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ECONOMIC ANALYSIS OF MILK PRODUCTION IN ALWAR DISTRICT OF RAJASTHAN

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ABSTRACT

An attempt has been made in this study to compare the cost and returns from milk production across members and non-members of dairy cooperative societies in Alwar District of Rajasthan during the year 2005-06. The study covered 75 cooperative member milk producers and 75 non-member milk producers. The results of the study revealed that the net cost of maintaining a buffalo was relatively higher in case of member group (Rs.47.99 per day) as compared to non-member group (Rs.44.22 per day), while corresponding figures for maintaining a cow were Rs.38.42 and Rs.36.56 respectively. The net maintenance cost was found to decrease with the increase in herd size categories in both member and non-member groups. The per litre cost of buffalo milk production was worked out to be Rs.11.43 and Rs.11.76 for member and non-member groups, respectively. The corresponding figures for cow milk production were Rs.10.20 and Rs.10.50, respectively. The net income of buffalo per day was relatively higher in case of member group (Rs.7.38) compared to non-member group (Rs.2.70), while corresponding figures for maintaining a cow was Rs. 5.37 and Rs. 1.82.

Key words: Member, Non-member, Net cost, Gross income, Net income.

INTRODUCTION

Dairying in India, in general, is closely interwoven as an integral part of agriculture, and it has also been recognized as an instrument of economic and social change especially of the weaker sections of the rural community. In dairying, a change that is taking place is shift from the maintenance of dairy animals on homegrown feed inputs to purchased feed inputs, due to the decreasing size of land holding and shrinking common property resource base. Cost plays an important role in portraying economic viability of a dairy enterprise. It is a critical economic indicator for milk producers, consumers and policy makers in order to provide an effective linkage between the milk producers and consumers for fixing the price of milk rationally. Generally, a milk producer can increase his dairy income in two ways either by increasing the milk production or by reducing cost of milk production. Cost of milk production often becomes a policy issue, when milk producers complain that the price of milk they are getting does not the cover cost of milk production.

In the past many studies have been conducted on cost of milk production of dairy farming in various agro-climatic regions at different points of time by Devraj and Gupta (1994), Gupta and Agarwal (1996), Kalra *et al.* (1995), Shiyani *et al.*(1989), Raju *et al.* (2005), Badal and Dhaka (1998), Baruah *et al.* (1996). The study on the aspect of cost and return of milk production in Alwar district has not been yet conducted. Therefore, to fill this existing information gap, an attempt has been made in the present study to compare the cost and returns from milk production among different herd size categories across members and non-members of cooperative societies.

MATERIAL AND METHODS

Alwar district milk producers' cooperative union was purposively selected from Rajasthan state. An exhaustive list of all the milk producers' cooperative societies in Alwar milk union was prepared. All the societies were stratified into three strata, viz., Low (less than 150 litres), Medium (150-300 litres) and High milk procurement societies (more than 300 litres) on the basis of milk procurement per day. Amongst these societies, six milk procurement societies were randomly selected based on probability proportion to number of

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societies in each stratum. A complete enumeration of all milk producing households of six selected societies as well as villages covered under these societies was carried out. All the milk producing households were classified on the basis of number of milch animals into three categories, viz., Small (1-2 milch animals), Medium (3-4 milch animals) and Large (more than 4 milch animals) herd size categories through cumulative frequency square root technique (Delenius and Hodges, 1950). From six selected societies, 75 member[1] households were randomly selected based on probability proportional to number of households in each category. Thereafter, an equal number (75) of non-member[2] households of almost similar resource situation were selected from each category of households in the same society villages to serve as valid basis of comparison. Thus, a total of 150 households were randomly selected. The information on value of milch animal, cattle shed and dairy equipments were collected through personal interview method, once at the beginning of the study period, while data on feeds, fodders, dung, veterinary and miscellaneous expenditure were collected seasonally during the year (2005-06). The year 2005-06 was divided into three seasons[3] on the basis of climatic conditions.

