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Research Article

INTER STATE VARIATION IN CONSUMPTION OF FLUID MILK-A VIEW FROM NSSO DATA

VEDAMURTHY K.B.[1]*, CHANDRASHEKAR H.[2] AND RANGEGOWDA R.[3]

[1]Head, Department of Dairy Business Management, Dairy Science College, Hebbal, 560024, Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar, 585401, Karnataka, India

[2]Former Professor of Statistics (Rtd), University of Agricultural Sciences, Bengaluru, 560065, Karnataka, India

[3]Department of Dairy Business Management, Dairy Science College, Hebbal, 560024, Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar, 585401, Karnataka, India

*Corresponding Author: Email - vedandri@gmail.com

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Abstract: Milk and milk products finds a prominent place in the food basket among both rural and urban households in India. Milk provides required nutrients to people of all age groups. Dairying is traditionally linked to the culture of rural India as means of livelihood and risk mitigation strategy. Dairying is recognized as an important source of income for small and marginal farmers in India since on an average 22-26 per cent of the income of the rural households is contributed by milk. The present study makes use of data published by NSSO in its 66th,68th and 77th rounds to analyse the households reporting owning livestock especially cattle and buffalo in milk, study the consumption pattern of fluid (liquid) milk across different states and as well among different fractile classes. Study observes that there is wide variation in ownership of cattle and buffalo across states. The analysis indicates high elastic nature of liquid milk and also observe that there is a wide variation in consumption of milk across states both in rural and urban areas. Majority of fractile classes do not meet the requirement in respect of consumption of liquid milk as prescribed by the ICMR. Concerted efforts are necessary to spread the operation flood programme to hitherto less exploited states, boost up production and also distribution of milk by chalking out appropriate welfare schemes especially to vulnerable section of the society.

Keywords: *Per-capita consumption, Engle elasticity, Fractile classes*

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Introduction

Milk and milk products find a prominent place in the food basket among both rural and urban households in India. Milk provides required nutrients to people of all age groups. Dairying is traditionally linked to the culture of rural India as means of livelihood and risk mitigation strategy. Dairying is recognized as an important source of income for small and marginal farmers in India since on an average 22-26 per cent of the income of the rural households is contributed by milk. The present study makes use of data published by NSSO in its 66th,68th and 77th rounds to analyse the households reporting owning livestock especially cattle and buffalo in milk, study the consumption pattern of fluid (liquid) milk across different states and as well among different fractile classes. Study observes that there is wide variation in ownership of cattle and buffalo across states. The analysis indicates high elastic nature of liquid milk and also observe that there is a wide variation in consumption of milk across states both in rural and urban areas. Majority of fractile classes do not meet the requirement in respect of consumption of liquid milk as prescribed by the ICMR. Concerted efforts are necessary to spread the operation flood programme to hitherto less exploited states, boost up production and also distribution of milk by chalking out appropriate welfare schemes especially to vulnerable section of the society.

Food and nutritional security play an important role in wellbeing of the society. Food security refers to "all people, at all times, have physical social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" [1]. UNICEF in 1995 defined nutritional security as "adequate nutrition in terms of protein, energy, vitamins and minerals for household members at all time".

The National Sample Survey Office (NSSO) conducts nationwide household consumer expenditure survey at regular intervals. The report brought out by NSSO are effectively utilised by policy makers and academia to assess the overall social and economic status of rural and urban households across the country. The link between nutrition, poverty, food security and agriculture has been recognised and is embodied in the UN's Sustainable Development Goals (SDGs). In India, the situation is far more alarming in terms of achieving food and nutritional security. India accounts for the highest proportion of stunted (31 per cent) and wasted children (51 per cent) and under five deaths (16 per cent). India is also the home to the largest number of undernourished people in the world (24 per cent of the world population) [2].

Milk and milk products find a prominent place in the food basket among both rural and urban households in India. Milk contains wide array of nutrients, including vitamins, minerals, protein, healthy fats and antioxidants. Quantity of milk to be consumed vary among age groups particularly from infants to aged people. Milk provides required nutrients to people of all age groups. capital intensity, short operating cycle, steady returns make dairying a preferred livelihood activity among the small and marginal farmers. "White Revolution" was instrumental for enhancing the milk production in the country, India has emerged as the largest producer of milk in the world during 1997-98. Per capita availability of milk in India during 2001-02 was 225 gms/day and increased to 460 gms/day during 2019-20, registering an increase of 204 per cent in a span of two decades. However, the availability of milk is not uniform across different states and consumption of milk considerably vary across different income classes.

