Pak. J. Agri. Sci., Vol. 45(2), 2008

ECONOMIC ANALYSIS OF MILK PRODUCTION IN DIFFERENT CATTLE COLONIES OF KARACHI

U.N. Khan, J.A. Lund, S. Javaid and Zia-ul-Hasan
Livestock & Fisheries Research Unit, SARC, PARC, Karachi

This study was planned to conduct detailed investigation on cost benefit analysis of buffalo milk production in the peri-urban areas of Karachi. Two cattle colonies i.e. Landhi and Bilal cattle colonies were surveyed and information regarding experience and educational level of the respondent, number of animals, feed resources and cost of feeding, labor cost, vaccination and medication cost, milk yield, price of milk and its marketing system etc. were gathered on specially designed proforma. It is analyzed that average experience level of dairy farmers in this business is about 25.6 years. Regarding education level, the percentages of dairy farmers below secondary level, secondary level, intermediate level and graduation categories are 45%, 25%, 20% and 10%, respectively. Purchase price of dairy animal has increased tremendously and become double i.e. Rs. 60,000/- as compared to the price i.e. Rs. 30,000/- in year 2003-04. The cost of feeding has increased rapidly and become almost double i.e. Rs. 177/- per animal/day as compared to the price in 2003-04 i.e. Rs. 90/- per animal/ day. The total costs including cost of feeding, vaccination/medication, labor, electricity and miscellaneous charges calculated on the basis of rearing 50 animals for 8 months is Rs. 2,488,000/- (i.e. Rs. 207/- per animal/day). The total income received from sale of milk and calves, calculated on the basis of rearing 50 animals for 8 months, is Rs. 2,925,000/-(i.e. Rs 244/- per animal/day) with net return of Rs. 437,000/- (i.e. Rs. 37/- per animal/day). The input-output ratio and cost benefit ratio are calculated as 1:1.18 and 1:0.18, respectively. It has been noted that calves rearing, commercial tariff on electricity, disposal of animal dung, occurrence of diseases like haemorrhagic septicemia, foot and mouth disease, mastitis, pneumonia and feed toxicity are major problems of cattle colonies in Karachi.

Keywords: Landhi and Bilal cattle colonies, costs, income, net return, milk production

INTRODUCTION

Livestock plays a pivotal role in the economy of Pakistan. This sector other than providing nutritious food like milk, meat and egg also provides hides, skins, wool and other by products. Livestock accounts for 11% of national Gross Domestic Product and almost 52.2% of agricultural value addition (Government of Pakistan, 2008). Livestock products also contribute significantly towards the export earnings of the country. The total export value of livestock products is about 55 billion rupees, which represents 14 percent of total export of Pakistan. Large population of Pakistan is dependent on livestock and more than 6.5 million families are involved in livestock raising (Afzal, 2003a). More than 30-35 million rural population is engaged in livestock raising having 2-3 cattle/buffalo per family deriving 30-40 percent of their household income from it (Government of Pakistan, 2008).

Over the last decade, the growth of livestock sector ranged from 5-6 percent per annum. Whereas, the demand for livestock products has increased rapidly due to increase in population, rise in household income and change in food taste and preferences. Among the livestock products, milk is the most important and extensively used product in the country. It contains all the essential constituents of food protein, carbohydrates, fat, mineral matter and the vitamins in the highly digestible form. Unfortunately milk consumption in Pakistan is not on the desirable level. It is too low as compared to developed and a number of developing countries as well. Increased price of milk and milk by-products coupled with high growth rate in population have resulted in low per capita consumption of milk. At present, per capita consumption of milk is estimated at 200 liters per annum. Though Pakistan is ranked fifth regarding milk production in the world but still the country is not self-sufficient in milk production (Government of Pakistan, 2008).

Buffalo is the principal source of milk and about 62 percent of total milk production (26.2 million tones) is received from buffaloes; 34 percent from cows and 4 percent from goats, sheep and camels. Despite good genetic potential, most of the animals produce considerably low quantity of milk mainly due to poor nutrition, management, disease control and lack of proper marketing of this highly perishable commodity. In urban and peri-urban areas, the cost of milk production is much higher than in rural areas.

