PLANT SCIENCE TODAY
Vol 13(sp1): 01–08
https://doi.org/10.14719/pst.7206

eISSN 2348-1900

RESEARCH ARTICLE

Estimation of consumer's willingness to pay for GI-tagged agricultural commodities: A conjoint analysis approach

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Received: 13 January 2025; Accepted: 08 March 2025; Available online: Version 1.0: 30 April 2025; Version 2.0: 03 February 2026

Cite this article: Thirumarudhan LT, Anjugam M, Suresh KD, Indu RC, Nirmala DM, Vasanthi R. Estimation of consumer's willingness to pay for GI-tagged agricultural commodities: A conjoint analysis approach. Plant Science Today. 2026;13(sp1):01–08. https:/doi.org/10.14719/pst.7206

Abstract

Consumer preferences for food products are evolving due to various factors, promoting producers to differentiate their products through unique production methods and adhere to quality standards. Certifications, such as Geographical indications (GI), assist consumers in identifying distinct product attributes while safeguarding producers against unfair competition. Geographical indications products linked to specific regions are recognized for their unique qualities, with certifications like protected designation of origin (PDO) and protected geographical indication (PGI) ensuring quality and market distinction. However, using PGI labels on low-quality products can harm their reputation and diminish their ability to command a premium price. This study explores consumer preferences for GI-certified products, specifically Vripakshi Hill banana, Kodaikanal Hill garlic and Madurai Malli jasmine, in Dindigul and Madurai districts, India. This study surveyed 90 households to identify key attributes influencing consumer preferences. These include production method, quality and price premium for bananas and garlic. For jasmine, the significant factors are price, fragrance, flower size and shelf life. Findings show that GI certifications enhance product quality perception, with variations in attribute importance across commodities. Consumer awareness mainly comes from traditional sources, with consumption patterns differing by product. The study highlights how GI products can support sustainable agriculture, regional growth and market differentiation. It also stresses the importance of educating consumers to raise awareness and improve the competitiveness of these products.

Keywords: agricultural commodities; conjoint analysis; consumer preference; geographical indication; WTP

Introduction

Consumer preferences for food products are evolving due to multiple factors, including health consciousness, sustainability concerns and regional identity. Producers adopt distinctive production methods, strategic distribution channels and rigorous quality standards to meet the growing demand for high-quality products and differentiate themselves in a competitive market (1). Numerous types of product certifications have been introduced to help consumers understand products' unique features and safeguard producers from unfair competition and deceptive practices (2). These certifications are applied to food and beverages, natural products, manufactured goods and other items. Geographical indications (GI) are a legal protection for products specific to a geographical region and have unique qualities or characteristics associated with that region. The relationship between a product and its origin is referred to as GI. In this context, the origin of a product has become a key factor in ensuring quality and distinguishing these products in the market (3). While certification systems for origin vary between countries, a shared concept links products to their place of origin, known as GI. Geographical indications are categorized into different forms, such as PDO and PGI, depending on the level of regional specificity and quality standards (1). However, misusing PGI labels on lower-quality products can damage their reputation, reduce their market value and diminish consumer trust, ultimately affecting their ability to command premium prices and influencing consumers' willingness to pay (WTP) (4).

India's GI journey began with the passage of the GI of Goods (Registration and Protection) Act, 1999. It existed in 2004 with the first GI tag awarded to Darjeeling tea (5). Since then, India has experienced rapid growth in GI registrations. The rise of GIs in India is largely driven by the need to protect traditional goods and boost rural economies. Geographical indications recognition has promoted sustainable production practices, as local communities focus on maintaining

traditional methods that are often environmentally friendly (6). Research has shown that GI status can significantly increase the market share of products, both within India and globally (7). Also, the higher probabilities of paying a premium are associated with consumers seeking certified products and believing certification can lessen environmental impacts such as tropical deforestation (8). The country of origin can positively or negatively affect consumers during product selection. Prior studies show that consumers distinguish between different countries of origin and the country of origin strongly affects consumers' quality perception (9, 10). In Malaysia, gender, geographical area, income, consumers' preference, motivation, intention, perception, environmental friendliness and food safety significantly influence consumers' WTP for green foods (11). The results showed that consumers are willing to pay a higher price for green foods estimated to 16.93 % higher than the market price. In Eastern Washington and Northern Idaho, the distance of origin is an important factor in choice preference, i.e., consumers prefer beef and beef products produced close to the consumer market (12). The average price premium is remarkably high (43 %) for discounters, which focus on reaching price-sensitive consumers, indicating a perceptible price premium for GI products in the Hungarian market (13).

