

ECONOMICS OF COW MILK PRODUCTION IN SINDH AND AZAD JAMMU & KASHMIR

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ABSTRACT:- The study aimed to find out the economics of major breeds of cow in selected areas of Sindh and Azad Jammu and Kashmir. It is based on primary data of 130 livestock farmers, selected through simple random sampling technique. Shares of different feed resources in total feeding cost have been determined and cost-benefit analysis of milk production by ecological zones was also conducted. Wide variations in share of feed sources in total feeding cost per annum, milk productivity and profitability of main cow breeds across selected areas have been observed. Concentrate feeding is the main cost item for cow milk production in irrigated areas of Sindh and constitutes more than half (54 %) of the total feeding cost per annum. While, in coastal and desert areas of Sindh, and mountainous - AJK wheat straw is the major cost item and shares more than half of the total feeding costs per annum (51 - 58 %). Mean milk productions per lactation of Red-Sindhi breed were 1845 lit and 1590 lit in the irrigated and coastal areas of Sindh, respectively. Productivity of Thari breed in desert areas of Sindh and that of non-descript cow breed in AJK was 1411 lit and 2008 lit per lactation, respectively. Cow milk production is profitable farming activity in irrigated areas of Sindh and mountainous-AJK with benefit-cost ratios of 1.5 and 1.4, respectively. While, benefit-cost ratios of cow milk production were 1.0 and 0.7 in desert and coastal areas of Sindh, respectively, indicating subsistence nature of cow farming in these ecologies.

Key Words: Cow; Breeds; Milk; Lactation; Economics; Benefit-cost Ratio; Pakistan.

INTRODUCTION

Pakistan is ranked fourth by milk production in the world and milk production in the country amounts to 5% of the total world milk production. Put in a different way, the country produces about 31 and 40 percent of the amount of milk produced in India and USA, the world largest milk producing countries, respectively (FAO,

2010). In the year 2012-13 cattle population in the country was 38.3 million, which is 53% of the national population of major dairy animals. Total milk production in the country for human consumption was 39.9 million tonnes and cow milk share in total milk production was 34.8%. Cattle population is increasing at highest rate among livestock in the country. During last decade (from

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2002-03 to 2012-13), mean annual growth rates of cattle, buffalo, goat and sheep populations in the country were 5.4, 3.1, 1.9% and 1.7%, respectively (GoP, 2013).

Cattle breeds of Pakistan are Sahiwal, Red Sindhi, Cholistani, Dhanni, Tharparker, Bhagnari, Djal, Lohani, Rojhan and Kankrej. Among the ten breeds of cattle, only two (Sahiwal and Red Sindhi) can be classified as dairy breeds; all other are low milk producing breeds. Furthermore, pure-bred cattle in Pakistan comprise 25-30% of the population only, and rest are non-descript low producers (Afzal and Naqvi, 2004). In 2006, cattle population in Sindh province was 6.9 million, with a share in total national cattle population of 23%. In Sindh province, Red-Sindhi and Thari are main cattle breeds and share about 38% and 23% in total cattle population of the province, respectively. Similarly, Red-Sindhi is the main cow breed in irrigated and coastal areas of Sindh, and Thari is the main cow breed in desert areas of Sindh (GoP, 2006). Cattle population in AJK is about half million and farmers generally keep cows of non-descript/ cross breed (GoAJK, 2013).

The production (supply) and consumption (demand) of milk in Pakistan are characterized by seasonal fluctuations (Hussain et al., 2010). During past five years, the prices of fresh milk have increased by 77.2% from Rs. 36.6 lit⁻¹ in 2008-09 to Rs. 64.9 lit⁻¹ in 2012-13. During the same period, national milk production has increased by 13.6%; while, increase in human population was 8.4% (GoP, 2013). As the population is continuously increasing and peoples' taste and preferences for dairy products

are changing, the demand for milk is also expanding. In the present scenario of rising inflation and high poverty levels, consumers are more conscious about rising milk prices, a commodity consumed daily. On the producer side cost of production is a major concern. Fodder, cotton seed cake and straw prices have increased by about 45%, 60%, 130%, respectively from 2006-07 to 2010-11 (GoP, 2011). This imbalance between gains in production and output costs has an inverse affect on farm productivity, as sometimes farmers are not able to even cover costs of milk production. The reduced profitability of dairy farming with rising cost of production even drives out small producers from this sector and new investment is also discouraged.