In big cities like Karachi, livestock including buffaloes and cattle are kept in large cattle colonies in the periphery of the cities. Karachi has many big and small dairy cattle colonies with an aggregate cattle population of over 0.8 million. Landhi cattle colony

alone has a cattle population of over 0.4 million that produce 4 million liters of milk daily. Whereas, the other cattle colonies like Bilal cattle colonies, Al-Momin cattle colony, Nagori cattle colony and Surjani cattle colony have an aggregate of 0.4 million of cattle (Anonymous, 2008). The system of rearing cattle in these colonies is intensive farming system which is quite different from conventional system. In this production system, high yielding animals are kept for milk production, animals are stall-fed with highly concentrated feed and turn-over rate of animals is high. This production system is dominated by the buffaloes as buffalo milk contains higher butterfat and is preferred by the customers. This production system is the main source of supply of milk to the city customers who prefer to buy raw fresh milk. Milk is either sold through contract to the middleman or sold in the open market. During the past few years, rapid increase in the price of feed ingredients and other materials has greatly affected the economics of this business. There was dire need to workout the current economics of milk production under this system. Therefore the present study was launched to analyze the milk production system followed by the dairy farmers in Karachi and to estimate average per unit cost and income of milk production.

MATERIALS AND METHODS

This study was carried out through a primary survey of buffalo milk producers in the peri- urban areas of district Karachi who keep buffaloes on commercial basis. Two cattle colonies i.e Landhi cattle colony and Bilal cattle colony were selected for the survey. Primary data was collected through survey of dairy farms of different cattle colonies in Karachi. While secondary data was collected from various published and un-published sources.

A comprehensive questionnaire was prepared covering parameters like the age, experience and educational level of the respondent, number of animals, feed resources and cost of feeding, labor cost, disease incidence, vaccination and medication cost, milk yield, price of milk and its marketing system etc.

The size of sample and amount of variation usually affect the quantity and quality of information obtained from survey. Using appropriate sampling methods, both factors can be controlled. Out of the sampling frame we randomly selected the respondents from above two cattle colonies and the questionnaires were filled. The collected data were fed to the computer. Keeping in view the requirements of the study, simple statistical techniques like averages, their comparison and percentages were analyzed.

RESULTS AND DISCUSSION

The detailed findings of the study are presented and discussed as under:

Personnel information

It has been found that most of the farmers in this business are involved for many years. Average experience level of dairy farmers in this business is about 25.6 years. However, it is noticed that majority of the farmers are either illiterate or having education below secondary level. The percentages of dairy farmers having education below secondary level, up to secondary level, intermediate and graduation levels are 45%, 25%, 20% and 10%, respectively.

Type of shed and number of animals

Majority (more than 90%) of the sheds in dairy colonies of Karachi are pacca sheds, which are permanently constructed with blocks and cement. Some kacha shed, made up of wood and other materials as temporary arrangements can also be seen. The average farm size of dairy colonies in Karachi is 50 animals per dairy farm with a range of 25 to 200 animals. In dairy colonies of Karachi, The average milk production cycle of buffalo is of 8 months (240 days). Thereafter, the animal is either recycled for future milk production or slaughtered. Therefore, the calculations of different costs and income in this study are based on a dairy farm of 50 animals for 8 months of milk production.

Feeding system and cost of feeding

Nutritional feeding is one of the most important factors in livestock production. It is still a major problem hampering the livestock productivity in general and milk production in particular. All animals in the dairy colonies in Karachi are stall-fed. No grazing land is available in nearby vicinity. Due to high butterfat content requirement for the milk market, the feeding is very peculiar. The practice of feeding at dairy colonies consists of concentrate, green fodder and wheat straw. It is investigated that 08 to 10 kg of green fodder, 5 to 6 kg of wheat straw and 08 to 09 kg of concentrate is given to each animal daily into two equal portions (Table 1). In addition to these, rapeseed oil is also regularly fed to each animal by mixing it in the concentrate or feed. Some farmers do not mix oil in the daily feed rather give ½ kg of oil once every week or daily in equal doses. Individual feeding is not done and all animals irrespective of their production level are offered the same ration. The practice of offering mineral mixture to the dairy animals is very limited.

