P-ISSN: 2618-0723
E-ISSN: 2618-0731

NAAS Rating: 5.04
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 7; Issue 8; August 2024; Page No. 41-48

Received: 12-06-2024
Accepted: 19-07-2024

Indexed Journal
Peer Reviewed Journal

Economic insights into A2 milk: Production costs and consumption trends in southern Karnataka

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DOI: https://doi.org/10.33545/26180723.2024.v7.i8a.907

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Abstract

The study, titled "Economic Insights into A2 Milk: Production Costs and Consumption Trends in Southern Karnataka," aims to provide a comprehensive economic analysis of A2 milk production and consumer behaviour. Data were collected from 40 farmers rearing Hallikar, Gir, and Sahiwal cattle breeds in Bengaluru South district, focusing on the cost of production, revenue generation, and profitability. The total production cost was divided into variable and fixed costs, with variable costs constituting 88.30% (₹22,149), mainly driven by feed expenses. Fixed costs accounted for 11.70% (₹2,936), including depreciation and interest rates. Gross returns from maintaining desi cow breeds were ₹41,477, with milk sales contributing 90.74% (₹38,240) of the total returns, manure sales 6.85% (₹2,396), and calf sales 2.41% (₹841). The net return per cow was ₹16,392, indicating an economic viability with a return of ₹1.65 per rupee invested.

Consumer behaviour was analysed through a survey, revealing a significant knowledge gap regarding the nutritional benefits of A2 milk. While 82.50% of respondents were aware of A2 milk as a good source of lactose, awareness of other health benefits was lower, with only 25% aware that A2 milk is free of hormones and antibiotics. Purchasing behaviour indicated a strong preference for cow's milk (90.80%) and planned purchasing (91.66%). Brand preference highlighted Akshayakalpa as the most popular, followed by Mother Dairy. The majority of respondents (62.50%) purchased A2 milk in the morning, with home delivery being the preferred mode (60%). Sensory attributes such as taste, aroma, and appearance were highly accepted among consumers, contributing to the overall acceptance of A2 milk. These findings offer valuable insights for policymakers and dairy farmers aiming to maximize economic returns and enhance consumer awareness of A2 milk's health benefits in Southern Karnataka.

Keywords: A2 milk, factor analysis, Bartlett's test, garret's ranking, dairy

Introduction

The dairy industry is an important segment of India's agro-economic structure, and the industry has got important potentials for improving rural economy, generating employment, and ensuring nutritional security. It contributes around 5% of agricultural GDP to the country and provides livelihoods to over 80 million farmers (Balasubramanian, 2024; Gayathri *et al.*, 2023) [1, 6]. As the world's largest milk producer, India contributes about 23% to worldwide milk production. The country's milk production has increased from 146.31 million tonnes in 2014-15 to 230.58 MT in 2022-23, hence witnessing a compound annual growth rate of 5.85 percent. Karnataka distinguishes itself in this regard since the State produced 12.503 MT of milk during the period 2022–23, which makes the State play a vital role in strengthening India's self-sufficiency in dairying and contributing to economic growth. Milk is the backbone of the dairy industry and, being a cheap source of good-quality protein, it is also an excellent source of several vitamins such as A, D, B12, high amounts of minerals like calcium and phosphorus, and fats (Kumar, 2024; Lambrini *et al.*, 2021; Scholz-Ahrens *et al.*, 2020) [11, 12, 15]. Of particular interest is the casein, which is the main milk protein; it contains around 30-35% beta-casein (Gurtu *et al.*, 2023) [7]. Primary forms of beta-casein include A1 and A2, differing in just one amino acid at position 67. A1 milk is generally produced by exotics like Holstein, Friesian, and Ayrshire, while A2 milk is produced by indigenous breeds like Gir, Red Sindhi, and Sahiwal. Interest in A2 milk has been growing of late due to the associated health benefits connected with its better digestibility and reduced risk of lactose intolerance, which may alleviate the symptoms of diseases like IBS and autism (Kaplan *et al.*, 2022; Kaskous, 2020; Bodnár *et al.*, 2018) [9, 10, 3]. It tallies with broader consumer preferences for traditional and natural foodstuffs, reflective of a general preference for dietary healthier and more sustainable alternatives available in the marketplace (Jeong *et al.*, 2023; Bentivoglio *et al.*, 2020; Schettini *et al.*, 2020; Nystrom *et al.*, 2016) [8, 2, 14, 13].