There is need to study the production and consumption patterns of fluid milk across different states and income groups both in rural and urban settings [3,4]. The present study is undertaken with following specific objectives.

Objectives of the present study

1. To study the number of households reporting owning livestock especially cattle in milk and buffalo in milk across major states of India
2. To study the consumption pattern of fluid (liquid) milk across different states
3. To study the consumption pattern of fluid (liquid) milk across different fractile classes

Material and Methods

The data required for the present study was collated from the NSSO report of household consumption of various goods and services in India, 66th NSS round and 68th NSS round reports. Besides data from situation assessment of agricultural households and land and holdings of households in rural India 2019, NSS 77th round was also utilised. The monthly per capita quantity of consumption of milk (liquid) both in litres and value in rupees for different states was compiled from 66th and 68th NSS report for the years 2009-10 and 2011-12 respectively. The data pertaining to quantity of milk consumed and its value pertaining to different fractile classes was also collected from 68th NSS round for the year 2011-12. The data on number of households reporting owning cattle and buffalo in milk was compiled from 77th NSS report referring to the period July 2018 to Dec 2018.

To keep the analysis simple, tabular analysis is employed. An attempt has been made to derive Engel elasticities, combining data across different states from 66th and 68th NSS rounds in respect of expenditure on liquid milk verses expenditure on food. The functional form to derive Engle elasticities are;

$$LnY_i = \beta_0 + \beta_1 LnX_i + \beta_3 D_i + \beta_4 (D_i X_i) + \epsilon_i$$

Where,

$Ln\ Y_i$ = logarithmic Expenditure on Milk by i^{th} state

X_i = logarithmic Expenditure on food by the i^{th} state

D_i = 1 for the year 2011-12

0 for the year 2009-10

ϵ_I = Random disturbance term

β_o, β_1, β_2, β_3 are he regression coefficients

Results and Discussions

Ownership of cattle and Buffalo in Rural India

We shall begin our analysis by looking at [Table-1] where state wise number of rural households owning cattle and buffalo in milk are presented. This information is compiled from NSS 77th round pertaining to situation assessment of agricultural households and land and holding of households in rural India, 2019. For the purpose of the analysis, states are categorized in to two categories, namely, states having higher percentage of households compared to all India and states having less percentage of households compared to all India in respect of ownership of cattle and buffalo in milk. It may be noted from [Table-1] that only 16 % of rural households own cattle in milk at all India and corresponding figure for buffalo is only 11%. Further, states are arranged in ascending order of magnitude in terms ownership of cattle and buffalo in milk. Nine states have less than all India percentage in respect of number of rural households owning cattle in milk, whereas 12 states have above the all-India percentage in terms rural households owning cattle in milk. There is a considerable variation in the ownership of both cattle and buffalo in milk across the states. It is evident from [Table-1] that Telegana, Kerala and Andhra Pradesh have only five percent of their rural households possessing cattle in milk. On the other hand, in Himachal Pradesh little more than 40 percent of households rare cattle in milk. Gap is still more alarming in case of ownership of buffalo in milk. Thirteen states have registered ownership of Buffalo which are less than all India figures. Among these thirteen states, nearly six states namely Kerala, Odisha, Tamil Nadu, West Bengal and Assam have less than one percent of rural household's rare buffalo which are in milk. Operation flood is India's land mark programme, no doubt, it has changed the landscape of Indian dairy industry. White revolution has been termed as production by masses. But, considering the wide variation observed among ownership of cattle and buffalo across states indicate that there is a high a potential to spread the operation flood programme to hitherto less exploited states.

Consumption of liquid Milk

It is further hypothesised that the variation observed across states in terms ownership of cattle and buffalo by rural households gets reflected in respect of per-capita consumption of milk across states. With this view we proceed to examine the per capita monthly consumption of liquid milk across major states both for rural and urban areas. The required data has been collected from NSS 66th and 68th rounds providing household consumption of various goods and services in India for the years 2009-10 and 2011-12 respectively. The monthly per-capita household consumption expenditure on liquid milk both in terms of quantity and as well in value terms were compiled for the major states from two rounds of NSSO reports. Besides monthly per-capita expenditure on food for both rural and urban areas are compiled from the reports.