Consumers often struggle to identify quality products, especially in developing countries like India. This is primarily due to a lack of awareness and insufficient grading and standards, compounded by the wide range of products available. Increasing attention has been given to the impact of a product's country or region of origin on consumer perceptions. Growing attention has been paid to the country or region of origin of agricultural products and its effects on how consumers perceive them. Many studies highlighted the region's importance as a signal of quality (14). Most consumers in Dindigul district preferred to buy GI bananas for their medicinal value, followed by perishability and taste. For the price premium, the respondents preferred to pay less rather than more for the GI banana (15). The highest WTP of urban Nairobi kale buyers for the safety attribute of green vegetables in high-end speciality stores, supermarkets, open-air marketplaces and roadside markets (16). The study concluded that consumers demand most nutrition, sensory and safety attributes, while ethics and convenience were the least demanded attributes. The main factors that distinguished between willing to pay and unwilling to pay kale consumers were market type choice, weighted safety score, subjective overall risk, consistency and presence of children. However, a study revealed that labelling, visual appearance, freshness and availability significantly influenced consumers' WTP higher prices for safe vegetables (17). Incidentally, packaging, certification and accessibility did not impact the WTP to a higher price and the same results were found in organic watermelon and lettuce (18).

In India, approximately 1500 products have been identified as having the potential to be registered GIs (19). As of March 2024, 643 products were registered under GI, with the distribution spanning across agricultural (200), foodstuff (47), handicrafts (343), manufactured goods (50) and natural goods (3). Tamil Nadu ranks second with 59 GIs (9.18 % of total GIs), also dominated by handicrafts and foodstuff. The various product categories in Tamil Nadu are given in Table 1. This study aims to assess how the production method, quality parameters, size, fragrance, shelf life and price of GI commodities impact consumer purchasing preferences in Tamil Nadu, India. Understanding consumers' WTP for GI commodities will provide valuable insights for producers, helping them determine the value of their products and secure a fair price. To conduct this study, a survey method utilizing conjoint analysis will be employed to examine the influence of different product attributes on consumers' preferences for GI Commodities.

Table 1. Registered GI products in Tamil Nadu

Sl. No.	GI Products	Registered GIS
1.	Agricultural commodities	14 (23.73)
2.	Handicrafts	35 (59.32)
3.	Food stuffs	8 (13.56)
4.	Manufactured goods	2 (3.39)
	Total	**59 (100.00)**

Note: Figures in the parenthesis indicate the percent of total

Source: Intellectual Property India (2024) (27)

Sampling design and methodology

The study focused on 3 GI agricultural commodities in Dindigul and Madurai districts of Tamil Nadu. Virupakshi Hill banana and Kodaikanal Hill garlic are cultivated exclusively in the Upper and Lower Palani Hills and the Kodaikanal Hill region, which is part of the Kodaikanal and Palani blocks in Dindigul district. On the other hand, Madurai Malli is primarily grown in the Thiruparangundram, Chellampatti, Usilampatti, Kallikudi and Sedapatti blocks of the Madurai district. This study mainly focuses on the impact assessment of GI commodities for the first author doctoral program and 3 commodities are taken under the study. The consumer preference study is one of the objectives of the study. Hence, a minimum large sample size for the consumer preference analysis was taken for this study covering 3 commodities. About 90 consumers were randomly selected in the local markets at 30 per GI commodity to study the consumer preferences and their WTP for Virupakshi Hill banana, Kodaikanal Hill garlic and Madurai Malli.