Dairy farming has been part and parcel of rural livelihoods in Southern Karnataka for generations; the entry of A2 milk has brought in a new element to this traditional business. Close to ten A2 milk firms have born in this region in the last five years alone, riding the rising tide of consumer

demand for A2 milk that fetches premium price on account of its health benefits. Despite such a trend, there is a definite dearth of proper economic analyses with regard to the production costs and consumption pattern of A2 milk in Southern Karnataka. Therefore, this paper tries to fill up this gap by presenting an in-depth analysis of the economic aspects of A2 milk production and its consumption pattern in Southern Karnataka, Karnataka State, India. This analysis also hopes to give insight to potential policymakers, dairy industry players, and even farmers. This will include analysis in the socio-cultural aspect of the factors that drive consumer preference towards A2 milk and determine its acceptance within local dietary practices and traditions. This is holistic in approach to enhance the understanding of the economic and cultural impacts of A2 milk in Southern Karnataka, hence strategically contributing to the development of the dairy industry in that region.

Data source

The state has 32 districts, 13 in the northern part and the rest in the southern part. For the collection of data on A2 milk consumption and the cost of production of A2 milk in the context of the Hallikar breed of cattle, four districts from Southern Karnataka, namely, Bengaluru Urban, Bengaluru Rural, Kolar, and Chikkaballapur, have been taken up in this study. The state of Karnataka is focused on enhancing cattle and buffalo breeding work by implementing the National Project for Cattle and Buffalo Breeding. The state has around 88 million livestock, which constitutes cattle, buffalo, sheep, goats, pigs, and cattle mixture. The state's indigenous breeds being Hallikar and Amrith Mahal in the southern parts. In the northern side, the breeds are Khillar, Krishna Valley, and Deoni. These are selectively draught breeds. The areal type of dwarf cattle is the Malnad Gidda found in the Malnad parts. It has also preserved germplasm. Desi cow breeds are Gir, Sahiwal, Ongole, Kankrej, Tharparkar, Rathi, Haryanvi, and its derivative Gangatiri.

Table 1: Population status of indigenous cattle in Karnataka

Breed	Population			% Share in total indigenous cattle of Karnataka
	Pure	Graded	Total	
Amritmahal	105330	123617	228947	3.47
Deoni	49114	62080	111194	1.68
Hallikar	1148876	550559	1699435	25.73
Khillar	225207	495153	720360	10.91
Krishna Valley	3462	10919	14381	0.22
Malnad Gidda	897888	147448	1045336	15.83

For this study data was obtained from co-operative Milk Producers Federation Limited (KMF) and from private A2 milk dairies in Bengaluru. KMF is the Apex Body for the dairy co-operative movement in Karnataka. The state federation, KMF, has 15 milk unions across Karnataka covering 32 districts which procure milk from Primary Dairy Cooperative Societies (DCS) and distribute milk to the consumers in various Towns/Cities/Rural markets in Karnataka. KMF sells varieties of dairy products such as milk, milk powder, ghee, butter, curd, and other fermented products, milk sweets, UHT milk, chocolate, ice-cream desserts, A2 milk through its outlets (https://www.icra.in/).
The present study was conducted among 80 customers and five retailers in Bengaluru, who were purposively selected for this study. The data were collected through personal interviews and Google forms at retail outlets, college campuses, and homes. A structured schedule was prepared that contained particulars for general information (name, age, sex, literacy level, family details, expenditure, food habits, and income) and specific information (A2 milk brands, reasons for purchase, consumer awareness, buying behavior, influencing factors, information sources, purchase frequency, and brand loyalty). Further, the A2 milk production data for the Hallikar breed was collected from 40 farmers through direct contact and telephonic interviews. The general information schedule comprised of name, age, sex, literacy, family particulars, expenditure, food habits, and income, while the specific details were the cost of animal purchase, fodder cost, medical expenses, maintenance cost, and the market constraints.

