

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 7; July 2026; Page No. 673-678

Received: 18-05-2026
Accepted: 20-06-2026

Indexed Journal
Peer Reviewed Journal

Attributes driving purchase of functional dairy foods and consumer trust in labelling: Evidence from Northern India

¹Ashish Yadav, ²Ajmer Singh and ³Subhasis Mandal

^{1,2,3}Division of Dairy Economics, Statistics and Management, ICAR-National Dairy Research Institute, Karnal, Haryana, India

DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i7i.3934>

Corresponding Author: Ajmer Singh

Abstract

Functional dairy foods have emerged as one of the fastest growing sectors of the global dairy industry, and India, being the world's largest milk producer, offers a particularly dynamic yet underexplored consumer market. This study examines the purchase attribute preferences and label trust among 640 households surveyed across seven study locations i.e. Delhi, Chandigarh, Jaipur, Jammu, Karnal, Alwar, and Kathua in Northern India during 2024-25, of which 406 were identified as FDF consumers. A validated 24-statement Likert scale was used to score four purchase attributes across all 640 households, and a weighted average index (WAI) was calculated. Nutrition and health benefits was rated as the most important purchase attribute (WAI = 0.792, overall N = 640), followed by affordability (0.759), safety and trustworthiness (0.728), and taste and flavour (0.666). Affordability was valued equally to safety/trustworthiness among rural consumers (WAI = 0.751 each). Label trust evaluated among 406 FDF consumers using five statements; health benefit communication was the only statement in the Strongly Agree (mean = 4.21), while ingredient transparency scored lowest (3.81, Agree). These findings have implications for product design, pricing strategies, and label communication across diverse consumer segments in Northern India.

Keywords: Functional dairy foods, label trust, Northern India, weighted average index, Likert scale

Introduction

Non-communicable diseases linked to dietary choices account for increasingly contributing to mortality rate globally. Diet is estimated to contribute to six of the ten leading causes of mortality, with approximately 70 per cent of certain cancers directly influenced by food consumption (WHO, 2021). In response, consumers at income levels have started to seek foods with health benefits beyond basic nutrition. Among all functional food categories, dairy holds a important position. Dairy products are a major part of the Indian diet, serving as primary sources of protein, calcium and other micronutrients also act as an ideal carrier for bioactive compounds such as probiotics, vitamins and minerals (Khalaf *et al.*, 2021; Rani *et al.*, 2022; Sharma and Garg, 2013)^[8, 14, 15]. India is the world's largest producer of milk, with annual production of 247.87 million tonnes in 2024-25, showing a rise of 3.58 per cent over the previous year (DAHD, 2025). The dairy sector has responded to shifting consumer preferences by developing functional dairy foods (FDFs), which include products such as fortified milk, probiotic curd, probiotic lassi, probiotic drink, malted milk foods, and whey protein products that provides tangible health benefits. Product development, marketing and consumer acceptance are key obstacles in this growing market (Siro *et al.*, 2008)^[16]. According to the Institute of Medicine's Food and Nutrition Board, functional foods are defined as "any food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains" (IOM/FNB, 1994). The functional dairy food market in India is projected to grow at 5.7 per cent annually from 2022 to 2032 (Shireen and Aneesh, 2021)^[17]. Even with the supply

expansion, FDF use is uneven across income groups and parts of the geography. We know little about which product qualities actually influence purchase decisions, and whether consumers trust the information on labels. Very few studies on FDF consumer preferences have been carried out in India. Das (2017)^[4] studied the probiotic product preferences in Delhi and observed that price sensitivity was a major barrier among low income consumers group. Kerketta *et al.* (2023)^[9] conducted conjoint analysis in Ranchi and found the sources of availability, health claims and price as the major purchase criteria. Govindrao (2013)^[6] observed preference for fermented FDFs in Maharashtra. The Tamil Nadu studies (Dhasarathan *et al.*, 2025)^[5] have shown that although health-oriented motives are consistent across areas, affordability is of varying importance. No study has simultaneously examined purchase attribute preferences and label trust across income groups, area types and different districts in Northern India, a region with a distinct vegetarian dietary culture, varied purchasing power, and significant urban-rural diversity. The present study addresses this gap. The specific objectives were (i) to assess consumer preferences for functional dairy foods across four purchase attributes using the weighted average index approach; (ii) to evaluate consumer trust and perception of FDF product labels; and (iii) to examine variations across income groups and area types in Northern India during 2024-25.