Conjoint analysis was primarily developed in the mathematical psychology field and applied to marketing research (20). It was widely used to measure the WTP by quantifying the preferences about the attributes of a product or a service. In conjoint analysis, a set of attributes and various levels are used to capture the part-worth utility of the attributes. The utility function represents how various attributes impact households' overall utility from their alternatives (21, 22). Utility generally has 2 components: a structural component, which the model can estimate and an error component, which accounts for unobservable influences. The structural component is typically modeled as a linear sum of the marginal (or part-worth) utilities of various attributes, as expressed in Equation 1.

$$U_j = V_j + \varepsilon_j = \beta_0 + \sum_{i=1}^{I} \beta_i X_{ij} + \varepsilon_j \quad \text{(Eqn. 1)}$$

where, U_j = overall utility attached to alternative *j*

V_j = the part of the utility that the model determines

ε_j = an error component or random part of the utility

β_0 = the utility constant;

β_i = the coefficient to be estimated for attribute *i*

X_{ij} = the value of attribute i describing alternative *j*

$\beta_i X_{ij}$ = part-worth (or marginal) utility contribution of attribute i to the overall utility of alternative *j*

To assess the consumers' preference structure for the selected GI commodities in the study region, 3 attributes for GI were identified for Virupakshi Hill banana and Kodaikanal Hill garlic: production method, quality of commodity and price premium. In contrast, price, fragrance, flower size and shelf life are the 4 attributes identified for Madurai Malli. Attributes are recognized as significantly impacting consumer preferences and consequently, demand.

The identification of relevant demand-inducing attributes is typically done through a pilot survey. Individual respondents were asked to assess their preference for combinations of different levels of a product's most relevant demand-inducing attributes. Ranking each individual's preferences for these different combinations of attribute levels allowed one to estimate the share of the utility gained from attributes of a purchased or consumed product (12). By ranking individuals' preferences for these attribute combinations, it becomes possible to estimate the portion of utility derived from specific attributes of the product being purchased and/or consumed (23). The different attributes used for the study were the production method, quality and price premium. The questionnaire was developed and tested and the household responses were collected through the primary survey. The study participants completed the entire survey by asking the survey questions, which included a conjoint study, questions concerning GI commodities purchasing habits, GI commodities consumption patterns, perceptions regarding local production and demographic questions. Finally, the consumers' preferences and WTP premium prices were identified through the part-worth estimate for each attribute. The various attribute levels for the selected GI commodities are shown in Table 2, 3 and 4.

In the United States, among various attributes such as color, price and vitamin C content of Bell Pepper, color was preferred over retail price in consumers' purchase decisions. In contrast, vitamin C content was nearly irrelevant (24). For Satsuma mandarins, consumer preferences towards the factors such as price, color, size, seediness, blemishes, production region label and organic production (25). Another study used conjoint analysis to investigate how factors like the locality of production, production method and price of beef products affected consumer purchasing preferences (12). The conjoint analysis method and found the consumer preferences for cut roses were red rose with a 75 % bloom rate and stem length of more than 50 cm (26). Another study used conjoint analysis to assess the consumer preference and WTP for banana and found that consumer prefer GI banana for their medicinal properties, natural production method

Table 2. List of orthogonal designs used for the GI garlic survey

Attributes	Production	Price	Quality parameters
1	Inorganically produced	5 % price premium	Medicinal value
2	Inorganically produced	No price premium	Nutritional value
3	All-natural	No price premium	Medicinal value
4	Certified organic	5 % price premium	Shelf life
5	Certified organic	No price premium	Pungency
6	Organically produced	10 % price premium	Medicinal value
7	Organically produced	No price premium	Shelf life
8	Organically produced	No price premium	Nutritional value
9	Certified organic	No price premium	Medicinal value
10	Organically produced	5 % price premium	Pungency
11	All-natural	5 % price premium	Nutritional value
12	All-natural	No price premium	Pungency
13	Inorganically produced	No price premium	Shelf life
14	Certified organic	10 % price premium	Nutritional value
15	All-natural	10 % price premium	Shelf life
16	Inorganically produced	10 % price premium	Pungency

Table 3. List of orthogonal designs used for the GI banana survey

Attributes	Production	Quality parameters	Price
1	Inorganically produced	Medicinal value	5 % price premium
2	Inorganically produced	Nutritional value	No price premium
3	All-natural	Medicinal value	No price premium
4	Certified organic	Shelf life	5 % price premium
5	Certified organic	Taste	No price premium
6	Organically produced	Medicinal value	10 % price premium
7	Organically produced	Shelf life	No price premium
8	Organically produced	Nutritional value	No price premium
9	Certified organic	Medicinal value	No price premium
10	Organically produced	Taste	5 % price premium
11	All-natural	Nutritional value	5 % price premium
12	All-natural	Taste	No price premium
13	Inorganically produced	Shelf life	No price premium
14	Certified organic	Nutritional value	10 % price premium
15	All-natural	Shelf life	10 % price premium
16	Inorganically produced	Taste	10 % price premium

