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Microfinance and income from dairy in Haryana: An impact analysis

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ABSTRACT

This paper studies the impact of microfinance through Self Help Groups (SHGs) on income from dairy using with and without (credit) approach. Tabular and regression analysis were employed on primary data collected from a sample of 120 SHG members and 60 non-members randomly selected from 2 districts of Haryana during 2007–08. Average milk production per day per household was higher for members (6.13 litre and 2.85 litre) than non-members (5.85 litre and 2.68 litre) in both, buffalo and cow. Investments on dairy were ₹36136 and ₹34674 in case of per member and non-member household, respectively. Per household average annual gross income from dairy was worked out to be higher in member households (₹28256) than non-member households (₹26443). The variable credit turned out to have positive and significant impact on gross income from dairy.

Key words: Dairy, Impact, Microfinance, Regression, SHGs

Insufficient household income is the main cause of poverty (Khawari 2004). In India, only 30% of rural poor have a bank account and 13% have access to formal credit (RFAS 2003). Microfinance schemes using Self–Help Groups (SHGs) were designed and National Bank for Agriculture and Rural Development (NABARD) considered this 'SHG – Bank Linkage' model as a core strategy for rural development. Several studies reported that the assets holding as well as income of members have increased significantly in post-SHG situation compared to pre-SHG situation in India as well as in other parts of the world (Mathew 2006, Nirmala 2006). In most of the earlier impact studies, no control group has been used, so it is difficult to conclude that the increase in income is due to the participation in microfinance program only. In some cases follow up surveys were conducted but used a randomized new sample with unique observations instead of using the same respondents who were interviewed in baseline survey (Mathew 2006). Therefore, this paper tries to study the impact of microfinance via participation in SHGs on income from dairy farming using member and non-member approach.

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MATERIALS AND METHODS

Haryana state was selected purposively mainly due to 4 reasons – worsening poverty scenario in rural Haryana, low cattle population per 1000 households across the marginal holdings, existence of large number of dairy SHGs and lack of extensive empirical studies. Out of two agro-climatic zones i.e., Eastern Zone and Western Zone of the state Western Zone was selected purposively due to existence of higher number of SHGs. Fatehabad and Mewat districts were randomly selected from the Western Zone of the state. Bhuna, Fatehabad and Jakhal were the 3 developmental blocks selected randomly from Fatehabad district and Feroze Pur Jhirka, Hathin and Nuh were selected randomly from Mewat district. From these blocks, 30 SHGs which have already completed at least 2 years since its inception and have received dairy loans were selected randomly from each district; hence, a pre-determined sample of 60 SHGs was drawn from the Western Zone. It is assumed that the benefits of participation in SHGs are fairly pronounced in 2 years. Two members were selected randomly from each of the selected dairy SHG. Thus, 60 members from a district and a total of 120 members from the Western Zone were selected. Individuals who have received loans for dairy farming were selected as individual members. To examine the impact of dairy financing through SHGs on income, 60 non-members were selected at the ratio of 1:2 (non-member: member) as a control group. Individuals who were not member of any SHG

and come from the same socio-economic status with at least having one lactating animal were selected as non-members.

Primary data on different socio-economic variables were collected from the SHG members and non members with the help of pre-tested schedules during the period of 2007–08. To assess the income from dairy, data were collected on milk, dung and sale of animals. To judge the impact of microfinance through participation in SHGs, we have compared the investments made in dairy and gross annual incomes earned from dairy by the member and non-member households and the difference in mean values were tested with z-statistics. Our hypothesis is that the investment on dairy farming will be higher in member households due to easy access to credit from the SHGs in comparison to non-member households. Similarly, it is expected that income from dairy will be higher for member households than the non-member households due to investment in good quality of dairy animals and purchase of better dairy inputs.

Regression analysis: To isolate the impact of credit assistance for dairy received after participation in SHGs Ordinary least squares (OLS) technique was used, controlling the rest of the factors (Park and Ren 2001, Taishi 2005, Mathew 2006, and Nirmala 2006). An overall positive impact is expected when a household participates in a group-based credit programme. The following multiple regression model (Log-lin form) was used in the study.

$$Y_i = \alpha + \delta C_i + \sum_{j}^{n} \beta_{jt} X_{it} + \varepsilon_i$$

Where $Y_{i,}$ log of household gross annual income from dairy; α, intercept term; δ, coefficient of credit or participation dummy C_i; X_{it}, vector of other personal characteristics that explain *Yi*; β_j, partial regression coefficients and *j* varies from 1 to 6 $\mathring{a}_i$ is the error term.