Materials and Methods

Study design and sample

Primary data was collected during 2024-25 through structured personal interview from 640 consumer households

across seven locations in Northern India. Delhi, Chandigarh, Jaipur and Jammu were selected as urban study locations, representing metropolitan and state-capital markets with established FDF retail markets. Karnal (Haryana), Alwar (Rajasthan) and Kathua (Jammu and Kashmir), along with their adjacent rural areas, served as semi-urban and rural study locations representing markets at an earlier stage of FDF penetration. Sample households were categorised into three income groups using the cumulative square root frequency approach of Dalenius and Hodges (1957)^[3]: low-income group (monthly household income up to ₹91,000; n = 360), middle-income group (₹91,000-₹1,75,000; n = 189) and high-income group (₹1,75,000-₹3,72,000; n = 91). Out of the total 640 respondents, 406 were actively consuming FDFs. The preference attribute study employed the weighted average index across all 640 households, whereas the label trust analysis was limited to 406 FDF consumers, as the label perception statements required direct product purchase experience.

Preference scale construction and analysis

A five-point Likert scale (Likert, 1932)^[11] was employed to measure consumer preferences across four purchase attributes: (i) Nutrition and Health Benefits, (ii) Safety/Trustworthiness, (iii) Affordability, and (iv) Taste and Flavour. Statements for each attribute were drawn from previously published literature and adapted to fit the Northern India FDF context. Responses were rated from 1 (Strongly Disagree) to 5 (Strongly Agree). The weighted average index (WAI) was then calculated for each attribute across all 640 sample households. Responses were rated from 1 (Strongly Disagree) to 5 (Strongly Agree). The weighted average index (WAI) for each attribute was computed as follows:

$$WAI = (5N_5 + 4N_4 + 3N_3 + 2N_2 + 1N_1) \div (A \times N)$$

Where N_5 to N_1 represents the total number of respondents at each response level, $A = 5$ (highest weight) and N = total number of respondents (640). Index values range from 0 to 1; higher values signify stronger preference. Variations in WAI

values across income groups were assessed using analysis of variance (ANOVA) with Tukey's HSD post-hoc test at $p < 0.05$.

Label trust measurement

Trust in FDF labelling was evaluated among 406 FDF consumers using five Likert statements covering: (1) health benefit communication clarity; (2) ingredient source transparency; (3) expiry date visibility; (4) allergen information adequacy; and (5) confidence from FSSAI certification. Mean scores for each statement were calculated and classified using the Alkharusi (2022)^[1] class interval method. The class width was $(5 - 1) \div 5 = 0.80$, and the five intervals were Strongly Disagree (1.00-1.80), Disagree (1.81-2.60), Neutral (2.61-3.40), Agree (3.41-4.20) and strongly Agree (4.21-5.00).

Results and Discussion

Socio-economic profile of sample households

Table 1 presents the socio-economic characteristics of the 640 surveyed households. The majority of respondents belonged to low-income group (56.25 per cent) with average monthly family income of ₹66,968. The middle-income and high-income group included 29.53 per cent and 14.22 per cent of the sample, with an average monthly income of ₹1,29,423 and ₹2,37,013, respectively. Income differences across different groups were statistically significant ($p < 0.05$). Nuclear families comprised of 90.00 per cent of the sample, with an average family size of 4.57 members. Graduated people dominated across all income groups, which accounted for 42.34 per cent of the overall sample, followed by higher secondary (23.91 per cent) and high school (14.22 per cent) educated respondents. Vegetarian households constituted the majority of 62.81 per cent, a significant feature of Northern India's consumer preference. Salaried employment was the predominant occupation (50.00 per cent), followed by self-employed (35.00 per cent) and businessman (15.00 per cent). Out of the 640 respondents, 406 (63.44 per cent) were identified as current FDF consumers.

