

ANALYSIS OF MILK PRODUCTION SYSTEM IN PERI-URBAN AREAS OF LAHORE (PAKISTAN) A Case Study

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Abstract. This study is an attempt to investigate the market structure, sources of milk production and average unit of productivity in peri-urban¹ areas of Lahore. Using primary data of year 2007 from some selected peri-urban areas of Lahore, the results of this study reveal that the lack of training and dairy related education hinders opportunity of value addition with undue cost of poor transportation, low quality and mismanaged distribution. Lack of marketing and supply chain in dairy industry is another bottleneck of development. The results of this study call for the role of government in the development of dairy sector. The government needs to provide critical support for the promotion of smallholder producers in peri-urban areas.

I. INTRODUCTION

In Pakistan agriculture sector contributes more than 20 percent of the GDP and employs more than 40 percent of the total workforce. Pakistan has larger base of dairy sector allied with the agriculture. Dairy sector generates employment and business opportunities, particularly in the rural and peri-urban areas. A number of people in urban areas are also involved in dairy based business. The public sector departments hold primary responsibility to guide the farmers and play significant role in dairy sector development.

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¹Immediately adjoining an urban area; between the suburbs and countryside.

Dairy enterprise is dominated by the private sector and the role of government is regulatory.

Although dairy enterprise was badly neglected by the Government, Pakistan is the 5th largest milk producer in the world. According to livestock census 2006, approximately 80 percent of the milk is produced in the rural areas. Only 3-5 percent of total milk production of the country is marketed through formal channels. The remaining 97 percent is produced and marketed in raw form by informal agents in the marketing chain portion of milk producers.

Presently, Pakistan's dairy industry is facing a number of problems which include the lack of commercial dairy farm, lack of dairy related education and lack of financial and infrastructure facilities. Furthermore, lack of quality check is the most neglected aspect of the whole system. There is no test at any stage along the marketing chain. Many shops in urban areas are exposed to dust and flies. Very few shops have refrigeration facility. The containers used in transportation are unhygienic and also the milk adulteration is another serious concern in peri-urban milk supply chain. On the other side, due to increase in inflation and poverty level, the majority of consumers in Pakistan are price-conscious. Therefore, demand for open raw milk is high as compare to processed milk. Hence, raw milk is the primary dairy product marketed in the country. Over 90 percent of the unprocessed milk is collected and marketed through the informal market. Because of high milk demand there emerges excess demand for milk. To overcome the shortage of milk, powdered milk is imported every year. Furthermore, milk collected from urban area is not sufficient to meet the entire urban demand, more milk is collected from rural areas and also the remaining deficit is met through the imported powdered milk.

The findings of Ali and Saifullah (2006) reveal that the milk production is labor intensive. They pointed out that there are a large number of biological, technical and socio-economic constraints like shortage of feed, high mortality rate, poor genetic potentials, high input cost, scarcity of resources and inadequate marketing system. Burki *et al.* (2005) provided a preliminary assessment of the state of Pakistan dairy, explored the sector potential in making impact on the dairy economy and identified areas where more detailed research is needed. According to them research on production structure in dairying could enable us to understand the structural changes needed in this sector.

This study is an attempt to address the various important aspects related to dairy sector in Pakistan like source of milk production, average unit

productivity, cost of milk production and milk supply channels. It may also provide an understanding of the opportunities and problems associated with the dairy enterprises in Pakistan. The findings of the study may help in ensuring development of country's dairy sector because the research based decisions of policy makers may have real impact on welfare of farmers and progress of all the stakeholders of the sector. The above mentioned objectives of study are achieved through surveying the farmers of peri-urban areas and milk centres in urban areas of Lahore (see BOX).

BOX

The data has been collected from peri-urban areas of Lahore, the second largest city of Pakistan. A self-constructed research questionnaire was used as a tool of data collection. All the stakeholders and active players of dairy industry share their observations and experiences based on objectives set in this study. The questionnaire was further validated by pilot testing of 15 respondents and number of errors regarding language, structure, flow and scale options were removed. 120 owners/managers of dairy farms and 60 milk shops/collection centres were interviewed. Quality of survey was ensured through 10 percent back checking. The details of the number of dairy farms visited for sample collection from different areas are given below:

Name of the Area	Number of Dairy Farms Visited
Harbanspura	30
Rakhchandra	40
Thokar Niaz Baig	13
Kamahn Pind	12
Bund Road	8
Chungi Amer Sidhu	8
Shahdara Town	9

The remainder of the paper is organized as follows. In section II an analysis of the sources of milk production are presented. Section III gives an analysis of average unit productivity and cost of the production. Milk supply channels are discussed and analyzed in section IV. The analysis of milk by products is presented in section V. The last section concludes.