We have used per household gross annual income from dairy as the dependent variable in the regression model. It is per household gross annual return from dairy and was calculated by taking into account the value of milk production, cow dung and sale of young stocks. Value of milk was worked out by multiplying milk production per household with average milk price realized by the member and non-member households in the study area. Per capita income is calculated by dividing household income from dairy by the number of members of the household. Average milk production of individual animal on the previous day of visit was recorded by personal enquiry and multiplied by average lactation length of the dairy animals in the study area. Total annual milk production of a household is the sum of milk produced by each animal of the said household. The quantity of dung produced by the dairy animals was recorded by personal enquiry from the respondents and counter checked by considering the digestibility factor. The value of dung produced is evaluated on the basis of market rates of dung in the locality. The explanatory variables used in the model are given below:

Explanatory variables (X_i)	Measurement	Expected signs
Land holding (LAND)	Acre	+
Education level (EDN)	0 – illiterate 1 – primary 2 – secondary 3 – higher secondary 4 – university	+
Herd size (HERD)	Standard animal unit	+
Milk sale ratio (MSR)	Ratio of milk sale to total production	+
Experience in dairy (EXP)	Number of months in dairy	+
Formal training (TRNG)	Dummy 1, if skilled and 0, otherwise	+
Credit/participation dummy (CD)	Dummy 1, for members and 0, otherwise	+

RESULTS AND DISCUSSION

Status of dairy: The number of dairy animals maintained by a household directly controls the economy of the household. It is expected that with the increase in number of milch animals, milk production will increase leading to higher household income from dairy. As our sample households belong to marginal and weaker section of the society, it is expected that the possession of dairy animal may be restricted to one or two, hence the number of lactating animals reared by sample households was investigated to make sure of getting the household's return from dairy. Buffalo dominated (85.92% and 89.71%) among the dairy animals in our study area in case of both member and non-member households, respectively and followed by cow (12.68% and 10.29%). The share of crossbred cows was very poor among the dairy animals as only 2 crossbred cows were maintained by the member households in Mewat district. Average number of lactating animals, milk production per household and productivity per animal are presented in Table 1.

A comparison between member households and non-member households reveals that average number of lactating buffalo was slightly higher for non-members than the members but average number of lactating cow per household was higher for member households than the non-member households. Average buffalo milk production per day per household was higher for member households in comparison to non-member households. Productivity of milk was higher in member households for both buffalo milk as well as cow milk than the non-member households which may be due to better quality of buffalo breed and better management practices followed at member households.

Table 1. Average number of lactating animal, milk production and productivity across sample households

Category	Number of lactating animal/household			Milk production (litre/day /household)			Milk productivity (litre/animal/day)		
	Buffalo	Cow	CB	Buffalo	Cow	CB	Buffalo	Cow	CB
Member	1.06 (115)	1.06 (17)	1.00 (2)	6.13	2.85	5.88	5.78	2.69	5.88
Non-member	1.07 (57)	1.00 (7)	-	5.85	2.68	-	5.47	2.68	-
Mean difference	0.01	0.06	-	0.28	0.17	-	0.31	0.01	-
Z-stat	0.0	0.61	-	1.04	0.61	-	1.82	0.44	-

Figures in parenthesis indicate number of households rearing different types of animals.

Table 2. Investment pattern (in ₹) per household in dairy farming

Particulars	Member	Non-member	Member vs. Non-member	
			Mean difference	z-stat
Dairy animals	24963 (69.08)	24318 (70.13)	645	0.58
Cattle sheds/stores	9024 (24.97)	850424.53	520	1.79
Dairy equipments	2148 (5.95)	1851 (5.34)	297	0.59
Overall	36136 (100)	34674 (100)	1462	0.84
Per SAU				
Dairy animals	17329	17561	232	–0.56
Cattle sheds/stores	6369	6254	115	0.65
Dairy equipments	1214	1092	122	0.63
Overall	3032	2649	383***	4.17

***P≤ 0.01, in a two tail test; Figures in parenthesis indicate percentage to total.

Table 3. Annual gross income (in ₹) from milk across sample households

Particulars	Member	Non-member	Member vs. Non-member	
			Mean difference	z-stat
Annual income/household	24443	22627	1816*	1.77
Annual income/SAU	17066	16232	834**	2.83
Per capita annual income	4277	3846	431**	2.31
From dairy				
Annual income/household	28256	26443	1813	1.63
Annual income/SAU	19799	19012	786**	2.79
Per capita annual income	4950	4496	454**	2.18

**,P ≤ 0.05 and *, P≤ 0.10, in a two tail test.

Investment pattern in dairy farming: Farm asset structure plays an important role in streamlining the productivity of dairy farming. The pattern of investment in fixed assets in dairy farming is an indicator of income generating capacity of the milk producing households (Meena 2008). Investments on dairy animals, cattle sheds/stores and dairy equipments were worked out and presented in Table 2.