Methodology

Likert Scale

The hedonic Scale is a scale that indicates the extent of respondents' overall liking or disliking for something, e.g., a product they tasted or a concept they viewed. The main characteristics of the scale are that each category is associated with a verbal descriptor from “dislike extremely” to “like extremely” and that the scale has a neutral category “neither like nor dislike”. The five-point hedonic scale has been popular because of its simplicity, accuracy, and precision while being criticized mostly for end effects (i.e. avoidance of extreme categories) and the lack of equal hedonic intervals between categories. The hedonic scale has been accepted by sensory professionals to infer consumer acceptance from “liking”, despite its flaws because it provides internal validity (accurate and precise results of consumer liking) at the expense of external validity (relevance to the marketplace). Consumer acceptability scores on a 5-point hedonic scale (Scale: 5-like extremely; 4- like slightly; 3-neither like nor dislike; 2-dislike slightly; 1-dislike extremely).

Garrett’s ranking technique

Garrett’s ranking technique was used to analyze the consumer preference for A2 milk over conventional milk and the constraints faced by the respondents while buying A2 milk in the Bengaluru city of Karnataka. The order of merit given by the consumers was changed into ranks by using the formula: the procedure given by Henry Garrett and Woodworth R S (1969) [5].

The cost of production of A2 milk was calculated by using various cost concepts.

$$\text{Per cent position} = \frac{R_{ij-0.5}}{N_j} \times 100$$

Where,

R_{ij} = Rank given for ith item by j[th] individual

N_j = Number of items ranked by j[th] individual

The per cent position of each rank was converted into scores by referring to the Garrett table. Then for each factor, the

scores of individual respondents were summed up and divided by the total number of respondents for whom scores were gathered. The mean scores for all the factors were ranked; the factors having the highest mean value is considered to be the most important factor and ranked accordingly (Dhanavandan, 2016) [4].

Results and Discussion

1. Economics of Indigenous cow

In order to study the economics of rearing indigenous cattle breeds of Southern Karnataka, data had been procured from 40 farmers of Hallikar, Gir, and Sahiwal breeds of animals in Bengaluru South district. The total cost of production was identified as having two major components: variable and fixed costs. Among the major expenses, variable costs are the maximum substantial share of the total cost of ₹22,149.00, which is 88.30% of the production cost (Table 1). Variable costs constitute the major portion of the production expenses, accounting for 88.30% (₹22,149). Within this category, feed costs are significant, as proper maintenance of dry fodder, green fodder, and concentrates is essential to achieve higher milk yields. Specifically, the cost of dry fodder comprises 8.18% (₹2,053), green fodder accounts for 12.21% (₹3,063), and concentrates represent the largest portion at 20.58% (₹5,162). The data indicate that farmers predominantly invest in concentrates, followed by green and dry fodder, highlighting the emphasis on balanced nutrition to enhance milk production. Fixed costs, on the other hand, make up 11.70% (₹2,936) of the total production expenses. This includes the amortized cost of animals at 4.33% (₹1,085) and the amortized cost of buildings at 4.07% (₹1,022). Depreciation costs, which account for 2.18% (₹546), reflect the annual reduction in value of the infrastructure and livestock. Additionally, the interest rate on capital, calculated at 10% per year, constitutes 1.33% (₹283) of the total costs. The gross return from maintaining a desi cow breed is ₹41,477. A single cow yields 956 liters of milk annually, with a lactation period of 190 days, producing approximately 5 to 5.5 liters per day. Farmers sell the milk at ₹40 per liter, generating 90.74% (₹38,240) of the gross return from milk sales alone. Other sources of income include manure and calf sales, which contribute 6.85% (₹2,396) and 2.41% (₹841) respectively. The net return from a single desi cow breed is ₹16,392. This translates to a return of ₹1.65 per rupee invested, indicating that for every rupee spent on maintaining the cow, farmers gain an additional 0.65 rupees as profit. This figure underscores the economic viability of rearing indigenous breeds, given the substantial returns relative to the investment.

In conclusion, the economic analysis of rearing Hallikar, Gir, and Sahiwal breeds in Bengaluru South district reveals that while variable costs, particularly feed expenses, dominate the total production costs, the overall profitability is promising. The significant gross returns from milk sales, complemented by additional income from manure and calf sales, ensure that farmers can achieve a favorable return on investment. These insights provide valuable information for policymakers and farmers aiming to optimize the economic outcomes of dairy farming with indigenous breeds in Southern Karnataka.

