



Economics of dairy farming and marketing: Micro-level perspectives from three major milk producing states of India

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Received: 15 April 2013; Accepted: 29 September 2013

ABSTRACT

The study attempted farm level analysis of production and marketing behaviour of dairy farmers, in three major milk producing states, namely Punjab, Bihar and Uttar Pradesh of India. These states represent geographic and institutional diversity of milk production and marketing in India. The study also identified the major constraints faced by the dairy farmers and suggested policy prescriptions for creating future opportunities for the resource poor farmers and entrepreneurs engaged in this sector.

Key words: Constraints, Dairy farming, Economics, Milk marketing

The importance of dairy farming is obvious from the fact that more than 70% of Indian farming households, about two-thirds of which owns less than 1 ha of land, are engaged in milk production (FAO 2003, GoI 2005). Dairy Sector provides employment to around 21 million people and nearly 70% of them are women (Kumar *et al.* 2013). Since mid-2000s, the annual value of milk has been larger than the combined value of rice and wheat (Birthal and Negi 2012). Consistent with the relatively low resource base and subsistence level of farming, with nearly 75% of dairy farmers owning only 2–3 milch animals per herd, dairy farming in India mostly remains to be less input intensive (Singh and Datta 2010). The level of adoption of modern technologies and scientific rearing practices among dairy farmers is found highly variable across states. While, majority of the cattle stock in Punjab, Kerala, Tamil Nadu, Haryana, etc. are crossbred and high yielding, huge gaps in breed improvement remains to be plugged in backward states such as Bihar, Odisha, Rajasthan, Uttar Pradesh, etc. Similarly, a considerable part of dairy marketing, processing and distribution in most of the major producing states is taking place under the unorganized sector (Rajendran and Mohanty 2004, Kumar *et al.* 2010). The above issues point to the vast scope in improving the production, input delivery, marketing and processing related services as well as infrastructure in the dairy sector. This study attempts to add to the limited recent literature on the subject, with farm level analysis on production and marketing behaviour of dairy farmers in three major producing states, such as Punjab, Bihar and Uttar

Pradesh. The study also identifies the major constraints faced by the dairy farmers and suggests policy prescriptions for creating future opportunities for the resource poor farmers and entrepreneurs engaged in this sector.

MATERIALS AND METHODS

The study is predominantly based on primary data collected through field surveys using pre-tested questionnaires during 2007–08. The information was collected at different levels from the selected sites. Three states such as Uttar Pradesh, Bihar and Punjab were selected purposively to capture the geographic and institutional diversity of milk production and marketing. One district each from these states was selected and was Aligarh in Uttar Pradesh, Patna in Bihar, and Rupnagar in Punjab. For selection of dairy farmers, in each selected district three administrative blocks were identified randomly and from each block, three villages were chosen randomly. From each block 75 households were selected. At village level, numbers of the sample households were decided in proportion to the village population. The sample households were post-stratified into different categories namely landless, marginal, small, medium and large based on the officially accepted criteria. Interactions with various stakeholders like farmers, traders, processors, exporters, etc. using semi-structured questionnaires also helped in the process of gathering information. The survey collected detailed information on household characteristics, infrastructural environment of the farmers, details of the inputs and outputs in milk production, transaction costs and marketing practices at the farm level. Various statistical tools like compound growth rates, ratios,

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percentages etc. were used to derive the results which are presented using graphical and tabular means. The average costs and returns of dairy farming was estimated and economic performance indicators like profit, returns to family labour, etc. were derived and compared across regions.

RESULTS AND DISCUSSION

An overview of milk scenario in India

The dairy sector experienced a steady growth over the past decade, with a modest growth rate of 4.2% per annum (Table 1). Out of the total milk produced in the country, 51% is contributed by buffalo, 45% by cow and the rest 4% by goat. A little more than half of the cow milk comes from cross-bred cows and the rest from non-descript cow, mostly traditional varieties. Uttar Pradesh is the largest milk producing state in the country with around 21 million tonne of milk produced in 2010–11, followed by Rajasthan and Andhra Pradesh. Punjab, Gujarat and Bihar are also promising states with impressive strides in production over the last decade. Punjab is the state with highest per caput availability of milk with 937 g/day followed by Haryana with 679 g/day. Among the milk producing states, the study focuses on the micro-level dynamics of milk production in three prominent and upcoming ones, namely, Uttar Pradesh, Punjab and Bihar.