II. SOURCES OF MILK PRODUCTION

This section provides the details of various sources of milk production. It addresses the issues like quantity of total milk production, production division by animals and farmers, production brackets according to quantity and associated variables. The analysis is produced from the views of sampled farmers, taken through self-structured study questionnaire.

TABLE 1
Milk Production Brackets and Farmers

Production Brackets (in litres)	No. of Farmers	Percent
● Up to 100	76	63
● 100 to 200	25	21
● 200 to 400	13	11
● 400 and above	6	5
Total	120	100

The classification of farmers into various brackets, based on quantity of produced milk, gives significant insights of the dairy industry profile. The statistics show that majority of farmers (63%) produce up to 100 litres milk daily, followed by 21% farmers, who produce 100 to 200 litres milk daily. The larger quantity of milk production is covered by very small proportion of dairy industry, as 11% produce 200 to 400 and 5% produce more than 400 litres of milk daily.

TABLE 2
Milk Production of Animals and Average Unit Productivity

Category	Total	Average (Per farmer)	Animal Share	Maximum
Total Milk Production	14,387	120		1,020
Milk from Buffaloes	11,803	98	82%	1,000
Milk from Cows	2,587	22	18%	240
Number of Buffaloes	2,132	18	11.8 litres	85
Number of Cows	468	4	11.6 litres	35

As per the sample of survey, averagely 120 litres of milk are produced by a farmer of peri-urban areas of Lahore. The maximum limit of a farmer is 1020 litres of milk as shown in the data of this survey. Buffaloes produce major share (98 litres averagely in a farm), which constitutes 82% of the dairy market. Cows contribute 18% of the milk of dairy industry; 22 litres averagely in a farm. Interestingly, population of buffaloes is quite larger as

averagely 18 buffaloes in a farm as compared to 4 cows in a farm. Maximum numbers of buffaloes in a farm are 85 and cows are 35 in the peri-urban areas of Lahore.

III. AVERAGE UNIT PRODUCTIVITY

The average unit productivity of buffaloes stands at 11.8 litres per day. The milking cows also get average unit productivity around 11.6 litres per day, quite similar to the buffaloes.

TABLE 3

Milk Production across the Production Brackets

Production Brackets (litres)	Category	From Cows	From Buffaloes	Total Production
Up to 100 N = 76 (63%)	Average (per farmer)	9.2	38	48
	Bracket production	700	2921	3621
	Bracket share	27.10%	24.70%	25.20%
100 to 200 N = 25 (21%)	Average (per farmer)	28	108	136
	Bracket production	691	2688	3379
	Bracket share	26.70%	22.80%	23.50%
200 to 400 N = 13 (11%)	Average (per farmer)	53	243	296
	Bracket production	686	3154	3840
	Bracket share	26.50%	26.70%	26.70%
400 and above N = 6 (5%)	Average (per farmer)	85	507	592
	Bracket production	510	3040	3550
	Bracket share	19.70%	25.80%	24.70%
Total (all brackets)	Average (per farmer)	22	98	120
	Share in total	100%	100%	100%
	Total Sum	2785	127970	15582

The production of milk across the different production brackets gives very fruitful insights. Each bracket has different statistics of production. The production bracket of up to 100 litres covers 63% of dairy industry but contribute 25% of total milk share. The average production of farmer is 48 litres per day, contributed 38 litres by buffaloes and 10 litres by cows. The second bracket of 100 to 200 litres production stands 21% of dairy industry,

but contributes 23% of total milk production. In this bracket, a farmer averagely supplies 136 litres a day, shared 108 litres by buffaloes and 28 litres by cows. Almost 11% farmers fall in third bracket, which contributes 27% of milk in dairy industry. Average farmer in this bracket supplies 296 litres a day, consists of 243 litres from buffaloes and 53% litres from cows. In fourth bracket (above 400 litres), 5% farmers fall in this category averagely supply 592 litres of milk a day making 25% share in total milk production. The average total production is contributed by buffaloes 507 litres and by cows, 85 litres a day. All the production brackets have different averages of daily milk production, but interestingly, contribute in almost similar input/output ratio. The findings show again that cows are less in numbers than milk quantity, but milk production capacity is almost equal to buffaloes. Dairy industry observes good market equilibrium and not concentrated too few larger suppliers. The farmers having more than 400 animals are few in number, while people of less than 100 milking animals are quite large in numbers, which equate their total share of milk production in dairy industry.

COST OF MILK PRODUCTION

The expenses on milk production give valued figures for the strategic planners of dairy industry. The statistics of sampled farmers indicate that farmers spend daily average of Rs. 140 on family labour, Rs. 2906 on animal feed, Rs. 18 on vaccination and Rs. 36 on medicine/drugs and Rs. 56 on utility bills.