Certain expenses were incurred by the farmers for the entire herd on the farm. Fixed assets like cattle shed; other fixed equipments and miscellaneous items were jointly used for animals of all age groups and either sex. Hence, the total expenses of a household on the joint cost items; depreciation and interest on fixed assets (other than value of milch animal that is animal specific), human labour, miscellaneous cost were apportioned on the basis of standard animal units (SAUs) as suggested by Patel *et al.*[4]. The depreciation on milch local cows, crossbred cows and buffaloes were calculated by straight line method and rates of deprecation were considered as 12, 8 and 10 per cent, respectively, assuming a productive life of 8 years for local cows, 12 years for crossbred cows and 10 years for buffaloes. The depreciation for other fixed assets was taken based on the appropriate assumptions[5] regarding their useful economic life.

The annual gross cost of maintenance was worked out as weighted average of the season wise sum of the fixed and variable cost components, the weights being number of dairy animals in each category during the season. Net cost was obtained by subtracting the imputed value of dung from the gross cost. The net cost of maintenance per milch animal per day was divided by the respective average milk yield per milch animal per day to arrive at per litre cost of milk production. Various cost concepts and income measures were employed given as under.

Cost Concepts:

Cost A = Expenditure on feeds and fodders (+) Veterinary expenditure (+) Expenses on hired human labour (+) Miscellaneous expenditure (+) Depreciation on fixed assets.

Cost B = Cost A (+) Interest on fixed capital.

Cost C = Cost B (+) Imputed value of family labour.

Income Measures:

Gross Income = (Quantity of milk X Prevailing price of milk + Quantity of dung X Price of dung).

Farm labour income = Gross Income - Cost A

Family labour income = Gross Income - Cost B

Net income = Gross Income - Cost C

RESULTS AND DISCUSSION

Socio-economic profile of sample households:

The Socio-economic profile of sample households has a profound influence on the decision-making process and profitability of the dairy enterprises. The socio-economic characteristics of households such as family size, education status, herd size and size

[1] (Member who have atleast one milch animal and supplying milk to cooperative societies for a period of 180 days in a year).

[2] (Non-member who have atleast one milch animal and supplying the milk to any agency except milk cooperative societies for a period of 180 days in a year).

[3] (Summer (March-June), Rainy (July-October) and Winter (November-February)).

[4] (Conversion coefficients used by Patel *et al.* (1980) to make standard animal unit (SAUs)
Local cow = 1.00; Buffalo =1.30; Crossbred heifer >1 yr = 0.75
Crossbred cow = 1.40; Bullock = 1.00; Local cow heifer > 2 yr = 0.75
Buffalo heifer > 2 yr = 0.75; Calf of buffalo and local cow > 1 yr = 0.50; All calves < 1 yr = 0.33)

[5] (Assumptions regarding economic life of assets- Pucca building: 20 years, Chaff cutter: 10 years, Milking cans, Water cans, Buckets, Iron chains: 5 years, Ropes: 1 year, Measures etc.: 2 years).

Table 1: Milk productivity of milch animals by groups across herd size categories.
(Litres per animal per day)

Category	Buffaloes			Cows		
	Member	Non-member	t- values	Member	Non-member	t- values
Small	4.36	3.98	1.43	3. 29	3.08	0.28
Medium	4.40	3.80	2.94*	3.94	3.14	0.97
Large	4.60	3.65	3.41*	3.50	-	-
Overall	4.43	3.85	4.13*	3. 67	3.10	1.16

* Significant (P<0.05)

Table 2: Investment pattern in dairying across herd size categories.
(Rupees per annum)

Category	Member		Non-member		
	Investment per household	Investment per Standard Animal Unit	Investment per household	Investment per Standard Animal Unit	t- values(t-test carried out for investment per household)
Small	39129.03	14710.16	31382.85	13130.90	2.97**
Medium	60433.92	12283.19	56153.90	12102.13	1.37
Large	89683.89	11182.53	83947.00	11031.14	0.79
Overall	54569.76	13218.97	51070.87	12318.78	3.95**

** Significant (P<0.01).

of operational land holdings were found higher in member group as compared to non-member group. The size of operational land holding and family size increased with increase in herd size in both the member and non-member groups. Thus, revealing a positive association among herd size, size of operational land holdings and family size.