Milk production and marketing in the study area

The average milk produced per household and its utilization pattern in the selected districts of the 3 states showed an average of 13.4 litres of milk production per household in Aligarh, of which nearly 75% was sold raw in the market (Table 2). While average household production of landless producers was 7.2 litres, the large households

produced as high as 22.1 litres per day. Nearly one-fourth of the obtained milk was consumed within the household, majority of which was consumed raw. On an average, 7% of the total produced milk was utilized in various processed forms like curd, butter milk, *paneer* etc. The households in Rupnagar sold comparatively lesser share of the milk in the market and had a higher inclination towards consuming the milk in processed forms. In comparison to Aligarh and Rupnagar, the average milk produced per household in Patna was much lesser. Even large households produced only 7.3 litres of milk per day on an average, pushing the overall average to a mere 3.3 litres.

This indicates the wide differentials in milk productivity across the states, the reasons for which are innumerable. The low productivity of milk also results in low marketable surplus for these households after domestic consumption. In general, average milk production per household increased proportionately with increase in farm size. Per household milk production of large dairy farmers were found to be 3–4 times higher than that of landless farmers in all 3 states under study. This is mainly because of larger herd size, superior breeds, better management practices, etc. associated with large farms in relation to other household categories.

The selling behaviour of farmers is an important factor determining the profitability of milk sold. The share of milk sold by the households on-farm and off-farm are depicted in

Table 1. Trends in milk production in major producing states of India ('000 tonnes)

States	2000–01 (‘000 tonnes)	2010–11 (‘000 tonnes)	CGR (%)	Per caput availability, 2010–11 (g/day)
Andhra Pradesh	5,521	11,203	7.3	364
Bihar	2,489	6,517	10.1	184
Gujarat	5,312	9,321	5.8	435
Haryana	4,850	6,267	2.6	679
Madhya Pradesh	4,761	7,514	4.7	287
Maharashtra	5,849	8,044	3.2	197
Punjab	7,777	9,423	1.9	937
Rajasthan	7,455	13,234	5.9	538
Tamil Nadu	4,910	6,831	3.4	278
Uttar Pradesh	13,857	21,031	4.3	289
All India	80,607	121,848	4.2	281

Source: Basic Animal Husbandry Statistics 2012, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India.

Table 2. Average milk production and percentage use of milk by class

Districts	Class	Family size (No.)	Avg. milk production per household (litre)	Sold raw (%)	Consumed raw (%)	Processed (%)
Aligarh	Landless	8	7.2	77.6	18.2	4.2
	Marginal	8	10.7	76.1	18.2	5.7
	Small	9	12.0	74.3	18.1	7.6
	Medium	9	17.3	75.1	17.1	7.8
	Large	13	22.1	73.6	18.4	8.0
Patna	All	9	13.4	75.1	17.9	7.0
	Landless	7	2.1	47.2	41.5	11.3
	Marginal	7	2.4	56.8	36.9	6.3
	Small	9	3.9	53.9	32.6	13.5
	Medium	10	4.9	41.2	49.4	9.4
Rupnagar	Large	13	7.3	41.6	46.7	11.7
	All	8	3.3	49.3	40.8	9.9
	Landless	6	4.0	40.8	41.3	17.9
	Marginal	6	6.1	63.7	22.6	13.7
	Small	7	12.0	67.9	17.2	14.9
	Medium	7	19.4	73.4	15.1	11.5
	Large	10	25.6	64.7	21.1	14.2
	All	7	12.0	66.4	20.0	13.6

Source: Authors' estimates based on field survey 2007–08.