As per our expectation investments on dairy animals, cattle sheds and dairy equipments are higher in member households in comparison to non-member households which may be due to the effect of microcredit for dairy available to the SHG member households. Investment on dairy animals has contributed the highest share to the total investment, followed by cattle sheds and dairy equipments incase of member households which is in consonance with the findings of Meena (2008).

Income from dairy farming: Average annual gross income per household from milk and dairy were significantly higher in case of members than non-members (Table 3). Similar trend can be observed in average annual income per capita and average annual income per *Standard Animal Unit (SAU) also. Hence, it can be inferred that microfinance has shown its favourable impact on income from dairy farming.

Income according to type of animals: In case of both buffalo and cow average annual gross income from milk were higher in member households than that in non-member households but the difference in sample means is statistically nonsignificant (Table 4). Similar trend can also be observed in case of annual gross return per buffalo from milk but annual gross income per cow was marginally higher in non-member households than member households. Calculation of annual gross income from dairy enterprise across different types of animal revealed trends similar to annual gross income from milk across different types of animal in the study area.

Empirical analysis: The issue of problems in evaluating impact is well illustrated by Khandker (2003) and Morduch (1998) who came to different conclusions after analyzing the same data set (BIDS - World Bank panel data, 1991–92). Khandker (2003) reported positive effect of participation in poverty reduction but Morduch (1998) found no significant results on poverty reduction between control and participant groups using difference method. The thorough investigation of earlier impact studies revealed that in most of the cases no control group was used hence it is difficult to say that the increase in income is due to the participation in microfinance program only. Researchers have only compared the pre-SHG and post-SHG situation where responses were collected

*Local cow= 1 SAU, Crossbred cow =1.40 SAU and Buffalo=1.30 SAU]

Table 4. Annual gross income (in ₹) from milk and dairy across different types of animal

Types of animals	Income from milk			Income from dairy		
	Member	Non-member	Member vs. Non-member z-stat	Member	Non-member	Member vs. Non-member z-stat
Per household						
Buffalo	23806	22736	1.033	27323	26368	0.865
Cow	9289	8812	0.585	12129	11945	0.495
Crossbred	18815	-		21169	-	
Per animal						
Buffalo	22458	21249	0.913	25776	24643	1.564
Cow	8763	8812	0.762	11442	11945	0.350
Crossbred	18815	-		21169	-	

Table 5. Sample means of explanatory variables used in OLS regression

Explanatory Variables	Unit	Member	Non-member
Land holding (LAND)	Acre	0.62	0.60
Education level (EDN)	Categorical variable	0.52	0.42
Herd size (HERD)	SAU	1.50	1.44
Milk sale ratio (MSR)	Ratio	0.79	0.85
Experience in dairy (EXP)	Month	25.09	24.28
Formal training (TRNG)	Dummy (Yes-1, No–0)	0.34	0.03
Credit/participation (CD)	Dummy (Yes,1; No,0)	1.00	0.00

which are based on memory of the respondent. In some cases follow up surveys were conducted but used a randomized new sample with unique observations instead of using the same respondents who were interviewed in baseline survey (Mathew 2006). We used OLS regression in log-lin form on gross annual income from dairy as a function of land holding, educational level, herd size, milk sale ratio, experience in dairy, formal training and credit/participation dummy. To examine the impact of microfinance or credit on income from dairy farming the relationship between dependent variable and credit dummy is tested, controlling all other explanatory variables. The sample means of explanatory variables used in OLS regression are presented in Table 5.

The variable land holding acts as proxy for assets and it is expected that it will have positive influence on income from dairy. Size of average land holdings was around 0.60 acre in the study area.

Education level is a categorical variable. Different scores are assigned to the respondents on the basis of their educational qualification, viz. 0, if illiterate; 1, if educated up to primary level; 2, if secondary level; 3 if higher secondary level and 4, for university level. It is assumed that educational level will have positive effect on income as the respondent can manage records and registers for saving and credit operations efficiently and may be more aware of improved dairy farming (e.g. improved breeding, feeding, health management) practices. It is expected that herd size may positively influence the income level by increasing the production level. Average herd size was larger in member households (1.50) in comparison to non-member households (1.46).