At aggregate level, that is at all India level, NSS 68th round provides monthly per-capita consumption expenditure (MPCE) for fractile classes for the reference year 2011-12. Data in respect of quantity of liquid milk consumed and its value, and expenditure on food for fractile classes were collected for the analysis.

For convenience, combining data from 66th and 68th NSS rounds, average monthly per-capita consumption expenditure on liquid milk and on food across states have been derived. [Table-2] presents average daily per-capita consumption of liquid milk expressed in millilitres across major states of India.

The figures in [Table-2] reveal that the per-capita- per-day milk consumption at all India is 141 and 180 millilitres for rural and urban India respectively. One could see a wide variation in consumption milk across states. Lowest consumption in rural areas is noticed in Chhattisgarh state with a consumption of 24 millilitres per-day-per-capita. On the other hand, Haryana has recorded highest level liquid milk consumption in rural area with a consumption of 470 millilitres per-day-per-capita. Nearly two-thirds of the state have registered consumption of liquid milk below the all-India average in rural areas. Only the four states, namely, Haryana, Punjab, Rajasthan and Himachal Pradesh have highest level of liquid milk consumption in rural areas. The results in urban areas reveal similar story to that of rural India. Lowest consumption in urban areas is noticed in Assam state with a consumption of 58 millilitres per-day-per-capita. On the other hand, Punjab has recorded highest level liquid milk consumption in urban area with a consumption of 351 millilitres per-day-per-capita. Even in urban India nearly two-thirds of the state have registered consumption of liquid milk below the all-India average. Only the Punjab and Haryana states have registered consumption of more than 340 millilitres per-day-per-capita liquid milk consumption in urban areas. Difference among the consumption of liquid milk between rural and urban areas among the top consuming states was of the order 120 millilitres per-day-per-capita. Rural area has registered higher consumption than urban area. Whereas when we compare the consumption of liquid milk in respect of lowest consuming states, that is, between Chhattisgarh in rural area and Assam in urban area, Assam has almost registered double the consumption than Chhattisgarh. Thus, it is evident from the analysis that there is wide variation in consumption of milk across states both in rural and urban areas.

We wish to examine whether the variation noticed across states using NSSO data continue to persist in respect of consumption liquid milk. For this purpose, the data from National Dairy Development Board (NDDB) was collected for the latest available year, *viz*., 2019-2020 on per-capita availability of milk by states. We can take this series as proxy to consumption series across states. Correlation between consumption series from NSS rounds and availability of per-capita milk data collected from NDDB source was worked out. Correlation between NSSO data and NDDB series was the order of 0.92 for rural series and 0.90 for urban series. Correlation turns out to be highly statistically significant. Thus, we can infer those states continue to remain more or less in same positions despite the fact that there has been overall improvement in availability of liquid milk in all the states. Interestingly nearly nine states, namely, Assam, Bihar, Chhattisgarh, Goa, Jarkhand, Kerala, Maharashtra, Odisha, and West Bengal fall short of availability in terms prescribed standard by Indian Council of Medical Research (ICMR), *viz*., 300 gm/day per-capita.

Table-1 State wise Number of rural households owning cattle and Buffalo in Milk

Cattle in Milk		Buffalo in Milk	
All India (16.4%)		All India (10.7%)	
States Below All India	States Above All India	States Below All India	States Above All India
Telangana (4.8%)	Odisha (16.9%)	Kerala (0.1%)	Jammu & Kashmir (14.5%)
Kerala (4.9%)	Punjab (17.1%)	Odisha (0.2%)	Madhya Pradesh (15.7%)
Andhra Pradesh (5.0%)	Karnataka (18.5%)	Tamil Nadu (0.3%)	Uttara Pradesh (20.2%)
Chhattisgarh (11.9%)	Bihar (19.2%)	West Bengal (0.4%)	Punjab (23.6%)
Maharashtra (12.8%)	Jharkhand (19.6%)	Assam (0.9%)	Uttara khand(24.0%)
Tamil Nadu (12.9%)	Gujarat (19.8%)	Jharkhand (1.0%)	Rajasthan (27.0%)
Haryana (13.7%)	Assam (22.9%)	Chhattisgarh (2.1%)	Gujarat (27.5%)
West Bengal (14.1%)	Madhya Pradesh (24.8%)	Bihar (6.1%)	Haryana (37.3%)
Uttara Pradesh (14.2%)	Rajasthan (27.9%)	Telangana (6.7%)	
	Uttarakhand (34.6%)	Karnataka (8.1%)	
	Jammu & Kashmir (37.3%)	Andhra Pradesh (8.3)	
	Himachal Pradesh (42.1%)	Maharashtra (8.6%)	
		Himachal Pradesh (9.5%)	