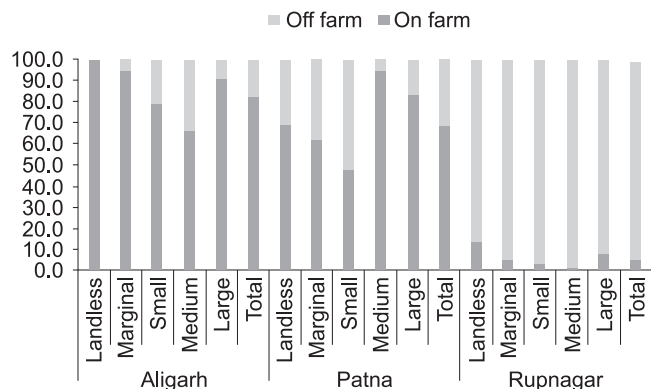


Fig. 1. Percentage of milk sold on-farm and off-farm.

Fig. 1. It was observed that the milk producers of Aligarh and Patna sold a major proportion of the milk produced on-farm, whereas the Rupnagar farmers sold their milk in markets outside their farms. It was also noticed that landless and marginal farmers are more inclined to selling off their produce at the farm gate. It is important to note that milk sold on-farm fetches lower price than sold off-farm as the buyers have an upper hand in deciding the price. In most of the cases the farmers are forced to sell the milk at the farm gate mainly because of lack of proper transport and storage facilities. The landless and marginal farmers are more vulnerable and can ill-afford the logistics for transportation and other marketing activities, because of which they are falling prey to the middlemen or wholesalers who are more empowered. The above observation suggests that the farmers of Rupnagar are better off in terms of storage and transportation facilities to take their milk to bigger markets where they can realise better prices than those of Aligarh and Patna.

Majority of the respondents in Patna and Rupnagar revealed that they were indulged in some kind of contract in selling milk. The type of contract varied from farm-to-farm and included quality contract where the seller vows to provide milk of certain quality specifications, quantity contract, which specifies the quantity of milk to be supplied, payment contract that determines the frequency of payment and delivery time contract, which requires conformity with the prescribed time of delivery of milk. In Patna, a major proportion of milk (57.1) was sold on quality contract (Table 3). Payment contract was also prevalent with 16.8% of the milk producers sticking to payment norms. Around a quarter of the respondents in Patna did not indulge in any contracts. In contrast to it, quantity contract was widely prevalent with around 63% of the milk producers abiding to it. Twentyseven % of the farmers opted for quality contract, while 7% of them did not accept any of them. Striking a quiet different chord, around 90% of the Aligarh farmers respected no contracts while selling their produce.

As in any other contract, provision of penalty for non-conformity was observed for milk sale contracts in the study

Table 3. Type of contract of milk sale and penalty for non-conformity (%)

Contract/penalty	Aligarh	Patna	Rupnagar
<i>Type of contract</i>			
1. Quality	5.9	57.1	27.3
2. Quantity	0.3	1.2	62.7
3. Payment	3.9	16.9	0.0
4. Delivery time	0.6	1.2	1.0
5. No contract	89.3	23.6	9.0
<i>Penalty for non-conformity</i>			
1. Rejection of supply	0.0	40.9	0.5
2. Price reduction by x%	40.5	12.6	98.4
3. Termination of contract	25.4	1.4	0.0
4. None	34.1	45.1	1.1

Source: Authors' estimates based on field survey 2007–08.

areas. Reduction of price by certain percentage was most common among them in Rupnagar and Aligarh. The milk buyers at Patna resorted to rejection of supply in breach of contract in 41% of the cases. Fortyfive per cent of Patna respondents did not report any penalty for violation. An extreme step of termination of the contract was also noticed in 25% of the cases in Aligarh.

The demand for milk came from various quarters and consisted mainly of household consumers, milk vendors, private dairies, dairy co-operatives and shopkeepers. In Aligarh, 88.6% of the milk producers sold their milk to milk vendors for an average price of ₹ 12/litre and only an insignificant proportion went to other type of buyers (Table 4). The milk producers at Patna resorted to both milk vendors and dairy co-operatives to sell their milk, from which they received an average price of ₹ 11.3 / litre and ₹ 11.2 / litre respectively. At Rupnagar 86% farmers also sold milk at dairy co-operatives at an average price of ₹ 14.8 / litre. In general, the farmers from Rupnagar realized higher prices than the other two regions. It was surprising to note that, even though the prices offered by milk vendors and dairy co-operatives were lesser other buyers like private dairy,