The variable milk sale ratio is measured as the ratio of total milk marketed to total production. Income will be higher, if higher quantity of milk is marketed. Proportion of milk sale to total production is higher in non-member households (85%) in comparison to member households (79%) as the non-member households sell out maximum of the milk as a percentage to total production in want of additional money.

Experience in dairy is measured as the number of months put in dairy farming by a respondent household. The hypothesis is that the higher work experience may lead to higher income generation due to better handling of production activities and marketing facilities through learning effect. On an average, all the respondent households have two years of experience in dairy farming in the study area. The member households have slightly more experience than the non-member households. Experience in dairy farming varied from 11 months to 46 months for member households and this range was 12 to 42 months in case of non-member households.

The variable formal training is captured as dummy and it takes the value of 1 if the respondent has received training and zero otherwise. It is expected that higher skill in production activities may increase the income level. It was observed that 37% of the total member households received some kind of formal training whereas only 3% of the non-member households received training in the study area.

The most important explanatory variable used in the regression is credit which is captured as dummy. Credit dummy is equal to one if the household has received dairy credit, otherwise zero. In our study, receipt of credit is the selection criteria for the member households. Hence, credit dummy is one for all the member households and zero for

Table 6. Correlation matrix: log income and explanatory variables

	Log income	LAND	EDN	HERD	MSR	EXP	TRNG	CD
Log income								
LAND	0.47***							
EDN	0.55***	0.28***						
HERD	0.89***	0.54***	0.52***					
MSR	–0.21**	–0.02	–0.28***	–0.23**				
EXP	0.46***	0.33***	0.36***	0.42***	–0.05			
TRNG	0.42***	0.32***	0.28***	0.42***	–0.20*	0.13		
CD	0.16	0.01	0.07	0.06	–0.32***	0.05	0.34***	

***,P≤ 0.01; **,P≤ 0.05;*,P≤ 0.10 in a two tail test.

Table 7. Factors influencing annual gross return from dairy: OLS

Explanatory variables	Estimated coefficients	Standard errors	p-value
Intercept	4.0791	0.0369	0.000
Land holding (LAND)	–0.0042	0.0043	0.326
Education level (EDN)	0.0158***	0.0056	0.006
Herd size (HERD)	0.1849***	0.0104	0.000
Milk sale ratio (MSR)	0.0508	0.0378	0.181
Experience in dairy (EXP)	0.0010**	0.0004	0.024
Formal training (TRNG)	0.0047	0.0086	0.582
Credit/participation (CD)	0.0213***	0.0073	0.004
R square	0.8217		
Adjusted R square	0.8144		
F value	113.238***		
Durwin-Watson D stat	1.980		
Number of observations	180		

***,P≤ 0.01 and **,P≤ 0.05, in a two tail test.

all the non-members. It is hypothesized that participation in SHG programme i.e., credit will have positive impact on gross annual income from dairy of the member households. The correlation matrix revealing relationship between the dependent and explanatory variables is presented in Table 6; out of 7 explanatory variables used in regression analysis, associations of 5 variables with the dependent variable i.e., gross annual income from dairy was statistically significant. Direction of associations of all the explanatory variables with the dependent variable is as per our hypotheses, except one variable i.e., milk sale ratio.

Regression results: OLS regression is run using SYSTAT and the estimates are presented in Table 7. Education level, herd size, experience in dairy and credit are the 4 explanatory variables which have significant influence on the annual gross income from dairy. The R square of 0.8217 indicates that 82.17% of the variations in the dependent variable are explained by the explanatory variables included in the regression model. The value of adjusted R square is 0.8144 which implies that if the model is estimated from the population rather than the sample it would account for approximately 0.73% (0.8217 – 0.8144) less variance in outcome. The F-value of 113.238 implies that the fitted model is statistically significant.

The variable credit/participation dummy showed positive impact on gross income and it is significant at 1% level (Table 7). Alternatively, it is proved that participation in SHG programme has had positive impact on the income from dairy in our study area. Similar findings were also reported across the globe by others (Sarangi 2007, Mathew 2006).

Hence, our study leads to the conclusion that microfinance through SHGs showed favourable impact on household income from dairy. Though microcredit alleviates the credit availability problem but it is not a panacea to all rural developmental problems but a ray of hope to the have-nots. It is suggested that microfinance through SHGs can be adopted as an instrument for social and economic change of rural poor.

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