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Economics of Production and Marketing of Buffalo Milk in Haryana

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The Haryana State possesses a very high milk production potential in the country due to its many favourable resource endowments like fertile land, assured irrigation, high-yielding breeds of milch animals and above all, a receptive farming community with a proven record of early adoption of improved crop milk technology. The production, consumption and marketing of buffalo milk are higher than those of cow milk in the state. The number of cows per hundred buffaloes decreased tremendously during the last three decades which indicates that the farmers have shifted from cows to buffaloes as a source of milk. The possible reasons for this may be higher lactating efficiency, milk yield, quality of milk and feed conversion efficiency of buffaloes as compared to cows.

With the increase in demand for milk in the urban areas and concentration of milk production activity in the rural areas, a large number of co-operative and private milk marketing agencies have entered into the business of procurement, processing and distribution of milk. The co-operative milk marketing societies were established with two major objectives: (a) to provide remunerative prices to the milk producer-sellers and (b) to ensure regular supply of milk to the urban consumers at affordable prices. Keeping in view these problematic situations, the present study was conducted with the following specific objectives: (1) to work out the economics of milk production, (2) to find out the break-even point of dairy enterprise, (3) to study the factors affecting marketed surplus of milk of members and non-members of milk co-operatives in the state, and (4) to study the economic efficiency in milk marketing through co-operative and private sectors of the state.

METHODOLOGY

Multi-stage stratified random design was used for the selection of the ultimate unit of the sample. The state was divided into two agro-climatic zones, i.e., western (dry) zone and eastern (wet) zone denoted as Zone I and Zone II respectively (Report on National Agricultural Research Project for Regional Group Meeting held at Ludhiana on September 29-30, 1994). One district was purposively selected from each zone on the basis of the highest population of buffaloes. Hisar and Kurukshetra were selected from Zone I and Zone II respectively. From each of the selected districts, two tehsils, viz., Hisar and Hansi from Hisar district and Pehova and Thanesar from Kurukshetra district were selected randomly applying the probability proportion to size (PPS) technique where the population of buffaloes acted as size. From each of the selected tehsils, one village was selected randomly making a total of four sample villages. The producer-sellers of each selected village were classified into three herd size-groups, i.e., small (one buffalo), medium (two buffaloes) and large (more than two buffaloes) based on simple cumulative method. From each selected village, 50 respondents were selected representing three size-groups proportionately. A sample of 13

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milk vendors, 16 Halwais, two co-operative societies, one co-operative chilling centre and two co-operative milk plants were also selected to examine the pattern of price spread, marketing cost, marketing margin and the producer's share in the consumer's rupee. The primary data were collected from the selected producer-sellers as well as intermediaries with the help of suitably structured and pre-tested schedules by holding personal interviews. The data related to winter (November to February), summer (March to June) and rainy (July to October) seasons of the year 1994-95.

To study the economics of milk production, the per day maintenance cost of a milch buffalo was worked out by simple tabular analysis. The break-even analysis was employed to work out break-even output for a buffalo by using the following formula:

$$\text{Break-even output (litres)} = \frac{\text{Total fixed cost (Rs.)}}{\text{Average selling price per litre of milk} - \text{Average variable cost per litre of milk}}$$

To study the factors affecting marketed surplus of milk in the case of both members and non-members of milk co-operatives in different seasons, multiple regression analysis was carried out. Two models, i.e., multiple linear regression and Cobb-Douglas function were fitted. In order to examine the exact effect of milk co-operatives on marketed surplus of milk, the data were pooled for members and non-members for each season pertaining to the selected milk producers and analysed by introducing dummy variable. The dummy variable was assigned value one and zero for members and non-members respectively. To compare the economic efficiency in milk marketing through private and co-operative sectors, the price spreads in different channels of these sectors were compared. The marketing efficiency through different channels was also compared by using the following formula:

$$\text{Marketing efficiency (Index)} = \frac{V}{I} - 1$$

where V = value of the marketed milk in rupees, and
I = total costs incurred in the marketing of milk in rupees.

The results of the study and discussion are presented below.

ECONOMICS OF MILK PRODUCTION

Maintenance Cost of a Milch Buffalo

The maintenance cost of a buffalo includes cost of feed and fodder, human labour, interest on fixed capital, depreciation on fixed assets and miscellaneous recurring expenditure minus income from dung and young stock. The different components of the maintenance cost per day per milch buffalo were calculated for different seasons for the three herd size-groups for both the zones, separately and are presented in Tables 1 (A) and (B).