Table 4. Average price received (in Rs/litre) for milk sold by type of buyer

Districts	Household consumers	Milk vendors	Private dairy	Dairy co-operatives	Shop-keepers	Overall
Aligarh	11.6 (1.2)	12.0 (88.7)	13.6 (4.7)	13.8 (4.6)	14.0 (0.8)	12.2
Patna	12.4 (21.4)	11.3 (36.6)	12.1 (5.4)	11.2 (34.8)	12.0 (1.8)	11.6
Rupnagar	16.8 (7.1)	11.9 (3.0)	14.9 (2.7)	14.8 (86.1)	13.0 (1.1)	14.9

Source: Authors' estimates based on field survey 2007–08. Figures in parentheses denote the percentage of milk sold out of total.

Table 5. Mode of price fixation of milk sold (%)

Districts	Existing market price	Seller decides	Buyer decides	Based on fat/SNF	Through negotiation
Aligarh	41.4	2.8	45.3	4.2	6.2
Patna	45.6	3.0	29.9	12.7	8.8
Rupnagar	8.7	1.0	24.1	66.1	0.1

Source: Authors' estimates based on field survey 2007–08.

shopkeepers and domestic consumers in all three areas under study, the producers relied more on either milk vendors or co-operatives. This is perhaps because of sustained demand from these sources and due to a perception of higher reliability.

Five modes of price fixation were observed in the areas under study and they were: (1) based on existing market price, (2) seller decides, (3) buyer decides, (4) based on fat/SNF, and (5) through negotiation between buyer and seller. Disparity in following the various modes of price fixation was noticed in the three districts under consideration. In Aligarh, 45.3% of the respondents suggested that in most of the cases, buyer decides the price. The existing market prices were the benchmark in 41.4% of the cases and only 4.2% cases of price fixation were based on fat or SNF (Table 5). In Patna, existing market prices (45.6%) were given more priority in fixing the price as compared to other means. In contrast, the price determination at Rupnagar was more scientific, and was based on fat/SNF. In this context, it is important to mention that, both buyer and seller are at gains in this mode of price fixation and hence to be popularized further. However, the practice is not followed in majority of the places, as depicted in Aligarh and Patna mainly because of lack of awareness or unavailability of equipments for measuring fat/SNF. There were very few instances where the seller decided the price. Price fixation through negotiation was also minimally practised in the places of interest.

Economics of milk production: To assess the profitability of milk production, the associated costs incurred, including marketing costs was worked out and then deducted from the gross price received per litre of milk. The return to family labour was also quantified along with margin for proper understanding of the economics of milk production. The average yield of Aligarh household was 6.1 litres of milk while those of Patna and Rupnagar were respectively 4.2 litres and 6.4 litres (Table 6). The per litre cost incurred for a household at Aligarh amounted to ₹ 8.2 / litre. In Patna, the cost of production was lower (₹ 7.9/litre) while that of Rupnagar was the highest in comparison (₹ 10.2/litre). The lower cost of production in Patna is mainly because of the less intensive dairy farming practised here wherein they save on more expensive feeds like concentrates. The marketing costs were found to be negligible in all three areas under the

Table 6. Costs and returns in milk production (in ₹ / litre)

Particulars	Aligarh	Patna	Rupnagar
Yield (litre)	6.1	4.2	6.4
Costs incurred in production ²	8.2	7.9	10.2
selling milk	0.1	0.0	0.0
Gross price received for milk sold	12.2	11.6	14.9
Net price received for milk sold	12.1	11.6	14.9
Margin	3.9	3.7	4.7
Return to family labour (₹/hour)	9.1	5.8	14.5

²The cost of production covers only operational expenditure and excludes family labour cost.

Source: Authors' estimates based on field survey 2007–08.

study. The results suggested that the milk producers at Rupnagar are deriving maximum profits than Aligarh and Patna and their margins were respectively ₹ 4.7, 3.9 and 3.7/ litre of milk sold. The Patna farmers realized lesser profits even with lower cost of production because they received lower prices from the buyers to whom they sell maximum amount of milk. The Rupnagar farmers also realized highest returns to family labour which amounted to ₹ 14.5/h spent in production and marketing of milk. The above analysis suggests that milk production is quite a profitable proposition with relatively high returns to labour. Large-scale production of milk can bring in economies of scale which would further reduce costs resulting in higher returns.