Table 4. List of orthogonal designs used for the GI jasmine survey

Attributes	Price	Fragrance	Flower size	Shelf life
1	10 % price premium	fragrance	medium size	lower shelf life
2	10 % price premium	fragrance	large size	medium shelf life
3	5 % price premium	fragrance	small size	medium shelf life
4	5 % price premium	no fragrance	large size	lower shelf life
5	5 % price premium	fragrance	medium size	higher shelf life
6	No price premium	fragrance	large size	higher shelf life
7	No price premium	fragrance	small size	lower shelf life
8	10 % price premium	no fragrance	small size	higher shelf life
9	No price premium	no fragrance	medium size	medium shelf life

Table 5. Profile of the sample consumers

Sl. No.	Particulars	Numbers (n = 30) for each commodity		
		Vripakshi Hill Banana (n = 30)	Kodaikanal Hill Garlic (n = 30)	Madurai Malli (n = 30)
		Age (nos.)		
1.	< = 30	7 (23.33)	2 (6.67)	1 (3.33)
	31- 40	5 (16.67)	3 (10.00)	7 (23.33)
	41- 50	9 (30.00)	10 (33.33)	17 (56.67)
	51- 60	7 (23.33)	11 (36.67)	4 (13.33)
	> 60	2 (6.67)	3 (10.00)	2 (6.67)
	Average age	**44**	**50**	**45**
		Education		
2.	Illiterate	2 (6.67)	2 (6.67)	1 (3.33)
	Primary	3 (10.00)	2 (6.67)	9 (30.00)
	Secondary	6 (20.00)	7 (23.33)	12 (40.0)
	Higher Secondary	11 (36.67)	8 (26.67)	4 (13.33)
	Graduate	8 (26.67)	11 (36.67)	4 (13.33)
3.		**Gender**		
	Male	22 (73.33)	16 (53.33)	12 (40.00)
	Female	8 (26.67)	14 (46.67)	18 (60.00)
		Family size (Nos.)		
4.	< = 2	---	1 (3.33)	---
	3 - 4	13 (43.33)	23 (76.67)	19 (63.33)
	4 - 5	16 (53.34)	6 (20.00)	10 (33.33)
	> 6	1 (3.33)	---	1 (3.33)
	Average family size	**5**	**4**	**4**
		Annual Income (Rs. in Lakh)		
5.	< = 1.0	8 (26.67)	8 (26.67)	9 (30.00)
	1.0 – 3.0	13 (43.33)	8 (26.67)	9 (30.00)
	3.0 – 5.0	7 (23.33)	10 (33.33)	11 (36.67)
	> 5.0	2 (6.67)	4 (13.33)	1 (3.33)
	Average annual income (lakh)	**2.38**	**3.07**	**2.41**
		Occupation		
6.	Government job	3 (10.00)	5 (16.67)	4 (13.33)
	Private employee	11 (36.67)	10 (33.33)	13 (43.33)
	Wage earner	11 (36.67)	5 (16.67)	4 (13.33)
	Self-employed	5 (16.66)	10 (33.33)	9 (30.00)
7.	**Average No. of earners in a family**	**1**	**1**	**1**

and lower price premium (15).

Results and Discussion

Consumers' profile

The profile of the sample consumers for the selected GI commodities namely Vripakshi Hill banana (GI banana), Kodaikanal Hill garlic (GI garlic) and Madurai Malli (GI jasmine) is summarized in Table 5. For GI bananas, the majority of the households fall in the age group of 41 - 50 years (30.00 %), followed by 51 - 60 years (23.33 %) and less than 30 years (23.33 %) with a mean age of 44. In terms of education, most households had completed higher secondary education (36.67 %), followed by graduates (26.67 %) and secondary education accounting for 20 %. Majority of banana growers are male (73.33 %) and females 26.67 %. Regarding family size, 53.34 % of households have 4 - 5 members, while 43.33 % have 3 - 4 members, with an average family size of 5 members. Regarding annual income, 43.33 % of households earn between 1.0 and 3.0 lakhs, 26.67 % earn less than 1.0 lakh and 23.33 % earn between 3.0 - 5.0 lakhs, with an average of 2.38 lakhs INR. Additionally, the majority (73.34 %) of GI banana-consuming households were private employees and daily wage earners (37 % each), followed by self-employed individuals (16.66 %) and government jobs (10 %). On average, there was earner one per family.

