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Cost of Milk Production in India :
A Study of Major Milk Producing States

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Abstract

The difference between agriculture and cattle rearing asserts that the later draws similarities more with industry, than agriculture. Agro-climatic conditions do not exert much influence in production and productivity of animals as compared to crops. The study is based on a prmary survey of milk producing farmers in major six states in India. The study found that there were significant difference in costs of production of milk across states in India while the price of milk and milk products weremore or less the same. The cost of production of rearing a cow incurs loss in three out of six sample states while cost of rearing she-buffalo for milk incurs loss in two states.A farmer bears a loss of Rs. 19.67 per day by rearinga in-milk cow in Rajasthan, the second largest milk producing state in India while a buffalo fetches a net return of Rs. 66.54 per day. In Punjab, daily net income from a cow is negative to the tune of Rs. (-)13.65 while a buffalo earns a meagre net income of Rs. 10.64/day.In Uttar Pradesh net return from both cow and buffalo are negligible. In states where the net return from an in-milk cow or buffalo is positive, the income is too inadequate for a household to remain above poverty line (US $1.9/per day), even with three in-milk animals. The loss in milk production is attributed to the reason that the price of milk lags far behind the rise in input price, particularly cattle feeds. Although the central government announces Minimum Support Price (MSP)for 24 agricultural commodities in India based on estimation of costs, yet milk has not yet been included in the list of commodities for cost estimation and MSP.

Introduction

India is the largest milk producer with a share of 22 per cent in global milk production. The USA has been the distant second since 1997 with 12 per cent share in world milk production. As per capita availability of food grains has been oscillating around 450 grams/per person/per day for the last two decades, the per capita availability of milk in India has increased from 227 grams in 2001 to 486 gms/per day/per person in 2020. In the farm dependent population of 263 million comprising cultivators and agricultural labourers, farmer seking out living solely form dairying is as high as 70 million, which is larger than the

total population size of many countries in the world. More importantly, milk production and cattle raising bear a gender dimension too. In the total workforce engaged exclusively in raising of cattle and buffalo, 69 per cent of them are female workers as revealed by Periodic Labour Force Survey, 2018-19 (NSO 2020). Moreover, Female workers employed in the sector constituted 5.72 per cent of the total female workforce in the country and 93 per cent of the females engaged in raising cattle and buffalo reside in rural area.

Dairy industry in India faces several threats. The foremost challenge of dairy sector is its low productivity of indigenous and non-descript cow population and their massive population size. In the international market, productivity of animal is the important single variable influencing export competitiveness. India's share in the world in dairy product export is as low as 2.6 per cent notwithstanding the fact that India accounts for 22 per cent of world milk production. Low productivity of animals and its massive size and growth are partly related to policy changes in contemporary India. The observed trend may be juxtaposed against the fact that imports of dairy products to India has been raising and it leads to sharing of the huge domestic market for dairy products in the country. It is the second threat to the Indian dairy industry. India accounted for 1.3 per cent of the global imports of dairy products in 2018. Emergence of dairy analogues in the market and long shelf life of liquid milk developed in Australia is yet another threat demanding urgent policy level interventions in the sector.

In the total milk produced in India, cow contributed 49 per cent and buffalo produced 51 per cent in 2019.Conversely, in-milk cow population accounted for 62 per cent while buffalo population is only 38 per cent in the total in-milk population. It is due to high proportion of unproductive indigenous and non-descript cow population. The share of exotic breed in the in-milk cow population is only 0.37 per cent. Between the last two livestock Census (2012 and 2019), buffalo population increased by 11.5 lakh and cow population by 25.50 lakh. Eventually, the animal concentration ratio in major milk producing states have increased significantly posing serious stress to scarce resources such as land, water, fodder and feed. Against this backdrop that the study analyses the cost and return from rearing milch animal and milk production in India.The discussion is organised intofive sections.The study area and sampling methods are explained in Section 1. Different cost components and its conceptual differences are elaborated in Section 2. The cost and revenue from milk production by states are estimated in Section 3 and Section 4 compares the profitability from milk production by cow and buffalo in sample states. The study is concluded in Section 5.

Section 1
Locale and Sample

The study used both primary and secondary data sources. Milk producing farmers in six major milk producing states in India, viz., Uttar Pradesh, Rajasthan, Punjab, Maharashtra, Gujarat and Kerala were selected for the study. Although Kerala is not counted as a major milk producing states in the country, the state is included in the sample for its higher proportion of higher breed milch animals in its total in-milk population and prevalence of relatively high labour cost. For sample selection and stratification of states, major milk producing and milch animal rearing states aredefined in terms of a combined index comprising relative share in total milk produced and milch animals reared in India for the year 2014-15. Table 1 shows triennium share in milk production and density of animals by states, based on which a composite share of milk production and animal density by states were arrived at. The justification of combining milk production and milch animal lies in the fact that relative share of milch animals (cow and buffalo) in certain states are below its share in milk production and vice versa. It could be on account of differences in the productivity of animals across states. The relative size of milch animals and milk production were combined together for the selection of sample in the study to give adequate representation for both milk production and animals. From these three strata, six states, 12 Districts, 48 Gram Panchayats and 1500 rural cultivator households were selected for the study. A multi-stage stratified random sampling procedure with village as the ultimate unit in th last stage was adopted.In the first strata, there were only two states, i.e., Uttar Pradesh and Rajasthan. In the second strata, Punjab, Gujarat and Maharashtra were selected. Kerala, the southern most state was selected under strata 3. The primary survey was administrered with a printed schedule and the data was elicited through direct personal interviews. The primary survey were conducted during 2016-17. Table 2 shows sample villages selected for primary survey by states.

Table 1: Trends in Milk Production-2013-15

State	Milk production Trinieum average (000 tone)	Per cent share in milk production	Trinieum average rate of change in milk production	% share in Milch animals	Combined average share in milk and milch population
Uttar Pradesh	17988	18.58	-0.99	15.41	17.00
Rajasthan	8799	9.09	6.22	8.53	8.81
Madhya Pradesh	6055	6.25	7.79	8.98	7.62
Andhra Pradesh	7607	7.86	4.59	7.15	7.51
Maharashtra	6771	6.99	3.08	7.29	7.14
Gujarat	7086	7.32	5.7	5.32	6.32
Punjab	8877	9.17	3.53	3.38	6.28
Others	3348	3.46	1.7	8.59	6.03
Bihar	5084	5.25	7.2	6.24	5.75
West Bengal	3888	4.02	2.5	6.4	5.21
Tamil Nadu	5273	5.45	8	4.32	4.89
Karnataka	4021	4.15	2.61	4.67	4.41
Haryana	5296	5.47	1.38	3.17	4.32
Orissa	1352	1.4	5.62	4.36	2.88
Jharkhand	1355	1.4	2.66	2.43	1.92
Kerala	2069	2.14	2.3	0.96	1.55
J & Kashmir	1407	1.45	-0.77	1.58	1.52
Uttarakhand	1205	1.24	0.75	1.22	1.23
All India	96806	100.00	4.44	100.00	100.00