Table 1: Socio-economic profile of sample households

Particulars	Income Group 1 (n=360)	Income Group 2 (n=189)	Income Group 3 (n=91)	Overall (N=640)
Family Type				
Nuclear	325 (90.28)	169 (89.42)	82 (90.11)	576 (90.00)
Joint	35 (9.72)	20 (10.58)	9 (9.89)	64 (10.00)
Food Habit				
Vegetarian	224 (62.22)	121 (64.02)	57 (62.64)	402 (62.81)
Non-Vegetarian	136 (37.78)	68 (35.98)	34 (37.36)	238 (37.19)
Occupation				
Salaried Employment	233 (64.72)	66 (34.92)	21 (23.08)	320 (50.00)
Self-Employed	119 (33.06)	100 (52.91)	5 (5.49)	224 (35.00)
Businessman	8 (2.22)	23 (12.17)	65 (71.43)	96 (15.00)

Figures in parentheses indicate the percentage of total respondents (n) in the respective income group columns.

Table 2: Average monthly household income and distribution of sample households by income class

Income Groups	Income (₹/month)	Average Family Income (₹/month)	No. of Households
Low-income group	Up to 91,000 ^a	66,968.06	360 (56.25)
Middle-income group	91,000 to 1,75,000 ^b	1,29,423.28	189 (29.53)
High-income group	1,75,000 to 3,72,000 ^c	2,37,013.74	91 (14.22)
Overall		1,09,590.24	640 (100)

Figures in parentheses indicate the percentage of total respondents. Different superscripts (a, b, c) indicate

significantly different average incomes across income groups at $p < 0.05$.

Consumers' preferred attributes of functional dairy foods

Table 3 displays the WAI values for the four purchase attributes across different income groups.

Nutrition and Health Benefits ranked highest overall ranking (WAI = 0.792) and was the top attribute across each income group: 0.803 in Income Group 1 (low), 0.785 in Income Group 2 (middle) and 0.777 in Income Group 3 (high). These findings confirm that health motive is the main driver of FDF purchase decisions in Northern India, consistent with evidence from Tamil Nadu (Dhasarathan *et al.*, 2025) [5] and Iran (Moodi *et al.*, 2021) [12]. Worldwide, functional food consumption has been shown to be related to health-consciousness and perceived health effects (Landstrom *et al.*, 2007; Ozen *et al.*, 2012) [10, 13], where health benefit perception was a primary predictor of functional dairy food adoption. The result is especially relevant for this sample given that 62.81 per cent of households are vegetarian and likely rely on dairy as a primary source of protein and micronutrients. Affordability was ranked second overall (WAI = 0.759). The income group-wise values show that Income Group 2 (0.767) valued affordability more than Income Group 1 (0.750), indicating that middle-income groups engage in active comparison

exposed to a wider range of brands. Affordability was also a high value (0.764) for Income Group 3. This pattern suggests that price sensitivity is not only present among low income consumers, as the price premium of functional dairy products relative to conventional dairy makes affordability a concern shared by many. Das (2017) [4] reported similar findings; even the high-awareness consumers in Delhi were deterred from regular FDF consumption due to pricing. Safety/Trustworthiness was ranked overall at third place (WAI = 0.728). Income Group 2 exhibited the lowest safety index (0.701), significantly lower than Income Group 1 (0.743) and Income Group 3 (0.742). Middle-income consumers, who exhibit greater brand-switching behaviour and exposure to a broader range of products, including less-established brands, possess more residual uncertainty about product quality. Taste and flavour ranked lowest ranking at 0.666 across all groups. The gap between the nutrition index (0.792) and the taste index (0.666) indicates that FDF purchase in Northern India is health-motivated rather than hedonic or impulsive factors.

All index values exhibited statistically significant differences across income groups ($p < 0.05$), as indicated by different superscripts in Table 3.