Table 1: Economics of Indigenous cow (₹/animal/year**)**

S. No.	Particulars	Amount (Rs)	%
1.	Variable cost		
a)	Cost of dry fodder	2053	8.18
b)	Cost of green fodder	3063	12.21
c)	Cost of concentrates	5162	20.58
d)	Labor cost	10055	40.08
e)	Veterinary cost	253	1.01
f)	Miscellaneous cost	114	0.45
g)	Interest on variable cost at 7%	1449	5.78
	Total variable cost	22149	88.30
2.	Fixed cost		
a)	Amortized cost of animal	1085	4.33
b)	Amortized cost of building	1022	4.07
c)	Depreciation cost	546	2.18
d)	Interest on fixed capital at 10%	283	1.13
	Total fixed cost	2936	11.70
3.	Total Cost	25085	
4.	Gross Returns		
a)	Total milk yield (l)	956	
b)	Returns from milk	38240	90.74
c)	Returns from Manure	2396	6.85
d)	Returns from the sale of male calf	841	2.41
	Total gross returns	41477	100
5.	Total net returns	16392	
	Returns per rupee investment	1.65	

2. Level of awareness of A2 milk among consumers in Bengaluru city

Table 2 revealed varying levels of awareness among respondents about the nutritional benefits of A2 milk. A significant 82.50% of respondents were aware that A2 milk is a good source of lactose, while 17.5% were unaware. Regarding vitamin content, 49.17% knew that A2 milk contains vitamins A, D, and B12, but 50.83% did not. Only 25% of respondents were aware that A2 milk is free of hormones and antibiotics, leaving 75% unaware. Noticeably, 75% of the respondents recognized that A2 milk is rich in calcium essential for bone health, while 25% were not aware. The level of awareness on omega-3 fatty acid content, which reduces the risk of heart disease or stroke, was very low at 19.16%, and hence 80.84% were not aware. Similarly, only 22.50% were aware that A2 milk prevents and treats osteoporosis, and a majority of 77.50% were not aware. Lastly, 27.5% were aware that A2 milk contains potassium, which helps in maintaining blood pressure; 72.50% were not aware about it. This implies that out of the seven indicators used to measure consumer awareness in Bangalore city, a majority did not know the benefits in five of those indicators. This thus showed that there was a wide knowledge gap concerning the health benefits offered by A2 milk to consumers. Therefore, it is upon companies selling A2 milk in Bangalore to embark on awareness campaigns so that most of their potential customers will be aware of the benefits, hence attracting new customers and also retaining old customers.

Table 2: Extent of awareness of A2 milk consumers

S. No.	Awareness Level	Aware		Not Aware	
		Frequency	Percent	Frequency	Percent
1.	Good source of lactose	99	82.50	21	17.50
2.	It contains vitamin A, D and B12	59	49.17	61	50.83
3.	Free of hormones and antibiotics	30	25.00	90	75.00
4.	It contains an abundance of calcium which strengthen the bones	90	75.00	30	25.00
5.	It contains a significant amount of omega-3 fatty acid which reduces the risk of heart disease or stroke	23	19.16	97	80.84
6.	It helps to prevent and treat osteoporosis, or weakening of bones	27	22.50	93	77.50
7.	The potassium present in A2 milk benefits your blood pressure	33	27.50	87	72.50

Table 3 revealed the overall extent of awareness of A2 milk among consumers in selected southern districts of Karnataka. The awareness of the health benefits of A2 milk in selected area, more than one-third (57.5%) of respondents categorized into a medium level of awareness of health benefits of A2 milk, followed by a low level of awareness (22.5%) and a high level of awareness (20%) on health benefits of A2 milk among respondents.

Buying behaviour of A2 milk consumers

The preferred brands of A2 milk, the place of purchase, frequency, time of purchase, and amount of purchase were analyzed and presented in table 4.