Source: Statistical Abstract, relevant issues

Table 2. Sample States, Districts and Villages

State	District	Name of Villages
Rajasthan	Jaipur Bikaner	Kalakh, Bhamod Palana, Dhirera
Gujarat	Banaskantha Narmada	Jalotra, Chandisar Gamkuva
Uttar Pradesh[1]	Agra Bulandshahar	Baruar, Turkiya Bagarai, Nagla Shekhu, Hazratpur Puthari
Punjab	Amritsar Kapurthala	Attari, Nesta Lakhanke Padde, Sangojala, Tilma
Maharashtra	Ahmadnagar Latur	Tandulwa, Arad Bamni, Brahmawadi
Kerala[2]	Thrissur Thiruvananthapuram	Puthur, Mulamkunathukvu Vellarada, Kollayil

Note : 1. In certain districts, adequate samples were not available or people were not satisfactorily responsive to the field investigators. In such cases, sample villages were substituted with adjacent villages for the field survey and, therefore, number of villages was more than the number of sample villages originally selected.

2. In the case of Kerala, farmers rearing she-buffalo were few and far between and, therefore, sample households could not be obtained for buffalo rearers.

Section 2

2.1 Concepts and Method of Cost Estimation

There exist different methods to estimate cost of production of milk. The cost of milk production is defined as the value of inputs on intermediate products consumed to produce milk (*Hemme et al., 2014*). The studies on the cost of production of milk in India do suffer from two major methodological issues: (i) Cost estimations are region specific; and (ii) lack of uniformity in concepts on cost and return. It makes inter-temproal and inter-spatial comparisons rather difficult. There is no official estimates of the cost of production of milk notwithstanding the fact that value of output from livestock sector far exceeds the combined value of wheat and rice produced in India. Among 24 major agricultural commodities produced in India, for which cost of production and Minimum Support Prices (MSP) are estimated annually, milk has been kept out of the purview for reasons logically not explainable. It is the reduction adabsurdum excluding milk from the purview of MSP.

A recent study on cost of milk production in 46 countries revealed that the average cost of milk production was 42 US$/100kg (*Hemme et al., 2014*). The cost of milk production is the highest in Western Europe (53.6 US$/100kg for Energy (Fat) Corrected Milk (ECM) and it was attributed to higher input costs. In contrast, the lowest cost was recorded in Asian countries with US$ 30.41/100kg for ECM. In the case of cost components, feed costs is the costliest item, followed by labour. An important finding of the study is that the herd size or the scale of production has no significant impact on production cost while milk yield has moderate impact on cost of production of milk in 104 typical dairy farms selected from 46 countries(*ibid)*.

In a study on cost of production of milk in Punjab, it was reported that there was an inverse relationship between rural poverty and livestock share in agricultural growth (*Kaur et al., 2012).* Major item in the cost of production of milk was found to be variable cost accounting for 87 per cent in the total. It was argued that the procurement price for milk had not taken into account in the estimation of cost structure of milk production in Punjab. In order to make dairying a profitable venture, profit margin over total cost of production should be 50% as against the prevailing profit margin of 25% to 30%. Along with Fat and Solid Not Fat(SNF) content in price fixation, cost of production of milk needs to be taken into account.However, a major limitation of the study is that the method adopted to estimate cost of production by its components are not on par with any standard method of cost estimation.

Ghuleet al.,(2012) analysed the cost of milk production in 40 commercial dairy farms in Maharashtra. Commercial farms for dairying is defined as the one established for production and sale of milk by employing hired labour and adopting modern management practices. The study took Ahmednagar district of Maharashtra as sample locale. Average

investment per farm was estimated at Rs. 12.17 lakh and the share of dairy animals in total investment accounted for 51.28 per cent for small farms and 70.12 per cent for large farms.The study observed that there was an inverse relationship between farm size and animal productivity.The average productivity of cross-bred cattle was 9.72 litre per day in small farms, 9.58 litre per day for medium farms and 9.49 litre per day for large farms. The cost of production of milk per litre was Rs. 12.49; Rs. 12.58; and Rs. 11.48 for small, medium and large farms respectively.The net return over cost per litre of cow milk produced was Rs. 2.16. However the study cannot be generalised for two reasons: (i) cost and return estimations are confined to Ahmednagar district in Maharashtra; and (ii) non-commercial farms which constitute a large chunk of milk production sector in India is not included in the sample for the study.

2.2 Estimation of Cost of Production of Milk

There are three methods to estimate cost of production of milk, viz., (i) descriptive analysis; (ii) survey method; and (iii) economic engineering method.A serious limitation to employ these methods in the Indian context is the heterogeneity of farms or households rearing cattle for milk production for subsistence.Households rearing cattle for milk have its own cost structure and it is important to identify certain costs, which are comparable across units of production within a geographical entity. Important type of costs are: (i) traceable cost; (2) common cost; (3) direct cost; (4) indirect cost; (5)variable cost; (6) fixed cost; (7) quasi-fixed cost; (8) explicit cost and implicit cost; (9) short-run; (10) medium term; and (11) long run cost. Although these cost concepts overlaps in several ways, each cost component is important with respect to dairy sector.

A major bottleneck in the estimation of cost of production of milk is the non-availability of reliable data on cost of and return from catrtle rearing.For international comparison, data on cost of and return from milk production are made available by International Farm Comparison Network (IFCN). The IFCN approach employs the Typical Farm Approach (TFA). The approach was developed in 1928 by Elliot. Under the TFA, a model farm or a representative farm is selected.A typical farm is defined as a model farm employing the same method of production with comparable farm size and technology. The model farm is often selected from a group or sample size based on its system of production and level of technology. Two type of farms are selected under TFA approach. The first type uses average management practices and the second type of farm is the one with a herd size larger than the first one. The farm with larger herd size would indicate the impact of scale economy on production. Available data on milk production, herd size, capital and technology employed are used to estimate cost of production of milk under the TFA. However, panel approach uses data from direct interview of model farms, experts on the subject and officials from the animal husbandry department. The advantage of TFA approach is that it is scientific because data available with the farm is validated with major stake holders of the sector and area from where sample is drawn.

The IFCN Network Approach, on the other hand, estimates cost of milk production. Often, the method is used to make inter-country comparisons. The IFCN is a global knowledge-creating network in milk production that connects different stake holders of the dairy sector, viz., dairy farmers, researchers, dairy companies, investors, policy makers, advisors and institutions working in the world. Whether it is at the national level or global level, primary challenge is the standardisation of input data and estimation of costs. The IFCN approach employs classical cost function, which states that the long run average cost curve is an aggregation of short-run cost or cost envelope curve.

The use of typical farms or representative farms in economic analysis occurred in 1928 when Elliot defined a typical farm as being a model farm in a frequency distribution of farms of the same universe.It is representative of what a group of farmers are doing. In IFCN approach, a typical farm represents a certain production system, farm size, production technology used and the related milk volume in a country or state. Two typical farms are set up in each region. First farm: A Model sized farm with average management performance. The second farm selected from the second most common farming system having larger herd size than the first one.

