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Milk production economics and micro financing impacts in Chhotanagpur platue of Jharkhand

MUKESH KUMAR SINHA[1], J P DHAKA[2] and M S MEENA[3]

National Dairy Research Institute, Karnal, Haryana 132001 India

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ABSTRACT

The study examined impacts of micro credit on milk production and factor productivity among tribal farmers of Chhotanagpur platue. Sample responses of 240 farmers were analysed for this study. The impact was evaluated with the benefits accrued by the beneficiaries over non-beneficiaries with respect to economic parameter of investment pattern, cost of production and income component from dairying. The study revealed that investment made on beneficiary households (₹ 14398.88) was almost double than non-beneficiary households (₹ 7506.20). The gross income from dairy enterprise on beneficiary (₹ 14372) was higher than that of non-beneficiary (₹ 10032.72). The difference in net income, and family labour income was even more pronounced than that of gross income. Marginal value productivity of operational expenses was positive (2.01) and significant, needs priority. The study observed a very positive and favourable response of micro credit to the tribal dairy farmers, needs a continued support for improved income, nutrition and sustained livelihood.

Key word: Dairy, Economics, Finance, Livelihood

About 40 million landless poor families get a major part of their income from milk production (World Bank 2005), with some very limited hired labor and the resource poor tribal families are not an exception. Significant amount of resources has been allocated for improvement of tribal society through dairy development programs. Katkar and Nandal (1983), Nabard (1992, 1998) and Hussain (1998) observed that the productivity and finance having a very strong positive linkages. But the small tribal families are unaware about the potential benefits and impact of milk production on the farm and family economy (Pandey 1998, Kumar 1992 and Kabir *et al*.1999). Further, allocating borrowed capital to different dairy activities and return to investment from milk production is another crucial decisional element to enhance farmer's profit margins. Wani *et al.* (1992), Thomas *et al*. (1993), Gaddi and Kunnal (1996), Shah *et al*. (1995), and Yezdani *et al*. (1998) revealed the positive impact of improved graded breed, additional inputs of feed and fodder, concentrate, etc., at farm level. Therefore, it is imperative to know the productivity of borrowed dairy capital, so that farmer could make judicious decisions in the allocation of the scarce resources on different dairy activities and to earn more profits. Keeping in view, the study was conducted to examine impacts of micro credit on milk production and factor productivity on smallholder tribal dairy farmers.

Present address: [1]Senior Scientist (drmukesh@scientist.com), DWM (ICAR), Bhubaneswar 751023 India.[2]Emeritus Professor (jaiprakashdhaka@yahoo.com), NDRI, Karnal 132 001 India.[3]Senior Scientist (ms101@sify.com) ICAR Research Complex for Eastern Region, Patna 800 014.

MATERIALS AND METHOD

Micro-finance programs extend small loans to poor people for their varied needs and income diversifying activity. Distributing milch animals at subsidized rate and for the technical inputs is one of the popular banking activities near sub urban areas. This study was carried out in Ranchi district of Chhotanagpur platue in Jharkhand. A multistage sampling design was used to select blocks, cluster villages and sample households. Three sample units, each from respective block, covering a group of villages around the bank operational area were taken for the study during the reference year 2001–02. Further, category-wise lists (based on land holding) of beneficiaries were prepared with the help of bank officials. A sum of 120 dairy loan beneficiaries, representing different farm size was considered for detailed investigation. To serve a valid basis of comparison, a sample of 120 non-beneficiary households was also taken randomly from the locality. Personal interview method was used for data collection by

designated pre-tested schedule for this purpose. Tabular analysis was carried out to evaluate benefits accrued by the beneficiaries over non-beneficiaries with respect to investment pattern, lactation yield, production and disposal, cost of production and the gross income component from dairying.

