



Munich Personal RePEc Archive

IMPACT OF MILK COOPERATIVES ON MARKETED SURPLUS OF MILK

Shah, Deepak

Gokhale Institute of Politics and Economics

5 July 2007

Online at <https://mpra.ub.uni-muenchen.de/3855/>

MPRA Paper No. 3855, posted 06 Jul 2007 UTC

IMPACT OF MILK COOPERATIVES ON MARKETED SURPLUS OF MILK IN MAHARASHTRA

Introduction:

In today's scenario, the marketing strength of an organisation spells the difference between success and failure. In the absence of a good marketing network, larger quantity of surplus milk produced in the village in a flush season is either consumed at home or is partly sold to milk vendors at unremunerative low price. Thus, there is actual shrinkage in marketed surplus due to high propensity of consuming milk at the production point. This has been established by various studies conducted in the past on marketed surplus of milk (Dhaka, 1981; Bahadure et al., 1981; Singh and Singh, 1986; Shah and Sharma, 1993). Therefore, for the development of dairy industry in the country, improvement in the marketing mechanism of milk is a must. The stranglehold and vice like grip of milk vendors and *halwais* (traditional sweetmeat makers) on the milk marketing should be weakened by ensuring a more profitable dairying enterprise for the farmers (Shah, 1996). In many areas and states this has been done by establishing and encouraging formation of milk producers' cooperatives, affiliated to either Government or private institutions. Further, for the process of economic development to become viable, it is necessary that the marketed surplus increases with increasing production volumes. This interalia lays emphasis on the need to adjust supply and demand through orderly marketing in order to avoid undue price fluctuations. And, to achieve this goal, it is necessary to ascertain the determinants of marketed surplus of milk that would help policy makers in formulating policies for increasing the marketed surplus through establishment of efficient marketing systems. There is dearth of empirical evidence on the determinants of marketed surplus of milk. The present study was, therefore,

conducted to test the hypotheses that ‘organized institutions’ engaged in the marketing of milk have benefited the milk producers and contributed significantly towards increasing milk supply.

Data and Methodology

The study was conducted during 1994-95 in Jalgaon and Kolhapur districts of Maharashtra.¹ Multistage stratified random sampling technique was used for the selection of talukas, villages and milk producing households. The talukas in each district were classified into two groups as those falling in the eastern and in the western part of each district. Two talukas, one of eastern and western parts, were selected purposely from each district.² The villages within each selected taluka were stratified into two strata, namely, villages covered under the umbrella of milk co-operative infrastructure encompassing the district co-operative milk union and those not covered by such organized milk marketing infrastructure. These were termed as ‘extension’ and ‘control’ areas, respectively. One village falling under the purview of co-operative infrastructure and another village not covered by it was selected randomly from each selected taluka. Thus, four villages were selected from each district – 2 villages under milk cooperatives with adequate market infrastructure through co-operatives and another 2 villages with inadequate market infrastructure.

The households in each selected villages were categorised as small (1-2 milch bovines), medium (3-4 milch bovines) and large (5 and above milch bovines) based on herd strength using cumulative frequency square root technique (Dalenius and Hodges, 1950) and 15 milk producing households were selected from each village subject to probability proportion to size technique. The households selected from villages under co-operatives were those who were also members of the village milk co-operative society.

Thus, 120 households were covered by the study (60 from Jalgaon and another 60 from Kolhapur).

The data were collected with the help of well-structured pre-tested performa by personal interview method. The selected households were visited once in each of the 3 seasons, viz., summer (March-June), rainy (July-October) and winter (November-February), for the collection of relevant information on the marketed surplus of milk. The information collected included demographic particulars, education status of individual members, herd size, land holding, milk production from individual animals, quantity of milk sold and the price realized.

The milk marketed surplus function for each season was construed as follows:

$$MS = f (MP, FS, EDU, Py)$$

Where, MS = Marketed surplus of milk per household per day in litres. The quantity of milk sold per day was considered as marketed surplus.

MP = Total milk production from all animals per household per day in litres.

FS = Family size of the milk producer household.

EDU = Education index of the head of the household. Total number of years of schooling was considered as the education index.

Py = Weighted average price of milk per litre. Since milk of different types like buffalo milk, local cow milk and crossbred cow milk was sold by individual milk producers, the weighted average price of milk, taking the weights as the quantity of each type of milk, was considered as the average price realized.