Source: NSSO 77th Round report no.587

Table-2 Average Consumption of Liquid Milk across Major States

SN	States	Average consumption of liquid milk (ml/day/per-capita)		Per-capita availability of milk;
		Rural	Urban	NDDB data for 2019-2020 (gms/day)
1	Andhra Pradesh	116	152	799
2	Assam	49	58	73
3	Bihar	110	135	240
4	Chhattisgarh	24	88	159
5	Delhi	243	289	
6	Goa	117	170	109
7	Gujarat	194	224	615
8	Haryana	470	343	1118
9	Himachal Pradesh	315	295	573
10	Jammu & Kashmir	270	284	507
11	Jharkhand	61	126	170
12	Karnataka	120	162	375
13	Kerala	101	120	198
14	MP	134	165	568
15	Maharashtra	105	160	269
16	Odisha	38	85	144
17	Punjab	393	351	1221
18	Rajasthan	319	281	904
19	Tamil Nadu	115	166	316
20	Uttara Pradesh	159	188	387
21	Uttarakhand	240	217	447
22	West Bengal	46	85	185
	All India	141	180	406

Source: NSSO 66th and 68th round, average over two NSS rounds; NDDB web site

More concerted efforts are necessary both from union and state governments to bring more people under the umbrella dairy development which is the second-best option after agriculture to secure livelihoods of vulnerable section in the rural areas and also ensure nutritional security.

Functional relationship between liquid milk consumption and total food expenditure

In this section an attempt has been made to establish functional relationship between expenditure incurred on liquid milk and on total food consumption. As discussed above, we have attempted to fit a log linear function incorporating a dummy variable for the data collected from 66th (D=0) and 68th (D=1) NSSO rounds. Separate regression equations were fitted for rural and urban series. Results are presented in [Table-3].

Regression coefficient of log liner relationship provides direct estimate of elasticities. Regression equation fitted for rural data indicate that expenditure on food alone explain 46 per cent of variation in expenditure on liquid milk. Both intercept and slope coefficient are significant at 1% level of significance. The non-significance of dummy variable indicates that there is no considerable change between 66th and 68th round information and relationships will be applicable for the both the periods. Slope coefficient of 2.32 indicate high elastic nature of liquid milk. Obviously, state with higher income will have more demand for liquid milk. The interpretation of results in respect of intercept needs little bit of causation, the negative and significant intercept coefficient indicate that states having lower food expenditure have to put more efforts to increase expenditure on liquid milk. Since there is other more priority items in food basket especially for the vulnerable section of rural areas that attracts higher expenditure than the liquid milk. States have to put more efforts to increase income to above the minimum critical level to realise the increased expenditure on liquid milk.

Regression equation fitted for urban data indicate that expenditure on food alone explain 28 per cent of variation in expenditure on liquid milk. The intercept and slope coefficient are significant at 10% and 1% level of significance respectively. The non-significance of dummy variable indicate that relationships will be applicable for the both the periods. Slope coefficient of 1.46 indicate high elastic nature of liquid milk. When compared to rural areas elasticities in urban areas is relatively less. The food basket is more diverse in urban areas compared to rural areas; the expenditure gets diverse to other food items. However, state with higher income will have more demand for liquid milk. The negative and significant intercept coefficient indicate that states with lower expenditure on food have to put more efforts to increase income to the above minimum critical level to realise increased expenditure on liquid milk.