Milk Productivity: The member group recorded higher milk yield than that of the non-member group **(**Table 1). Overall average milk yield of milch buffalo was significantly (P<0.05) higher on the member households (4.43 litres) as compared to non-member households (3.85 litres). The average milk yield of milch cow was found to be 3.67 litres on member group as against 3.10 litres on non-member group. The average milk yield of milch cow was found to be 3.67 litres on member group as against 3.10 litres on non-member group. Higher average milk yield of milch animal on member group could plausibly be attributed to better quality of animals and improved management practices adopted by member group. Supply of technical inputs provided by the dairy cooperatives to producers could also be another possible factor responsible for the higher milk yield in member group.

Investment Pattern: A close perusal of the Table 2 revealed that the overall average annual investment in dairy enterprise in member group (Rs.54,569.76) was significantly (P<0.01) more than the non-member group (Rs.51,070.87). The total investment per household increased with the increase in herd size categories in both the groups. On an average, Rs.13,218.97 was invested per standard animal unit in member group as against an average of Rs.12,318.78 per standard animal unit in non-member group. The total investment per standard animal unit decreased with the increase in the herd size categories in both the groups of households.

Economics of Milk Production

In order to understand milk production from its economic perspective, it is essential to find out the maintenance cost of different species of milch animals. It, therefore, is necessary to estimate expenditure such as feed cost, labour cost, depreciation and interest on fixed capital, miscellaneous of expenses on each type of milch animals. Maintenance cost of buffalo and cow across herd size categories has been presented and discussed separately below.

Maintenance cost of buffaloes: Average net maintenance cost per milch animal per day was found to be higher for member group *i.e.* Rs.47.99 than that of non-member group *i.e.* Rs.44.22 (Table 3). Shiyani and Singh (1995) also observed similar findings. The relatively higher net maintenance cost observed for member group could be due to better

Table 3: Net maintenance cost of buffaloes by groups across herd size categories.

(Rs./milch animal/day)

Items of cost	Member				Non-member			
	Small	Medium	Large	Overall	Small	Medium	Large	Overall
Fixed Cost								
Depreciation on Fixed Assets	4.23(8.29)	4.01(8.07)	3.82(7.93)	4.02(8.09)	4.09(8.69)	3.97(8.72)	3.56(8.24)	3.95(8.63)
Interest on Fixed Assets	3.13(6.13)	2.83(5.70)	2.55(5.3)	2.84(5.72)	3.07(6.52)	2.67(5.86)	2.47(5.72)	2.80(6.11)
(A) Total Fixed Cost	7.36(14.42)	6.84(13.77)	6.37(13.23)	6.86(13.81)	7.16(15.21)	6.64(14.58)	6.03(13.96)	6.75(14.74)
Variable Cost :								
Green Fodder	9.86(19.32)	11.17(22.48)	11.13(23.12)	10.80(21.75)	9.35(19.86)	10.04(22.10)	10.93(25.34)	9.89(21.60)
Dry Fodder	13.64(26.72)	13.15(26.47)	13.39(27.81)	13.33(26.84)	12.02(25.54)	12.00(26.28)	12.11(27.86)	12.02(26.26)
Concentrate	8.63(16.91)	7.99(16.08)	8.28(17.20)	8.22(16.56)	7.74(16.44)	7.45(16.31)	6.32(14.45)	7.37(16.10)
Total Feed Cost	32.13(62.95)	32.31(65.04)	32.80(68.12)	32.35(65.15)	29.11(61.84)	29.49(64.73)	29.36(67.74)	29.28(63.96)
Family Labour	10.12 (19.83)	9.22(18.56)	7.75(16.10)	9.14(18.39)	9.40(19.97)	8.18(17.98)	6.64(15.36)	8.44(18.42)
Miscellaneous Expenditure	1.43(2.80)	1.31(2.64)	1.23(2.55)	1.31(2.65)	1.40(2.97)	1.25(2.75)	1.31(3.03)	1.32(2.88)
(B) Total Variable Cost	43.68(85.58)	42.84(86.23)	41.78 (86.77)	42.80(86.19)	39.91(84.79)	38.92(85.42)	37.31(86.04)	39.04(85.26)
Gross Cost (A+B)	51.04(100.00)	49.68(100.00)	48.15(100.00)	49.66(100.00)	47.07(100.00)	45.56(100.00)	43.34(100.00)	45.79(100.00)
(C) Value of dung	1.68	1.68	1.69	1.67	1.54	1.60	1.60	1.57
Net Cost (A+B-C)	**49.36**	**48.00**	**46.46**	**47.99**	**45.53**	**43.96**	**41.73**	**44.22**