Table 3: Consumers' preferred attributes of functional dairy foods (index value)

Attributes	Income Group 1 (n=360)	Income Group 2 (n=189)	Income Group 3 (n=91)	Overall (N=640)
Nutrition and Health Benefits	0.803 ^a	0.785 ^b	0.777 ^c	0.792
Safety/Trustworthiness	0.743 ^a	0.701 ^b	0.742 ^a	0.728
Affordability	0.750 ^a	0.767 ^b	0.764 ^c	0.759
Taste and Flavour	0.662 ^a	0.678 ^b	0.654 ^a	0.666

Different superscripts (a, b, c) within a row indicate significantly different index values across income groups at $p < 0.05$.

Area-wise variation in purchase attribute preferences

Fig. 1 illustrates attribute preferences categorised by area type. Nutrition and health benefits ranked first in all three area types (rural = 0.793, semi-urban = 0.794, and urban = 0.791). However, affordability was higher for urban consumers (0.760) compared to rural (0.751) and semi-urban (0.754). Among rural consumers, Affordability and Safety/Trustworthiness were equal (both 0.751), indicating

the inherent price sensitivity of rural households, characterised by lower average incomes and access to a restricted range of FDF brands at limited price points. Urban and semi-urban consumers ranked nutrition and health benefits first (0.727 and 0.721, respectively). Second, safety/trustworthiness was highest for urban consumers (0.772), perhaps due to their better knowledge with FSSAI certification and established brand networks. Taste and flavour ranked lowest across all area types, confirming that the FDF purchase decision is purpose-driven and health-oriented across geographic contexts.

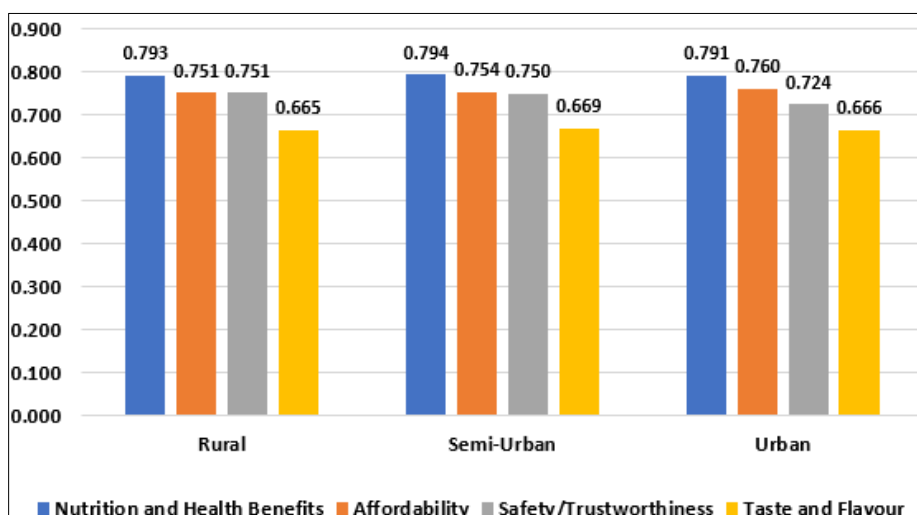


Fig 1: Purchase attribute preference scores for functional dairy foods by area type

Consumers' trust and perception of functional dairy food labels

Table 4 displays the mean scores for the five labelled

trust statements. Out of the five statements, health benefit communication (S1 (health benefit communication)) was the

only one attaining the Strongly Agree category with a mean score of 4.21. The remaining four statements were categorised within the Agree range (3.41-4.20): expiry date visibility (4.09), FSSAI certification confidence (3.98), allergen information adequacy (3.86) and ingredient source transparency (3.81). The findings for S1 (health benefit communication) indicates that FDF consumers in Northern India widely agree that labels effectively communicate health value propositions. This is consistent with the study conducted by Kerketta *et al.* (2023)^[9] who found that health claims were the most important label attributes for the consumers of probiotic products in Ranchi. Ingredient transparency was the least well-developed component (S2 (ingredient transparency) = 3.81). A similar gap was found in Delhi by Das (2017)^[4] where consumers with high brand awareness could not understand the information on the