In the case of GI Garlic, the majority of the households fall in the age group of 51 - 60 years, comprising 36.67 % of the households, followed by 41 - 50 years (33.33 %) and 31 - 40 years (10 %) with a mean age of 50. Most garlic growers graduated (36.67 %), followed by secondary education (23.33 %) and 26.67 % with higher secondary education. Gender distribution shows 53.33 % were males and 46.67 % were females. Regarding family size, the largest group belongs to families of 3 - 4 members (76.67 %), with 20 % in families of 4 - 5 members with a mean family size of 4 members. Regarding annual income, 33.33 % of garlic-consuming households earn between 3.0 - 5.0 lakhs, while 26.67 % earn less than 1.0 lakh and 26.67 % earn between 1.0 - 3.0 lakhs with a mean of 3.07 lakhs per annum. Occupation-wise, 33.33 % were self-

employed and 33.33 % worked as private employees. The average number of earners was one per family.

For GI jasmine, most respondents fall in the 41 - 50 age group, comprising 56.67 %, followed by 31 - 40 years (23.33 %) and 51 - 60 years (13.33 %) with a mean age of 45. Education-wise, 40 % had completed secondary education, followed by primary education (30 %) and higher secondary education (13.33 %). Gender-wise, females dominate the jasmine-consuming households (60 %) compared to males (40 %). Regarding family size, 63.33 % belong to families with 3 - 4 members and 33.33 % are in families with 4 - 5 members, with a mean family size of 4. Annual income is relatively well-distributed, with 36.67 % earning between 3.0 - 5.0 lakhs, followed by 30.00 % earning between 1.0 - 3.0 lakhs and another 30.00 % earning less than 1.0 lakh with a mean of 2.41 lakhs per annum. Occupation-wise, most jasmine-consuming households were private employees (43.33 %) and 30.00 % were self-employed. The average number of earners was one per family.

Awareness and consumption of GI commodities

The awareness of GI commodities among sample households reported various sources of information about the GI commodities (Table 6). Most consumers were aware of the study GI commodities, namely Vripakshi Hill banana, Kodaikanal Hill garlic and Madurai Malli, through their parents or forefathers, with 33.33 %, 33.33 % and 30 % respectively. Social media also played a significant role in awareness, with 30 % of banana and garlic consumers and 10 % of jasmine consumers being aware of this. Exhibitions were the least common source of awareness, particularly for jasmine, where no respondents mentioned exhibitions. Neighbours and personal contacts were also remarkable sources of information, particularly for jasmine, where 90 % of households mentioned parents or forefathers, neighbors and friends and personal contacts as the main sources of awareness.

Regarding the years of consumption, the patterns varied across commodities. For GI banana, most consumers (66.66 %) had been consuming them for 1 - 5 years, while only 6.67 % had consumed it for less than one year and more than 10 years. Garlic consumption patterns were also found to vary, with 36.67 % of consumers consuming it for 1 - 5 years and 30 % for less than one year. A smaller proportion (6.66 %) had consumed garlic for over 10 years. Jasmine had the highest percentage of consumers (60 %) who had been consuming it for 1 - 5 years, while 20 % had consumed it for over 10 years and no one had consumed it for less than one year (Table 7). These results suggested that the awareness of GI commodities is primarily transmitted through traditional means such as family and friends, with social media also contributing significantly. Additionally, most consumers of these commodities have been using them for an average period of 4 - 6 years, although there is variation in the consumption history of each commodity.