Figures in parentheses indicate the percentage of gross cost.

feeding and management practices adopted by this group to achieve the higher milk yield. The average per day net maintenance cost was found to decrease with increase in herd size category in both the member and non-member groups indicating economies of the scale. Chand (1997) and Baweja (2004) also reported decrease in net maintenance cost per day with increase in herd size category which was in agreement with our findings.

The component wise analysis of maintenance cost indicated that for overall category, fixed and variable costs accounted for 13.81 and 86.19 per cent, respectively of gross cost in the case of member group while it was 14.74 and 85.26 per cent respectively for non-member group. Sharma and Singh (1994) and Kalra *et al*. (1995) also observed the share of variable and fixed cost to be approximately 85 and 15 per cent of gross cost respectively. The component wise break-up of variable cost component indicated that the feed cost accounted for 65.15 per cent of gross cost for overall category of member group and 63.96 per cent for non-member group. Siwach *et al.* (1992), Shiyani and Singh (1995) also observed the feed cost to account for 55 to 70 per cent of the gross cost in the case of buffaloes. The share of labour cost in gross cost was found to be almost similar at 18.39 per cent for member group and 18.42 per cent in the case of non-member group. This was in conformity with the findings of Singh *et al.* (1994) who reported labour cost to be about 17 per cent of gross cost. The percentage share of feed cost increased with the increase in herd size category while the labour cost decreased with increase in herd size category in both the member and non-member groups.

Maintenance cost of Cows: The average net maintenance cost per milch animal per day for member and non-member households for cows across herd size categories are presented in Table 4. The analysis has not been carried out for large herd size category due to very small sample size. The average net maintenance cost per milch animal per day for member group (Rs.38.42) was found to be higher as compared to non-member group (Rs.36.56) which was in conformity with the finding of Shiyani and Singh (1995). The average net maintenance cost was found to be highest for medium herd size category followed by small and large herd size

Table 4: Net maintenance cost of cows by groups across herd size categories.

(Rs./milch animal/day)

Items of cost	Member				Non-member		
	Small	Medium	Large	Overall	Small	Medium	Overall
Fixed Cost							
Depreciation on Fixed Assets	3.09(7.68)	2.98(7.31)	2.86(7.83)	2.98(7.48)	2.94(7.72)	2.91(7.77)	2.93(7.74)
Interest on Fixed Assets	2.89(7.18)	2.68(6.58)	2.21(6.04)	2.65(6.65)	2.827.41)	2.46(6.57)	2.71(7.16)
(A) Total Fixed Cost	5.98(14.86)	5.66(13.89)	5.07(13.87)	5.63(14.13)	5.76(15.13)	5.37(14.34)	5.64(14.90)
Variable Cost							
Green Fodder	7.09(17.61)	8.25(20.24)	8.17(22.35)	7.91(19.87)	7.42(19.50)	8.23(21.98)	7.66(20.25)
Dry Fodder	10.99(27.30)	11.45(28.09)	10.60(28.99)	11.17(28.04)	10.02(26.33)	10.28(27.46)	10.10(26.68)
Concentrate	6.88(17.09)	6.36(15.60)	4.95(13.54)	6.24(15.67)	5.94(15.61)	5.70(15.22)	5.86(15.49)
Total Feed Cost	24.96(62.01)	26.06(63.94)	23.72(64.88)	25.32(63.58)	23.38(61.43)	24.21(64.66)	23.62(62.42)
Family Labour	8.07(20.05)	7.80(19.14)	6.69(18.30)	7.67(19.26)	7.72(20.28)	6.74(18.00)	7.41(19.59)
Miscellaneous Expenditure	1.24(3.08)	1.24(3.04)	1.08(2.95)	1.21(3.03)	1.20(3.15)	1.12(2.99)	1.17(3.09)
(B) Total Variable Cost	34.27(85.14)	35.10(86.11)	31.49(86.13)	34.20(85.87)	32.30(84.87)	32.07(85.66)	32.20(85.10)
Gross Cost (A+B)	40.25(100.00)	40.76(100.00)	36.56(100.00)	39.83(100.00)	38.06(100.00)	37.44(100.00)	37.84(100.00)
(C) Value of dung	1.40	1.43	1.42	1.41	1.23	1.39	1.28
Net Cost (A+B-C)	**38.85**	**39.33**	**35.14**	**38.42**	**36.83**	**36.05**	**36.56**

