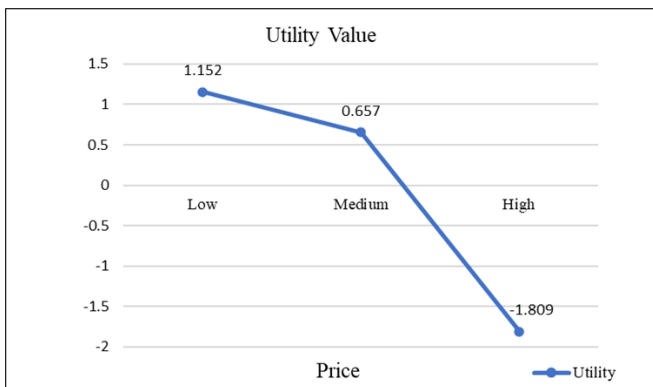

Fig. 1. Part worthy utility value of price

Berry size

Fig. 2 depicts the part worth utility value of berry size with three classifications: large, medium, and small. The large berry size has the highest preference level, with a part worth utility value of 0.954, indicating that customers have a significant preference for large-sized strawberries. The other two attribute levels, small and medium, have negative part utility values of -0.497 and -0.457, respectively. This indicates that both the small and medium sized strawberries are less preferred by the consumers.
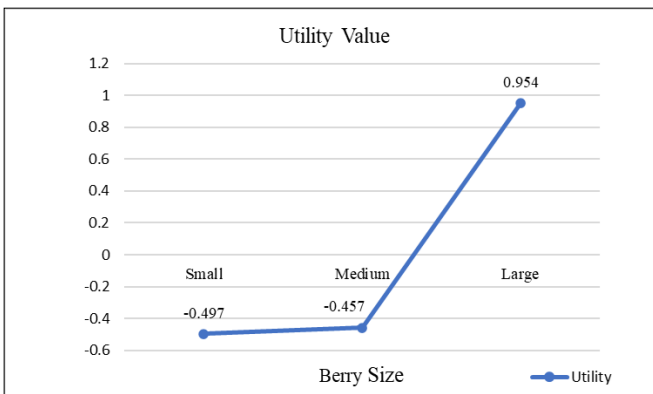

Fig.2. Part worthy utility value of berry size

Freshness

Fig. 3 depicts the part-worth utility values associated with the freshness of the fruit attribute at 3 levels: very fresh (harvested today), fresh (harvested within 2 days), and less fresh (harvested within 1 week). The utility value of very fresh fruit (1.479) was the greatest. The attribute fresh fruit level has a utility value of 0.099,

indicating that it is not highly preferred. The attribute less fresh level has a negative utility estimate of -0.1578, indicating that less fresh fruits are not chosen by customers.
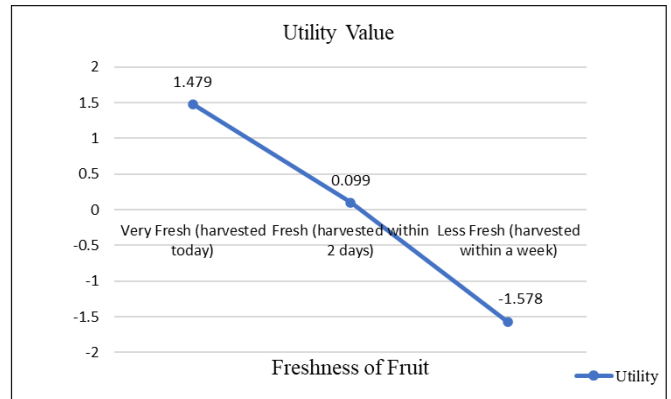

Fig. 3. Part worthy utility value of freshness of the fruit

Cultivation method

The part worth utility value for the cultivation method by consumers is shown in Fig. 4. Organic cultivation has the highest utility value of 0.031 indicating a preference for organically cultivated strawberries. The negative utility value for conventional cultivation method (-0.772) indicates less preference towards strawberries cultivated by conventional methods.
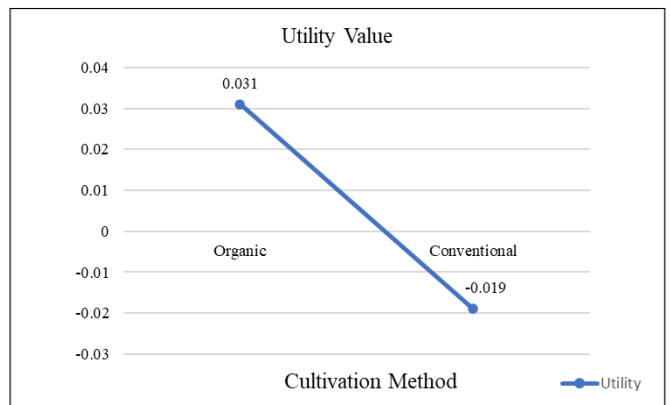