Different mathematical models like Linear and Cobb-Douglas forms were tried and the model which conformed to statistical considerations and economic logic was selected.

The major reason as to why the above marketed surplus model was confined to only four explanatory variables is that in one of earlier studies (Shah, 1991; Shah and Sharma, 1993) conducted on the subject more number of variables were included in the

model used to ascertain their influence on marketed surplus of milk. These variables not only included the variables used in the present investigation like MP, FS, EDU and Py, but also some other variables like total number of milch animals and total operational land holding of the households. But these additional two variables in the earlier study failed to exercise their influence on the marketed surplus of milk. Since in the earlier study the major influence was seen in respect of only four variable viz., MP, FS, EDU and Py on the marketed surplus of milk, these four variables only were retained in the marketed surplus model selected in the present investigation.

Empirical Findings

Milk, being a perishable commodity, cannot be stored for sale at future date and, therefore, has to depend upon the immediate demand for milk. The quantity of milk available for sale depends upon a number of factors like production, family size, education, price, demand, etc (Shah and Sharma, 1993). Therefore, it is of utmost importance to have an idea about the economic profile of the milk producer households supplying milk to various marketing agencies. Table 1 presents the general information of different categories of milk producer household in the two sample pockets under study.

It could be noticed from Table 1 that the average size of a family consisted of 5-6 persons in both extension and control areas and it held true for both Jalgaon and Kolhapur districts. On a facile view, the number of members in the family increased with the increase in herd size category of milk producers, particularly in Kolhapur district. Further, the cattle keepers in the medium and large herd size categories, particularly in extension areas, attained higher education level and appeared to be better equipped to take effective managerial decisions than cattle keepers in small category. The operational land holding increased with the increase in herd size category, thus, revealing positive association between herd size and land holding. The average price realization was

marginally higher in extension area for all the categories of households than that in control area. This could be attributed to variation in quantities sold to different agencies by cattle keepers and the existence of organized milk market infrastructure in extension area.

Impact of Milk Cooperatives:

In order to examine the impact of milk cooperatives on production and marketed surplus of milk in different seasons, mean differences of production and marketed surplus between beneficiary and non-beneficiary households were computed, which were also tested to see their significance using t-statistics. The subsequent sections provide an insight into the average production and marketed surplus of milk during summer, rainy and winter seasons for both the sampled districts and areas, and also mean differences in the same between beneficiary and non-beneficiary households.

Production and Marketed Surplus in Summer Season:

Almost all the sampled households of extension as well as control areas sold a part of the milk produced by them. The levels of production as well as marketed surplus of milk were observed to be substantially higher in clusters covered by the organized sector than those where no organized marketing facilities existed (Table 2). This was noticed in both the sampled districts. The proportion of milk marketed to total production was about 78 per cent in extension and 72 per cent in control area of Jalgaon district. These proportions in respect of sampled pockets of Kolhapur district were 81 per cent and 72 per cent. Both the production and absolute marketed surplus increased with the herd size category. However, percentage sale of production was observed to decrease with the increase in herd size in extension area of both the districts. This indicates that small category of producers sold higher proportion to total production compared to other categories of producers. Since the small producers' need for immediate cash being

higher, they sold higher proportion compared to other categories. However, control area of both the districts presented a different scenario. While the average marketed surplus to total production increased with the increase in herd size in control area of Jalgaon district, the proportion was more for medium category and it was same for small and large categories in Kolhapur district. The lower proportion of sale in small category in control area of both the districts could be expected due to lower production and some minimum quantity of milk needed for home consumption. However, lower proportion of milk marketed by large category compared to other categories in control area of Kolhapur district is really strange which may be associated to higher quantity of milk utilized for conversion into products instead of selling as liquid or fluid milk. This factor obviously might have depressed marketed surplus of milk for the large category of producers.

While comparing results of extension and control area of our study districts, it was observed that the percentage marketed surplus was little higher in extension area of Kolhapur district compared to Jalgaon district. But in the case of control area, the proportion was same in both the districts. However, in absolute quantity these parameters were much higher in extension area of Kolhapur compared to Jalgaon district.