Production function analysis: To determine resource productivity of borrowed capital for dairy activities,the variable and fixed expenses incurred in dairying, viz., animal operating expenses, value of purchased animal and value of other dairy farm assets such as cattle shed, stores, dairy equipments, etc., were regressed on the gross income from dairy enterprise. Both linear and Cobb Douglas form of function were tried and finally Cobb Douglas function was selected based on economic and statistical criteria. The data was therefore, subjected to functional analysis by using following form of equation.

$$Y = a X_1^{b_1} X_2^{b_2} X_3^{b_3} e^u$$

where,

Y, Gross income per milch animal/annum (₹); X_1, operating expenses per milch animal/annum (₹);X_2,value of purchased milch animals (₹); X_3, value of other dairy farm assets (₹); a, constant representing intercept of production function; b_i, regression coefficient of i^{th} variation; e^u, random error term assumed to follow normal distribution with zero mean and constant variance.

Estimation of marginal value productivity: Factors of production were derived at the mean of each factor (input) used and output. Thus marginal value of productivity of each factor was computed as derivative of output i.e. income from milk with respect to input at its mean level computed using the respective bi of the Cobb Douglas production function, other things held constant. The MVPs in monitory term of input was computed for those inputs statistically significant in the estimated production functions. The marginal value productivity of resource indicates the addition of gross value of farm production for a unit increase in the i^{th} resource with all other resources fixed at their geometric mean levels (Dayanandan 2011). The marginal value productivity of different input factors was worked out using following formula.

$$MVP_{xi} = bi \frac{\bar{y}}{\bar{x}_i}$$

where, MVP_{xi}, marginal value productivity of i^{th} inputs; bi,elasticity coefficient of i^{th} input in production function; $\bar{x}_i$, geometric mean of i^{th} input variable; $\bar{y}$, estimated level of return from milk when all inputs are at geometric mean level.

RESULTS AND DISCUSSION

Social background: Livelihood systems are primarily dependent on various combinations of agriculture, forests and labour. Livestock and fish rearing are closely integrated in the tribal farming systems. There are several artisanal castes and tribal groups who depend either on providing services to the community or on small-scale processing and marketing. They are grappling with survival on poor quality non-forest lands without modern agricultural implements. Women's work is regarded as crucial for the survival of tribal households in terms of provisioning for food, income earning, as well as management of resources. The poor literacy is probably the most possible reason for poor adoption of scientific dairy farming and exploitation of available natural resources. On an average, land holding size was 1.73 acres and average milch animal was recorded 1.35/sampled household.

Investment pattern: The investment pattern on milch animals, cattle shed/store and dairy equipment shows the marked difference between the two groups of beneficiary and non-beneficiary households (Table 1). The total investment made on beneficiary households (₹ 14398.88) was almost double than that of non-beneficiary households (7506.20). Component-wise investment found that milch animals alone accounted for about 64% of total investment on beneficiary households, while its share on non-beneficiary households are relatively less (56%). The next item of importance was cattle shed and stores, which shared 32% and 40% of total investment among beneficiary and non-beneficiary households, respectively. The investment on dairy

Table 1. Investment pattern among beneficiary and non-beneficiary households (₹/households)

Particulars	Beneficiary households				Non-beneficiary Households			
	Landless	Marginal	Small	Overall	Landless	Marginal	Small	Overall
Milch animals	9470.63	9249.46	8624.32	9211.62	4364.23	4239.62	3826.71	4208.18
	(69.43)	(64.57)	(53.90)	(63.97)	(64.90)	(56.66)	(42.57)	(56.06)
Cattle shed/ store	3672.43	4549.20	6769.41	4656.20	2146.86	2996.31	4690.73	3023.87
	(26.92)	(31.76)	(42.31)	(32.34)	(31.92)	(40.04)	(52.19)	(40.29)
Dairy equipment	498.33	525.40	608.12	531.06	213.63	246.78	470.64	274.15
	(3.65)	(3.67)	(3.80)	(3.69)	(3.18)	(3.30)	(5.24)	(3.65)
Total	13641.39	14324.06	16000.85	14398.88	6724.72	7482.71	8988.08	7506.20
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Figures in parentheses indicate the percentage to the total investment.

equipments was only 4% on both the groups of households.

Production traits of dairy animals: The production traits such as lactation length and lactation yield of milch animals have a profound influence on cost and returns in the process of milk production. On an average, buffaloes and crossbred cows were in milk for 323 and 303 days in beneficiary households while the corresponding figures for non-beneficiary households were 298 and 288 days, respectively. Surprisingly, in spite of better lactation yield and adaptability in buffalo, the bank provided loan only for the crossbred particularly Jersey animals and to a very limited extent to buffaloes. Average heard size among beneficiary were distinctly higher (2.82) than non beneficiary (2.29). More animal were found with landless category and decreased with land size holding in the study area.