Table 1. Cost of feeding for 50 animals for a period of 8 months

Items	Quantity per animal/day (Kg)	Rate (Rs. / Kg)	Cost per animal/day (Rs)	Cost per animal/month (Rs)	Total feeding cost on 50 animals for 8 months (Rs)
Green fodder	08	2.5	20	600	240,000
Wheat straw	05	04	20	600	240,000
Oil cakes	03	20	60	1800	720,000
Wheat bran	02	12	24	720	288,000
Broken wheat	01	20	20	600	240,000
Gram/pea husk	01	10	10	300	120,000
Broken pulses	01	13	13	390	156,000
Mustard oil			10	300	120,000
Total			**177**	**5310**	**2,124,000**

Production of green fodder in Karachi is very limited and most of the green fodder comes from Hyderabad and Thatta districts. Green fodders available during the year are maize, sorghum and berseem. Green maize is normally available though out the year and is the main fodder in dairy colonies of the Karachi. The rate of cut green maize ranges from Rs. 80 to 120 per 40 kg. Berseem is a common fodder in winter and is normally available from December to February. The price of berseem also ranges from Rs. 80 to 120 per 40 kg. The sorghum and millet are not a preferred green fodder and are mainly used during shortage of green maize.

The price of wheat straw varies according to season and dairy farmers normally buy the whole truck-load of wheat straw. On an average, the rate of wheat straw ranges from Rs. 160 to 240 per 40 kg.

Feed ingredients come into Karachi market from almost all parts of the country. There are more than 20 items that are used as ingredients in the concentrate at the dairy colonies. Cotton seed cake is the major ingredients in ration of most of the farmers. 'Tukray', the left-over pieces of bread from houses and hotels also make an important component of the concentrate in a large number of farmers' routine. Other major ingredients used are wheat bran, rice polish, covering of peas and grams, by products of pulses, broken wheat, sunflower cake, canola cake, sesame-oil cake and mustard oil cake.

Commercial compound feeds have been introduced in the dairy colonies but with limited success. The main concerns of the farmers have been the quality of the compound feed and the availability of credit to the farmers. Almost whole system of feeding of animals in the dairy colonies of Karachi runs on credit for a period of 15 to 30 days. Less than 20% of the farmers use commercial feed and mix it with home-made concentrate. It is calculated that the average daily cost on feeding (green fodder + wheat straw + concentrate etc.) of one dairy animal is Rs. 177/- (Table 1).

Veterinary services and expenses

Both public and private veterinary services are available in most of the dairy colonies of the Karachi. In the public sector, Department of Animal Husbandry, Government of Sindh has set up veterinary hospitals in dairy colonies of the Karachi and a diagnostic laboratory in Ladhi cattle colony to provide quick diagnosis for the diseases at the colony. In addition to these, there is a wide network of private veterinary practitioners in most of the dairy colonies of Karachi. Most of the veterinarians are employed by the veterinary medicine companies and provide free service to the farmers but prescribe medicines or supplements of their employers only and also work as sale agents for the drugs. There are some independent private practitioners who charge on per case basis.

Infectious diseases have continued to have a high incidence in the dairy colonies of Karachi. Foot and Mouth Disease (FMD) is one of the major infectious diseases prevalent in dairy colonies of Karachi causing huge economic losses by affecting milk production. For the last few years, Haemorrhagic Seticaemia (HS) has been causing significant losses in terms of mortality in the dairy colonies of Karachi. Dairy farmers use vaccines (both local and imported) to control infectious diseases like HS, FMD, Anthrax, Black Quarter, Brucellosis and Tuberculosis etc. The incidences of feed toxicity are also being reported quite often for the last few years.

Use of oxytocin for milk let down is very common in all cattle colonies of Karachi. Buffaloes normally take longer for milk let down particularly without calves and to avoid delay, oxytocin is used for milk let down. The

effects of long-term use of oxytocin in buffaloes are not known (Afzal, 2003b). Use of recombinant bovine somatotropin (bST) is also common in some cattle colonies of Karachi particularly Landhi cattle colony in name of Boostin and Somatech. Most of the farmers use bST in mid or late lactation and provide extra feed supplement to compensate for extra milk yield. Most of the farmers have reported 12.5 to 25 per cent increase in milk yield due to bST. However, many have reported side effects also (Afzal, 2003b). It has been analyzed that the average monthly cost of vaccination/ medication for one animal is Rs. 300 (Table 2).