In fact, the weaknesses in organization and management of cooperatives in general have been highlighted in the past. But very little efforts have so far been made to examine the impact of dairy cooperatives on production and marketed surplus of milk in different seasons. An attempt in this regard, therefore, has been made by working out mean differences in production and marketed surplus between extension and control area and testing it for statistical significance. In general, it was observed that the milk cooperatives in Jalgaon district neither had any impact on production nor on marketed surplus of milk. However, a little positive impact of cooperatives can be observed in the case of small and medium category. But in the case of large category, the impact of

cooperatives was observed to be negative on production, though not on marketed surplus. Since the level of significance was at 20 per cent and as the number of observations were very few for large category, a concrete and clear-cut conclusion in this regard cannot be drawn.

In the case of Kolhapur district, it was noticed that the mean differences in production and marketed surplus of milk between extension and control areas were statistically highly significant for all the herd size groups which indicated that the above parameters were significantly higher for beneficiary households compared to non-beneficiary households suggesting thereby positive impact of milk cooperatives on production and marketed surplus of milk in summer season.

Production and Marketed Surplus in Rainy Season:

Though the production and absolute marketed surplus for each category of households increased in rainy season, by and large, compared to summer, the proportion of sale to production declined during this season for all the categories of our sampled households (Table 3). The average milk production per household per day during this season was 11.09 litres in extension area of Jalgaon district, out of which 8.01 litres was sold representing marketed surplus of 72.23 per cent. On the other hand, the quantities of milk produced and sold in control area of this district were 10.33 litres and 6.26 litres and thus giving an average marketed surplus of only 60.60 per cent. This shows that though the average quantity of milk produced by an average sample household is almost same in both the areas of this district; however, the quantity of milk marketed was much higher in extension area compared to control area. In the case of Kolhapur district, it can be observed that the percentage milk marketed to production was reduced during this season compared to summer season. In general, medium category of producers sold higher proportion to production in extension and control area of Jalgaon district. On the other

hand, in Kolhapur district, the proportion was much higher for medium category in extension and for large category in control area. Thus, though the large category producers' contribution to sale was least in summer season, by and large, it was much higher for this category in rainy season in control area of Kolhapur district.

In rainy season too, except for medium category, the impact of milk cooperatives was absolutely nil on production as well as marketed surplus of milk in Jalgaon district. On the other hand, milk cooperatives had positive impact on milk production and marketed surplus in Kolhapur district in general and for small and medium categories of producers in particular. In the case of large category, these cooperatives had little positive impact and that too only on production.

Production and Marketed Surplus in Winter Season:

In winter season, the proportion of milk marketed to production was lower than summer season but little higher than rainy season for all the categories of households in both the sample pockets of our study districts (Table 4). In this season, no discernible trend could be observed in terms of proportion of milk marketed to production by various categories of households in our study districts. While large category sold higher proportion in extension area of Jalgaon district, the proportion was more for medium category in control area of this district. In Kolhapur district, the proportion was higher for small category in extension and for large category in control area. The reasons for higher quantity of milk sold by a particular category of household have already been discussed in the earlier section.

In winter season also, the positive impact of milk cooperatives on production and marketed surplus could be found only in Kolhapur district. However, though these cooperatives were found to exercise a positive impact on the marketed surplus of small

category of producers in Jalgaon district, by and large, they did not have any impact on these parameters in this district.

Thus, seasonal fluctuations were observed in production and marketed surplus of milk in all herd size categories in both the areas of the districts. The production and marketed surplus per day was the lowest in summer season followed by rainy and winter seasons. However, the percentage marketed surplus was the highest in summer season followed by winter and rainy seasons. The higher percentage of marketed surplus in summer season could be due to lower milk production, higher demand and higher price offered by various agencies compared to other seasons. In the above context, we can compare our results with the findings of Bahadure et.al. (1981), Balishter et.al. (1982) and Shah and Sharma (1993).

Marketed Surplus Functions (MSF) for Milk

An attempt has been made in this sub-section to examine the empirical nature of relationship between marketed surplus of milk and its determinants. The explanatory variables considered to develop MSF were level of milk production, family size, education of head of the household and the unit price of milk. An attempt was also made to develop seasonal MSF for various categories of households. However, due to smaller number of observations for medium and large categories of sample producers in our sample pockets, it was not possible to develop seasonal MSF for these categories of households. Therefore, annual average MSF pooled over seasons were fitted separately for each district using seasonal dummies for all the categories of households. Dummy variable D_1 was used for rainy season and D_2 for summer season. Further, in this investigation Linear and Cobb-Douglas types of mathematical models were tried. However, as the Linear model explained maximum variation in marketed surplus and

also the coefficients of the explanatory variables were consistent in sign and economic logic, it was finally selected for interpretation of results.