Table 3: Overall extent of awareness of A2 milk by consumers

Category	Respondents (n=120)	
	Frequency	Percent
Low	27	22.50
Medium	69	57.50
High	24	20.00

Table 4: Buying behavior of A2 milk by the consumers

S. No.	Particulars	Number of respondents	Percentage
1. Preferred A2 milk			
a)	Cow Milk	109	90.8
b)	Buffalo Milk	11	9.2
Total		120	100
2. Nature of Purchase Decision			
a)	Planned Purchase	110	91.66
b)	Unplanned Purchase	10	8.34
Total		120	100
3. A2 milk is of superior quality than regular milk			
a)	Yes	115	95.8
b)	No	5	4.2
Total		120	100
4. Regular consumption of A2 milk			
a)	Yes	114	95
b)	No	6	5
Total		120	100
5. Preferred A2 milk brand			
a)	Nandini	6	5
b)	Akshayakalpa	26	21.67
c)	Mother Dairy	15	12.5
d)	Gatti Gaushala	12	10
e)	Haritas	12	10
f)	Mathruka	3	2.5
g)	Organic Mandya	6	5
h)	Surabhi Milk	3	2.5
i)	Pyramid Organic Goshala	1	0.83
j)	Erden Creamery	5	4.17
k)	Tirumala	9	7.5
l)	Dodla	4	3.33
m)	Sids Farm	12	10
n)	Country Delight	5	4.17
o)	Indus Milk	1	0.83
Total		120	100
6. Time of purchase			
a)	Morning	75	62.5

b)	Afternoon	5	4.17
c)	Evening	23	19.17
d)	Anytime as per requirement	17	14.17
Total		120	100
7. Frequency of purchase			
a)	Once in a day	66	55
b)	Twice in a day	54	45
Total		120	100
8. Form of A2 milk preferred			
a)	Loose	23	18.75
b)	Packed	97	81.25
Total		120	100
9. Quantity purchased (Liters/ day)			
a)	1/2 - 1 Liters	63	52.5
b)	> 1- 2 Liters	44	36.25
c)	> 2 Liters	13	11.25
Total		120	100
10. Preference of shop for purchasing			
a)	Home delivery	72	60
b)	Local Dairy	35	28.75
c)	Specialty food store	13	11.25
Total		120	100
11. Source of information about A2 milk			
a)	Friends	54	45
b)	Doctor Recommended	31	25.83
c)	Neighbors	12	10
d)	Newspaper	14	11.67
e)	Television	9	7.5
Total		120	100
12. Year of consuming A2 milk			
a)	0 – 1 Year	48	40
b)	1 – 2 Year	33	27.5
c)	2 – 3 Year	15	12.5
d)	3 – 4 Year	9	7.5
e)	More than 4 Year	15	12.5
Total		120	100
13. Monthly expenditure on A2 milk			
a)	< Rs.500	8	6.67
b)	Rs. 500-1000	4	3.33
c)	Rs. 1001-2500	75	62.5
d)	Rs. 2501-3000	30	25
e)	> Rs.3000	3	2.5
Total		120	100
14. For whom you purchase A2 milk			
a)	Children	66	55
b)	Elders	35	29.17
c)	Self	14	11.67
d)	Everyone	5	4.17
Total		120	100
15. Brand preferred before shifting to A2 milk			
a)	Nandini	75	62.5
b)	Tirumala	24	20
c)	Dodla	15	12.5
d)	Others	6	5
Total		120	100

Table 4 shows the purchasing behavior of A2 milk consumers in Southern Karnataka. The survey discovered that 90.80% preferred cow's milk, and 9.20% were favoring buffalo's milk. Nutritional benefits attached to cow's milk like calcium, proteins, vitamin B12, and iodine may be the reason for its higher preference. It also, of course, includes casein, which helps in lowering blood pressure, and magnesium, which is essential in the building up of strong

bones and muscles. Besides, cow's milk is lighter and less fatty, hence more easily digested, especially in the case of young children and old people. In contrast, buffalo milk is creamier and thicker.

Decision-making in purchasing A2 milk revealed that 91.66% of respondents bought A2 milk through proper planning, whereas the rest, which is 8.34%, bought it without any planning. This planned purchase behavior likely emanates from the health benefits associated with A2 milk, such as its being more nutritious than commercial milk, promoting growth and development in children, and aiding mothers who have a deficiency of milk secretion. This planned approach differs considerably from the more straightforward act of deciding by those respondents who purchased A2 milk without planning.