Table 6. Consumer awareness of GI commodities

Sl. No	Awareness	Numbers		
		Banana	Garlic	Jasmine
1.	Parents or forefathers	10 (33.33)	10 (33.33)	9 (30)
2.	Social media	9 (30)	9 (30)	3 (1)
3.	Exhibition	3 (10)	2 (6.67)	----
4.	Neighbours and friends	6 (20)	5 (16.67)	9 (30)
5.	Personal contact	2 (6.67)	4 (13.33)	9 (30)

Note: Figures in the parenthesis indicate the percent of the total sample

Table 7. Years of consumption of GI commodities

Sl. No.	Years of Consumption	Number of consumer household		
		Banana	Garlic	Jasmine
1.	< 1 year	2 (6.67)	9 (30)	0 (0)
2.	1 - 5 years	20 (66.66)	11 (36.67)	18 (60)
3.	5 - 10 years	6 (20)	8 (26.67)	6 (20)
4.	> 10 years	2 (6.67)	2.00 (6.66)	6 (20)
	Average years of consumption	**5**	**4.3**	**6**

Note: Figures in the parenthesis indicate the percent of the total sample

Frequency of consumption of GI commodities

The consumption pattern for GI banana reveals a fairly varied frequency of consumption. A major portion of respondents (43.33 %) reported consuming GI banana monthly, while 26.67 % consumed it once a week, 16.67 % consumed it twice a week and 13.33 % consumed it daily (Table 8). This shows that GI banana is consumed regularly monthly and consumers consume it less frequently than daily. For GI garlic, it shows that most respondents (43.33 %) consumed it bimonthly, while 40 % consumed it quarterly. Smaller proportions of consumers reported monthly consumption (10 %) and (6.67 %) twice a month (Table 9). This indicates that GI garlic is consumed less frequently than bananas, with a strong preference for bimonthly and quarterly usage, possibly due to its usage in specific recipes or as a supplementary ingredient. For GI jasmine, the consumption pattern is more varied in frequency. A substantial number of consumers (40 %) reported using jasmine once a week, while 20 % consumed it twice a week (Table 10). Other respondents reported consuming it daily (10 %), thrice a week (13.33 %) and four times a week (16.67 %). The results suggested that jasmine is used more regularly than banana and garlic, with weekly consumption being the most common, though some consumers still opt for higher frequency use.

Expenditure on GI commodities

The average expenditure of consumer households purchasing GI banana, garlic and jasmine was calculated and depicted in Table 11. The average quantity purchased for GI

Table 8. Frequency of consumption of GI banana

Sl. No.	Frequency of consumption	Numbers
1.	Daily	4 (13.33)
2.	Once in a week	8 (26.67)
3.	Twice in a week	5 (16.67)
4.	Monthly	13 (43.33)

Note: Figures in the parenthesis indicate the cent of the total sample

Table 9. Frequency of consumption of GI garlic

Sl. No.	Frequency of consumption	Numbers
1.	Twice in a month	2 (6.67)
2.	Monthly	3 (10)
3.	Bimonthly	13 (43.33)
4.	Quarterly	12 (40)

Note: Figures in the parenthesis indicate the cent of the total sample

Table 10. Frequency of consumption of GI jasmine

Sl. No.	Frequency of consumption	Numbers
1.	Daily	3 (10)
2.	Once in a week	12 (40)
3.	Twice in a week	6 (20)
4.	Thrice in a week	4 (13.33)
5.	Four times in week	5 (16.67)

Note: Figures in the parenthesis indicate per cent of the total sample

Table 11. Average quantity and expenditure on GI commodities

Sl. No.	Particulars	Number of consumer household		
		Banana	Garlic	Jasmine
1.	Average quantity purchased (Kg)	3.12	0.50	0.72
2.	Average price (Rs. /Kg)	150	377	350
3.	Mean expenditure (Rs. /month)	468	190	253
4.	Average distance to Purchase place (Km)	6.5	8.7	2.3

banana was 3.12 kg per month, with an average price of Rs. 150 per kg. As a result, the mean expenditure on bananas was Rs. 468 per month. Consumers typically travel an average distance of 6.5 km to purchase GI bananas. In the case of GI garlic, households purchase an average of 0.50 kg per month at an average price of Rs. 377 per kg. The mean expenditure for garlic was Rs. 190 per month. The average distance to the purchase place was 8.7 km, which is higher than for bananas. For GI jasmine, consumers purchase an average of 0.72 kg per month at an average price of Rs. 350 per kg. The mean expenditure on jasmine was Rs. 253 per month. Jasmine buyers travel an average of 2.3 km to purchase the commodity, the shortest distance between the 3 commodities.