Consumption of liquid Milk-Macro view

National sample survey, 68th round report provides information on monthly consumer expenditure on fractile classes at All India for rural and urban areas. As per the definition, for any fraction "f' between 0 and 1, the MPCE level such that 100f%of population lies below it is called 5th fractile of MPCE distribution. Accordingly estimates of fractile classes provided in 68th NSSO report are, 0-5%, 5-10%, 10-20%, 20-30%, 30-40%, ...70-80%, 80-90%, 90-95% and 95-100%.

Table-3 OLS estimates of log linear relationships between expenditure on liquid milk and expenditure on food

OLS Estimates		
Rural	LnY_i= -10.8422* +2.323635*LnX_i – 0.16567 $^{NS}D_i$ (-4.07) (5.68) (-0.77)	R^2 =0.46, F=17.48
Urban	LnY_i= -5.26466*** +1.4656909 *LnX_i – 0.04029 $^{NS}D_i$ (-1.87) (3.54) (-0.23)	R^2 =0.28, F=8.18
	LnY= logarithmic value on expenditure on liquid Milk LnX = logarithmic value on expenditure on food. D dummy variable =1 for 68th NSSO round = 0 for 66th NSSO round n=number of observations=44 * Significance at 1%, *** Significance at 10%, NS= Non-significance, Figures in brackets are t-values.	

Table-4 Consumption of liquid Milk across different Fractile Classes of Monthly Per-capita consumption expenditure –All India

Fractile Classes	Rural			Urban		
	Consumption of liquid milk Per capita /month (litres)	Value on liquid milk (Rs) Per capita /month	Expenditure on Food(Rs) Per capita /month	Consumption of liquid milk Per capita /month (litres)	Value on liquid milk (Rs) Per capita /month	Expenditure on Food(Rs) Per capita /month
1	0.816	16.94	315.84	1.455	36.1	414.73
2	1.464	30.58	400.51	2.266	57.66	532.40
3	2.125	46.46	472.35	2.910	77.27	628.17
4	2.436	54.60	535.26	3.803	100.65	741.07
5	3.130	71.46	599.07	4.434	122.88	855.47
6	3.728	86.05	659.10	4.895	138.86	948.34
7	4.093	97.18	721.78	5.480	161.34	1057.81
8	4.750	115.29	794.89	6.188	180.12	1183.05
9	5.534	136.29	891.33	7.030	208.65	1342.64
10	6.868	176.58	103.54	7.659	232.28	1576.60
11	8.224	217.58	1216.55	9.359	287.27	1945.69
12	10.821	291.77	1770.35	10.567	343.47	2859.12
ALL	4.333	106.25	756.49	5.4222	158.43	1120.88

Source: NSSO 68th round report no. 568

Thus, information on 12 fractile classes are available for rural and urban areas. The data on quantity of consumption of liquid milk in litres and value of consumption of milk and total expenditure on food for all the 12 fractile classes for rural and urban areas are presented in [Table-4]. The cursory look at the [Table-4] reveal that the consumption of liquid milk varies widely across MPCE farctile classes. It may be further observed from the [Table-4], that in all the fractile classes, consumption of liquid milk by urban population is more than the rural population. Similar pattern is being depicted even in respect of value on total food consumption. In rural areas, the bottom most class consume less than one litre per capita-per- month while top most fractile class consume almost 11 litres per-capita-per-month. Though the consumption of liquid milk by bottom most class in urban areas is relatively more than the rural area, that is, nearly 1.5 litres per-capita-per-month, even among urban areas, wide variation across farctile classes continue to persist. ICMR recommends on an average daily intake of 300 gm per day/per-capita milk to deliver the requisite macro-micro nutrients. As per ICMR standards per-capita liquid consumption per month on an average should be nine litres. According to this standard, it may be observed that in rural areas population falling in top most farctile that is those who are grouped in 12th fractile alone satisfy the requirement. It may be further noticed that population categorized up to 7th fractile in rural India do not even meet half of the requirement prescribed by the ICMR. Compared to rural India, situation prevailing in urban India is relatively better. Top two fractile classes namely, 11th and 12th satisfy the requirement prescribed by the ICMR for urban India population. On the other hand, population classified up to 5th fractile do not even meet the half the requirement prescribed by the ICMR. Thus, it may inferred that overall situation both in rural and urban areas are highly unsatisfactory despite the rapid progress made by the country in terms milk production through white revolution.