In the estimation of cost of production of milk, there are several challenges and some of them are insurmountable.The challenge is mostly of conceptual differences, changes in defenitions and indivisibilities of different cost components. It is important to examine how one can measure and compare the cost of milk production in diverse farming systems in an unbiased manner.

2.3 Method used in the Present Study

There are three methods employed in the estimation of cost and return from milk production, viz., (i) Survey Method; (ii) Direct Observation Method; and (iii) Formula Method.

(i) Survey Method: It is the widely used method n India for the estimation of cost and return of milk production. In this method, the researcher visits dairy farms and collects data on cost items and price of milk either from the records maintained by the farmer or elicit data through direct interview.The advantage of this method is that the size of sample can be increased substantially to arrive at a robust estimate with minimum expenditure.

(ii) Direct Observation Method (DOM): In this method, the researcher directly observes daily activities of the farm and records it for the purpose of undertaking research.Under the direct observation method, the researcher does not use the data gathered by the farmer, but collects data for herself. The advantage of Direct Observation Method over Survey Method is that the DOM supplies more accurate and reliable data on cost and returns as compared to other methods. However, the

limitation of the method is its practical difficulty involved in observing many farms at a time.

(iii) Formula Method (FM): It is one of the oldest methods of cost estimation. In this method, the cost is estimated using a linear regression with the assumption that the feed cost accounted for about 65 percent to 70 percent of the cost of milk production.

The present study employs survey method to estimate cost of production and returns from dairying in sample states. Tables 3, 4 and 5 explain important cost concept used in the present study. The concepts and definitions of different cost components are adopted from IFCN cost concepts and definitions.

Table 3. Definition of Cost Concepts

Sl. No.	Concept	Type of cost	Description
1	Labour cost	Direct cost	Actual wage paid in cash for hired labour.
2	Family labour	Variable cost	Prevailing wage rate for MGNREGA in the state on an hourly basis is used for wage imputation. Mostly, female labours are engaged in cattle rearing in subsistence farm households.
3	Capital cost	Fixed cost	Capital (assets excluding land), plus circulating capital. Interest rate is charged as 10% for borrowed capital from formal money market. For borrowed capital from informal sector, actual interest paid is used.
4	Depreciation	Fixed cost	Depreciation for machinery and buildings were estimated using a straight-line schedule on purchase price with a residual value of zero.
5	Adjustment of GST	Variable cost	Cost components and returns are stated without value added tax
6	Land cost	Opportunity cost or implicit cost Fixed cost and long term cost	It is estimated based on the prevailing land rent in the village wherein the farm is located. For farmers with one or two cattle and maintained in the yard of the house, no rent is charged because the cattle shed is used for other purposes like keeping fire wood and agricultural machine. Land in the yard of the house often does not fetch any rent and, therefore, its opportunity cost is negligible or zero. However, land cost was calculated for only commercial farms with ten or more cattle.

Table 4.Estimation of Fixed Cost Components

Sl.No	Fixed Cost Item	Defentions and Computations
1.	Depreciation of animals	(Purchase price of animal (P_t) -Discounted value of animal after productive life P_{t-7}) / Productive life in years (PDL) (Assumed productive life – 7 years) Estimated value after productive life = P_t * 0.3)
2.	Annual Depreciation of animals	(P_t) – (P_t * 0.3) / (PDL)
3.	Interest rate	10%,I_r (Actual Interest rate)
4.	Building expenses	It has been estimated that a buffalo or cow requires 70 sq.ft floor.
5.	Cost of construction of cattle shed for a buffalo/ cow	Rs. 750 per sq.ft. 70 sq.ft. *Rs. 750 =Rs. 52500. It is assumed that life of cattle shed is 25 years. Annual depreciation of the cattle shed is worked out as (52500 / 25) = Rs. 2100.
6.	Equipment cost Depreciation cost of equipment	Life span 10 years. (Meh_{t10}) Annual Depreciation of Machines= Machine cost price ((M_{pr}) * 0. 29) / (10))+ annual interest rate on principal amount.

Table 5.Computation of Variable Cost

Item	Bought from the market	Home Production
Fodder cost	Market price * Quantity fed	Market price * Quantity fed
Concentrates	Market price * quantity fed	Nil
Labour	Man hours spent per day per animal	Inputed
Light and water	Rs. 50 per day per animal	Nil
Cost of Medicine per day per year	Actual	Nil

Assumptions of cost estimation of milk Production

1. Average lactation period is considered 300 days for buffalo and cross breed cow. Dry period is 100 days for buffalo and 80 days for cross breed cow;
2. Male calves are disposed off for bullocks;
3. Labour cost is estimated employing MGNREGA wage rate for respective states. It is justifiable in the context that majority of workers in MGNREGA are women and they tend animals in households;
4. An estimated cost of Rs. 5000 is fixed for the purchase of milk Can, other vessels, chaff cutting machines and other paraphernalia used in households for milk production;
5. For the estimation of cost of production of milk, daily cost of production of milk per cow and buffalo are estimated.
6. The cost of construction of cattle shed is estimated using the actual cost of construction as reported by the farmer and accounted for annual depreciation to arrive at the current value.

Section 3
State-wise estimation of Cost of Production of Milk and its Return

It may be noted that the primary survey was conducted during 2016-17 and the price of cattle feed and veterinary expenses have increased manifold after the survey.Conversely, the price of milk has recorded only minimum increase during the last five years and the same is the case with price of milch animals.

3.1 Rajasthan

In Rajasthan, as compared to other states, preference for cow and buffalo do vary significantly across districts depending on the availability of water, green fodder and weather conditions. The desert districts in the western part of Rajasthan prefer to rear indigenous cow. Farmers experience in western Rajasthan is that the indigenous and non-descript cow withstand extreme heat in 17 out of 33 districts in the state and cow is preferred to buffalo. Further, non-descript cow is preferred to hybrid animals as farmers believe that indigenous cow is less susceptible to diseases and withstand extreme weather conditions in desert districts. However, the productivity of indigenous cow is relatively low and, therefore, production of milk is rather confined to own consumption. Cattle are reared mostly on non-commercial purpose in desert districts in Rajasthan. Table 6 shows the cost of production of milk in Rajasthan by type of animals. It is estimated that average cost of rearing in-milk buffalo is Rs. 202.36 per day and cow is Rs. 218.25. Cattle feed is the single largest item in the cost and the second largest cost item is labour. Table 7 shows the cost, return and net income from rearing cow and buffalo in Rajasthan. It is found that average daily net income from rearing in-milk cow is Rs. 198.58 and buffalo is Rs. 268.89. By rearing a cow, a farmer incurred a loss of Rs. 19.67 per day while the buffalo earned a net income of Rs. 66.53 per day.Production of cow milk in Rajasthan is a loss making venture for the reason that cow milk fetches a lower price as compared to buffalo milk. In the sample, particularly in districts like Bikaner and Sri Ganganagar, commercial production of cow milk incurs a higher cost.Table 7 shows the sale pattern of milk by animals in Rajasthan. The Dairy Cooperative Societies (DCS) are major buyers of both buffalo and cow milk in Rajasthan. More than 55% of buffalo milk is sold to the DCS and 33% of the milk is used for own consumption by the farmer. The sale of buffalo milk to vendors and non-milk producing households in the neighbourhood accounted for 7% and 3% respectively of the total buffalo milk production in the state. In the case of cow milk too, DCS is the single major buyer (55%) and 22% of the total milk produced is used for own consumption. A notable difference in the sale structure between cow and buffalo milk is that 17% of the cow milk is sold to the milk vendors in the village because the price of cow milk in DCS is less as compared to buffalo milk.