The large majority of the respondents originally consumed A2 milk on a regular basis, standing at 95%, whereas the remaining 5% used it as per requirement. A large percentage of regular consumption can mean strong preference and satisfaction in the consumption of A2 milk by consumers and the liking of the taste, considering the milk healthily beneficial.

Among the respondents, preferences for different brands among A2 milk consuming were 21.67% for Akshayakalpa, followed by Mother Dairy 12.50%, Gatti Gaushala, Sids Farm, and Haritas 10.00%. Other brands include Tirumala 7.5%, Nandini and Organic Mandya 5.00%, Country Delight, and Erden Creamery 4.17%. According to the respondents, all of them were popular, but Akshayakalpa was more sought after because of the freshness and quality, which scored higher compared to other brands available in the Bengaluru market. On the other hand, Mother Dairy also qualified to be among the high-quality brands consumers targeted.

As far as the time of purchase is concerned, 62.50% of the total respondents purchased A2 milk in the morning, 19.17% in the evening, 14.17% as required, and 4.17% in the afternoon. Thus, purchases in the morning are predominant because most of the customers start their day with fresh milk or tea or coffee.

The mode of purchase showed that 60% of the respondents had availed the home delivery mode, 28.75% bought from the local dairies, and the remaining 11.25% from food specialty stores. COVID had been the major influence in the buying behavior, as most preferred home delivery for convenience and safety while some went to the local dairy due to proximity.

On the frequency of purchase, 55% of the respondents purchased A2 milk twice a day while 45% purchased once a day. On the quantity purchased, there were sales of half to one liter daily by 52.50%, more than one liter by 36.25%, and above two liters per day by 11.25%.

Sources of information about A2 milk were further explained to have come from various backgrounds. The friends' click carried as a heavy decides the vote as 45%. Then next came doctors' recommendation 25.83%, Newspapers 11.67% Neighbors 10% and Television 7.5%. Friends made the step of influence to the buying decision of the customers, followed by doctor and media.

The duration during which the respondents have been consuming A2 milk shows 40% of them for less than a year, 27.5% for one to two years, 12.5% for two to three years, 7.5% for three to four years, and 12.5% for more than four years. The fairly short length of time most respondents had been consuming A2 milk suggests that A2 milk is still a relatively new product in urban areas and that many consumers are only recently becoming aware that it is available.

The main use of A2 milk was for children, followed by elders. More particularly, 55% of the respondents purchase A2 milk for their children, and 29.17% purchase it for the elder members of the family. These are followed by 11.67% for self and 4.17% for all members. A2 milk is also a favorite for children because it is assumed to help in their growth and development, make bones and teeth strong, and keep them on a balanced diet. For the elderly, this kind of milk is recommended because of the ability to probably lower high blood pressure and levels of cholesterol.

Shopping on A2 milk was reported to vary at 62.50% of respondents for the per month spending range of Rs. 1001 to 2500, between 25% for spending Rs. 2501-3000 to 6.67%, spending less than Rs. 500 to 3.33% and spending between Rs. 500-1000, thereafter having more than Rs. 3000.

Before opting for A2 milk, 62.50% of the respondents used to like the Nandini brand, 20% liked Tirumala, 12.50% liked Dodla, and 5% other brands. It was further found that the females consumed more milk and milk drinks inclusive of fermented milk drinks than their male counterparts. In both the sexes, the whey-based beverages were taken regularly.

Consume, the findings of the research as being a very strong inclination for using cow's milk among the surveyed population, as it offers the maximum nutritional value. A vast section of customers' plans to purchase A2 milk, uses it on a regular basis, and definitely has a positive orientation towards one particular brand with good quality. Friends and media, such as online information portals, are also equally important in disseminating information on A2 milk. The purchasing is done predominantly keeping in mind the health benefits of children and elderly people. This also highlights the importance of targeted marketing and education campaigns to raise awareness and intake of A2 milk in this region.