MSF in Jalgaon District:

A perusal of Table 5 giving the MSF for various categories of milk producers in the two sample pockets of Jalgaon district revealed that the explanatory variables included in the study contributed 95 per cent of the variation in the marketed surplus of milk showing high degree of predictability of marketed surplus with the knowledge of the variables included in the function.

Milk production in the household was observed to be the single most determining factor in the marketed surplus of milk. However, its contribution to the marketed surplus with additional increase in milk production was observed to be different among different categories of milk producers in the two sample areas. The extension area was found to contribute more to marketed surplus in all the categories of milk producers. This could be due to adequate market infrastructure through milk cooperatives available in the area. Though tabular analysis shows higher proportion of marketed surplus to total milk production in the case of small category in extension area, the functional analysis, on the other hand, reveals a relatively lower increase in marketed surplus for every additional increase in milk production for this category in both extension and control areas. This is understandable for the total production being lower in this category of household, a larger proportion of additional milk produced would be retained at home for internal consumption.

The price of milk was found to be another significant factor next only to milk production in MSF, particularly in the case of small and medium categories in extension and medium and large categories in control areas.

Education level of the head of the household was the third significant factor affecting marketed surplus, though the level of significance was at 20 per cent probability level. Its positive and significant influence was observed only in the case of large category in extension, and medium category in control area. Normally, selling of milk is considered as a social taboo. However, with the increase in the education level and adequate market infrastructure, the taboo is no longer a constraint in the sale of milk. This is also revealed by the non-significance of education level in small and medium categories in extension and small and large categories in control area who mainly maintained milch animals for the sale of milk.

The family size had no significant impact on marketed surplus. This could be due to relatively small variation in the number of family members for a particular category of household. Normally, there is a negative relationship between marketed surplus of milk and family size. (Shah and Sharma, 1993). However, such a relationship could not be observed due to non-significance of regression coefficients.

The seasonal dummy variables included in the model revealed that the contribution of additional milk production to the marketed surplus of milk progressively increased from rainy to winter and winter to summer seasons. The production of milk being lower in summer, demand and price being higher, larger proportion of additional milk produced was, therefore, diverted to marketed surplus. Though the production was the highest in winter season, the proportionate contribution to marketed surplus was lower due to lower demand and lower price.

MSF in Kolhapur District:

The MSF for Kolhapur district are presented in Table 6. Milk production in the household was again found to be one of the most determining factors in the marketed

surplus of milk ($P < 0.01$) in all the herd size categories in both the sample pockets of Kolhapur district. The magnitude of the regression coefficients of average category of household revealed that with every additional increase in milk production, the marketed surplus was more or less the same (of the order of 800 ml) in both the sample pockets. However, the response was slightly more in control area compared to extension area especially for small and medium categories of households.

The family size had a negative influence on marketed surplus. Though it was not significant in a number of cases, by and large, larger family sizes tended to decrease the marketed surplus. This could be due to larger requirement of milk for internal consumption. This was more so in extension than that of control area.

Education level of the head of the household was found to have positive and significant influence on marketed surplus particularly in control area of the district. The price of milk had no significant effect. Further, while both rainy and summer seasons had significant and positive impact on marketed surplus in the case of small category in control area, the influence of former on marketed surplus was negative in extension area of Kolhapur district.

Thus, the foregoing analysis revealed that milk production was the only determining factor in the marketed surplus of milk. Its response was relatively higher in Kolhapur compared to Jalgaon district. Though the price of milk had a significant positive influence on marketed surplus in Jalgaon district, its influence on marketed surplus could not be observed in Kolhapur district. However, family size, which did not exercise any influence on marketed surplus in Jalgaon district, had a negative impact on marketed surplus in Kolhapur district. Larger family size tended to decrease the marketed surplus in Kolhapur district. Thus, the usual phenomenon that the family size is negatively associated with marketed surplus of milk could be confirmed only in Kolhapur

district. Except some isolated cases, the education level of the head of the household, who is one of the important decision makers in the family, had a positive and significant influence on marketed surplus of milk in both the sample districts. Thus, with more awareness, the milk producers showed tendency to increase marketed surplus of milk.