Economics of production of any commodity provides necessary information about cost of production, productivity and profitability. This study has been undertaken to conduct in-depth analysis of cow milk production, to find out inventory of cows at the sampled farms in irrigated, coastal and desert areas of Sindh and mountainous-AJK, to determine the productivity of main cow breeds and determine economics of cow milk production in selected areas of Sindh and AJK.

MATERIALS AND METHOD

Data for this study was collected in June and July, 2011 using simple random sampling technique. In total, 130 livestock farmers were interviewed by using a well-structured and pre-tested questionnaire from selected areas of Sindh and Azad Jammu and Kashmir (AJK). Thirty-five farmers each from irrigated (Hyderabad

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district), and coastal areas (Badin district) of Sindh, and 30 farmers from desert areas (Umarkot district) of the province were interviewed for the study. In addition, 30 farmers from mountainous-AJK were also interviewed. The sampled farmers were selected from seven villages of Hyderabad district, six villages each of Badin and Umarkot districts of Sindh. In AJK livestock farmers from 20 villages of Muzafarabad and Rawalakot districts were interviewed.

Economics of cow milk production were calculated on per annum basis, as lactation length of main cow breeds is 270-305 days. Moreover, farmers do not replace their animals when they got dry. Quarter wise milk yield data by cow breeds was obtained from the farmers to control the issue of difference in production levels during lactation period. The cost of milk production covers both the variable and fixed costs. The fixed costs include interest on capital input and depreciation charges for milch animals. These costs were determined by the methods as reported by Ahmad et al. (1996) and Chaudhary and Ahmad

(1987). As stated earlier, farmers mostly do not replace their animals when they got dry, thus interest was charged at 5.25% (i.e., half of the prevailing interest rate) on the current value of the animals and depreciation was charged at 5.5%. There were three types of animal sheds in the surveyed areas viz., concrete, mud and mixed type. Depreciation on the current values of shed was charged @ 2.5%, 5.0% and 4.0% for concrete, mud and mixed type sheds per annum, respectively. Shed cost per animal unit/milch cow was calculated by dividing the total shed cost per annum by total number of animal units per farm. Animal units by livestock types are given in Table 1.

The variable costs include feed costs, labour cost and miscellaneous expenses like vaccination, de-worming, animal treatment, insemination, dairy equipment repair costs, and electricity charges etc. Green fodder and wheat straw costs were calculated by considering the numbers of fodder abundant and scarcity months, average price per 40kg and quantity fed per day during fodder

Table 1. Animal units by livestock types

Types	Animal Units	Types	Animal Units
Milch buffalo	1.50	Buffalo bull	1.20
Milch cow	1.00	Cow bull	1.10
Dry buffalo	1.20	Sheep	0.25
Dry cow	0.80	Goat	0.25
Buffalo/cow heifer	0.50	Donkey	0.50
Buffalo/cow calf	0.25	Horse/camel	1.20

Source: Ahmad et al., 1996.

scarcity and abundance months. Oil seed cake, choker and vanda are the main concentrates fed to the milking cows. Costs of individual concentrates were calculated by the following formulas.

$$\begin{aligned} \text{Concentrate cost} = & \\ & \text{Quantity of concentrate (kg day}^{-1}\text{)} \\ & \times \text{Price (kg}^{-1}\text{)} \times \text{Feeding days} \\ & \text{(annum}^{-1}\text{)} \end{aligned}$$

Then total concentrates cost per animal unit milch cow was calculated by the following equation.

$$\begin{aligned} \text{Total concentrates cost} = & \\ & \text{cost of main concentrates} + \text{cost} \\ & \text{of wheat grains per annum} + \text{cost} \\ & \text{of maize grains per annum} + \text{cost} \\ & \text{of molasses (gur) per annum} + \\ & \text{cost of salt per annum} + \text{cost of} \\ & \text{spices per annum} + \text{cost of oil per} \\ & \text{annum.} \end{aligned}$$

Breeding cost was calculated on per animal basis; whereas, veterinary care cost was estimated on per animal per annum basis by following expression.

$$\begin{aligned} \text{Veterinary care cost} = & \\ & \text{cost of de-worming} + \text{cost of} \\ & \text{vaccination} + \text{cost of treatment} \end{aligned}$$

Cost of both permanent and occasionally hired labour, and opportunity cost of family labour engaged in livestock farming were calculated on per annum basis. Then, labour cost per milch cow was calculated by dividing the total labour cost with total number of animal units per farm. Similarly, other miscellaneous costs were also calculated. Returns from milk production per cow were

calculated by multiplying milk production per lactation (liter per annum) with mean farm gate prices per liter during summer and winter seasons. Cost of milk production, net income per liter and benefit-cost ratios of cow milk production by ecological zones were also determined. Considering use of input resources milk production and returns per lactation normal in irrigated areas of Sindh these were compared with that of other ecologies by using Chi-square test. The Chi-square value for the test as a whole is the sum of observed minus the expected, squared and divided by the expected/normal (Greenwood and Nikulin, 1996).