component of probiotic labels, specifically the technical terms of probiotic strains and fortification compounds. Improving ingredient transparency via clear summaries and multilingual labelling constitutes a feasible industry initiative that does not necessitate regulatory modification. The FSSAI certification confidence score (S5 (FSSAI certification confidence) = 3.98) is in the 'Agree' range which means that the government quality mark is a widely accepted trust signal. The second lowest scored statement was allergen information (S4 (allergen information) = 3.86). This raises concerns on the adequacy of allergen communication especially to semi-urban and rural consumers with limited prior knowledge of the product. One of the more robust items was expiry date visibility (S3 (expiry date visibility) = 4.09). This shows that this basic labelling need is effectively consistent across FDF products.

Table 4: Consumers' trust and perception of functional dairy food labels

S.No.	Statements	Mean Score	Interpretation
1	Labelling on functional dairy foods clearly communicates the health benefits of the product.	4.21	Strongly Agree
2	The source of ingredients mentioned on functional dairy food labels is transparent and easy to understand.	3.81	Agree
3	Expiry dates on functional dairy food labels are clearly visible and easy to understand.	4.09	Agree
4	Functional dairy food labels provide adequate information about potential allergens.	3.86	Agree
5	Certification or licence information (e.g., FSSAI) on labels increases my confidence in the product.	3.98	Agree

District-wise variation in consumer preferences

Table 5 presents consumer preference index values across the seven study districts, whereas Fig. 2 depicts the composite preference scores by district. Nutrition and health benefits were ranked highest in all the seven districts, confirming uniformity in different geographic contexts. Nutrition indices were highest in Jaipur and Karnal (0.806 and 0.805, respectively) and lowest in Alwar (0.779). The maximum variation was observed in the affordability index. Chandigarh

(0.767) and Delhi (0.766) got the highest indices, which shows more brand price competition in large urban markets. Kathua had the highest safety/trustworthiness (0.756) where consumers in a border district may have more reliance on certified branded products and the lowest was in Chandigarh (0.719). The characteristics of taste and flavour were scored the lowest with a narrow range of 0.658 (Alwar) to 0.671 (Karnal). Delhi had the highest composite preference score (0.740) and Alwar had the lowest (0.733).

Table 5: Consumers' preferred attributes of functional dairy foods by district (index value)

District	Nutrition and Health Benefits	Safety/Trustworthiness	Affordability	Taste and flavour
Alwar	0.779	0.740	0.756	0.658
Chandigarh	0.793	0.719	0.767	0.670
Delhi	0.785	0.720	0.766	0.667
Jaipur	0.805	0.735	0.746	0.664
Jammu	0.790	0.724	0.760	0.664
Karnal	0.806	0.730	0.750	0.671
Kathua	0.790	0.756	0.751	0.662
Overall	0.792	0.728	0.759	0.666