Table 2. Variable cost on rearing 50 dairy animals for 8 months (Rs.)

Items	Cost per animal/day	Cost per animal/month	Total cost on 50 animals for 8 months
Feeding cost	177	5310	2,124,000
Veterinary cost	10	300	120,000
Electricity	02	60	24,000
Laborers cost	13	400	160,000
Miscellaneous cost	05	150	60,000
Total	**207**	**6220**	**2,488,000**

Water source and electricity tariff

Majority of the farmers use water supply from the city government. However, regular water supply in the required quantity is also a problem in most of the dairy colonies. With huge population of animals, the requirement of water both for drinking and washing exceeds the supply provided by the relevant agencies of the district government. To fill-in the gap, the farmers either pump underground water if it is useable or purchase the water from tanks that is very expensive. Currently, each dairy farmer is paying Rs. 30/ - per animal/month water supply charges.

It is noticed that dairy farmers pay commercial tariff instead of agricultural tariff. Electricity for agricultural use is normally subsidized by the government to improve agricultural productivity. However, dairy farming in spite of being part of the agriculture has not given this treatment. Rather all electricity tariffs are being charged at commercial tariff which affect the profit margin of this business. It is noticed that farmer is paying monthly electricity charges @ Rs 60/- per animal (Table 2)

Sanitary conditions

Hygienic practices of most of the dairy colonies of Karachi are very poor. More than 90 percent of the animals in the farm continue to be fastened at one place. The animals' excreta is cleaned 3 to 4 times a day with the help of a wooden spade. The premises are washed once or twice a day depending upon the availability of water. The dung is collected and placed in the street in front of farm. Thus heaps of dung can be seen in almost each street of the most dairy colonies in Karachi. If sufficient water is available, the whole excreta is washed into disposal channel running on both sides of the street. This usually results in choking of the channel and overflowing in the street resulting in standing water in the streets. Ultimately these disposal channels discharge into the sea causing a major pollution problem (Afzal, 2003b).

In better-organized dairy farms, which are very few in numbers, open space is also provided to the animals where they are again fastened. Dung in these open places gets dried and then it is lifted by the interested persons i.e. normally truck owners who transport green fodder or wheat straw. The labor cost of lifting the dried dung is also borne by the farmer @ Rs. 150 to 200 per truck of dry dung. This is about 25 per cent of the total dung produced. The rest 75 percent is washed away with water. (Afzal, 2003b)

Total operational or variable costs

The variable costs essentially incurred to employ inputs to a production unit. Variable costs in the present study include cost of feeding, veterinary cost, electricity charges, laborer and miscellaneous cost etc. It is analyzed from the survey data that each milk producer is spending Rs. 207/- per animal/day or Rs. 2,488,000/- on rearing 50 dairy animals for 8 months as variable cost (Table 4).

Marketing of milk

Milk is one of the most important and extensively used of livestock products. About one-third the total production of milk is consumed as fluid, and almost similar amount is used for the preparation of ghee and remainder is converted into butter, cream and indigenous milk product like curd, khoa and lassi (Memon and Khushk, 2004). There are two marketing systems for the milk in the dairy colonies of Karachi i.e.

annual contract system and daily open market system. Annual contract of milk runs from April 1 to March 30 each year. Most of the milk produced (more than 90 percent) in the dairy colonies at Karachi is sold through this contract system (Afzal, 2003b). Dairy Farmers' Association of Landhi cattle colony reaches agreement with various stake-holders of the milk marketing system and announces the annual contract rate. Current contract rate of milk in Karachi is Rs. 1280 per 40 litres (Rs. 32 per litre). Milk required in the annual contract should have at least 6-7 percent butterfat. This is very high butter fat requirement and to maintain this, farmers use very rich feed and vegetable oil in the feed. Transportation cost of the milk from the colonies to the market is born by the dairy farmer. If middleman picks up the milk from the farm gate, he deducts the transportation cost from the payment. The transportation cost is Rs. 2 per litre of milk (Table 3).