The cost of feed and fodder constituted the most important item of the total maintenance cost accounting for 58 to 68 per cent in Zone I and for 52 to 67 per cent in Zone II [Tables 1 (A) and (B)]. This finding is in conformity with the finding of Jha *et al.* (1982). The cost of feed and fodder per buffalo per day was the highest in winter season, followed by summer and rainy seasons in all the herd size-groups in each zone which may be attributed to the

TABLE I (A). MAINTENANCE COST OF A MILCH BUFFALO PER DAY IN ZONE I

(Rs.)

Items of cost	Small size-group				Medium size-group				Large size-group			
(1)	Winter (2)	Summer (3)	Rainy (4)	Pooled (5)	Winter (6)	Summer (7)	Rainy (8)	Pooled (9)	Winter (10)	Summer (11)	Rainy (12)	Pooled (13)
Feed and fodder	35.00	32.53	30.26	32.61	35.02	32.42	30.36	32.68	33.37	31.04	29.60	31.43
	(61.73)	(60.00)	(58.10)	(60.00)	(64.53)	(62.42)	(60.56)	(62.63)	(67.77)	(66.14)	(64.57)	(66.28)
Human labour	10.03	10.02	10.15	10.07	8.50	8.77	9.02	8.75	6.50	6.52	6.87	6.62
	(17.69)	(18.48)	(19.49)	(18.53)	(15.66)	(16.88)	(17.99)	(16.77)	(13.20)	(13.89)	(14.99)	(13.96)
Interest on fixed capital	8.03	8.03	8.03	8.03	7.29	7.29	7.29	7.29	6.18	6.18	6.18	6.18
	(14.16)	(14.81)	(15.42)	(14.77)	(13.43)	(14.04)	(14.54)	(13.97)	(12.55)	(13.17)	(13.48)	(13.03)
Depreciation on fixed assets	3.18	3.18	3.18	3.18	3.03	3.03	3.03	3.03	2.85	2.85	2.85	2.85
	(5.61)	(5.86)	(6.11)	(5.85)	(5.58)	(5.83)	(6.04)	(5.81)	(5.79)	(6.07)	(6.22)	(6.01)
Miscellaneous	0.46	0.46	0.46	0.46	0.43	0.43	0.43	0.43	0.34	0.34	0.34	0.34
	(0.81)	(0.85)	(0.88)	(0.85)	(0.79)	(0.83)	(0.86)	(0.82)	(0.69)	(0.72)	(0.74)	(0.72)
Total cost	56.70	54.22	52.08	54.35	54.27	51.94	50.13	52.18	49.24	46.93	45.84	47.42
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)
Income from dung	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Income from young stock	1.32	1.32	1.32	1.32	1.37	1.37	1.37	1.37	1.25	1.25	1.25	1.25
Net cost	54.27	51.79	49.65	51.92	51.79	49.46	47.65	49.70	46.88	44.57	43.48	45.06

Figures in parentheses are percentage to the total cost.

TABLE 1 (B). MAINTENANCE COST OF A MILCH BUFFALO PER DAY IN ZONE II

(Rs.)