TABLE 4
Cost of Milk Production

Spending	Average (monthly)	Total	Average (Daily)
Family Labor	4,204	504,500	140
Feed	87,176	10,461,160	2,906
Vaccination	531	62,677	18
Medicine/Drugs	1,068	128,205	36
Utility bills	1,678	199,650	56
Transportation	3,561	423,810	119
Total spending in sample	16,370	11,780,002	3,274

The average cost of production per litre of milk in peri-urban areas of Lahore is Rs. 30 per litre but most of the time this cost boost up to Rs. 38 per litre due to poor management practices including shortage of labor, feed, morbidity and mortality of high yield animals. It results into losses and results into demotivation of stakeholders especially dairy farmers. It pushes farmers in unethical practices like adulteration of milk for compensating their losses. The farmers make expense of Rs. 1678 on utilities bills and Rs. 3561 on transportation of the milk on average. Almost 29% farmers, having less than 14 buffaloes and less than 3 cows, use their own transportation facilities, which incur insignificant extra cost. The results report the highest spending on feed, followed by labor, transportation, utilities and medicine. The vaccination ranked the lowest in priority list of farmer's spending.

IV. MILK SUPPLY CHANNELS

Milk is produced from dairy farmers in variable quantity depending on number of milking animals and better management practices. Dodhis/Gawals collect 60-70% of the total milk from dairy farmers in peri-urban areas. Milk collected from Dodhis/Gawals is distributed by different channels. The 70% of milk collected from them are distributed to End consumer as home delivery because civic population of Lahore mostly consumed milk from Dodhis/Gawals. The milk produced from peri-urban areas and small cities near Lahore are unable to fulfill the demand of civic population of Lahore. It means there is adverse imbalance in supply and demand of milk in Lahore. The remaining 30 percent of milk collected from Dodhis/Gawals is also distributed through other channels including whole sale milk shops and milk sale points in urban areas of Lahore. The halwai and hotels are also part of milk supply channels in peri-urban areas of Lahore. It constitutes 10-20% of milk supplied. These halwai and hotels processed this milk into different milk by-products or milk directly consumed by consumers.²

The distribution of milk to different channels of supply indicate market portfolio of dairy industry. According to survey statistics of sample, almost 13.20% of milk production goes to Halwai/collection centres, 78.20% to Dodhis/Gwalas, 8.60% is sold to others sources without any clear

²The milk in peri-urban areas are also collected by milk collectors and transported to milk collection centres of milk companies including Nestle, Chaudary Dairy and Engro Foods. It constitutes rest of 5-10% of milk collected in peri-urban areas of Lahore.

specification. There is large number of farmers (72%) of total sample sell milk to Dodhis/Gawalas. It includes the farmers who sell milk by themselves and act as Dodhis/Gawalas. Most of them reside in major cattle colonies of Peri-urban areas of Lahore. It constitutes major percentage of total milk sold in peri-urban areas. Next to this category, there are Halwai/milk shops that purchase milk directly from farmers. It constitutes 22% of total sample size. Almost 6% of farmers sell milk to other sources which are unknown in sample of dairy farmers.

TABLE 5
Milk Sale across Supply Channels

Channels	Total	% of Total
● Halwai/collection centre N = 26 (22%)	1881	13.20%
● Dodhi /Gawalas N = 87 (72%)	11252	78.20%
● Others N = 7 (6%)	1254	8.60%
Total (N = 120)	14387	100.00%

V. MILK BY-PRODUCTS

According to conducted survey of sample milk purchasers/collection centres, almost 10% purchase up to 100 litres, 40% purchase 100 to 200 litres, 22% purchase 300 to 400 litres and 28% buy more than 400 litres milk daily. 10% milk centres buy averagely 68 litres daily, where they use 30 litres for by products and rest 38 litres sell to the end users (see table 6). This category of milk centres buys only 2% total centre market of Lahore. 40% of milk centres make purchase of 171 litres daily on average, where 86 litres are used for making by-products and 84% litres are sold to end users. This category has 18% share of milk purchase in dairy market. 22% milk centres purchase daily 318 litres on average, where 107 litres are consumed for developing by-products and 211 litres are sold for general users with 21% market share. 28% milk centres hold largest market share of 58% with 12930 litres daily purchase on average. They make various dairy products from 4520 litres and make sale of rest 8410 litres.