In daily open market system the price of milk is announced jointly by the Dairy Farmers' Association and brokers of milk at the Lee market at 7 am and 7 pm daily. The standard for the milk at the Lee market is 6 percent butterfat milk. The milk with higher butter fat sells quickly. Milk with lower butterfat does not fetch the market price. Last year, market price of milk ranged from Rs. 800 to Rs. 1600 per 37.5 litres (one maund) of milk. But most of the time, it fluctuated between Rs. 1200 and Rs. 1400 per 37.5 litres. The price of milk is generally higher from May to July each year than rest of the months. On an average, less than 5 percent milk coming to the market remains unsold at the market rate particularly in months of milk surplus. This surplus milk is then sold for almost half the price of the market (Afzal, 2003b).

Milk produced in the Karachi colonies mainly reaches the customers through middlemen. These middlemen get about 70 percent of total milk and supply milk to the milk hawkers who in turn sell to milk shops and homes. Some of dairy farmers have their own milk outlets in the Karachi. About 20 percent of the milk produced in the Karachi dairy colonies is sold through farmers owned outlets. Remaining 10 percent milk goes to the open market from where shop-keepers and milk hawkers buy according to their requirement. The milk reaches the city markets after long chain of middlemen who are involved from the point of produce, hauling to cities, selling to milk plants or big collectors or retailers and uptil the point of sale. During this very long chain of trade, many operations are done during handling like addition of ice or water, skimming and churning, etc. (Memon and Khushk, 2004).

Total income

In the present study, the calculation of total income includes income received from sale of milk and sale of calves. It is investigated that total income received by a dairy farmer on rearing 50 animals for a period of 8 months is Rs. 2,925,000/- that comes to Rs 244/- per animal/day (Table 4).

Net return

Net returns are referred to the residual, which remains with the entrepreneur after incurring all production outlays from the gross income. As matter of fact net returns represent to the combined income received by the entrepreneur for his different services extended during production period (Memon and Khushk, 2004). Net returns per producer were computed by

Table 3. Distribution of milk price received per liter among different persons

Item	Price received	Percentage
Dairy farmer	Rs. 30/liter	75%
Transportation cost	Rs. 2/litre	5%
Middleman(Whole seller)	Rs. 4/liter	10%
Shopkeeper (Retailer)	Rs. 4/liter	10%
Total	**Rs. 40/liter**	**100%**

Table 4. Physical productivity of a dairy farm of 50 animals for 8 months

Item	Milk yield per animal/day (L)	Milk yield per animal/month (L)	Milk yield of 50 animal for 8 months (L)	Rate (Rs.)	Total Income on 50 animals for 8 months (Rs)
Milk	8.0	240	96,000	30	2,880,000
Calves			45 Calves	1000	45,000
Total					**2,925,000**

subtracting the total expenses from the total gross income of dairy farms. The net return of a dairy farm of 50 animals for 8 months has been analyzed as Rs. 437,000/- i.e. Rs. 37/- per animal/day. It may be seen from the data presented in Table 5 that input output ratio and cost benefit ratio are 1: 1.18 and 1: 0.18, respectively on rearing of 50 dairy animals for a period of 8 months.

Table 5. Net return of dairy farm of 50 animals for 8 months

Item	Amount (Rs.)
Total income	2,925,000
Total cost	2,488,000
Net return	437,000
Input output Ratio	1:1.18
Cost benefit ratio	1:0.18

In the absence of real data, it is difficult to determine the profitability of the production system in the dairy colonies of Karachi. In the above calculations, only variable costs have been subtracted from income to determine profitability. However, if the fixed costs like purchase price of animal is included then the estimate balance sheet per animal for 240 days shows different picture (Table 6).

capital are facing difficulties in being competitive in the market. Every year 3 to 5 farmers in Landhi dairy colony alone leave the business. However, almost same or more number of farmers also enter in the business.