Items of cost	Small size-group				Medium size-group				Large size-group			
(1)	Winter (2)	Summer (3)	Rainy (4)	Pooled (5)	Winter (6)	Summer (7)	Rainy (8)	Pooled (9)	Winter (10)	Summer (11)	Rainy (12)	Pooled (13)
Feed and fodder	25.83 (55.39)	24.87 (54.56)	22.95 (52.18)	24.55 (54.07)	27.12 (59.56)	26.36 (58.86)	24.94 (57.02)	26.16 (58.52)	28.51 (66.66)	26.63 (65.16)	25.89 (64.05)	27.07 (65.37)
Human labour	9.98 (21.40)	9.89 (21.70)	10.21 (23.21)	10.03 (22.09)	8.58 (18.84)	8.59 (19.18)	8.97 (20.51)	8.71 (19.49)	6.40 (14.96)	6.38 (15.61)	6.67 (16.50)	6.48 (15.65)
Interest on fixed capital	7.34 (15.74)	7.34 (16.10)	7.34 (16.69)	7.34 (16.17)	6.56 (14.41)	6.56 (14.65)	6.56 (15.00)	6.56 (14.68)	5.03 (11.76)	5.03 (12.31)	5.03 (12.44)	5.03 (12.15)
Depreciation on fixed assets	3.07 (6.58)	3.07 (6.73)	3.07 (6.98)	3.07 (6.76)	2.85 (6.26)	2.85 (6.36)	2.85 (6.52)	2.85 (6.37)	2.50 (5.84)	2.50 (6.12)	2.50 (6.18)	2.50 (6.04)
Miscellaneous	0.41 (0.88)	0.41 (0.90)	0.41 (0.93)	0.41 (0.90)	0.42 (0.92)	0.42 (0.94)	0.42 (0.96)	0.42 (0.94)	0.33 (0.77)	0.33 (0.81)	0.33 (0.82)	0.33 (0.80)
Total cost	46.63 (100.00)	45.58 (100.00)	43.98 (100.00)	45.40 (100.00)	45.53 (100.00)	44.78 (100.00)	43.74 (100.00)	44.70 (100.00)	42.77 (100.00)	40.87 (100.00)	40.42 (100.00)	41.41 (100.00)
Income from dung	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Income from young stock	1.18	1.18	1.18	1.18	1.17	1.17	1.17	1.17	1.25	1.25	1.25	1.25
Net cost	44.49	43.44	41.84	43.26	43.40	42.65	41.61	42.57	40.56	38.66	38.21	39.20

Figures in parentheses are percentage to the total cost.

highest quantity of concentrates fed per buffalo per day in winter season, followed by summer and rainy seasons by the farmers of all the herd size-groups in both the zones. The higher quantity of concentrates fed during winter season may be attributed to the higher milk yield obtained. It was further observed that the cost of feed and fodder per day was higher in small and medium size-groups as compared to the large size-group in all the three seasons in Zone I. However, in Zone II, it showed an increasing trend with an increase in the herd size in all the three seasons. Comparing the two zones, the higher feeding cost in each herd size-group in Zone I as compared to Zone II may be attributed to the higher quantity of concentrates fed in the former zone as compared to the latter zone. This may be partly on account of the availability of home produced concentrates due to higher gram, oilseeds and cotton acreage in the cropping scheme of the farmers of Zone I and partly due to inter-zonal differences in livestock management practices.

Tables 1 (A) and (B) further show that the cost of human labour per milch buffalo per day was comparatively higher in rainy season as compared to the other two seasons in all the herd size-groups in both the zones which may be attributed to the fact that the actual time spent by the farmers of each herd size-group was higher in rainy season on account of more grazing hours. The average cost of labour per buffalo per day was Rs. 10.07, Rs. 8.75 and Rs. 6.62 on small, medium and large size-groups respectively in Zone I. The findings were similar in Zone II. The decreasing trend in labour cost with an increase in herd size may be attributed to the economies of scale. The interest on fixed capital and depreciation on fixed assets per buffalo per day in each zone was the highest in small size-group and the lowest in large size-group again due to the economies of scale. It was further observed that the interest and depreciation on fixed capital in each herd size was comparatively higher in Zone I than in Zone II only on account of differences in the quality of buffaloes maintained leading to a wide variation in the fixed cost.

The net maintenance cost per milch buffalo per day was estimated by deducting the income from dung and young stock from the total maintenance cost as presented in Tables 1 (A) and (B). The findings were similar to those of total maintenance cost.

Buffalo Milk Yield Per Day

The average daily milk yield has been estimated for milch buffaloes by taking into account the dry period because the maintenance cost per buffalo was estimated on the basis of maintenance cost of both dry and lactating buffaloes during the specific period of the study. It is obvious from Table 2 that the average daily milk yield of a milch buffalo on small size-group was higher in winter season, i.e., 7.24 litres as compared to summer season (6.00 litres) and rainy season (6.15 litres) in Zone I. Similarly, the average daily milk yield of a milch buffalo was higher in winter season as compared to the other seasons in medium and large herd size-groups.