Conclusion

The application of 't' statistics to test the mean differences in production and marketed surplus between extension and control areas clearly revealed that, in general, milk cooperatives in Jalgaon district neither had any impact on the production nor on marketed surplus of milk. However, in Kolhapur district, the cooperatives had positive impact not only on milk production but also on marketed surplus of milk and this impact was more manifest in the summer season than other seasons. Further, an analysis drawn from MSF showed that milk production and education level of the head of the household were the two most important determining factors responsible for increasing the marketed surplus of milk and it was particularly so in the control area of both the districts. With more awareness the milk producers showed tendency to increase marketed surplus of milk. Nonetheless, in Kolhapur district, family size had negative impact on marketed surplus and in this district larger family size tended to decrease the marketed surplus of milk. The price of milk had no significant influence on marketed surplus in Kolhapur district, though the influence of this variable on marketed surplus was significant and positive in Jalgaon district in some cases. Relatively small variation in price of milk within a season could be one of the reasons for lack of impact of price on marketed surplus of milk in Kolhapur district. Further, it is to be noted that in the short run there is no possibility of increasing the milk production even though the prices vary and, hence, MSF did not show significant influence of prices on marketed surplus of milk in majority of cases.

Policy Perspective

The findings of this investigation have some policy implications insofar as the dynamic role of cooperatives in milk marketing is concerned. First, the study shows a positive relationship between milk production and marketed surplus in both extension and control areas. Second, it also shows a direct correlation between literacy level of the head of the household and the magnitude of marketed surplus of milk in both the selected areas. Nonetheless, the point that merits attention is that the positive influence of both the explanatory variables on the expansion/rise in marketed surplus of milk is more manifest in the area covered by organized milk marketing infrastructure, i.e., the area covered under the umbrella of milk cooperatives. Obviously, with the rise in literacy level, the milk producers in the area covered under organized milk marketing infrastructure have clear tendency to increase milk production by adopting superior or exotic breeds of bovines, which in turn increases their marketed surplus of milk. This is a positive feature insofar as the role of cooperatives in shaping or strengthening/ expanding the marketing of milk is concerned. This dynamic role of cooperatives should further be capitalized by enhancing awareness among the producers about the possible benefits that these cooperatives are capable of extending to them. The multiplier effect of rise in awareness and the resultant increase in milk production will certainly improve marketing efficiency of milk.

Notes

1. The criteria for the selection of districts in the state was based on certain parameters such as productivity of foodgrains, irrigation potential, cropping intensity, livestock density, number of milk producers' cooperatives, literacy rate, etc. in each district of the state. Appropriate weights were assigned to these parameters to calculate standard scores and a scale was developed for ranking all the 30 districts of the state. The districts scoring high on this scale were selected for this study.
2. The procedure for the selection of talukas in each district was similar to that of selection of districts in the state. However, the parameters considered in the selection of talukas were a little different and encompassed variables such as area under

foodgrains, total livestock population, number of milk producers' cooperative societies, literacy rate and cropping intensity in each taluka of the district.

References

- Bahadure, J.Z., C.B. Singh and R.K. Patel (1981), 'Milk Production, Consumption and Marketed Surplus in Some Villages around Karnal', *Agriculture Marketing*, Vol. 24, No. 3, pp. 19-22.
- Balishter, R.P. Singh and Bhikam Singh (1982), 'Milk Production, Consumption and Marketed Surplus in Agra District - A Case Study', *Dairy Guide*, Vol. 4, No. 9, pp. 33-35.
- Dalenius, T. and Jr. J.C. Hodges (1950), 'The Problem of Optimum Stratification', *Journal of American Statistical Association*, pp. 88-101.
- Dhaka, J.P. (1981), 'Study of Marketed Surplus and Supply Functions for Milk in the Plains and High Ranges of Kerala State', Unpublished *Ph.D. Thesis submitted to Punjab University, NDRI, Karnal (Haryana)*.
- Shah, Deepak (1991), 'An Economic Analysis of Milk Production and Supply in Bulandshahr District of Uttar Pradesh' *An Unpublished Ph.D. Theses* submitted to the National Dairy Research Institute, Karnal, Haryana.
- Shah, Deepak and K.N.S. Sharma (1993), 'Marketed Surplus Functions in Bulandshahr District of Uttar Pradesh', *Indian Journal of Animal Sciences*, Vol. 63, No. 10, pp. 1085-1093.
- Shah, Deepak (1996), 'Working of Milk Producers Cooperatives in Maharashtra', *Mimeograph Series No. 41*, A Publication of Gokhale Institute of Politics and Economics, Pune (Maharashtra).
- Singh, Lotan and C.B. Singh (1986), 'Impact of Dairy Cooperatives on Production, Consumption and Marketed Surplus of Milk in Western Uttar Pradesh', *Indian Dairyman*, Vol. 38, No. 8, pp. 404-405.