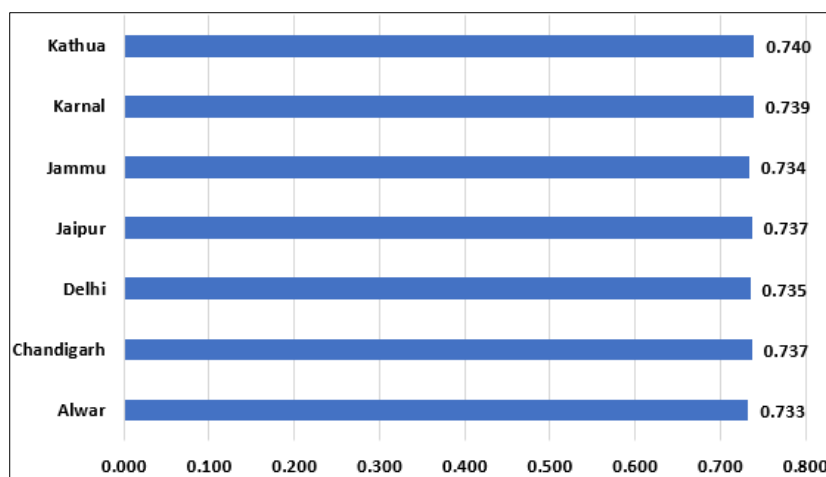


Fig 2: Consumer preference attributes by district

Area-wise and district-wise variation in label trust

Table 6 shows that Urban consumers scored the highest in S1 health benefit communication (4.26, Strongly Agree) while rural (3.98) and semi-urban (3.94) consumers were in the Agree category indicating higher health literacy in the urban environment. A key finding is the semi urban score for S4 allergen information (3.31, neutral), the only instance in the

study where any group scored below the agreed threshold, and points to a significant communication gap in allergen labelling for semi-urban markets. Rural consumers scored the highest on S5 FSSAI certification (4.14) which indicates that government quality mark is a particularly strong trust signal in markets where other quality indicators are limited.

Table 6: Consumer trust and perception of functional dairy food labels by area type (n = 406 consumers)

Statement	Rural	Interpretation	Semi-Urban	Interpretation	Urban	Interpretation
Health benefit communication	3.98	Agree	3.94	Agree	4.26	Strongly Agree
Ingredient transparency	3.77	Agree	3.81	Agree	3.81	Agree
Expiry date visibility	4.11	Agree	4.19	Agree	4.08	Agree
Allergen information	3.64	Agree	3.31	Neutral	3.92	Agree
FSSAI certification confidence	4.14	Agree	3.88	Agree	3.95	Agree

S1: Health benefit communication; S2: Ingredient transparency; S3: Expiry date visibility; S4: Allergen information; S5: FSSAI certification confidence.

Table 7 reports the level of trust in the labels by district. Delhi recorded the highest score for S1 (4.40, strongly Agree) and S4 allergen information (4.13) indicating urban consumers' awareness of health claims and allergen labelling. S3 expiry date visibility by Kathua district only reached Strongly Agree

(4.21). Jaipur scored the highest on ingredient transparency (S2 = 3.91). Karnal had the lowest scores for S1 (3.91) and S4 (3.51), indicating that the communication of health claims and the allergen labelling need to be improved in this market. FSSAI certification scores (S5) exhibited relative uniformity across districts ranging from 3.83 to 4.19, consistent with the finding that this mark is a widely recognised trust signal regardless of geographical location.

Table 7: Consumer trust and perception of functional dairy food labels by district

District	Health benefit communication	Ingredient transparency	Expiry date visibility	Allergen information	FSSAI certification confidence	Mean
Alwar	4.11	3.7	4.19	3.59	4.19	3.96
Chandigarh	4.15	3.7	4.02	3.75	4.07	3.94
Delhi	4.40	3.88	4.03	4.13	3.83	4.05
Jaipur	4.26	3.91	4.06	3.96	4.09	4.06
Jammu	4.21	3.73	4.07	3.86	3.95	3.97
Karnal	3.91	3.77	4.19	3.51	3.96	3.87
Kathua	4.0	3.82	4.21	3.59	3.97	3.91
Overall	4.21	3.81	4.09	3.86	3.98	3.99

Conclusions

This study assessed purchase attribute preferences and label trust for functional dairy foods among 640 households across Northern India in 2024-25, of which 406 were consumers of functional dairy foods. Nutrition and health benefits was the leading purchase attribute overall (WAI = 0.792), consistent across all three income groups and indicating that FDF adoption in the region is predominantly driven by health considerations. Affordability was ranked second overall (0.759) and was particularly high among rural consumers (0.751), matching the level of safety/trustworthiness in that group. Urban consumers recorded the highest affordability index (0.760). Safety/Trustworthiness ranked third (0.728) with the middle-income group recorded the lowest score (0.701), while taste and flavour were ranked last (0.666). On label trust, only health benefit communication attained a rating of 'Strongly Agree' (4.21); ingredient transparency received the lowest rating (3.81, 'Agree'). FSSAI certification (3.98) was valued consistently across income groups, confirming its role as a widespread trust mechanism. Manufacturers and cooperatives should develop smaller and less expensive package sizes for rural and lower-income market segments where affordability is a more important factor than nutrition in driving purchase decisions. Cooperative dairies, with their strong rural distribution networks, are well placed to cater to this segment. FDF labels

should communicate ingredient and probiotic strain information in plain language accessible to non-specialist consumers. The current lack of ingredient transparency (3.81) is a missed opportunity to foster deeper consumer trust. Third, the FSSAI certification mark should be prominently displayed on the FDF product packaging as it has a consistent trust value across all income groups.