TABLE 2. DAILY MILK YIELD OF A MILCH BUFFALO IN DIFFERENT HERD SIZE-GROUPS

Seasons	Zone I			Zone II		
	Small	Medium	Large	Small	Medium	Large
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Winter	7.24	6.71	6.05	6.35	6.05	5.65
Summer	6.00	5.55	4.95	5.39	5.25	4.73
Rainy	6.15	5.67	5.10	5.35	5.21	4.90
Pooled	6.46	6.00	5.39	5.70	5.52	5.11

TABLE 3 (A). ECONOMICS OF MILK PRODUCTION PER MILCH BUFFALO PER DAY IN ZONE I

Particulars	Small size-group				Medium size-group				Large size-group			
(1)	Winter (2)	Summer (3)	Rainy (4)	Pooled (5)	Winter (6)	Summer (7)	Rainy (8)	Pooled (9)	Winter (10)	Summer (11)	Rainy (12)	Pooled (13)
Net cost (Rs.)	54.27	51.79	49.65	51.92	51.79	49.46	47.65	49.70	46.88	44.57	43.48	45.06
Milk yield (litres)	7.24	6.00	6.15	6.46	6.71	5.55	5.67	6.00	6.05	4.95	5.10	5.39
Price (Rs./litre)	7.78	8.99	8.64	8.43	7.76	9.00	8.67	8.41	7.80	8.97	8.66	8.41
Gross return (Rs.)	56.33	53.94	43.14	54.46	52.07	49.95	49.16	50.46	47.19	44.40	44.17	45.33
Net profit (Rs.)	2.06	2.15	3.49	2.54	0.28	0.49	1.51	0.76	0.31	-0.17	0.69	0.27

TABLE 3 (B). ECONOMICS OF MILK PRODUCTION PER MILCH BUFFALO PER DAY IN ZONE II

Particulars	Small size-group				Medium size-group				Large size-group			
(1)	Winter (2)	Summer (3)	Rainy (4)	Pooled (5)	Winter (6)	Summer (7)	Rainy (8)	Pooled (9)	Winter (10)	Summer (11)	Rainy (12)	Pooled (13)
Net cost (Rs.)	44.49	43.44	41.84	43.26	43.40	42.65	41.61	42.57	40.56	38.66	38.21	39.20
Milk yield (litres)	6.35	5.39	5.35	5.70	6.05	5.25	5.21	5.52	5.65	4.73	4.90	5.11
Price (Rs./litres)	7.23	8.29	8.04	7.82	7.21	8.26	8.04	7.80	7.26	8.29	8.04	7.80
Gross return (Rs.)	45.91	44.68	43.01	44.57	43.62	43.36	41.89	43.06	41.02	39.21	39.40	39.86
Net profit (Rs.)	1.42	1.24	1.17	1.31	0.22	0.71	0.28	0.49	0.46	0.55	1.19	0.66

A similar trend was observed in the case of average daily milk yield of a milch buffalo in different seasons and herd size-groups in Zone II also. The findings of Balishter and Singh (1983) were also the same regarding the milk yield in different seasons. The average daily milk yield of a milch buffalo was the highest in small size-group and the lowest in large size-group in all the three seasons and in both the zones. This may be due to the fact that the percentage of buffaloes in milk in all the seasons was the highest in small size-group and the lowest in large size-group and the time devoted by the farmers for care and maintenance of each animal was the highest in small herd sized farms, followed by medium and large herd sized farms in both the zones. It was further revealed that the daily milk yield of a buffalo in each season in each herd size-group was higher in Zone I than in Zone II which may be due to better health of animals, higher quantity of concentrates fed to the buffaloes and better management in Zone I than in Zone II. Thus the above findings reveal that there exists sufficient scope to increase milk yield per buffalo through better feed, fodder and health management from the existing breed being maintained by the farmers.

The economics of milk production in different seasons in all the herd size-groups in both the zones is shown in Tables 3 (A) and (B). It is obvious from the tables that on an average, the total returns from the sale of milk per milch buffalo per day was the highest in small size-group, i.e., Rs. 54.46, followed by medium (Rs. 50.46) and large (Rs. 45.33) herd size-groups in Zone I. A similar trend was also observed in the case of total returns in different herd size-groups in Zone II. The total returns per buffalo per day was higher in winter season in each zone. The net profit from a milch buffalo per day was higher in rainy season as compared to winter and summer seasons in each herd size-group in Zone I. However, in Zone II, it was higher in rainy season only in large size-group.