RESULTS AND DISCUSSION

Inventory of Cows and other Livestock by Agro-ecological Zones

On an average, farmers in the study area keep two or three milch cows per farm (Table 2). Mean number of milch cows per farm was highest in the irrigated areas of Sindh, followed by desert areas of the province, mountainous-AJK and coastal areas of Sindh. Similarly, total animal units per farm were also highest in irrigated areas of Sindh and lowest in coastal areas of the province.

The reason is better availability of fodder/forage resources in irrigated areas of Sindh than in coastal and desert areas of Sindh, and mountainous-AJK.

Productivity of Main Cow Breeds

Productivity of Red-Sindhi cow breed was higher in irrigated areas of Sindh as compared to coastal areas of

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Table 2. Number of cows and total animal units per farm

Livestock types	Zones				Total
	Irrigated Sindh	Coastal Sindh	Desert Sindh	Mountainous AJK	
Milch cows	4.1 (5.3)	1.3 (0.6)	2.7 (0.9)	2.1 (1.4)	2.6 (3.5)
Dry cows	0.9 (1.5)	0.7 (0.6)	2.2 (2.8)	0.3 (1.0)	1.0 (1.9)
Heifers	0.3 (0.8)	0.3 (1.0)	0.4 (0.8)	0.9 (2.1)	0.5 (1.2)
Calves	1.6 (3.3)	0.3 (0.7)	2.4 (1.4)	0.4 (0.8)	1.2 (1.6)
Total animal units	38.2 (47.2)	10.8 (7.6)	12.2 (11.6)	11.3 (15.8)	18.6 (29.8)

Figures in parenthesis are standard deviations

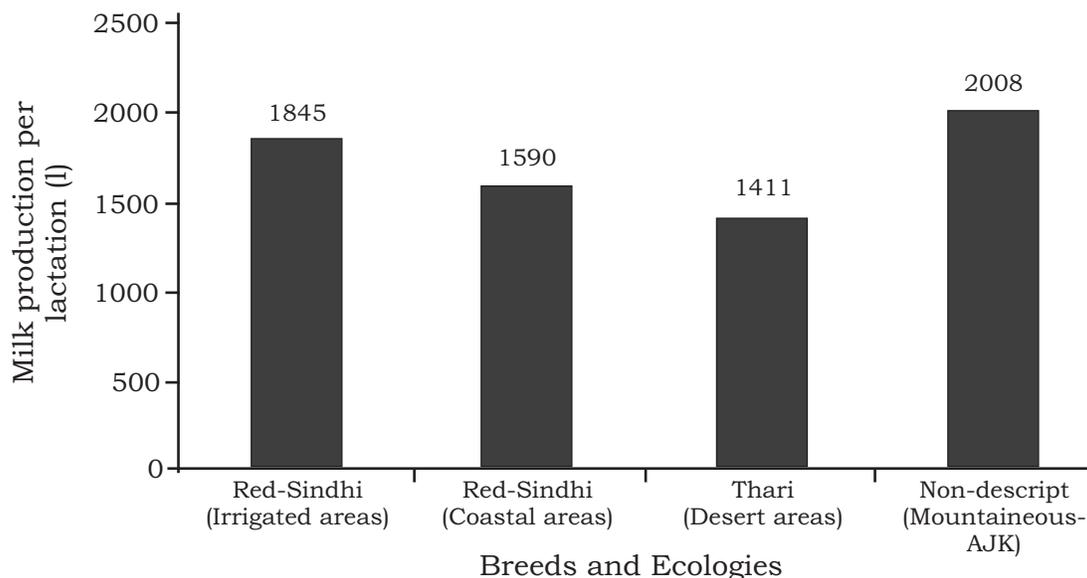


Figure 1. Productivity of main cow breeds in selected ecologies

the province (Figure 1). Mean milk productions per lactation of this breed were 1845 lit. and 1590 lit. in irrigated and coastal areas of the province, respectively.