Form of A2 milk consumed by the respondents

Figure 1 represents the form of A2 milk consumed by the respondents. Cent per cent of the respondents consume in the form of milk because milk form is highly nutritious and easily digestible to the respondents followed by 62.50 per cent of the respondents consume in the form of curd, 33.3 consume in the form of ghee, 30.0 per cent consume in the form of buttermilk, 20.8 per cent consume in the form of tea, 16.70 per cent consume in the form of coffee, 12.5 percent of respondents consume in the form of Badam milk and the remaining five per cent of the respondents consume in the form of other value-added products.

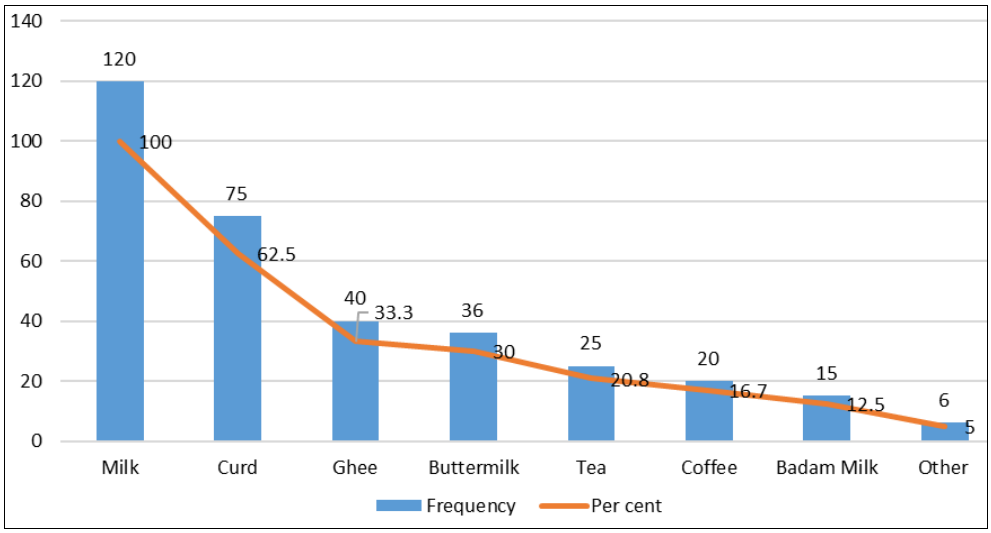

Fig 1: Form of A2 milk consumed by the respondents

Preference for A2 milk over the conventional milk

Table 5 presents the consumer preferences for A2 milk over conventional milk in Bengaluru city, Karnataka. The primary reason for the preference is the nutritive value of A2 milk, which has a mean score of 84. Respondents noted that A2 milk is rich in calcium, aiding in bone growth, repair, and the prevention and treatment of osteoporosis. The second significant factor is the brand image, with a mean score of 62.50. Consumers place high importance on brand reputation, which simplifies and speeds up their purchasing decisions. Another notable factor is the organic nature of A2 milk, with a mean score of 60.50. Consumers prefer A2 milk for its nutritional value, flavor, freshness, appearance, and its alignment with safety, health, and environmental concerns. Attractive packaging also plays a role in consumer preference, with a mean score of 54.75. Respondents believe that appealing packaging conveys a sense of quality and enhances the product's brand image. Lastly, price sensitivity appears to be the least influential factor, with a mean score of 42.75. Despite the higher cost, consumers are willing to choose A2 milk due to its perceived health benefits and superior nutritional value. These findings underscore the importance of nutritive value, brand image, organic nature, and packaging in consumer preferences for A2 milk over conventional milk.

Table 5: Preference for A2 milk over the conventional milk

S. No.	Particulars	Garrett's Values	
		Mean Score	Rank
1.	A2 milk is more nutritious than commercial milk.	84.00	I
2.	I prefer A2 milk for its nutritious value	76.75	II
3.	Brand image is most important while buying	62.50	III
4.	I prefer organic to inorganic	60.50	IV
5.	Attractive packaging is the most important consideration while buying A2 milk	54.75	V
6.	I don't care about the price of milk	42.75	VI