Acknowledgement

The authors acknowledge the institutional support of National Dairy Research Institute, Karnal. The participation of all consumer respondents across the seven study locations is gratefully acknowledged.

Conflicts of Interest

The authors declare no conflict of interest.

References

1. Alkharusi H. A descriptive analysis and interpretation of data from Likert scales in educational and psychological research. *Indian J Psychol Educ.* 2022;12(2):13-16.
2. Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. *Basic Animal Husbandry Statistics.* New Delhi: Department of Animal Husbandry and Dairying; 2025.

3. Dalenius T, Hodges JL. Minimum variance stratification. *J Am Stat Assoc.* 1957;54(285):88-101.
4. Das J. Consumption pattern and consumer preferences for fermented probiotic dairy products: a study in metropolitan Delhi [MSc thesis]. Karnal: ICAR-National Dairy Research Institute; 2017.
5. Dhasarathan M, Sen B, Mandal S, Singh A. Analyzing the drivers and preferences of functional dairy food consumption: a socioeconomic perspective from Tamil Nadu. *Indian J Dairy Sci.* 2025;78(5):470-477.
6. Govindrao HP. Consumption pattern and consumer preferences for fermented functional dairy foods in Mumbai and Pune District of Maharashtra [MSc thesis]. Karnal: ICAR-National Dairy Research Institute; 2013.
7. Institute of Medicine, Food and Nutrition Board. Opportunities in the nutrition and food sciences: research challenges and the next generation of investigators. Washington (DC): National Academy Press; 1994.
8. Khalaf AT, Wei Y, Alneamah SJ, Al-Shawi SG, Kadir SYA, Zainol J, *et al.* What is new in the preventive and therapeutic role of dairy products as nutraceuticals and functional foods? *BioMed Res Int.* 2021;2021:8823222.
9. Kerketta A, Sen B, Chaudhary U, Verma A. Consumer's preference towards probiotic and fortified milk by conjoint analysis. *Res Rev J Dairy Sci Technol.* 2023;12(2):17-23.
10. Landstrom E, Hursti UKK, Becker W, Magnusson M. The use of functional foods among Swedish consumers is related to health-consciousness and perceived effect. *Br J Nutr.* 2007;98:1058-1069.
11. Likert R. A technique for the measurement of attitudes. *Arch Psychol.* 1932;22(140):1-55.
12. Moodi M, Salmani F, Norozi E, Zeinali T. Predictors of functional dairy product consumption among Iranian consumers. *Int Dairy J.* 2021;121:105061.
13. Ozen AE, Pons A, Tur JA. Worldwide consumption of functional foods: a systematic review. *Nutr Rev.* 2012;70(8):472-481.
14. Rani DA, Virginia P, Sana A. Fortified food consumption and awareness in Indian market. *Int J Res Eng Sci.* 2022;10(5):1-3.
15. Sharma M, Garg S. Functional foods: marketing 'health' to modern India. *Int J Innov Res Dev.* 2013;2(5):720-739.
16. Siro I, Kapolna E, Kapolna B, Lugasi A. Functional food: product development, marketing and consumer acceptance: a review. *Appetite.* 2008;51:456-467.
17. Shireen A, Aneesh M. Knowledge and consumption of probiotics and prebiotics in India: a narrative review. *Int J Community Med Public Health.* 2021;8(10):5119-5126.
18. World Health Organization. Diet and non-communicable diseases. Geneva: World Health Organization; 2021.