Average milk productions per lactation of Thari breed in desert areas of Sindh and non-descript / cross cow breed in mountainous- AJK were 1411 lit. and 2008 lit. respectively. While, production potentials of

Red-Sindhi and Thari cow breeds are 4000 lit and 2160 lit. per lactation, respectively (Iqbal and Ahmad, 1999). Thus, farmers obtain above 56% of the potential productivity of Red Sindhi breed in irrigated areas and just 40% in coastal areas of Sindh province. Similarly, farmers in desert areas of the province obtain about two-third (65%) of the potential productivity of cows of Thari breed.

Table 3. Cost and income per annum of cow milk production by breeds in various ecological zones of Sindh and AJK

Parameter	Red-Sindhi (Irrigated areas)		Red-Sindhi (Coastal areas)		Thari- (Desert areas)		Non-descript (Mountainous- AJK)	
	Rs.	%	Rs.	%	Rs.	%	Rs.	%
Fixed Costs								
Amount of interest	3806 (557)	45.3	3150 (420)	48.3	4200 (540)	48.6	3500 (753)	45.5
Animal depreciation	3988 (583)	47.4	3300 (440)	50.6	4400 (580)	50.9	3667 (790)	47.6
Depreciation on shed	612 (482)	7.3	70 (35)	1.1	50 (32)	0.6	530 (298)	6.9
Total fixed cost	8406 (1110)	100.0	6520 (645)	100.0	8650 (816)	100.0	7697 (1529)	100.0
Variable costs								
Green fodder	10440 (7208)	19.2	22350 (3377)	39.4	9605 (678)	35.2	15872 (5617)	24.7
Wheat straw	14400 (6437)	26.4	28750 (8363)	50.7	15750 (3727)	57.7	33374 (20463)	51.8
Concentrates	29644 (14766)	54.4	5600 (9699)	9.9	1947 (6458)	7.1	15121 (12507)	23.5
Total feeding cost	54484 (8791)	90.9	56700 (9900)	81.7	27302 (4811)	75.8	64367 (24884)	86.5
Labour cost	3867 (1773)	6.4	9075 (4410)	13.1	8001 (3271)	22.2	6696 (5059)	9.0
Miscellaneous cost	1620 (976)	2.7	3667 (4726)	5.3	705 (537)	2.0	3391 (5340)	4.6
Total variable cost	59971 (9015)	100.0	69442 (18416)	100.0	36008 (5199)	100.0	74454 (26842)	100.0
Total Cost	68377 (20274)		75962 (19214)		44658 (6061)		82151 (28311)	
Returns								
Milk production per lactation (Liters)	1845 (445)		1590 (586)		1411 (114)		2008 (952)	
Price/liter	54.0 (6.0)		33.0 (6.0)		31.0 (4.0)		56.0 (4.0)	
Gross income from milk	99630 (28354)		52470 (20265)		43741 (3532)		112448 (48482)	
Cost of milk production per liter	37.0 (9.0)		48.0 (15.0)		32.0 (8.0)		41.0 (21.0)	
Net Income per liter	17.0 (13.0)		15.0 (21.0)		-1.0 (9.0)		15.0 (20.0)	
Benefit - cost ratio	1.0:1.5		1.0:0.7		1.0:1.0		1.0:1.4	