Table 1: General Information of Milk Producer Households

Household Category	No. of Sampled Households	Family Size (Nos.)	Education of Head of the Households	No. of Milch Animals	Land Holding (Ha)	Price of Milk (Rs/Litre)
Jalgaon District						
Extension						
Small	16	5.53	7.25	2.00	2.86	7.49
Medium	10	5.38	7.80	2.77	4.62	7.23
Large	4	5.00	7.75	5.75	7.29	7.45
Control						
Small	16	4.88	5.50	2.00	2.57	7.12
Medium	8	6.01	6.00	3.38	2.02	6.90
Large	6	5.80	5.00	5.84	6.09	6.73
Kolhapur District						
Extension						
Small	23	4.96	7.13	1.99	0.97	7.91
Medium	4	5.50	6.75	3.50	2.23	7.81
Large	3	6.34	9.00	5.00	2.97	7.98
Control						
Small	18	5.21	3.83	2.00	2.44	7.53
Medium	8	5.26	9.50	3.26	2.44	7.45
Large	4	6.25	3.25	5.00	2.63	6.78*

Note: * - The lower price of milk for large category of farmers in control area of Kolhapur district is mainly due more number of cows with them, which fetched lower price as compared to buffalo milk

Table 2: Per Day Per Household Average Production and Marketed Surplus of Milk-Summer Season (in litres)

Household Category	Extension			Control			MD-I (1-3)	MD-II (2-4)
	MP	MS	MS to MP (%)	MP	MS	MS to MP (%)		
Jalgaon District								
Small	8.38 (1.14)	6.59 (0.93)	78.64	6.81 (0.89)	4.59 (0.69)	67.40	1.57 [@] (1.0422)	2.00 [@] (1.1950)
Medium	13.60 (1.31)	10.65 (1.42)	78.31	10.19 (1.88)	7.38 (1.55)	72.42	3.41 [@] (2.3609)	3.27 [@] (2.2356)
Large	11.25 (1.24)	8.50 (1.09)	75.56	21.17 (4.80)	16.08 (3.86)	75.96	-9.92 [@] (6.6754)	-7.58 (5.3726)
Overall	10.50 (1.21)	8.20 (1.11)	78.10	10.58 (1.94)	7.63 (1.55)	72.12	-0.08 (2.3255)	0.57 (1.9390)
Kolhapur District								
Small	11.70 (1.24)	9.74 (1.10)	83.25	5.00 (0.58)	3.47 (0.55)	69.40	6.70 ^{***} (1.5341)	6.27 ^{***} (1.3700)
Medium	24.25 (4.80)	19.75 (3.61)	81.44	14.44 (2.23)	11.25 (2.41)	77.91	9.81 [*] (5.0737)	8.50 [*] (4.6707)
Large	42.17 (3.50)	32.33 (3.47)	76.67	22.38 (4.73)	15.25 (3.90)	68.14	19.79 ^{**} (7.3880)	17.08 ^{**} (6.4030)
Overall	16.42 (1.94)	13.33 (1.67)	81.18	9.83 (1.57)	7.12 (1.49)	72.43	6.59 ^{**} (2.5384)	6.21 ^{***} (2.2763)

Notes: 1) MP = Milk Production; MS = Marketed Surplus

2) Figures in parentheses under production and marketed surplus are their respective standard errors

3) Figures in parentheses under MD-I and MD-II are standard errors of differences between mean values of beneficiary and non-beneficiary households

4) ***, **, *, and @ indicate significance of mean difference at 1, 5, 10, and 20 per cent level of probability.