Fig. 4 Part worthy utility value of cultivation method

Origin of the fruit

Fig. 5 depicts the part-worth utility values associated with the origin of the fruit attribute at two levels: local and other state fruit. The utility value of local fruit (Nilgiris) was the greatest (0.346). The other state strawberry has a utility value of -0.231, indicates a clear preference for locally (Nilgiris) originated fruit.

Place of purchase

Fig. 6 shows the part-worth utility values associated with the place of purchase of strawberry attribute at two levels: directly from farm and any retail outlets. The utility value of any retail outlets was the highest (0.206). The value for directly from the farm has a utility value of -0.357, indicating the preference of consumers towards buying strawberries in nearby retail outlets.

Relative importance score of selected attributes

The significance of each attribute on product selection was assessed using relative importance values, which are shown in Table 4. Assigning relative importance scores highlights which aspects have a higher influence on customer preferences and subsequently impact their decision-making processes.
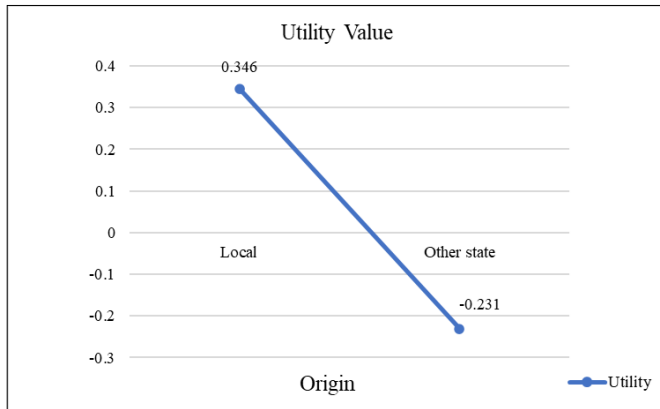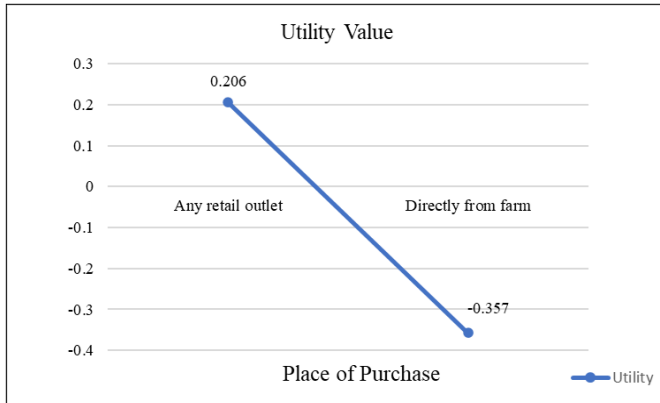
Fig. 5. Part worthy utility value of origin.

Fig. 6. Part worthy utility value of place of purchase

Table 4. Relative importance score of selected attributes.

S. No	Attributes	Importance value
1	Price	26.66
2	Berry size	17.14
3	Freshness	22.13
4	Cultivation method	8.83
5	Origin	14.32
6	Place of purchase	10.91

Fig. 7. Averaged importance

Table 4 shows the relative importance score for the attributes selected for conjoint analysis. Price emerges as the most important factor, with a relative relevance score of 26.66 %. This indicates that consumers place a high value on the price of the fruit when making purchase decisions. Freshness is the second most important attribute, with a score of 22.13 %, demonstrating its considerable impact on consumer preferences. Berry size has significant importance, with a score of 17.14 %, highlighting its influence in customer decision-making. Origin, with an importance score of 14.32 %, contributes to customer preferences to some extent. Place of purchase and cult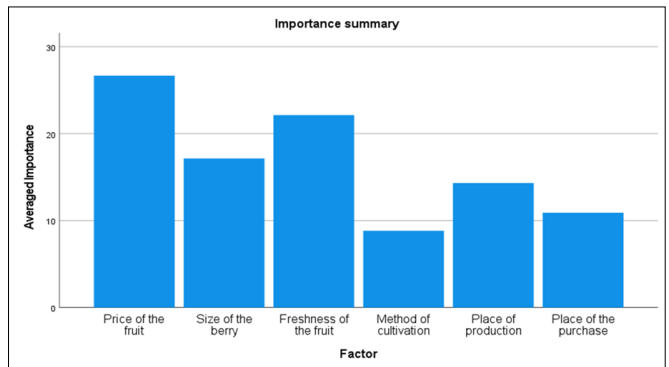ivation method, with importance values of 10.91 % and 8.83 %, respectively; hold minimal importance in the purchasing decision of the consumers. Fig. 7 shows the average importance score of the selected attributes.