BREAK-EVEN ANALYSIS

The break-even analysis was done to estimate the minimum production level required to cover the total costs. The herd sizewise break-even output levels worked for the two zones are shown in Table 4. The table shows that the total milk produced per milch buffalo during

TABLE 4. BREAK-EVEN OUTPUT FOR MILCH BUFFALOES IN DIFFERENT SIZE-GROUPS

(per annum)

Zones/state and size-groups	Milk yield per buffalo (litre)	Fixed cost per buffalo (Rs.)	Variable cost per buffalo (Rs.)	Total cost per buffalo (Rs.)	Variable cost per litre of milk (Rs.)	Price per litre of milk (Rs.)	Break-even output (litre)	Percentage of break-even output to total output
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Zone I								
Small	2,357.90	4,091.65	14,859.15	18,950.80	6.30	8.43	1,920.96	81.47
Medium	2,190.00	3,766.80	14,373.70	18,140.50	6.56	8.41	2,036.11	92.97
Large	1,967.35	3,295.95	13,150.95	16,446.90	6.68	8.41	1,905.17	96.84
Overall	2,197.30	3,770.45	14,271.50	18,041.95	6.49	8.42	1,953.60	88.91
Zone II								
Small	2,080.50	3,799.65	11,990.25	15,789.90	5.76	7.82	1,844.49	88.66
Medium	2,014.80	3,434.65	12,103.40	15,538.05	6.01	7.80	1,918.80	95.23
Large	1,865.15	2,748.45	11,559.55	14,308.00	6.20	7.80	1,717.78	92.10
Overall	1,894.35	2,883.50	11,639.85	14,523.35	6.14	7.80	1,737.05	91.70

the year in small, medium and large herd size-groups was 2,358 litres, 2,190 litres and 1,967 litres respectively which were higher than the required break-even output levels at 1,921 litres, 2,036 litres and 1,905 litres respectively in Zone I. Similarly, the milk production in each herd size-group was higher than the break-even output level to cover both the fixed and variable costs in Zone II. The break-even output level varied from 81 to 97 per cent of the actual milk yield in small, medium and large herd size-groups respectively in Zone I. In Zone II, it ranged from 89 per cent of the total output in small herd size-group to 95 per cent in medium herd size-group. Thus it can be concluded that the break-even output was achieved earlier in small size-group than in the other size-groups in both the zones. This conclusion is also confirmed by the findings of Siwach *et al.* (1992).

MARKETED SURPLUS FUNCTIONS

In order to obtain quantitative estimates of factors affecting marketed surplus of milk, linear and log-linear functions were used for both private and co-operative systems of milk marketing prevalent in the study areas. Finally, the log-linear function was retained on the basis of R^2 (coefficient of multiple determination), logical signs of the parameters and with maximum number of the parameters being significant. The results are presented in Table 5. The regression coefficient of milk production variable was positive and significant at one per cent probability level in all the three seasons in the case of both private and co-operative systems as well as for pooled data. This observation is also verified by the findings of Gupta and Patel (1988). The regression coefficients for family size variable, as expected, were found to be statistically significant and negatively influencing the marketed surplus of milk in each season in general, except in winter season under co-operative system where it was non-significant. The coefficient of price variable was found to be positive and statistically significant irrespective of the season and system of milk marketing. The higher values of the coefficient in summer season indicate that the positive impact of price on marketed surplus of milk was higher in summer season as compared to the other seasons. There was no impact of holding size on marketed surplus of milk. The coefficient of dummy variable turned out to be positive and statistically significant in all the three seasons. This clearly shows that the milk co-operatives have positive impact on the marketed surplus of milk on member farms. Thus the remunerative price for milk and co-operative system of milk marketing can go a long way in improving milk supply in the state. Chahal and Gill (1993) also confirmed the above positive impact of milk co-operatives on marketed surplus of milk.

ECONOMIC EFFICIENCY IN MILK MARKETING THROUGH CO-OPERATIVE AND PRIVATE SECTOR

The analysis was focused only on the fluid milk due to limitation of time and money. The following milk distribution channels in the state were identified:

1. Channel I : Producer - milk vendor - consumer.
2. Channel II : Producer - milk vendor - Halwai - consumer.
3. Channel III : (i) Producer - milk co-operative society - co-operative milk plant - consumer.
   : (ii) Producer - milk co-operative society - co-operative chilling centre - co-operative milk plant - consumer.
4. Channel IV : Producer - vendor - private milk dairy - private milk plant.
5. Channel V : Producer - Halwai - consumer.
6. Channel VI : Producer - consumer.