**Table 3: Per Day Per Household Average Production and Marketed Surplus of Milk-
Rainy Season (in litres)**

Household Category	Extension			Control			MD-I (1-3)	MD-II (2-4)
	MP	MS	MS to MP (%)	MP	MS	MS to MP (%)		
Jalgaon District								
Small	7.41 (0.92)	5.09 (0.56)	68.69	7.06 (0.92)	4.06 (0.66)	57.51	0.35 (1.3425)	1.03 (0.8969)
Medium	14.60 (1.67)	11.10 (1.55)	76.03	10.38 (2.26)	6.56 (1.64)	63.20	4.22 [@] (2.9199)	4.54 (2.4132)
Large	17.00 (5.12)	12.00 (4.02)	70.59	19.00 (3.80)	11.75 (2.65)	61.84	-2.00 (6.9971)	0.25 (5.1583)
Overall	11.09 (1.73)	8.01 (1.35)	72.23	10.33 (1.85)	6.26 (1.32)	60.60	0.76 (2.5762)	1.75 (1.9204)
Kolhapur District								
Small	9.70 (0.81)	7.67 (0.75)	79.07	4.81 (0.60)	3.19 (0.56)	66.32	4.89 ^{***} (1.5429)	4.48 ^{***} (1.0070)
Medium	21.25 (3.99)	16.13 (2.93)	75.91	8.50 (1.17)	5.19 (0.90)	61.06	12.75 ^{***} (3.5851)	10.94 ^{***} (2.6633)
Large	29.67 (4.32)	22.33 (3.95)	75.26	17.75 (3.98)	13.38 (4.37)	75.38	11.92 [@] (7.0118)	8.95 (7.2163)
Overall	13.24 (1.59)	10.26 (1.36)	77.49	7.52 (1.20)	5.08 (1.16)	56.55	5.72 ^{***} (2.0519)	5.18 ^{***} (1.8181)

Notes: 1) MP = Milk Production; MS = Marketed Surplus

2) Figures in parentheses under production and marketed surplus are their respective standard errors

3) Figures in parentheses under MD-I and MD-II are standard errors of differences between mean values of beneficiary and non-beneficiary households

4) ***, **, *, and @ indicate significance of mean difference at 1, 5, 10, and 20 per cent level of probability.

**Table 4: Per Day Per Household Average Production and Marketed Surplus of Milk-
Winter Season** (in litres)

Household Category	Extension			Control			MD-I (1-3)	MD-II (2-4)
	MP	MS	MS to MP (%)	MP	MS	MS to MP (%)		
Jalgaon District								
Small	11.44 (1.60)	8.47 (1.23)	74.30	8.88 (0.91)	5.22 (0.83)	58.78	2.56 [@] (1.9036)	3.25 ^{**} (1.5346)
Medium	17.80 (8.19)	13.10 (2.38)	73.60	17.25 (2.54)	11.75 (1.98)	68.12	0.55 (4.4798)	1.35 (3.3949)
Large	26.00 (1.37)	19.88 (0.62)	76.46	26.83 (4.57)	17.08 (3.14)	63.66	-0.83 (6.3853)	2.80 (4.3385)
Overall	15.50 (2.10)	11.53 (1.53)	74.39	14.70 (2.08)	9.33 (1.60)	63.47	0.80 (3.0050)	2.20 (2.2516)
Kolhapur District								
Small	13.04 (1.12)	10.87 (1.06)	83.36	7.17 (0.71)	4.58 (0.77)	63.88	5.87 ^{***} (1.4443)	6.26 ^{***} (1.4157)
Medium	27.75 (5.18)	21.75 (4.75)	78.38	12.75 (3.78)	8.81 (2.03)	69.16	15.00 ^{***} (4.8692)	12.94 ^{***} (4.8363)
Large	32.00 (3.86)	25.33 (2.88)	79.16	19.75 (6.97)	15.38 (6.59)	77.87	12.25 (10.3108)	9.95 (9.4741)
Overall	16.90 (1.93)	13.77 (1.73)	81.48	10.34 (1.83)	7.15 (1.88)	69.15	6.56 ^{**} (2.7333)	6.62 ^{**} (2.5985)

Notes: 1) MP = Milk Production; MS = Marketed Surplus

2) Figures in parentheses under production and marketed surplus are their respective standard errors

3) Figures in parentheses under MD-I and MD-II are standard errors of differences between mean values of beneficiary and non-beneficiary households

4) ***, **, *, and @ indicate significance of mean difference at 1, 5, 10, and 20 per cent level of probability.