Figures in parenthesis are standard deviations

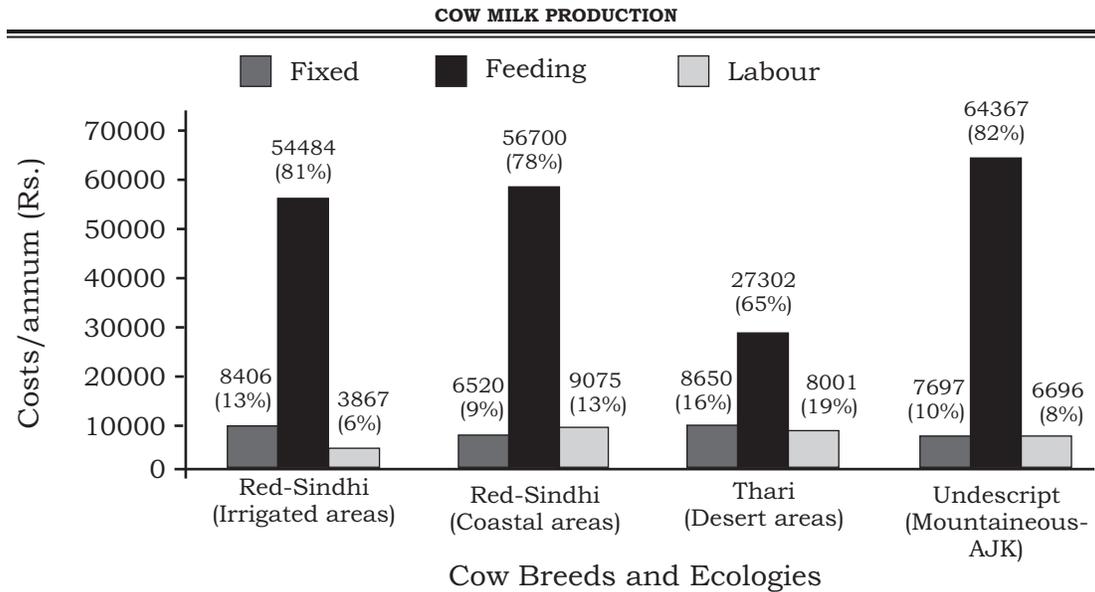


Figure 2. Main cost items for cow milk production by breeds in selected ecologies

Economics of Cow Milk Production

Share of fixed costs in the total cost of cow milk production ranged from 9-16%, across selected ecological zones (Table 3). Total costs of milk production per annum of Red-Sindhi breed in irrigated cropping zone and coastal areas of Sindh were Rs.68377 and Rs.75962, respectively. Total cost of milk production per annum of cows of Thari breed in desert areas of Sindh and non-descript breed in mountainous-AJK were Rs.44658 and Rs.82151, respectively.

Concentrate feeding cost was the main cost item followed by wheat straw cost in irrigated areas of Sindh and constitutes more than half (54%) of the total feeding cost per annum. In coastal and desert areas of Sindh, and mountainous-AJK wheat straw is the major cost item and shares more than half (51- 58%) of the total feeding costs per annum in these areas. Productivity of Red-Sindhi breed in coastal areas and Thari breed in

desert areas of Sindh are low, mainly due to very low feeding of concentrates. Shares of concentrates in total feeding cost per annum were just 10% and 7% in coastal and desert areas of the province, respectively.

Feeding cost is the main variable cost item and constitutes about two third (65%) to four-fifth (82%) of the total cost of production per annum (Figure 2). In irrigated and coastal areas of Sindh, and mountainous-AJK farmers have abundant fodder resources for eight months in a calendar year, while in desert areas farmers generally have enough fodder resources for five months (FAO, 2002 and Sarwar et al. 2002). The inter-zone comparison of feeding costs revealed that it was highest in AJK, mainly due to high prices of wheat straw and concentrates. In the irrigated and coastal areas of Sindh average feeding costs of Red-Sindhi breed were Rs.54484 and Rs.56700 per annum, respectively. In desert areas of the province, cows are grazed

on natural vegetation and fed low quantities of other feed resources. Thus, feeding cost per annum was almost half (Rs.27302) than in other selected zones of the province. Conversely, labour cost was low in irrigated area of Sindh than other ecological zones as the cow are stall fed; while in other ecologies cow are grazed for long hours by engaging family/hired labour.

Milk prices per liter were comparatively higher in AJK (Rs.56) and irrigated areas of Sindh (Rs.54) than in the coastal (Rs.33) and desert areas (Rs.31) of Sindh. As the milk production per lactation as well as milk prices were comparatively higher in irrigated areas than coastal areas of Sindh, thus gross income per lactation was high in irrigated areas of the province. Similarly, as farmers obtain higher milk production per lactation and fetch better prices for milk in AJK, thus gross income per annum was substantially higher. Costs of milk production per liter of milk in irrigated, coastal and desert areas of Sindh were Rs.37, Rs. 48 and Rs.32, respectively. Benefit-cost ratios of cow milk production of Red-Sindhi breed in irrigated and coastal areas of Sindh were 1.5 and 0.7, respectively.

Benefit-cost ratio of cow milk production in desert areas of the province was 1.0. Thus, a modest benefit-cost ratio in irrigated areas indicates that cow milk production is profitable activity. While, inverse is in coastal and desert areas of Sindh, which indicates subsistence nature of livestock farming in these ecologies. Thus, farmers keep cows just to make their subsistence relying on local forage and fodder resources. Cost of

milk production was quite high (Rs.41 per liter) but net income per liter was quite reasonable (Rs.15) in AJK with benefit-cost ratio of 1.4. Thus, cow milk production is also a profitable farming enterprise in AJK (Table 3). Pair-wise comparison of total cost of cow milk production, milk production per lactation, gross income from milk in the coastal and desert areas of Sindh, and mountainous-AJK with irrigated areas of Sindh revealed statistically significant difference at acceptable limit of 5% significance level. Thus, economics of cow milk production varies to a great extent across selected ecologies of the country.

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