Consumer preferences of GI commodities

The part-worth estimates for various attributes of Vripakshi Hill banana, Kodaikanal Hill garlic and Madurai Malli, reveal the consumer preferences based on attributes such as production type, quality, size, fragrance, shelf life and price (Table 12). For Vripakshi Hill banana, consumers show a clear preference for organically produced Vripakshi Hill bananas (0.345) and value taste (0.328) and shelf life (0.284). However, nutritional value (-0.405) and medicinal value (-0.207) appear to be less important and there is a significant dislike for certified organic (-0.138) and all-natural (-0.172) production attributes. In terms of price, no price premium (0.414) is preferred and 5 % price premium (0.207), while a 10 % price premium (-0.621) is the least favored. For Kodaikanal Hill garlic, the most valued attribute is its medicinal value (0.508), while pungency (-0.417) and nutritional value (-0.200) are less attractive to consumers. Shelf life (0.108) also has a positive impact, though it is less significant than medicinal value. Organic and inorganic production attributes both have slightly positive estimates, with certified organic (-0.208) and all-natural (-0.033) being less preferred. As like Vripakshi Hill banana, no price premium (0.027) is favored in terms of price, with small negative effects for the 5 % (-0.055) and 10 % price premiums (-0.082).

For Madurai Malli, consumers prefer medium size (0.405) over small (-0.214) or large (-0.190) size, while fragrance plays a minimal role, with high fragrance (0.045) and no fragrance (-0.045) having very similar impacts. The most favorable shelf life is medium (0.286), while higher (-0.262) is less desirable. In terms of price, the consumer prefers to pay less rather than more for the Madurai Malli, since all the price attribute levels are negative, no price premium (-0.292), 5 % price premiums (-0.583) and 10 % price premiums (-0.875). The findings suggested that for Madurai Malli, size and shelf life are more significant than fragrance or price, with a strong unwillingness to price premiums. The preferences across all three products highlight the importance of product characteristics like size, taste, shelf life and price, with an evident consumer preference for organic or natural products without price premiums. The results also suggest that consumers of Kodaikanal Hill garlic value its medicinal benefits. In contrast, Madurai Malli consumers prioritize size and shelf life over fragrance or price premiums.

Table 13 shows the important value of research. The 3 attributes for banana and garlic; 4 attributes for jasmine in the study. The quality attribute has the highest importance value among other attributes for banana and garlic (production method and price), while for jasmine, size has the highest importance value than other attributes (fragrance, shelf life and price premium) shown in Fig. 1. Additionally, to assess the accuracy of the conjoint analysis conducted in this study, we examine the combination of each attribute with the consumer preferences for purchasing banana, garlic and jasmine, correlation test results are shown in Table 14. Pearson's R correlation values for bananas were 0.668, 0.499 and 0.931, which shows a connection between research attributes and consumer preference for buying bananas,

Table 12. Part-worth utility estimates using conjoint analysis for selected GI commodities

Vripakshi hill banana				Kodaikanal hill garlic			Madurai malli (Jasmine)			
Attributes	Attribute level	Part worth estimate	Std. error	Attribute level	Part worth estimate	Std. error	Attributes	Part worth estimate	Std. error	
Production	Organically produced	0.345	0.282	Organically produced	0.133	0.398	Size	Small size	-0.214	0.171
	Inorganically produced	-0.034	0.282	Inorganically produced	0.108	0.398		Medium size	0.405	0.171
	Certified organic	-0.138	0.282	Certified organic	-0.208	0.398		Large size	-0.190	0.171
	All-natural	-0.172	0.282	All-natural	-0.033	0.398	Fragrance	High fragrance	0.045	0.128
Quality	Shelf life	0.284	0.282	Shelf life	0.108	0.398		No fragrance	-0.045	0.128
	Nutritional value	-0.405	0.282	Nutritional value	-0.200	0.398	Shelf life	Lower shelf life	-0.024	0.171
	Taste	0.328	0.282	Pungency	-0.417	0.398		Medium shelf life	0.286	0.171
	Medicinal value	-0.207	0.282	Medicinal value	0.508	0.398		Higher shelf life	-0.262	0.171
Price	No premium	0.414	0.196	No premium	0.027	0.277	Price	No price premium	-0.292	0.148
	5 % premium	0.207	0.392	5 % premium	-0.055	0.554		5 % price premium	-0.583	0.296
	10 % premium	-0.621	0.588	10 % premium	-0.082	0.831		10 % price premium	-0.875	0.444
(Constant)		8.138	0.380		8.452	0.537			5.598	0.323