TABLE 5. MARKETED SURPLUS FUNCTIONS ON SAMPLE HOUSEHOLDS

Variables	Members			Non-members			Pooled		
(1)	Winter (2)	Summer (3)	Rainy (4)	Winter (5)	Summer (6)	Rainy (7)	Winter (8)	Summer (9)	Rainy (10)
Constant	0.00001	0.00001	0.00029	0.02532	0.00001	0.00167	0.01267	0.00001	0.00098
Milk production	1.48763*** (0.17070)	0.69221*** (0.16656)	0.15799*** (0.13558)	0.96074*** (0.11443)	0.64177*** (0.15451)	1.14893*** (0.12881)	1.20419*** (0.09256)	0.64699*** (0.12054)	1.15046*** (0.10219)
Family size	-0.5382^{NS} (0.13282)	-0.38874** (0.14379)	-0.25999* (0.15024)	-0.38188** (0.16590)	-0.39045*** (0.12320)	-0.37875** (0.18320)	-0.25785** (0.11936)	-0.39959*** (0.10347)	-0.32887** (0.13422)
Price of milk	2.71587** (1.19698)	9.52678*** (1.95888)	3.17423** (1.22504)	1.60187** (0.62803)	6.77288*** (1.36901)	3.10450** (1.49575)	1.50892** (0.58237)	8.14983*** (1.26395)	2.88371** (1.11039)
Land holding	-0.00070^{NS} (0.01520)	0.00345^{NS} (0.01631)	-0.02693* (0.01585)	-0.02083* (0.01220)	-0.01302^{NS} (0.01685)	-0.01465^{NS} (0.02384)	-0.01076^{NS} (0.01070)	-0.00823^{NS} (0.01158)	-0.02579* (0.01385)
Dummy variable	-	-	-	-	-	-	0.01123** (0.00513)	0.00922* (0.00498)	0.00712* (0.00420)
R^2	0.78851	0.86620	0.84140	0.67620	0.82696	0.75017	0.73263	0.83658	0.80578

Figures in parentheses are standard errors.
***, **, * Significant at 1, 5 and 10 per cent level respectively.
NS = Non-significant.

The results of the analysis reveal that about 60 per cent of the total marketed surplus of milk in the state was marketed through channels I and II of the private sector and about 32 per cent of the total marketed surplus moved through the co-operative sector, i.e., channel III. Khatkar *et al.* (1993) also observed that the most prevalent channels of milk marketing were through co-operatives and vendors in Hisar and Jind districts of Haryana. The remaining 8 per cent of the total marketed surplus of milk in the state was marketed through channels IV, V and VI. Hence, the price spreads were not worked out for channels IV, V and VI. It is also important to note that milk marketed through channel III in Zone I was from producer to milk co-operative societies to co-operative milk plant to consumer. In the case of Zone II in this channel another intermediary, i.e., co-operative milk chilling centre was also involved. However, while calculating the price spreads of milk marketing in channel III, all the expenses incurred by the chilling centre were included in the marketing costs borne by the milk plant.

The economic efficiency in milk marketing was compared through various channels of private and co-operative sectors of the state. The price spreads of milk marketing through channels I, II and III in both the zones are presented in Table 6.

TABLE 6. PRICE SPREADS IN DIFFERENT MARKETING CHANNELS OF MILK

(Rs./litre)

Sr. No.	Particulars	Zone I			Zone II		
		Channel I	Channel II	Channel III	Channel I	Channel II	Channel III
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	Net price to the producer	8.30 (74.24)	8.30 (60.89)	8.36 (72.07)	7.58 (73.38)	7.58 (59.36)	7.96 (71.33)
2.	Costs incurred by the milk vendor/co-operative society	1.35 (12.07)	1.28 (9.39)	0.44 (3.79)	1.29 (12.49)	1.21 (9.48)	0.35 (3.14)
3.	Net margin of milk vendor/co-operative society	1.53 (13.68)	1.43 (10.49)	0.16 (1.38)	1.46 (14.13)	1.35 (10.57)	0.17 (1.52)
4.	Costs incurred by the Halwai/milk plant	-	0.83 (6.02)	2.60 (22.41)	-	0.82 (6.42)	2.74 (24.55)
5.	Net margin of Halwai/milk plant	-	1.80 (13.21)	0.04 (0.34)	-	1.81 (14.17)	-0.06 (-0.54)
6.	Price spreads (2+3+4+5)	2.88 (25.76)	5.33 (39.10)	3.24 (27.93)	2.75 (26.62)	5.19 (40.64)	3.20 (28.67)
	Purchase price of consumer	11.18 (100.00)	13.63 (100.00)	11.60 (100.00)	10.33 (100.00)	12.77 (100.00)	11.16 (100.00)
	Marketing efficiency	2.88	1.56	2.58	2.76	1.46	2.49

Figures in parentheses are percentages of the consumer's price.