Figures in parentheses indicate the percentage of gross cost.

categories in the case of member group while it was found to be highest for small herd size category followed by medium herd size categories in non-member group. Relatively higher average net maintenance cost observed in medium herd size category in member group could be due to comparatively more number of cross bred cows with this category which in turn required higher feed intake. The component wise break up of maintenance cost indicated that for overall category, fixed and variable costs accounted for 14.13 and 85.87 per cent of gross cost in the case of member group. Similar pattern was observed for non-member group. Further, the break-up of cost components indicated that the sizable portion of the gross cost was accounted for by the feed cost. It was 63.58 and 62.42 per cent of gross cost for overall category of member and non-member groups. Khemchand *et al.* (2002) and Aitawade *et al.* (2005) also observed the feed cost to account for 65 to 70 per cent of the gross cost in the case of cow. The share of labour cost was found to be 19.26 and 19.59 per cent of gross cost for overall category of member and non-member groups. The percentage share of feed cost increased with increase in herd size category while that of labour cost decreased with increase in herd size category in both the member as well as non-member groups.

Cost of Milk Production and Income Measures

Cost of milk production per unit is an important indicator of efficiency of milk production. A major issue in fixation of milk prices is whether, the milk price should be fixed on the basis of total cost of milk production, which entails the value of family labour computed at the on-going wage rates for permanent farm labour or only the paid out costs, which naturally excludes a major chunk of unpaid costs. By and large, in subsistence dairying, purchased inputs constituted a small proportion of total costs. Under these circumstances, an attempt has been made in this study to compute maintenance cost of milk production inclusive and exclusive of family labour and fixed cost. A comparative analysis of maintenance cost, per litre cost of milk production and various income measures for buffaloes and cows between member and non-member groups have been presented in Table 5 and 6.

Table 5: Cost of milk production and income measures for buffaloes by groups across herd size categories.

(Rs./milch animal/day)

Items of cost/income	Member				Non-member			
	Small	Medium	Large	Overall	Small	Medium	Large	Overall
I. Cost Concepts								
1. Expenditure on feed and fodders	32.13	32.31	32.80	32.35	29.11	29.49	29.36	29.28
2. Miscellaneous expenditure	1.43	1.31	1.23	1.31	1.40	1.25	1.31	1.32
3. Imputed value of family labour	10.12	9.22	7.75	9.14	9.40	8.18	6.64	8.44
4. Depreciation on fixed assets	4.23	4.01	3.82	4.02	4.09	3.97	3.56	3.95
5. Interest on fixed investment	3.13	2.83	2.55	2.84	3.07	2.67	2.47	2.80
6. Cost-A = 1+2+4	37.79	37.63	37.85	37.68	34.60	34.71	34.23	34.55
7. Cost-B = Cost-A+ Interest on fixed investment	40.92	40.46	40.40	40.52	37.67	37.38	36.70	37.35
8. Cost-C = Cost-B+ Imputed value of family labour	51.04	49.68	48.15	49.66	47.07	45.56	43.34	45.35
II. Income Measures								
9. Gross income	56.65	56.90	57.58	57.04	48.89	47.73	46.71	48.05
10. Farm labour income = 9-6	18.66	19.27	19.73	19.36	14.29	13.02	12.48	13.50
11. Family labour income = 9-7	15.73	16.44	17.18	16.52	11.22	10.35	10.01	10.70
12. Net income = 9-8	5.61	7.22	9.43	7.38	1.82	2.17	3.37	2.70
III. Per litre cost	11.79	11.46	10.94	11.43	11.82	11.71	11.44	11.76

Figures in parentheses indicate the percentage of gross cost.