Further, the trend of investment on different items was also much higher on beneficiary households and decreasing with holding size. This seems to be a sign of growing awareness and dairy as a felt avenue to improve the socio-economic condition, particularly in the proximity to the city surrounded sample areas.

Milk production, consumption and disposal pattern: The milk production is bound to increase with better breed, feed and management practices. On an average, per day buffalo producing 3.65 liters with lactation yields was 1179 liter on beneficiary households, the maximum lactation yield was observed on marginal farm category (1231.75 litre) and minimum on landless households (1081.60 litre). It can be inferred that good lactation output by marginal farmers expected early loan repayment than other category of farmers. The average lactation yield (950.62 l) of buffalo on non-beneficiary households was much less than that of beneficiary households (Table 2).

The average milk yield of cow was 3.89 litre/lactating animal, while the corresponding figure for non-beneficiary household was only 1.92 litre. Category-wise analysis showed that the average milk yield was maximum with small farmers (4.17 litre) and minimum (3.88 litre) with the landless households in beneficiary groups. Better performance of animals among beneficiaries ascribed to the better quality of animals purchased by beneficiary with the help of bank finance, resulting in higher milk yield.

The marginal farmers were found more committed in production over other categories in both groups of beneficiary (3.85 litre) and non-beneficiary (2.71 litre). Commensurate with production, higher level of milk was marketed (64.78%) on beneficiary as compared to non-beneficiary (62.18%). Further the proportion of marketed surplus showed a decreasing trend with holding size among beneficiary, while it was less surplus in non-beneficiary. The consumption was observed better among beneficiary showing that dairy supported programs affected favorably by higher production and consumption among the beneficiaries.

Cost of production: The cost of production of per kg buffalo milk was lower ₹ 5.23 on beneficiary and ₹ 5.58 on non-beneficiary households. The lowest cost of milk production was found on small farmer (₹ 5.04) on beneficiary, while among non-beneficiary, it was lowest (₹ 5.52) in the case of marginal farmers. Similar trend was observed in case of cow milk production. Across holding size also, lower cost of production was observed on beneficiary households as compared to non-beneficiary, which clearly implied that household possessed better animals giving more milk yield, resultant lower cost of production.

Income from dairy: To compare the effect of dairy financing on income generation, the gross income, net income, income to fixed dairy asset, family labour income and cost benefit ratio were computed (Table 5). The gross

Table 2. Average milk production among the beneficiary and non-beneficiary (litre)

Particulars	Beneficiary households				Non-beneficiary Households			
	Landless	Marginal	Small	Overall	Landless	Marginal	Small	Overall
Milch animals								
Buffalo	3.38	3.79	3.73	3.65	2.95	3.33	3.37	3.19
Crossbredcows	3.88	3.91	4.17	3.89	1.57	2.09	2.01	1.92
Average production	3.63	3.85	3.95	3.77	2.26	2.71	2.69	2.57

Table 3.Production, consumption and disposal pattern among households (litre)

Particulars	Beneficiary households				Non-beneficiary Households			
	Landless	Marginal	Small	Overall	Landless	Marginal	Small	Overall
Milch animals								
Production	3.63	3.85	3.78	3.77*	2.26	2.71	2.69	2.57*
Consumption	0.97	1.38	1.84	1.33	0.68	1.09	1.14	0.98
Marketed surplus	2.66(73.43)	2.47(64.33)	1.94(51.46)	2.44(64.78)	1.58(69.02)	1.62(60.11)	1.55(57.98)	1.59(62.18)

Figures in parentheses indicate the % of total marketed surplus; *, overall average milk production.