Table 6 shows that the producer's net price in absolute terms remained the same in channels I and II in both the zones as the milk vendors maintained the same level of prices for their purchases from the farmers. But the producer's share in the consumer's rupee declined in channel II as compared to channel I because another intermediary, i.e., Halwai had stepped into the marketing channel II. The producer received a higher price per litre of milk in channel III as compared to channels I and II but his share in the consumer's rupee in channel III was lower than in channel I in both the zones. A perusal of the table further indicates that the net price to the producer per litre of milk in all the three channels was much higher in Zone I as compared to Zone II. It may be due to the reason that the farmers of Zone I

produced better quality milk having high fat percentage (on account of differences in feeding and management practices discussed earlier) as compared to the farmers of Zone II. It was also observed that the producer's share in the consumer's rupee in all the three channels was higher in Zone I than in Zone II. It may be attributed to the fact that the price spread did not increase in the same proportion as the net price received by the producers in Zone I.

The vendor's marketing cost per litre of milk and its share in the consumer's rupee was lower in channel II than in channel I in both the zones (Table 6). It may be due to the fact that the per litre cost on labour and transportation incurred by the vendor was lower in channel II than in channel I due to economies of scale. The marketing costs and net margins of the Halwai in absolute terms in channel II remained the same in both the zones. However, the net margins of the Halwai in percentage terms were higher in Zone II (14.17 per cent) as compared to Zone I (13.21 per cent). Table 6 further shows that the marketing cost incurred by the milk co-operative society and its share in the consumer's rupee were higher in Zone I than in Zone II which may be due to price differentials on account of difference in milk quality (fat percentage). In general the fat percentage in the milk produced was higher in Zone I as compared to Zone II. The marketing cost incurred by the milk co-operative society in channel III both in absolute and percentage terms was much lower as compared to the marketing cost incurred by the vendor in channels I and II in both the zones which may be attributed to the fact that the volume of business was much higher in the case of co-operative society in channel III than that of vendors in channels I and II. The plant gained very low net profit of Re. 0.04 per litre of milk collected from Zone I and incurred a net loss of Re. 0.06 per litre of milk collected from Zone II. This may be attributed to the under-utilisation of the milk plant.

In terms of net price received by the producers, milk marketing channel III established its superiority over channels I and II. However, in terms of producer's share in percentage terms in the consumer's rupee, channel I was found to be most efficient, followed by channel III and channel II in both the zones. Thus milk marketing channels I and III were found to be most efficient in protecting the interests of producers as well as consumers thereby maximising the welfare of the society as a whole.

CONCLUSIONS

The study concluded that the feed and fodder cost was the most important item of the total maintenance cost accounting for 58 to 68 per cent of the total cost in Zone I and 52 to 67 per cent in Zone II. The net profit per day of a milch buffalo was very low due to the higher maintenance cost and low milk yield of milch buffaloes on each herd size-group in each zone of the state. The net profit from milk production per buffalo per day was observed to be higher in the case of small size-group due to higher milk yield of milch buffaloes in this size-group as compared to medium and large herd size-groups in both the zones. However, all the herd size-groups in each zone were operating above the break-even levels. But the average yield in most of the farms was very near to the break-even point making them vulnerable to fall below with minor change in milk yield and its prices/price of feed and fodder. Price of milk was found to be the most important factor influencing volume of milk business significantly, besides production level. The establishment of milk co-operative societies in the rural areas had positive impact on the marketed surplus of milk.

The study further showed that the milk vendor being an important intermediary in milk marketing was taking huge profits by adopting various types of malpractices. Under-utilisation of plant capacity was the major factor for incurring losses by co-operative milk plant in fluid milk marketing. The net gain (in absolute) was higher to the producer selling milk through milk-co-operative society (channel III). However, the producer's share in the consumer's rupee (in percentage terms) was higher for those selling milk through private milk vendors (channel I). Thus the indicators of marketing efficiency confirmed that channel I of private sector was the most efficient channel in milk marketing in the study area.

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