Average cost of production of cow milk per litre is Rs. 31.77 while the income from the sale of milk including the quantity consumed at home is Rs. 28.91. The loss per litre of cow milk production is Rs. 2.86. In the case of buffalo milk, average cost of production is

Rs. 27.72 and average income from the sale of buffalo milk is Rs. 36.77. A litre of buffalo milk yields a profit of Rs. 9.11 (Table 6).The cost of production of cow milk was found to be on a higher side because the quantity of cattle feed and dry fodder fed for cow is on a higher side as compared to buffalo. Moreover, average productivity of buffalo is higher than cow and it also has added onto the cost of production and net return. A higher purchase price of buffalo is offset by its higher productivity and lower maintenance cost as compared to cow.

Table 6. Cost of Production of Milk in Rajasthan

Item	Buffalo			Cow		
	Quantity	Price (Rs.)	Total value (Rs.)	Quantity	Price (Rs.)	Total value (Rs.)
Average cost of animal	1	32850	32850	1	19780	19780
Cattle shed (construction cost)	1	57857	57867	1	57857	57867
Milking pails, buckets, canes, chains, milk recording balance, chaff cutter, bicycles and other equipment- Purchase price	All	5000	5000	All	5000	5000
Depreciation on cost of animals per day	1	18	18	1	10.83	10.83
Depreciation on cost of buildings	1	22.19	22.19	1	22.19	22.19
Depreciation on cost of machine and other accessories	1	2.90	2.90	1	2.90	2.90
Dry fodder (Kg/day)	8.75	6	52.5	9	6	54
Green fodder (Kg/day)	4	2	8	5	2	10
Concentrates (Kg)/day) per animal	3.36	18	60.48	4.5	18	81
Veterinary aids (Doctors cost per visit)	1	235	235	1	235	235
Medical expenditure per visit (Rs.)	1	260	260	1	260	260
Number of Medical visits	3	0	0	3	3	3
Average medical cost per animal per day	1	4.06	4.06	1	4.06	4.06
Insurance cost/per day	1	1000	2.73	1	1000	2.73
Insemination cost/day	1	185	0.50	1	200	0.54
Labour (in hours & Rs.)/day	2 hrs.	31	31	2 hrs.	31	31

Source: Primary survey

Table 7. Sale Pattern and Price of Milk in Rajasthan

Item	Buffalo					Cow				
	Society	House-holds	vendor	Own consu-mption	Total milk	Society	Vendor	House-holds	Own consu-mption	Total
Sale of milk (in litre)	4.03 (55)	0.3 (4)	0.53 (7)	2.44 (34)	7.30 (100)	3.76 (55)	1.14 (17)	0. 5 (7)	1.47 (22)	6.87 (100)
Price of milk per litre (Rs.)	36.80	36	30	36.80	264.79	28	27	30	30	195
Value of cow dung (per year) / per day (Rs.)	1500	0	0	0	4.10/ day	1250	0	0	0	3.42

Note: Figures in parenthesis indicate the per centageshare.

Source: Primary survey

Table 8. Comparison of Cost and Income from Milk Productionby Type of Animals in Rajasthan

Item	Buffalo (per animal)	Buffalo (Per Litre)	Cow(Per animal)	Cow (Per Litre)
Cost (Rs.)	202.36	27.72	218.25	31.76
Income (Rs.)	268.89	36.83	198.58	28.90
Net Income (Rs.)	66.53	9.11	(-) 19.67	(-) 2.86

Source: Primary survey

3.2 Kerala

At the outset, it needs to be pointed out that agriculture, particularly rice cultivation, has declined significantly in Kerala. Further, rice cultivation is confined to a few districts in the state (Mohana Kumar, S., 2008). The fall in area under rice cultivation, which has supplied fodder to animals in the past has a significant bearing on the profitability of milk production in the state. For the last few decades, dry fodder or straw is imported to Kerala from neighbouring states and it adds onto the cost of maintenance of animals. During the field survey, it was noted that cattle rearing have considerably declined in the state. Farmers rearing buffalo was found to be very rare and, therefore, the cost of production of buffalo milk was not include in the study.

Important reasons, other than the fall in area under rice cultivation, which have contributed to the decline in cattle rearing are: (i) fall in the size of family, particularly the supply of family labour for tending cattle; (ii) the price of milk paid by DCS based on fat content is less during the early lactation stage of the animal and it makes cattle rearing a loss a making venture; (iii) shortage of labour for agriculture related activities in the state on the one side and higher daily wage, particularly in the context of the non-remunerative price for

milk; (iv) average size of holdings in the state even in rural area is 0.19 acre and it makes cattle rearing rather difficult as farmers find it difficult to dispose dung and urine. It was reported in Thiruvananthapuram district that farmers had sold off their cattle as non-cattle rearing households in the neighborhood complained about the smell of dung and urine and the farmer was rather forced to end cattle rearing.

Table 9. Cost of Production of Milk in Kerala

Item	Cow		
	Quantity	Price (Rs.)	Total value (Rs.)
Average cost of animal (buying price)	1	15665	15665
Cattle shed (No)	1	26354	26354
Milking pails, buckets, canes, chains, milk recording balance, chaff cutter, bicycles and other equipments	All	5000	5000
Depreciation on cost of animals per day	1	8.55	8.55
Depreciation on cost of buildings/day	1	10.10	10.10
Depreciation on cost of machine/day	1	2.90	2.90
Dry fodder (kg)/day	6.15	7.30	45
Green fodder (kg)/day	25	4	100
Concentrates (kg)/day	5.87	17.53	103
Veterinary aids (Doctors cost per visit)	1	215	215
Medical expenditure per visit/day	1	944	944
Number of visits in a year/day	1	7.2	7.2
Insurance cost/day	1500	4.10	4.10
Average medical cost per animal per day	1	22.27	22.27
Insemination cost (per unit)/day	170	0.50	0.50
Labour charges (in hour)/day	1.88	38.54	38.54

Source: Primary survey

Table 9 shows the cost of production of cow milk in Kerala. Important observations from Table 9 are: (i) average price of a milch cow in Kerala is less as compared to other sample states; (ii) number of visits of a veterinary doctor to a household in Kerala is much higher than other sample states and more or less the same is the case with the cost of medicine; (iii) average productivity of cow in Kerala is comparable with other major cow rearing states in India; (iv) purchase price of cow in the early lactation stage in the state is between Rs. 30000 and 40000, but the average price has worked out so low because in the late lactation phase, cow is sold at very low price because of higher fodder cost and labour cost in the state.