SUGGESTIONS AND RECOMMENDATIONS

Based upon the findings of the study following are the suggested recommendations:

1. Commercial tariff on electricity of the dairy farms is being charged. All activities of dairy farming should be declared as part of agriculture and thus agriculture tariff for electricity should be applicable to all activities of dairy farming.
2. Calves are not raised in the Karachi dairy colonies due to high mortality rate, absence of milk replacer or calf starters and non availability of extra land and labor. Most of the calves find way to slaughter house. This results in loss of good gene pool as well as chance for raising the male calves for beef production. Government should provide extra land to dairy farmers and introduce early weaning diets for calf rearing and fattening puposes.
3. The animals at dairy colonies are normally kept for 240 days or 8 months for milk production and most of

Table 6. Balance sheet of keeping one animal for 8 months in dairy colonies of Karachi

Item	Expenditure (Rs.)	Income (Rs.)
Price of Animal	60,000	
Mark-up of investor	6,666	
Cost of transportation	2,500	
Cost feeding (240 days x Rs. 177/day)	42,480	
Rent of shed (Rs. 320/month)	2,560	
Labor cost, 5 laborers (Rs. 20,000 x 8/50)	3,200	
Veterinary cost	2,400	
Miscellaneous Expenditure	1,200	
Sale of milk @ Rs. 30/litre x 240 days x 8.0 liters average/day		54,000
Sale of spent animal		30,000
Total	121,206	84,016

Calculations indicate that it is not profitable to invest in this business. However, expansion in the dairy colonies over the years suggests the otherwise. Some experts believe that this was due to higher inflation rate in the past (Afzal, 2003b). Sustainability of dairy cattle colony production system has also been questioned by many experts. In fact, there is significant turn-over of farmers in this production system particularly in the recent years. Usually small dairy farmers with less

the animals are then slaughtered due to non availability of agricultural land for recycling and use of bST harmone which affects the reproductive performance of animal. This is a great loss of superior germplasm. Extra agricultural land for recycling purpose should be provided by the government and the use of bST harmone must be banned.
4. Disposal of dung and animal excreta is a major issue of dairy colonies. Dung is very useful for the

organic matter deficient soils of Pakistan. If properly utilized, the farmyard manure generated at these colonies can enrich the soils of Sindh and increase agricultural productivity many fold. The animal excreta can also be utilized to provide biogas which then can be utilized as such or converted into other forms of energy.

5. In order to reduce the feeding cost, alternate feed resources should be utilized like treatment of wheat straw and dry grasses with urea or alkli and use of silage etc. Feeding should be aimed keeping in view the physiological stage of the animals rather than feeding animals haphazardly.

6. The dairy farmers at cattle colonies use many non-conventional feed ingredients whose chemical composition is not available in literature. Secondly, there is a continues problem of feed toxicity. There is a need to have a well-equipped nutrition laboratory to support the farmers for formulating cheaper rations and prompt testing of feed ingredients for toxins level.

7. The disease diagnostic labs of dairy cattle colonies are not well equipped to carry out the required job. Furthermore, the workers of these labs have not been provided with the required on the job training. Up-gradation of the lab infrastructure and training of the staff are needed immediately to make these labs functional and useful for the dairy colonies of the Karachi.

8. Most of the dairy farmers are either illiterate or having education below metric. The people learn by experience and run the business on much higher cost. There is no arrangement for training of farmers, supervisors and workers for specialized dairy farming of cattle colonies. Relevant training of dairy farmers in cattle colonies production system can bring significant improvement in economics of dairy production in these colonies.

REFERENCES

Afzal, M. 2003a. Livestock its role in poverty alleviation. Farming outlook January-March, 2003. pp.6-8. Islamabad.

Afzal, M. 2003b. Plan of action for the development of dairy colonies around Karachi. Report of FAO of United Nation, Islamabad.

Anonymous. 2008. Dairy industry awaits modern inputs. Livestock Engineering. 32: 16.

Government of Pakistan. 2008. Economic Survey 2007-08. Finance Division, Economic Advisor's Wing, Islamabad.

Livestock Census. 2006. Agricultural Census Organization, Statistic Division, Government of Pakistan, Lahore.

Memon, A. and A.M. Khushk. 2004. Economic analyses of buffalo milk production in Sindh. PARC Socioe-conomics Research Studies 2003-04. pp.1-19.