Table 13. Average importance value for each attribute in GI commodities

Attributes	Importance value		
	Banana	Garlic	Jasmine
Production method	35.955	37.706	---
Quality	43.535	43.804	---
Size	---	---	31.169
Fragrance	---	---	18.214
Shelf life	---	---	29.346
Price premium	20.510	18.490	21.272

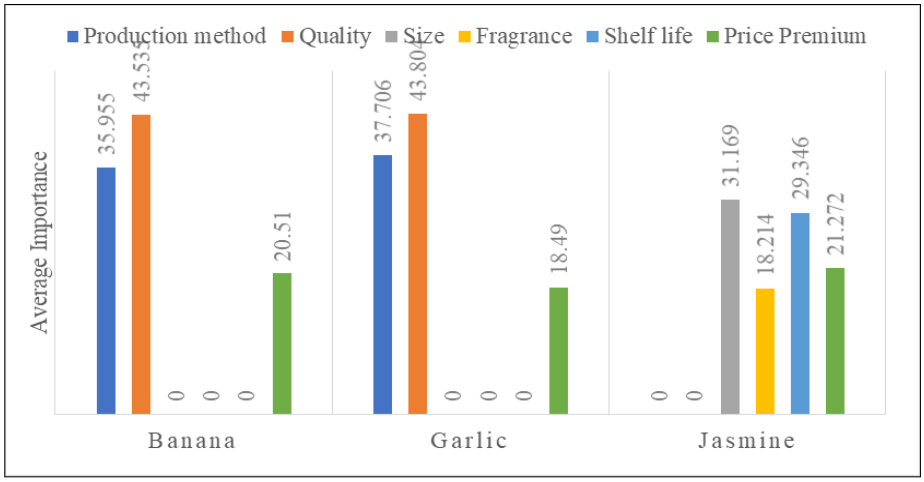

Fig. 1. Relative Importance for each attribute in preference for GI commodities.

Table 14. Results of the correlation test

Criteria	Banana		Garlic		Jasmine	
	Value	Significance	Value	Significance	Value	Significance
Pearson's R	0.668	0.002	0.499	0.025	0.931	0.001
Kendall's tau	0.460	0.007	0.226	0.112	0.722	0.003

garlic and jasmine, respectively. The significance values of 0.002, 0.025 and 0.001 for banana, garlic and jasmine respectively show a significance of 5 %.

Conclusion

This study highlights the growing importance of GI in influencing consumer preferences and purchasing behavior, particularly for GI commodities like Vripakshi Hill banana, Kodaikanal Hill garlic and Madurai Malli (jasmine). The results underscore the significant role that product origin and associated certification play in shaping consumer perceptions of quality. GI products are recognized for their unique attributes linked to specific regions. The research shows that consumers are generally willing to pay a premium for products with GI certification, especially when they believe they offer superior quality or are produced sustainably. Consumer awareness of GI products largely stems from traditional sources such as family and friends, though social media also plays a growing role. Additionally, the study reveals that consumption patterns vary across the different GI commodities, with bananas consumed more frequently monthly, garlic used less often but in more specific recipes and jasmine incorporated regularly into weekly routines.

The findings suggest that while GI products can command a price premium, consumer WTP is influenced by factors such as production methods, quality attributes and price sensitivity. With the increasing recognition of GI products in India, especially for traditional goods, there is considerable potential to leverage these certifications further to enhance marketability and foster sustainable agricultural practices. Furthermore, these results provide valuable insights for producers and policymakers to focus on improving consumer awareness and education regarding the benefits of GI-certified products, which can ultimately support the economic development of rural communities and safeguard traditional production methods.

Acknowledgements

The authors acknowledge the financial support from the Indian Council of Social Science Research (ICSSR), New Delhi, India, for the Ph.D program of the first author.

Authors' contributions

LTT conducted the survey, collected the data, analyzed it and prepared the manuscript. AM guided the research, helped formulate the concept and approved the final manuscript. SKD, IRC, NDM and VR helped in writing and approved the final manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interest to declare.

Ethical issues: None

Declaration of generative AI and AI-assisted technologies in the writing process : While preparing this work, the authors used Quill Bot to check for grammar and spelling errors. After using this tool, the authors reviewed

and edited the content as needed and takes full responsibility for the publication's content.

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Peer review: Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

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