Table 10 shows the sale pattern and price of milk in Kerala. It has to be noted that the state of Kerala is not a state with habitual milk drinkers like the northern part of India. In the total production of cow milk, 76% is sold to DCS. The DCS exist almost in every ward of the Gram Panchayat. The scope of milk vendors is limited and only negligible proportion of the milk is sold to them. Similarly, unlike in other states, only 10% of the milk produced at home is consumed in households whereas in other states, it is above 20%. Like in other states, there is a significant difference in price between DCS and the open market, comprising mostly non-milk producing households in rural and urban Kerala. The milk sold to households fetches a price 20% to 25% higher as compared to the price in DCS. However, sale of milk to households is limited as packed milk is available in every corner of the village, which can be stored at home for more than a day. The income from the sale of milk in the state is higher and further the substitution of rice with banana and vegetables has increased the use of dung. However, unlike in other states, farmers with banana and vegetable cultivation do not prefer to have cattle at home because of the higher rearing cost of the animal in terms of labour.

Table 10. Sale Structure and Price of Milk in Kerala (Rs.)

Item	Cow				
	Society	Vendor	Households	Own consumption	Total
Sale of milk	6.42 (76)	0.10 (1)	1.03 (13)	0.88 (10)	8.43 (100)
Price of milk per liter	26.77	28.84	32.66	26.77	275.32
Value of cow dung (per year)	4380	0	0	0	12/day

Source: Primary survey

Table 11. Comparison of Cost and Income from Milk Production in Kerala (Rs.)

Item	Cow (per animal)	per litre of milk
Cost	330.86	39.25
Income	287.32	34.08
Net Income	(-) 47.64	(-)5.65

Source: Primary survey

Table 11 shows the cost and return from the production of cow milk in Kerala. It is found that rearing a milch cow in the state costs Rs. 330.86 per day and the average production of milk from cow is Rs. 287.32 and it amounts to a loss of Rs. 47.64 per day. One kilogram of milk produced in the state costs Rs. 39.25 to the farmer while the return from the milk including the quantity of milk consumed at home is Rs. 34.08.A litre of cow milk produced in the state incurs a loss of Rs. 5.65. The higher costs of dry fodder and green fodder dissuade farmers from rearing cattle and it is the price of fodder and feeds which push up the cost of production of milk in the state.

3.3 Gujarat

Gujarat is one of the major milk producing states in India. It is also a state with prominence of buffalo population over cow. Further, like other states in the northern part of India, milk drinking habit is also very prominent in the state. It may be noted that cost of construction of cattle shed is the same for both buffalo and cow and further, it is rather difficult to separate the cost of construction of shed for cow and buffalo. Unlike many other states in the sample region, there is green fodder cost in villages. Farmers grow green fodder along with other crops and, therefore, fodder is priced. However, farmers with minimum land under possession do not grow fodder crops but the tradition in villages is that they can cut fodder from neighbour's land for their cattle and that is precisely the reason for the absence of a fodder market in the state. In the absence of a fodder market, farmers are unable to report the price for green fodder. The cost of production of milk in Gujarat remains relatively low because of the inferior variety of cattle, and low wage and availability of cheap fodder. In other states, cattle feed and concentrates per kg cost Rs. 18-20 whereas in Gujarat it is only Rs. 13/. The average number of doctors' visits for an animal per annum is about 3 and it is the second highest after Kerala.

Table 12 shows the market structure of buffalo and cow milk in Gujarat. It is found that 67% of buffalo milk and 85% of cow milk is sold out in the market. Cooperative societies (DCS) is the single most important marketing network in the state accounting for more than 75 per cent of the total milk traded in the state. Almost every household in rural area tend milch animal and therefore there exists very little possibility to sell milk in neighbourhoods. Although milk vendors and *Dhudias* (milk vendor with money lending for purchase of animals) are very prominent in Gujarat. It was reported that 33% of buffalo milk and 15% of cow milk is used for own consumption by farmers.

Table 13 shows the cost and return from the production of milk per animal per day as well as per litre. Production of cow milk is relatively more profitable in Gujarat as compared to buffalo milk and the difference is mainly on account of the difference in productivity of cow and buffalo. Average daily net income from a buffalo is Rs. 9.03 while the same from a cow is Rs. 50.35/animal/day.

Table 12. Cost of Production of Milk in Gujarat

Item	Buffalo			Cow		
	Quantity	Price (Rs.)	Total value (Rs.)	Quantity	Price (Rs.)	Total value (Rs.)
Average cost of animal	1	28818	28818	1	16725	16725
Cattle shed (No.)	1	58135	58135	1	58135	58135
Milking pails, buckets, canes, chains, milk recording balance, chaff cutter, bicycles and other equipments (Rs.)	All	5000	5000	All	5000	5000
Depreciation on cost of animals per day (Rs.)	1	7.89	7.89	1	4.58	4.58
Depreciation on cost of buildings per day (Rs.)	1	6.37	6.37	1	6.37	6.37
Depreciation on cost of machine per day (Rs.)	1	6.37	6.37	1	2.88	2.88
Dry fodder (kg)	11.90	2.07	24.63	11.41	2.5	28.52
Green fodder (kg)	20.07	0		16.42	0	0
Concentrates (kg)	3.92	13.93	54.60	4.11	13.48	55.40
Veterinary aids (Doctors cost per visit)	1	108	108	1	108	108
Medical expenditure per visit	1	395	395	1	395	395
Average number of visits in a year	3.27	0	0	3.27	0	0
Insurance cost	1	1000	2.73	1	1000	2.73
Average medical cost per day/ per animal	1	4.50	4.50	1	4.50	4.50
Insemination cost	1	160	160	1	160	160
Labour (in hour)	2.77 hr	46.77	46.77	2.77 hr	46.77	46.77

Source: Primary Survey

Table13. Sale Structure and Price of Milk in Gujarat

Item	Sale of Buffalo Milk					Sale of Cow Milk				
	Society	House-holds	Vendor	Own consum-ption/use	Total milk	Society	Vendor	House-holds	Own consum-ption/ use	Total
Sale of milk (Qty.)	4.19	0	0	2.11	6.30	6.61	0	0	1.15	7.76
% share	66.51	0.00	0.00	33.49	100.00	85.18	0.00	0.00	14.82	100
Price of milk per litre (Rs.)	36	0	0	36	36	26	0	0	26	26
Value of cow dung (per year) & per day (Rs)	1450	0	0		3.97/ day	705	0	0	0	1.93/ day

Source: Primary survey

Table14. Comparison of Cost and Income from Milk Production in Gujarat (Per litre of Milk)

Item	Buffalo per animal	Buffalo milk per litre	Cow per animal	Cow milk per litre
Cost (Rs.)	145.78	23.03	153.28	19.75
Income (Rs.)	154.81	24.46	203.69	26.15
Profit (Rs.)	9.03	1.43	50.35	6.40

Source: Primary survey

3.4 Punjab

Punjab is the second largest milk producing state in India after Uttar Pradesh. Punjab is primarily a buffalo rearing state. The average price of a cow is only Rs. 12583 while a buffalo cost Rs. 24633. A murrah breed buffalo in its early lactation phase cost between Rs. 70000 and Rs. 85000 while a hybrid cow in its early lactation phase costs between Rs. 40000 and Rs. 50000.Dry fodder is costlier in Punjab. On an average, annually an animal needs 3.5 times visit of a veterinary doctor and insemination cost is Rs. 150 (Table 13). Table 14 shows the market structure of milk produced in Punjab by type of animal.