Table 5: Marketed Surplus Functions for Milk – Jalgaon District

Household Category	N	Constant	Regression Coefficients						R ²
			MP	FS	EDU	Py	D ₁	D ₂	
Extension									
Small	48	-0.6540	0.7346*** (0.0312)	0.0368 (0.1128)	0.0424 (0.0670)	0.1138@ (0.0857)	-0.4244 (0.3912)	0.4033 (0.3821)	0.9427
Medium	30	6.7599	0.8005*** (0.0444)	-0.1493 (0.5094)	-0.0600 (0.0872)	0.9286*** (0.3828)	0.7324 (0.7549)	1.3977* (0.7883)	0.9401
Large	12	-12.6797	0.7971*** (0.1035)	0.5094 (0.8589)	0.5164@ (0.3161)	0.7183 (0.6288)	-0.4066 (1.6423)	-0.2678 (2.0890)	0.9684
Overall	90	-0.8834	0.7652*** (0.0211)	0.0372 (0.1152)	0.0597 (0.0511)	0.0429 (0.1008)	-0.1396 (0.3769)	0.4857@ (0.3803)	0.9459
Control									
Small	48	-1.0464	0.6999*** (0.0605)	-0.1149 (0.1740)	-0.0340 (0.0499)	0.1179 (0.2762)	0.1197 (0.4952)	0.7235@ (0.5630)	0.8167
Medium	24	-0.8549	0.7780*** (0.0242)	0.0264 (0.0846)	0.0872@ (0.0619)	0.1691* (0.0897)	0.0728 (0.3599)	1.1958*** (0.3737)	0.9899
Large	18	-13.6159	0.7112*** (0.0838)	0.4812 (0.7832)	0.0013 (0.2980)	1.4054** (0.5827)	-0.5519 (1.2299)	1.7206@ (1.2266)	0.9753
Overall	90	-1.3394	0.7130*** (0.0182)	0.0416 (0.1030)	0.0474@ (0.0374)	0.0337 (0.1359)	0.0493 (0.3712)	1.2108*** (0.3839)	0.9567

Notes: Figures in parentheses indicate standard errors of regression coefficients

***, **, *, and @ - indicate significance of regression coefficients at 1, 5, 10, 20 per cent level of probability

Table 6: Marketed Surplus Functions for Milk – Kolhapur District

Household Category	N	Constant	Regression Coefficients						R ²
			MP	FS	EDU	Py	D ₁	D ₂	
Extension									
Small	69	0.1954	0.8979 ^{***} (0.0198)	-0.1808 [*] (0.1042)	-0.0255 (0.0257)	0.0066 (0.0868)	-0.1840 (0.2485)	0.0732 (0.2544)	0.9756
Medium	12	-20.7275	0.7849 ^{***} (0.0941)	2.1646 (2.5864)	-0.6861 (0.6795)	0.5743 (1.2472)	-0.5662 (1.7823)	0.1700 (2.0504)	0.9632
Large	9	10.0748	0.8134 ^{***} (0.0937)	0.4090 (0.5587)	0.7449 [@] (0.4971)	-2.6092 (2.6746)	-0.2932 (1.6069)	1.3308 (2.9383)	0.9890
Overall	90	1.4808	0.7935 ^{***} (0.0138)	-0.3342 ^{***} (0.1203)	0.0155 (0.0340)	0.0676 (0.1202)	-0.2990 [*] (0.3162)	-0.1163 (0.3325)	0.9796
Control									
Small	54	-1.8533	0.9357 ^{***} (0.5757)	-0.0147 (0.1265)	0.0696 [@] (0.0453)	-0.0872 (0.1177)	0.8108 ^{**} (0.3413)	1.0167 ^{***} (0.3831)	0.8962
Medium	24	-7.3287	0.8679 ^{***} (0.0996)	-0.4608 [@] (0.3223)	0.2366 ^{***} (0.0823)	0.0431 (0.4183)	0.0437 (0.9218)	0.9375 (0.9270)	0.9557
Large	12	-1.7340	0.6482 ^{***} (0.2044)	0.2853 (1.2744)	0.8746 (1.0652)	-0.0534 (2.4296)	-0.6474 (3.1493)	-1.7280 (4.3142)	0.9865
Overall	90	-3.9869	0.8040 ^{***} (0.0253)	-0.2223 [*] (0.1236)	0.1301 ^{***} (0.0385)	0.1367 (0.1421)	0.1711 (0.3872)	0.1851 (0.4250)	0.9525

Notes: Figures in parentheses indicate standard errors of regression coefficients

***, **, *, and @ - indicate significance of regression coefficients at 1, 5, 10, 20 per cent level of probability