The break-up of cost of production of milk is depicted in Table 7. The results suggest that a major proportion of amount spend for milk production is set apart for feeds and fodder. In Aligarh, around 73.4% of the total operational expenses are towards feeding charges, of which concentrates claim the highest share (36.2). In Patna and Rupnagar also the expenses towards concentrates and fodder were higher in comparison to other expenses, and were 60.5% and 80.1% respectively. The higher milk yield of Aligarh and Rupnagar farmers can be substantiated with their higher spending on

Table 7. Structure of cost in milk production (%)

Particulars	Aligarh	Patna	Rupnagar
Dry fodder	27.9	26.5	34.9
Green fodder	9.3	6.5	7.8
Concentrates	36.2	27.5	37.4
Transaction cost in input procurement	1.2	0.7	1.1
Family labour	24.6	33.7	16.6
Hired labour	0.1	4.1	1.4
Veterinary expenses	0.6	1.0	0.7
Total cost incurred	100 (10.9)	100 (11.9)	100 (12.2)

Source: Authors' estimates based on field survey 2007–08.

Note: Figures in parentheses are total cost incurred for producing one litre of milk in ₹ litre including imputed value of family labour.

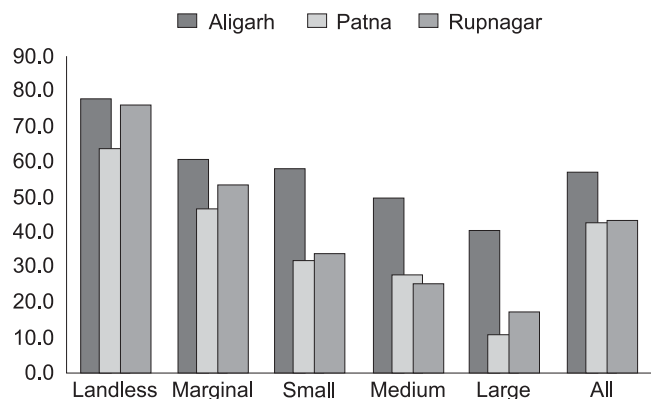


Fig. 2. Percentage of farmers reporting shortage of fodder.

concentrates. Most of the farmers relied on family labour rather than hired labour and the fact is reflected from the relative shares of expenditure on them. The transaction costs in input procurement and veterinary expenses were minimal in all the three areas of study.

Constraints in milk production

There are various biological, technical and socio-economic constraints associated with milk production. Some major constraints identified based on the feedback from farmers are being discussed here. An important one is scarcity of feeds and fodders, with the farmers in all three areas under study having reported shortage of fodder in various degrees. Mostly, landless farmers bear the brunt of acute shortage of fodder on account of unavailability of common grazing lands. Sixty five to 80% of the landless farmers Aligarh, Patna and Rupnagar have reported fodder shortage in their locality (Fig. 2). The marginal, small-, medium- and even large-farmers are facing this problem though to lesser extent. The number of farmers reporting shortage of fodder was higher in Aligarh, Patna and Rupnagar. The finding points towards a common problem of mismatch of demand and supply of feeds and fodder in the country as reported by BIRTHAL and JHA 2005, RAMACHANDRA *et al.* 2007, and DIKSHIT and BIRTHAL 2010. The small and fragmented holdings further constrain

Table 8. Farmers reporting death of animals and loss incurred during last one year

Class	Aligarh		Patna		Rupnagar	
	% farmers reporting mortality	Loss (₹)	% farmers reporting mortality	Loss (₹)	% farmers reporting mortality	Loss (₹)
Landless	43.5	8,111	50.0	1,690	56.7	4,408
Marginal	59.7	3,726	43.8	2,206	64.4	1,822
Small	64.0	2,188	38.2	2,235	74.3	4,371
Medium	66.7	3,461	36.0	2,208	76.9	5,521
Large	63.0	2,709	45.0	7,585	91.2	8,801
All	60.9	3,654	43.6	2,574	71.1	4,259

Source: Authors' estimates based on field survey 2007–08.

the adequate allocation of land for fodder production (Singh and Datta 2013).