Table15 shows the cost and return from cattle rearing in Punjab. It is found that cow milk production in Punjab incurs a loss of Rs. 13.65 per animal and Rs. 2.08 per litre. It may be noted that although the cost of production of cow milk is less as compared to cost of production of buffalo milk, higher fodder and feed costs on the one hand and low price for cow milk resulted in a loss. However, it is found to be the practice in Punjab that farmers

keep both cow and buffalo together. Buffalo milk is often sold out and cow milk is used for own consumption.

Table15. Cost of Productionof Milk in Punjab

Item	Buffalo			Cow		
	Quantity	Price (Rs.)	Total value (Rs.)	Quantity	Price (Rs.)	Total value (Rs.)
Average cost of animal	1	24633	24633	1	12583	12583
Cattle shed (No.)	1	48996	48996	1	48996	48996
Milking pails, buckets, canes, chains, milk recording balance, chaff cutter, bicycles and other equipment	All	5000	5000	All	5000	5000
Depreciation on cost of animals per day	1	13.59	13.59	1	6.94	6.94
Depreciation on cost of buildings/day	1	19.01	19.01	1	19.01	19.01
Depreciation on cost of machine & equipment/day	1	2.88	2.88	1	2.88	2.88
Feeding during lactation						
Dry fodder (kg)/day	11.16	3.16	35.27	10.71	3.26	34.91
Green fodder (kg)/day	21.07	2	42.14	21.72	2	43.44
Concentrates (kg)/day	2.95	17.22	50.80	2.66	15.91	42.32
Veterinary aids (Doctors cost per visit)	1	150	150	1	150	150
Medical expenditure per visit	1	175	175	1	175	175
Number of visits in a year	4.10	NA	NA	4.10	NA	NA
Average Medical Expenditure per day	1	3.5	3.5	1	3.5	3.5
Insurance cost/day	1	1000	2.74	1	1000	2.74
Insemination cost/day	1	150	0.41	1	170	0.46
Labour (hours)/day	1.95	40.66	40.66	1.95 hr	40.46	40.46

Source: Primary survey

Table16. Sale Structure and Price of Milk in Punjab

Item	Buffalo (Quantity)					Cow (Quantity)				
	Society	House-holds	Ven-dor	Own consum-ption	Total	Society	Ven-dor	House-holds	Own consum-ption	Total
Sale of milk (in kg)	1.36 (19.10)	2.74 38.48	0.43 6.04	2.23 31.32	7.12 (100)	1.12 17.10	0.39 (5.95)	2.79 (42.60)	2.25 (34.35)	6.55 (100)
Price of milk per kg	29.20	28.83	30.60	68.23	220.32	23.74	27.66	22.90	51.52	181.73
Value of cow dung (Rs per year)	492	0	0	0	1.43/ day	473	0	0		1.29/ day
Income per day (Rs)	39.71	79	13.15	68.23	221.75	26.58	10.78	63.89	51.52	183.01

Note: Figures in the parenthesis show per centage share of milk sold and consumed .
Source: Primary survey

Table17. Comparison of Cost and Income from Milk Productionin Punjab

Item	Buffalo (per animal)	Buffalo milk per litre	Cow (per animal)	Cow milk per litre
Cost (Rs.)	211.11	29.65	196.66	30.02
Income (Rs.)	221.75	31.14	183.01	27.94
Profit (Rs.)	10.64	1.49	(-) 13.65	(-) 2.08

Source: Primary survey

3.5 Maharashtra

Maharashtra is another important milk producing state in India. The state is primarily a cow rearing state while buffalo population is equally prominent in the state. In Maharashtra, the region with prominent banana cultivation, banana leaves and banana *kant* (roots and stumps) are widely used to feed both cow and buffalo. As fodder is available free of cost from farmers, green fodder is not very costly in the area. Moreover, drinking cow milk is part of the food habit in the region because people traditionally believe that cow milk has certain nutrient characteristics, which are absent in buffalo milk. Hybrid cow is reared in the state and a cow of such variety in its early lactation stage cost about Rs. 50000-60000. (Table 18).

Table 18. Cost of Productionof Milk in Maharashtra

Item	Buffalo			Cow		
	Quantity	Price (Rs.)	Total value (Rs.)	Quantity	Price (Rs.)	Total value (Rs.)
Average cost of animal	1	19333	19333	1	24300	24300
Cattle shed	1	31744	31744	1	31744	31744
Milking pails, buckets, canes, chains, milk recording balance, chaff cutter, bicycles and other equipments	All	5000	5000	All	5000	5000
Depreciation on cost of animals per day	1	10.66	10.66	1	13.30	13.30
Depreciation on cost of buildings/day	1	13.79	13.79	1	13.79	13.79
Depreciation on cost of machine/day	1	0.39	0.39	1	0.39	0.39
Feeding during lactation						
Dry fodder (kg)/day	8.21	1.66	13.62	5.44	1.66	9.03
Green fodder (kg)/day	22.33	0	0	25.99	0	0
Concentrates (kg)/day	2.44	16.41	40.04	3.44	16.41	56.45
Veterinary aids (Doctors cost per visit)/day	1	211	211	1	211	211
Medical expenditure per visit/day	1	412	412	1	412	412
Number of visits in a year	3	1869	1869	3	1869	1869
Average Medical cost per day	1	5.02	5.02	1	5.02	5.02
Insurance cost/day	100	0.27	0.27	100	0.27	0.27
Insemination cost/day	220	0.60	0.60	310	0.60	0.60
Labour (hour)/day	2.37	145	42.94	2.37	145	42.94

Source: Primary survey

Table 19. Sale Structure and Price of Milk in Maharashtra

Item	Buffalo					Cow				
	Society	House-holds	vendor	Own consu-mption	Total	Society	vendor	House-holds	Own consu-mption	Total
Sale of milk	0.82	3.06	0.10	2.01	5.99	4.22	5.44	0.22	1.72	11.60
% share	13.69	51.09	1.67	33.56	100.00	36.38	46.90	1.90	14.83	100
Price of milk per litre	28.50	30	25	30	177.97	18.33	19.5	24	24	229.99
Value of cow dung (per year)/day	0	1570	0	0	4.30/ day	1520	0	0	0	4.16/ day