TABLE 6
Milk Consumption Across the Categories of Purchasers

Categories of milk purchasers (litres)		Total milk	Used for by-products	Sold to end users
Up to 100 N = 6 (10%)	Average	68.6	29.6 (43%)	39 (57%)
	Sum of this category	412	178	234
	Share of this category	1.90%		
100 to 200 N = 24 (40%)	Average	171	86 (50%)	84 (49%)
	Sum of this category	4110	2075	2035
	Share of this category	18.50%		
300 to 400 N = 15 (22%)	Average	318	107 (34%)	211 (65%)
	Sum of this category	4783	1610	3173
	Share of this category	21.50%		
Above 400 N = 15 (28%)	Average	862	301 (35%)	560 (62%)
	Sum of this category	12930	4520	8410
	Share of this category	58.20%		
Total N = 60 (100%)	Average	370	139 (38%)	230 (62%)
	Sum of this category	22235	8383	13852
	Share of this category	100.00 %	100.00%	100.00%

The yogurt is most prominent by-product in the dairy industry of Punjab. Milk centre purchase up to 100 litre of milk, produce 26 kgs of yogurt daily on average, with 2.5% share of total yogurt market (see Table 7). The milk centres of 100 to 200 litres produce 75 kgs yogurt daily on average with 27% market share. The purchasers of about 400 litre milk use 95 litres for yogurt production, making 22% yogurt market share. The milk centres, buy above 400 litres milk daily, consume 238 litres daily for yogurt production. Averagely, the milk centres produce 113 kgs of yogurt daily and sell on the price varies from 38 to 39 rupees per kg.

TABLE 7
Yogurt Production Across the Categories of Purchasers

Categories of milk purchasers (litres)		Production Daily in litre	Price per litre
Up to 100 N = 6 (10%)	Average	26.5	38.6
	Sum of this category	159	
	Share of this category	2.50%	
100 to 200 N = 24 (40%)	Average	75.3	38.6
	Sum of this category	1732	
	Share of this category	26.90%	
300 to 400 N = 15 (25%)	Average	95.8	38.5
	Sum of this category	1437	
	Share of this category	22.40%	
Above 400 N = 15 (25%)	Average	238.5	39.1
	Sum of this category	3100	
	Share of this	48.20%	
Total N = 60 (100%)	Average	112.8	38.7
	Sum of this category	6428	
	Share of this category	100.00%	

Along with yogurt, numbers of other dairy products are produced in urban and peri-urban areas of Lahore. Among milk centres of Lahore, 10% produce butter, 4% Cheese, 2% Ghee, 73% flavored milk and 12% produce Khoya (see Table 8). 85 Kg butter is averagely produced constituting 10% of by-products market other Yogurt. Butter is sold at Rs. 250 per kg. Cheese contribute 4% share with average production 32 kg by cheese producers. Cheese is being sold at Rs. 135 per kg. Very few milk centres produce Ghee,

which stands almost 1.5% market share of Ghee producers, with 25 kg average production, sold at Rs. 360 per kg. Majority of milk centres produced 89 litres flavored milk daily on average, taking 72% share of dairy by-products, sold at Rs. 25 per litre. Khoya also have significant share of 12% in dairy by-products with average daily production of 105 kgs, which is sold at Rs. 233 per kg by Khoya producers.

TABLE 8
Production and Sale of other By-Products

Types of by products		Daily Production	Sale price ³
Butter in kg (10%)	Average	85	250
	Sum of this category	170	
	Share of this category	9.90%	
Cheese in kg (4%)	Average	32.5	135
	Sum of this category	65	
	Share of this category	3.80%	
Ghee in kg (2%)	Average	12.5	350
	Sum of this category	25	
	Share of this category	1.50%	
Flavoured milk in litre (73%)	Average	89.3	25.7
	Sum of this category	1250	
	Share of this category	72.70%	
Khoya in kg (12%)	Average	105	233
	Sum of this category	210	
	Share of this category	12.20%	
Total	Average	78.2	
	Sum of all categories	1720	

³Sale prices may be different now because of substantial increase in the prices of food items in the last one and half year (after the completion of the study).

VI. CONCLUSION

This study analyzes the sources of milk production and average unit of productivity in peri-urban areas of Lahore. Dairy industry is a labour-intensive business with lot of hygienic considerations in milk transportation in Pakistan. The results of the study show that the demand of the raw and unprocessed milk in Lahore is higher than its supply. This leads to a lot of malpractices in the supply of milk making it equal to its demand. Furthermore, it does not seem commercially viable unless huge planning and dairy development efforts are made by the concerned department of the Government of Punjab.

This study also identifies several factors like lack of dairy related education and training, lack of marketing and supply chain in dairy industry. These factors are considered to be responsible for slow dairy development in Pakistan. Furthermore, the proportion of small milk producers is quite high in Pakistan which hinders the economies of scale and profitability in the dairy industry. It calls for effective decision making in the operations of dairy industry from planning department, key stakeholders, and policy makers. These measures may include extensive training in the area of marketing, management, supply chain, and credit schemes for small farmers.⁴

⁴In future it needs further investigation to pinpoint the exact percentage and quantity to make better policies to balance the supply-demand of milk in big cities like Lahore. This study can also provide a basis for further rigorous analysis of the issue by using the modern econometric estimation techniques.

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