Table 5 provides insights into the total utility value of selected combinations based on various producer profiles and their respective importance values. These combinations encompass factors like Price (Rs./200 g), Berry size, freshness, cultivation method, origin, place of purchase. It is evident from the Table 5 that respondents assign varying degrees of importance to these factors when choosing fresh strawberries. For instance, combinations like price range of Rs. 160 - Rs. 200, coupled with large sized berries that are very fresh, cultivated using conventional method of cultivations, locally sourced and available in any retail outlet, hold a total utility value of 12.825 signifying their high desirability. On the other hand, combinations involving high price range (> Rs. 240), medium

Table 5. Total utility value of selected combinations.

Sl.No	Price	Size	Freshness	Cultivation	Origin	Place of Purchase	Total Utility Value
1	Medium	Small	Less fresh	Conventional	Local	Any retail outlet	7.822
2	High	Large	Very Fresh	Conventional	Other state	Any retail outlet	9.287
3	Low	Small	Less fresh	Organic	Other state	Any retail outlet	7.790
4	High	Small	Very fresh	Organic	Local	Directly from farm	7.900
5	High	Medium	Very fresh	Organic	Local	Any retail outlet	8.503
6	High	Small	Fresh	Organic	Local	Any retail outlet	7.083
7	Medium	Small	Very fresh	Conventional	Local	Directly from farm	10.316
8	Low	Large	Very Fresh	Conventional	Local	Any retail outlet	12.825
9	Low	Small	Very fresh	Organic	Other state	Directly from farm	10.284
10	Medium	Large	Fresh	Organic	Other state	Directly from farm	9.860
11	Low	Medium	Fresh	Conventional	Local	Directly from farm	9.471
12	Medium	Medium	Very fresh	Organic	Other state	Any retail outlet	10.392
13	High	Medium	Less fresh	Conventional	Other state	Directly from farm	4.256
14	High	Small	Very fresh	Conventional	Other state	Directly from farm	7.273
15	High	Large	Less fresh	Organic	Local	Directly from farm	6.294
16	High	Small	Fresh	Conventional	Other state	Any retail outlet	6.456

sized berries, less fresh and conventional method of cultivation which is originated in other state and purchased directly from farm has lower total utility value of 4.256, indicating their relatively lower attractiveness. This analysis underscores the intricate interplay of factors that influence consumers' preferences when it comes to purchasing fresh strawberries, shedding light on the key determinants that drive their choices.

Conclusion

The study revealed that price is the primary determinant of consumer preferences for fresh strawberries, followed by freshness and berry size. The cultivation method has a significantly lower impact on consumer preferences. Consumers prefer large-sized strawberries and those harvested today, while smaller or less fresh fruits are less desirable. The combination of a large berry, very fresh, conventional method of cultivation, local origin and a high price range of Rs. 160 to Rs. 200 has the highest total utility value, indicating high desirability. The total utility value decreased when medium-sized berry, less fresh, conventional farming method and a high price of (>Rs. 240) are combined. The study highlights the importance of cost and fruit freshness when purchasing fresh strawberries. The marketers should focus on offering strawberries at a competitive price range, ensuring freshness through harvest timing and quick distribution, promoting local origins through farm branding and expanding retail availability through retail outlets and convenience stores. The study also emphasizes the importance of local produce and promoting the product's availability in high-traffic areas. These strategies aim to maintain price attractiveness and appeal to consumers.

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Authors' contributions

GP conducted the survey, data gathering, research analysis and drafted the manuscript. ML, MK, PR and AK helped in formulating research questionnaire, conducting research and formulation of manuscript.

Compliance with ethical standards

Conflict of interest: The authors have no competing interests.

Ethical issues: None

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