Source: Primary survey

Table 20. Comparison of Cost and Income from Milk Production in Maharashtra

Item	Buffalo per animal	Buffalo milk per litre	Cow	Cow milk per litre
Cost	127.33	21.26	141.79	12.22
Income	182.27	30.43	234.15	20.19
Profit	54.94	9.17	92.36	7.96

Source: Primary survey

Table 19 shows the market structure and price of milk in Maharashtra. It is found that buffalo milk is mostly sold to households and not to to DCS. People buy buffalo milk at a higher price as compared to cow milk because of its high fat content.Buffalo milk is mostly sold to vendors. The consumption of buffalo milk from production is as high as 34 per cent as compared to 14 per cent in the case of cow milk. Cow milk is sold to vendors *(dhuthias)* because farmers receive loan from them and purchase cow and buffalo or vendors supply cow and buffalo to farmers. Vendors buy milk from the farmer at a pre-determined price which includes the interest of the capital invested by the *Dhuthia*. Table 20 shows the income and expenditure of producing a litre of cow and buffalo milk in Maharashtra and also the cost of milk production from a cow and a buffalo. It is found that both cow and buffalo milk production is profitable in Maharashtra and relatively buffalo milk production yields Rs. 9.17 per litre as profit while cow milk production earns Rs. 7.96 litre per litre of milk production in the state.

3.7 Uttar Pradesh

Uttar Pradesh is the largest milk producing state in India.It is also a state with prominence of buffalo.Table 21 shows the cost structure of cow and buffalo milk production in the state.There exists a green fodder market in Uttar Pradesh and it is priced unlike in other states like Maharashtra and Rajasthan.

Table 21. Cost of Production of Milk in Uttar Pradesh

Item	Buffalo			Cow		
	Quantity	Price (Rs.)	Total value (Rs.)	Quantity	Price (Rs.)	Total value (Rs.)
Average cost of animal	1	30640	30640	1	33000	33000
Cattle shed	1	39089	39089	1	33000	33000
Milking pails, buckets, canes, chains, milk recording balance, chaff cutter, bicycles and other equipments	All	5000	5000	All	5000	5000
Depreciation on cost of animals per day	1	17.64	17.64	1	18.10	18.10
Depreciation on cost of buildings/day	1	14.97	14.97	1	12.65	12.65
Depreciation on cost of machine/day	All	0.50	0.50	1	0.50	0.50
Dry fodder (kg)/day	10.41	3	31.23	9.11	3	27.33
Green fodder (kg) /day	12.44	1.3	16.17	11.45	1.3	14.89
Concentrates (kg) /day	3.6	19.22	69.19	2.95	18.99	56.02
Veterinary aids (Doctors cost per visit)	1	134	134	1	134	134
Medical expenditure per visit	1	337	337	1	337	337
Number of visits in a year	1	3	3	1	3	3
Insurance cost/day	1	1000	2.70	1	1000	2.70
Average Medical Expenditure per day	1	3.87	3.87	1	3.87	3.87
Insemination cost/day	1	95	0.26	1	95	0.26
Labour (hour)	1	1.5	23.47	1	2.00	31.25

Source: Primary survey

Table 22 shows the market structure and price of milk in Uttar Pradesh. Buffalo appears to be relatively more productive as compared to cow population in Uttar Pradesh. The state is known for its dominance of *Dudhias* in milk trade and milk vendors account for a major share of the milk traded in the state. However, DCS are also prominent in the state. More than 40 per cent of the domestic production of cow milk is used for own consumption while the same for buffalo milk is 24 per cent. As buffalo milk fetches higher price in the market, farmers sell it while they drink cow milk.Table 22 compares the cost and income from milk production in Uttar Pradesh. It is found that a buffalo earns a profit of Rs. 81.75 per day while cow milk production earns no profit, but incur a loss.

Table 22. Sale Structure and Price of Milk in Uttar Pradesh

Item	Buffalo					Cow				
	Society	House-holds	vendor	Own consu-mption	Total milk	Society	vendor	House-holds	Own consu-mption	Total
Sale of milk	3.08	0	2.95	2.01	8.04	2.07	1.65	0	2.48	5.89
% share	38.31	0	36.69	25.00	100	35	28.01	0	42.11	100
Price of milk per litre	32	0	32.95	32	257.38	25.47	27	0	27	164
Value of cow dung (per year) /day	1596	0	0	0	4.37	1116		0	0	3.05

Source : Primary survey

Table 23. Comparison of Cost and Income from Milk ProductioninUttar Pradesh

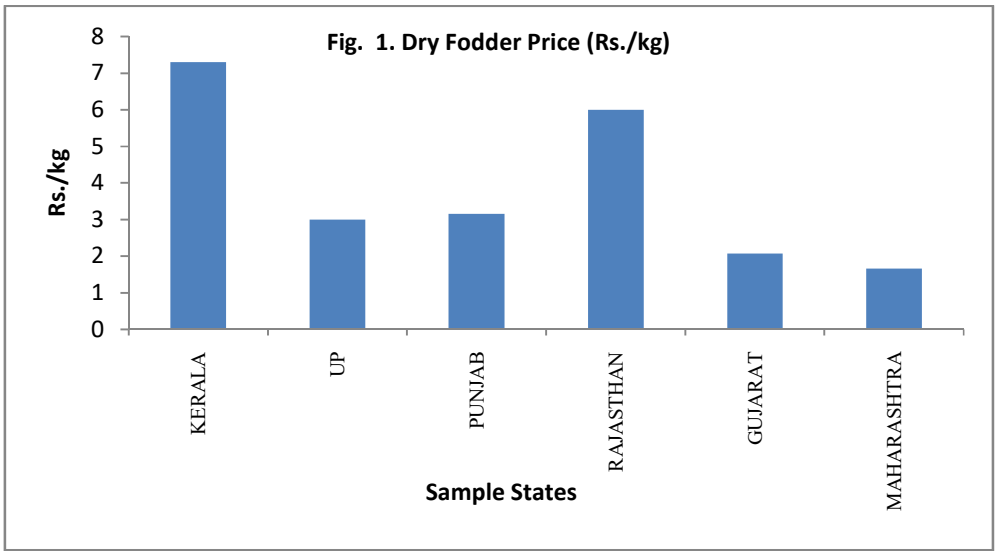
Item	Buffalo (per animal)	Buffalo milk per litre	Cow	Cow milk per litre
Cost	180	22.39	167.57	28.45
Income	261.75	32.56	167.28	28.40
Profit	81.75	10.17	(-)0.29	(-)0.05

Source: Primary survey

Section 4
Comparison of Profitability of Milk Production in Different States

A comparison of cost and return of milk production in sample states reveal that cost of fodder and feed are important items influencing cost of production of milk. In Punjab and Gujarat, there exists no market for green fodder. However, the price of cattle feed being an industrial products with strong brand loyalty, its price is more or less the same in all sample states.Figure 1 compares dry fodder price in sample states. It was found that the dry fodder price was the highest in Kerala followed by Rajasthan. A higher dry fodder price in Kerala is attributable to two factories: (i) source of dry fodder is mainly paddy straw and paddy cultivation in Kerala has declined from about 10 lakh hectare in 1976 to almost 1.5 hectare in 2020; (ii) dry fodder is transported to Kerala from neighbouring state of Tamil Nadu. Figure 1 gives green fodder price in sample states. In most of states, there is no market for green fodder and it is mostly available free of cost. As a part of mutual cooperation in rural villages, farmers with larger land area allow their fellow farmers and wage labours to cut green fodder free of cost. However, farmers with larger tracks of arable land lease out land for fodder cultivation to landless farmers who rear cattle. The practice has cropped up after the introduction of MGNREGA. Labour households particularly women labours are not available for low wage after MGNREGA. To an extent, the practice has helped evolve market for green fodder.