Acceptance of A2 milk among the consumers

Table 6 presents the acceptance of A2 milk among consumers in the southern districts of Karnataka. The sensory attributes of A2 milk were evaluated, revealing that taste is the most highly accepted attribute, with 90.50% of respondents expressing a positive perception. Consumers indicated that A2 milk tastes similar to milk containing the A1 protein, allowing them to enjoy their favorite milk-based products without experiencing digestive discomfort or compromising on taste. Following taste, the aroma of A2 milk is accepted by 88.50% of respondents. Other sensory attributes also received high acceptance rates: appearance (87.75%), thickness (87%), color (86.25%), and odor (85.75%). These findings indicate a broad acceptance and appreciation of A2 milk's sensory qualities among consumers. The high acceptance of A2 milk can be attributed to its health benefits, which align with the sensory preferences of the respondents. The combination of favorable sensory attributes and perceived health advantages significantly contributes to the overall acceptance of A2 milk in this region.

Table 6: Acceptance of A2 milk among the consumers

S. No.	Particulars	Total score	Average score	Per cent
1.	Appearance	351	4.39	87.75
2.	Aroma	354	4.43	88.50
3.	Taste	362	4.53	90.50
4.	Colour	345	4.31	86.25
5.	Thickness	348	4.35	87.00
6.	Odor	343	4.29	85.75

Conclusion

This study provides a comprehensive analysis of the economic aspects of A2 milk production and its consumer behavior in the region. The study encompassing data from farmers and consumers in Southern Karnataka sheds light on production costs of indigenous cattle breeds, alongside the consumption patterns of A2 milk among local

consumers. The findings reveal that the total cost of production for these indigenous breeds is substantially influenced by variable costs, accounting for 88.30% of the total production cost of ₹22,149.00. Among these, the major expenses are on feeds, particularly concentrates, which contribute significantly to improved milk production. The cost proportions for dry fodder, green fodder, and concentrates are 8.18%, 12.21%, and 20.58%, respectively. This indicates a high demand for a balanced diet to enhance milk yield. Fixed costs, comprising 11.70% of the total production cost, include amortized values for animals and buildings, depreciation costs, and interest rates on capital. The economic viability of rearing indigenous breeds is highlighted by the gross return of ₹41,477 per cow per year. Milk sales constitute the major share of returns at 90.74%, followed by manure sales at 6.85% and calf sales at 2.41%. This yields a net return of ₹16,392, translating to a return of ₹1.65 for every rupee invested, thereby affirming the profitability and economic sustainability of maintaining these indigenous breeds. On the consumer side, the study uncovers varying levels of awareness about the nutritional benefits of A2 milk among respondents in Bengaluru. While a significant majority are aware of some benefits, such as lactose content (82.50%) and calcium richness (75%), there is a notable knowledge gap regarding other benefits like omega-3 fatty acids (19.16%) and hormone-free properties (25%). This highlights the need for increased awareness campaigns by A2 milk companies to educate potential consumers about the comprehensive health benefits of A2 milk. Consumer purchasing behaviour reflects a strong preference for cow's milk (90.80%) over buffalo's milk, attributed to its nutritional benefits and digestibility. The majority of respondents (91.66%) plan their purchases, driven by the health benefits associated with A2 milk, such as better nutrition, growth promotion in children, and aid for mothers with milk secretion deficiencies. Regular consumption is high, with 95% of respondents using A2 milk daily, indicating strong satisfaction and preference. Brand preference analysis shows that Akshayakalpa is the most favoured brand (21.67%), followed by Mother Dairy (12.50%) and other local brands. Morning purchases dominate (62.50%), and home delivery is the preferred mode (60%) due to convenience and safety, especially post-COVID. The frequency of purchase is also notable, with 55% of respondents buying A2 milk twice a day, and a majority purchasing between half to one litre daily. Sources of information about A2 milk are predominantly from friends (45%) and doctors' recommendations (25.83%), underscoring the influence of word-of-mouth and professional advice. The relatively recent adoption of A2 milk, with 40% of respondents consuming it for less than a year, suggests growing awareness and acceptance in urban areas.

In conclusion, the economic analysis reveals that rearing indigenous cattle breeds for A2 milk production is profitable, with significant returns on investment. Consumer behaviour shows a strong preference for A2 milk due to its nutritional benefits, despite a gap in awareness about certain health aspects. The findings suggest that targeted marketing and education campaigns could further enhance the consumption of A2 milk, benefiting both producers and consumers in Southern Karnataka.

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