Another serious problem faced by the livestock farmers is high mortality rate of milch animals. The magnitude of the problem is evident from the figures provided in Table 8. As high as 91% of the large farmers in Rupnagar have reported death of animals in the previous one year of survey with an average loss of ₹ 8,801 during the period. The loss incurred by the landless farmers of Aligarh was even higher to the tune of ₹ 8,111. In general, 61% farmers of Aligarh, 44% of farmers in Patna and 71% of Rupnagar farmers reported loss of money due to death of animals. These estimates indicate the need for up-scaling disease surveillance and control mechanisms as well as better health care facilities required for milch animals in the study areas.

Various other constraints like poor genetic potential of the animals, high input cost and scarcity of resources are also hindering the farmers to realize the full potential of milk production. Still a large number of livestock populations in the country are of low milk yielding breeds. Up-gradation of genetic potential of livestock remains a major challenge before the scientists and policy makers. In this context, artificial insemination (AI) stands out as a promising method of breeding to bring out a perceptible change. However, the survey results suggest that the level of adoption of AI still remains partial in the study areas. Table 9 provides the source of breeding adopted by the respondent farmers by farm size categories. Among the three areas under study, Aligarh

Table 9. Sources of breeding used by the farmers (%)

Class	Cow		Buffalo	
	Bull	AI	Bull	AI
Aligarh				
Landless	100.0	0.0	100.0	0.0
Marginal	54.8	45.2	69.0	31.0
Small	68.8	31.2	85.4	14.6
Medium	69.2	30.8	86.8	13.2
Large	89.5	10.5	90.9	9.1
Total	69.1	30.9	82.6	17.4
Patna				
Landless	43.5	56.5	91.7	8.3
Marginal	43.6	56.4	88.1	11.9
Small	28.0	72.0	58.3	41.7
Medium	31.3	68.7	85.2	14.8
Large	19.2	80.8	76.2	23.8
Total	34.1	65.9	83.3	16.7
Rupnagar				
Landless	16.7	83.3	75.0	25.0
Marginal	62.5	37.5	82.0	18.0
Small	38.9	61.1	83.6	16.4
Medium	0.0	100.0	62.6	37.4
Large	18.2	81.8	62.1	37.9
Total	23.5	76.5	72.7	27.3

Source: Authors' estimates based on field survey 2007–08.

reported the lowest adoption of AI with only 31% use of AI in cows and 17.4% in buffalo. Here, none of the landless farmers adopted AI as a method of breeding. The farmers in Patna were relatively better off with nearly 70% of cows and 16.7% buffaloes being inseminated artificially. In contrast, Rupnagar farmers, including that belonged to the landless category, were found to be more progressive with 76.5% of all cows and 27.3% of buffaloes being administered with AI. The major reasons behind low adoption were lack of awareness among farmers and lack of adequate facilities available, with several respondents having reported inadequate insemination facilities available in their locality. These reported facts clearly indicate the need for launching more awareness drives and setting-up of AI centres for upgrading genetic potential of the animal stock.

In addition to the above constraints, adequate availability of cold storage, transportation, marketing and processing facilities are also reportedly limiting the farmers from deriving optimum returns to their investments. Other problems like monopsonic tendencies among milk buyers with frequent incidences of under-quoting, delays in getting payments for the milk supplied etc. also add to the woes of the milk farmers in the study areas. For instance, only 1.1% of farmers in Rupnagar and 2.6% farmers in Patna were reported to have been receiving daily payments. None of the farmers in Aligarh received payments on a daily basis. Instead, most of them received payments once in 10–15 days. An even longer interval of up to one month was reported by 25.8% of farmers in Aligarh, 57.7% in Patna and 10.5% in Rupnagar. In nutshell, proactive measures are required to address the various constraints faced by the milk farmers not only in the study areas but also in many other parts of the country where the sector remains under developed.

ACKNOWLEDGEMENT

The paper has been derived from the study conducted under the Lal Bahadur Shastri Young Scientist Award of the Indian Council of Agricultural Research given to the first author. We are grateful to ICAR for the award and financial

support for undertaking this study.

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