Figure 2 shows purchase price of a cow and buffalo in sample states. The price of cow is the lowest in Punjab and highest in Uttar Pradesh. A comparison of cost and return from milk revealed that buffalo milk production is profitable in all states while cow milk production incurs a loss in three out of six states considered for the study. The amount of loss per litre of milk production is the highest in Kerala (Figure3).



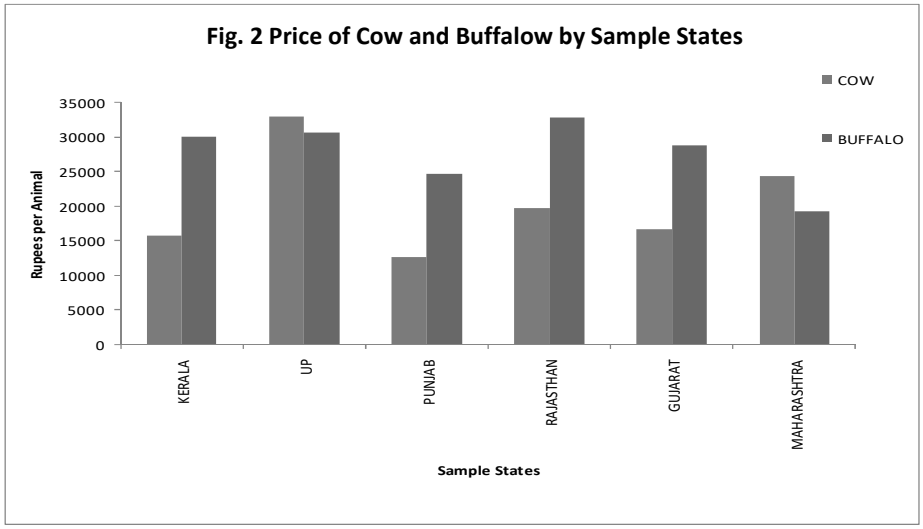


Fig. 2 Price of Cow and Buffalow by Sample States
COW
BUFFALO
Rupees per Animal
35000
30000
25000
20000
15000
10000
5000
0
KERALA
UP
PUNJAB
RAJASTHAN
GUJARAT
MAHARASHTRA
Sample States

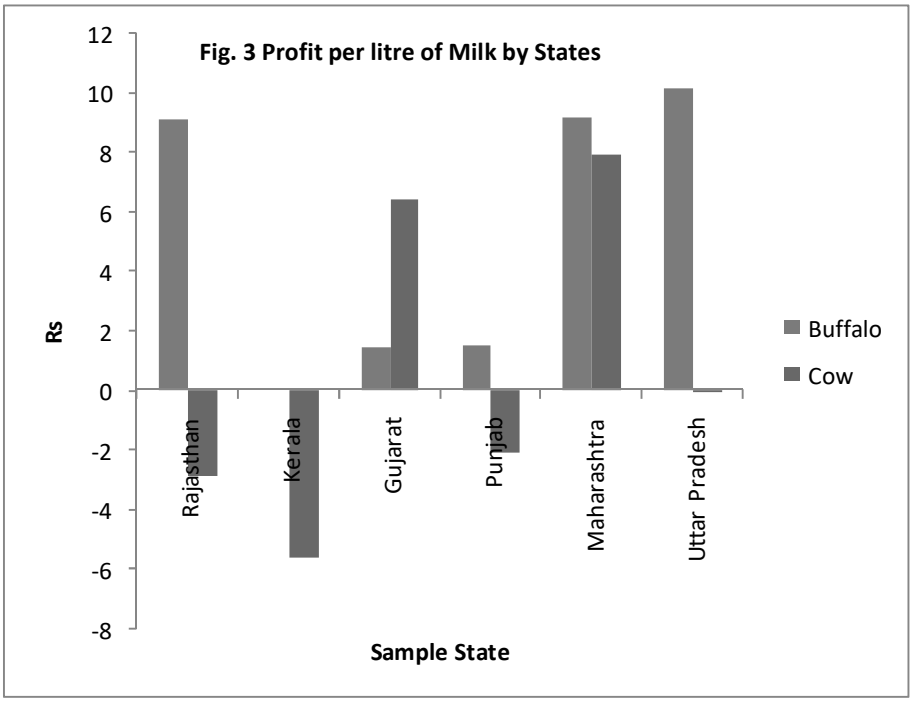


Fig. 3 Profit per litre of Milk by States
12
10
8
6
4
2
0
-2
-4
-6
-8
Rs
Rajasthan
Kerala
Gujarat
Punjab
Maharashtra
Uttar Pradesh
Buffalo
Cow
Sample State

Conclusion

The analysis of cost and return from rearing cow and buffalo in major milk producing states has shown a mixed trend. The study found that a farmer incurs a loss of Rs. 19.67per day by rearing an in-milk cow in Rajasthan, the second largest milk producing state in India while a buffalo earns a net return of Rs. 66.54 per day.In Punjab, daily net income from a cow is negative to the tune of Rs. (-)13.65 while a buffalo gives a meagre income of Rs. 10.64/day.In Uttar Pradesh net return from both cow and buffalo are positive but negligible. In states where the net return from rearing cow and bufflow are positive, it is rather difficult for a family to earn a bare minimum of US $1.9/per day required to be above the statuory poverty line, with even three in-milk animals in early lactation cycle.

The trend emerged from the analysis indicated that profitability from milk production varied across states. Unlike the crop production sector, constraints such as suitable agro-climatic conditions for production and crop-specific seasonality and glut in the market have relatively less influence on milk production.Another notable characteristics of milk production and its market is that milk price is devoid of volatility and the market is stable and steady. In spite of such advantages of the dairy sector over crop production, dairying still continue to be a sub-set of the crop production and its existence is largely interdependent. The labour force engaged in cattle rearing are unskilled family labour, mostly women. Primitive methods of productions are in vogue.For the development of dairy sector in India, which is comprised mostly of landless, marginal and small farmers, who rear cattle for subsistence, public investment to advance production relations along with remunerative price based on annual cost estimates by the government agency is inevitable. Given the present cost and return from milk production, it would be difficult for the sector to exist in the long run.

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