Conclusion

India attained first position in terms of milk production since 1998. The green revolution initiated during late 1960s and white revolution in early 1970s ensured self-sufficiency in food grain production and as well in milk. Co-operative structure adopted under the operational flood programme both in terms production and distribution of milk had enabled to make milk and milk products economically viable reaching consumers across 700 towns and cities through the establishment of national milk grid. Dairying accounts for more than two-thirds of the value of total livestock output. Dairy plays an important role in providing employment and income generating opportunity especially to small and marginal farmers. As on 2018-19 there are 1.91 lakh dairy cooperative in India 1.70 crore producer members. There are only six states marketing milk on their own brand names, Gujarat (Amul), Karnataka (Nandini), Tamil Nadu (Aavin), Rajastahn (Saras) and Punjab (Verka), and Bihar (Sudha) and rest of the states are yet establishing their own brand names. There is wide scope to bring more families under the ambit of dairy sector and expand the sector to unexplored areas of the country. Private sector can play a vital role in expanding the dairy industry and ensure to reach the unreached. Government of India [5] and NABARD has initiated several schemes for expanding milk processing in the country. As part of Atma Nirbhar Abihiyan stimulus package, Rs.1500 crores animal husbandry infrastacture development fund has been set up by Government of India [6]. This will provide incentives to individual entrepreneurs, private companies including MSME and FPOs to establish dairy processing and value addition Infrastructure (Economic Survey, 2021). As part of National Programme for Dairy development (NPDD), by the end of Feb.2020, 129 new projects have been approved in 28 states and 2UTs with an outlay of Rs. 1535 crores (Central assistance Rs 1249 crores) [7]. Department of Animal Husbandry and Dairying, Government of India [8] had established Dairy processing and Infrastructure development fund (DIDF) to strengthen milk production through co-operative sector. Programme encourages modernisation of the dairying sector and facilitate value-added products. Based on the population growth and increase in urbanisation for the next four decades, it is estimated that India needs 600 million tons milk per year to fulfil the demand for milk and milk products (FICCI 2020). NITI Aayog has identified several constraints for development of dairy sector, they are, low productivity, chronic shortages of feed & fodder, large population of unproductive cattle, absence of effective extension system, low health care, immunization and hygienic programme, lack of cold chain logistics, unorganised marketing, etc. Besides breed improvement has to be taken up on priority basis as most of the farmers being small and marginal farmers their herd size will be small, there has to be substantial improvement in milk yield to make the dairy as economically viable unit.

Malnutrition is describing as all kinds of nutritional deficiencies. Malnutrition still remains alarmingly high in the country. Malnutrition among children under five is one of the most serious health problems in India. The condition of women is also very poor, approximately 36 per cent of Indian women of childbearing age are underweight [9]. Globally, India accounts for the highest proportion of stunted (31 per cent) and wasted children (51 per cent) and under five deaths (16 per cent). Improving nutritional outcomes also depend upon the availability and affordability of a nutritious diet. Pattern of food basket in both rural and urban areas continue to be cereal and millet-based food items making them nutritionally insecure. NSSO reports on household consumer expenditure survey of various rounds, indicate that between1993-94 and 2011-12 share of milk in total food expenditure has improved from 15.45% to 19.24%, change of 3.8%, but in terms calorie, the intake of milk, is far from the expected standards.

The growth of dairy sector is not only necessary to boost Indian economy but also essential to ensure livelihoods of most vulnerable section of rural areas, *viz*., small and marginal farmers. Presently the proportion farmers practicing in dairy activity is very low, and it has to be doubled at least in next one decade, since dairying is the next best source of income after agriculture. Moreover, augmenting availability of milk helps in improving nutritional status of rural and urban India a prerequisite to build healthy and strong society.

Application of research: Both union and state governments have to lay more emphasis to improve infrastructure, veterinary services and other backward and forward linkages especially in those states that have not experienced white revolution. Some of the social measures like, distribution of milk in mid-day meals and Anganawadi Kendra's to the children of age group 5-14 years will go a long way in improving health status and also to create demand for fluid milk in rural areas.

Research Category: Dairy Business Management

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****Principal Investigator or Chairperson of research: Dr K B Vedamurthy**
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