Table 6: Cost of milk production and income measures for cows by groups across herd size categories.

(Rs./milch animal/day)

Items of cost/income	Member				Non-member		
	Small	Medium	Large	Overall	Small	Medium	Overall
I. Cost Concepts							
1. Expenditure on feed and fodders	24.96	26.06	23.72	25.32	23.38	24.21	23.62
2. Miscellaneous expenditure	1.24	1.24	1.08	1.21	1.20	1.12	1.17
3. Imputed value of family labour	8.07	7.80	6.69	7.67	7.72	6.74	7.42
4. Depreciation on fixed assets	3.09	2.98	2.86	2.98	2.94	2.91	2.93
5. Interest on fixed investment	2.89	2.68	2.21	2.65	2.82	2.46	2.71
6. Cost-A = 1+2+4	29.29	30.28	27.66	29.51	27.52	28.24	27.72
7. Cost-B = Cost-A+ Interest on fixed investment	32.18	32.96	29.87	32.16	30.34	30.70	30.43
8. Cost-C = Cost-B+ Imputed value of family labour	40.25	40.76	36.56	39.83	38.06	37.44	37.84
II. Income Measures							
9. Gross income	45.46	46.13	42.00	45.20	39.77	39.42	39.66
10. Farm labour income = 9-6	16.17	15.85	14.34	15.69	12.25	11.18	11.94
11. Family labour income = 9-7	13.28	13.17	12.13	13.04	9.43	8.72	9.23
12. Net income = 9-8	5.21	5.37	5.44	5.37	1.71	1.98	1.82
III. Per litre cost	10.44	10.14	10.04	10.20	10.61	10.27	10.50

The Cost-A, Cost-B and Cost-C for buffalo per day were observed to Rs.37.68, Rs.40.52 and Rs.49.66 for member group which were relatively higher than Rs.34.55, Rs.37.35 and Rs.45.35 for non-member group (Table 5). The overall average gross income, farm labour income, family labour income and net income per day in the case of buffaloes were Rs.57.04, Rs.19.36, Rs.16.52 and Rs.7.38 for member households as compared to Rs.48.05, Rs.13.50, Rs.10.70, and Rs.2.70 for non-member households. On an average, the per litre cost of milk production for buffaloes was Rs.11.43 for the member group and Rs.11.76 in the case of non-member group.

The Cost-A, Cost-B and Cost-C for cow per day were Rs.29.51, Rs.32.16 and Rs.39.83 for member group which were relatively higher than Rs.27.72, Rs.30.43 and Rs.37.84 for non-member group (Table 6). The overall average gross income, farm labour income, family labour income and net income per day in the case of cows were Rs.45.20, Rs.15.69, Rs.13.04 and Rs.5.37 for member group as compared to Rs.39.66, Rs.11.94, Rs.9.23, and Rs.1.82 for non-member group. The per litre cost of

milk production for cows was Rs.10.20 for the member group and Rs.10.50 in the case of non-member group.

The findings of present study were in conformity with that of Kairon (1992), Shukla *et al.* (1995), Shiyani and Singh (1995), Rao and Singh (1995) and Chandra (2002) who reported per litre cost of buffalo as well as cow milk production to be lower in programme area / member households / beneficiary households as compared to non-programme area / non-member households / non-beneficiary households.

CONCLUSION

It can be concluded from above discussion that the per litre cost of milk production was slightly lower in case of member of dairy cooperatives than the non-member group, which can be attributed to the higher milk yield per milch animal in member group. The gross income, farm labour income, family labour income and net income per milch animal per day in the case of buffaloes and cows were also relatively higher in member group as compared to non-member group. Relatively higher income measures observed for member group could be due to the relatively higher milk yield and higher price of milk realized by member group as compared to non-member group. The cost of milk production and income measures obtained in the present study suggested that buffalo milk production is relatively more profitable than cow in the study area. Thus, sound economic logic exists for persuading both the member and non-member households to continue buffalo rearing to enhance their income. Hence, adequate attention should be paid to promote buffalo upgradation programme.

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