Table 4. Average cost of milk production in ₹/litre

Particulars	Category	Landless	Marginal	Small	Overall
Buffalo	Beneficiary	5.34	5.24	5.04	5.20
	Non-beneficiary	5.62	5.52	5.58	5.58
Cow	Beneficiary	5.22	5.06	5.08	5.09
	Non-beneficiary	6.21	5.75	5.97	5.93

income from dairy enterprise on beneficiary (₹ 14372) was higher than that of non-beneficiary (₹ 10032.72). The difference in net income, and family labour income was even more pronounced than that of gross income. The income on beneficiary households through dairy enterprise was higher, obviously due to higher milk production. The income from dairy enterprise occupied top priority in landless (61.56%) among beneficiary and 47% in non-beneficiary, This could be attributed to a well-known fact that the households, which were provided the milch animals through institutional finance scheme, were taking interest in dairy farming activities. Where non-beneficiary devoted more time to off-farm activities, still their participation in dairy is significant. It was observed that all type of income on beneficiary households had definite edge over the non-beneficiary households.

Marginal value productivity of dairy capital: The marginal value productivity of short and medium term investments was estimated for different categories of beneficiary. Table 6 explained the estimated MVPs coefficient of operating expenditure for each category of households and found that the overall average MVP of short-term investment on the beneficiary household was 2.01 and was significant at 10% level. The coefficient was highest (₹ 2.31) on the marginal farm, which indicates that an increase in operating expenses by one rupee at geometric mean level cause an increase of ₹ 2.31 in dairy income. This positive coefficient trend was followed by small (₹ 2.13) and landless (₹ 1.42) dairy farmers. These outcomes suggest that the beneficiary households could productively incur additional short-term investment for increasing their income from dairying.

A wide variation was observed in medium term investment coefficients also. The overall MVP of the purchased animal was found to be - 0.6216 and significant at P<0.05. However, it was highest in small farms indicating their possession of better quality of milch animals. The negative MVP among landless category responded by the fact that lower qualities of animals were purchased at higher price, resulting in low outcome. Therefore, it is essential to assess the real value of animal to be purchased by weaker sections under the supervision of competent bank authority for getting higher income. The overall X_3 value, i.e., other dairy farm assets was found to be negative (–0.6456), indicated the excess investment on other dairy farm assets, which needs to be reduced. It may also be reflection of either overvaluation of dairy asset or the biased information provided by the farmers in absence of any inventory record.

The coefficient of determination (R^2) explains the various factors influencing the farm income, namely, operating short expenses, milch animal and assest explained about 73, 78 and 62% of the total variation among landless, marginal and small farmers, respectively. In view of the above, it may be suggested that institutional credit agencies should come forward to finance short-term investment for purchase of improved feed, fodders and veterinary expenses in dairying, since additional funds are not available with farmers to increase the short-term investment in these inputs. Besides, proper selection of quality animals and their valuation should

Table 5. Income from dairy among beneficiary and non-beneficiary household (₹)

Particulars	Beneficiary households				Non-beneficiary Households			
	Landless	Marginal	Small	Overall	Landless	Marginal	Small	Overall
Gross income	13812	14687	15018	14372	8944	10609	10550	10033
Net income	6824	7455	7723	7274	4143	5057	5383	4709
Return to fixed assets	2654	2380	346	2087	1782	1814	222	4709
Family lab-income	1827	1924	1880	1869	1274	1484	1552	1431
Benefit-cost ratio	0.97	1.03	1.06	1.02	0.86	0.91	1.04	0.88

Table 6. Marginal value productivities of short and medium term investment

Category	N	Short term investment (X_1)	Value of milch animal(X_2)	Value of other dairy assets(X_3)	R^2
Landless	36	1.4263*	–0.4136*	0.0528*	0.7312
Marginal	64	2.3142*	0.7894**	–0.0641*	0.7816
Small	20	2.1376*	1.9483**	0.0778*	0.6184
Overall	120	2.0183*	–0.6216**	–0.6456*	0.7392

**, Significant at 5% level.; *, Significant at 10% level.

be done before taking decision to purchase them.

There are perceptible changes in the social and economic attributes of dairy farm families. The gross income, net income, income from fixed dairy assets, family labour income, and benefit-cost ratio were considerably higher on beneficiary households. The production, consumption and marketed surplus of milk were distinctly higher among beneficiaries, shows another positive social dimension of the nutritional security and ensuring loan repayment. The finding favoring dairy farming with supportive technical inputs having great potential to change social dimensions and their livelihood.

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