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Future of Smallholders in the Indian Dairy Sector – Some Anecdotal Evidence

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ABSTRACT

Dairying is an important activity in Indian economy contributing about 27 per cent of the agricultural gross domestic product (GDP) and around 4.35 per cent of the national GDP. The total milk production has increased from 48.40 million tonnes in 1988-89 to 127 million tonnes in 2011-12. Dairying in India is more inclusive compared to crop production in the sense that it involves a majority of the vulnerable segments of the society for livelihoods. Land fragmentation also impacts the distribution of dairy animals because of integration of agricultural land with dairying. Increase in the number of agricultural holdings and their continuous sub-division among the family siblings seemed to be affecting the consolidation of milk animal holdings. As a result of land fragmentation, the numbers of operational holdings across the landless, marginal and small categories have increased over the years resulting in reduction in the average size (Government of India, 2006). It is with this background that this paper has studied the structural transformation and current structure of the Indian dairy sector, along with its contribution to the household income. It has also examined the contribution of dairy sector to achieve the inclusive and equitable growth process in the country. The study observed that fragmentation of land has led to increase in the operational holdings across different categories in the last four decades. The study also revealed that the proportional expenses on dairying to total production expenditure at the household level is inversely related to land ownership whereas as income from dairying to total family income of the households is also inversely related to land ownership. Therefore, dairying has the capacity to reduce poverty at the household level and it should be an integral part of poverty alleviation programmes.

Keywords: Dairying, Livestock sector, Inclusive growth, Land relations.

JEL: O13, Q13, Q19

I

INTRODUCTION

Dairying is an important activity in Indian economy contributing about 27 per cent of the agricultural gross domestic product (GDP) and around 4.35 per cent of the national GDP (Government of India, 2007-08). The total milk production has increased from 48.40 million tonnes in 1988-89 to 127 million tonnes in 2011-12. Dairying in India is more inclusive compared to crop production in the sense that it involves a majority of the vulnerable segments of the society for livelihoods. Livestock population is more equitably distributed than the land (Kumar and Singh, 2008). The income from livestock sector helps in alleviating poverty and smoothening of income distribution (Birthal *et al.*, 2002).

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In case of livestock sector, the targeted growth rate during the Eleventh Five Year Plan Period was 6 per cent per annum but its achievement was 4.17 per cent (Mid Term Appraisal of Eleventh Plan). Over the plan period, the annual growth rate of livestock sector maintained a moderate pace and their contributions towards the total growth process in agricultural sector helped to achieve around 3 per cent in the first three years of the Eleventh Five Plan Period. The outcomes of the growth are very important in the democratic country like India because in the one billion plus populated country there is a need to address the issues of inclusiveness and poverty alleviation through the growth process. The association between rural poverty and agriculture suggested that there is a direct relationship between the growth of agriculture and reduction in the rural poverty. A recent study indicated that the benefits of growth in agriculture have trickled down to the rural poor and the distributive growth has been inclusive (Kumar *et al.*, 2011).

Over the years the operational land holdings have increased nearly two-fold from 56 million to 101 million. The reason for increase in the number of operational holdings was land fragmentation. As a result of land fragmentation the average land holdings was reduced from 1.67 ha to 1.06 ha within the period 1981-82 to 2002-03 (Government of India, 2006). Land fragmentation also impacts the distribution of dairy animals because of integration of agricultural land with dairying. The results of different studies indicate positive and negative relationship between landholdings size and productivity in crop production systems (Ram *et al.*, 1999, Wattanutchariya and Jitsanguanet, 1992). The results of a recent study show that dairy farms can increase their income from 9 to 14 per cent by reducing the degree of land fragmentation (Corral *et al.*, 2011).

Increase in the number of agricultural holdings and their continuous sub-division among the family siblings seemed to be affecting the consolidation of milch animal holdings. As a result of land fragmentation, the number of operational holdings across the landless, marginal and small categories have increased over the years resulting in reduction in the average size (Government of India, 2006). Therefore, in these categories households' dependence on the crop sector reduced over the years and off-farm and dairying income share have increased. The income from off-farm and dairy farming reduces the income equality across the different categories (Richard and He, 1995; Mandal *et al.*, 2010). It is with this background that this paper has studied the structural transformation and current structure of the Indian dairy sector, along with its contribution to the household income. It has also examined the contribution of dairy sector to achieve the inclusive and equitable growth process in the country.

II

DATA SOURCES AND ANALYTICAL TOOLS

2.1. *Description of Data Sources*

The study is based on the secondary data, available from National Sample Survey Organisation (NSSO) unit level data on *Situation Assessment Survey of Farmers, 2003 (visit-2)*, Report of *Livestock Ownership Across Operational Land Holding Classes in India, 2002-03* survey Round and *Milk Production Statistics* from Department of Animal Husbandry, Dairying and Fisheries. It may be mentioned that the *Situation Assessment Survey of Farmers* was conducted in the rural area of India with the sample size of 51,105 households.

2.2. *Analytical Tools*

Data on distribution pattern of land holders and dairy animals across the different categories of households has been analysed through tabular analysis and percentage method while contribution of different sources in income inequality has been estimated through source wise decomposition of Gini index (Lerman and Yitzhaki, 1985). Denoting total household income by y , the cumulative distribution function for total household income by $F(y)$, which takes a value of 0 for the poorest household and 1 for the richest, and the mean total household income across all households by \bar{y} , the Gini index can be decomposed as follows:

$$G_y = 2 \frac{\text{Cov}[y_i, F(y)]}{\bar{y}} = \sum S_i R_i G_i \quad \dots(1)$$

Where, G_y is the Gini index for total income, G_i is the Gini index for income y_i from source i , S_i is the share of total income obtained from source i and R_i is the Gini correlation between income from source i and total income. The Gini correlation is defined as

$$R_i = \text{Cov}[y_i, F(y)] / \text{Cov}[y_i, F(y_i)] \quad \dots(2)$$

Where, $F(y_i)$ is the cumulative distribution function of household income from i -th source. The Gini correlation R_i can take values between -1 to +1. The overall (absolute) contribution of source of income i to the inequality in total household income is thus $S_i R_i G_i$. When the income source is a constant, then R will equal 0, implying that the source's share of the Gini is 0. As such when components raise their share of total income, overall inequality falls.

A key rationale for studying decompositions by source is to learn how the changes in particular income source will affect overall income inequality. Consider a change in each household's income from source i equal to $e y_i$, where e is close to 1.

Starting from equation (1), we can derive a clear expression for the partial derivatives of the overall Gini with respect to a percentage change in source i . The derivation yields:

$$\frac{\delta G_y}{\delta e_i} = S_i(R_i G_i - G_y) \quad \dots(3)$$

Dividing Equation (3) by G_y yields the source's marginal effect relative to the overall Gini, which can be written as the source's inequality, contribution as a percentage of the overall Gini minus the source's share of total income:

$$\frac{\delta G_y / \delta e_i}{\delta G_y} = \frac{S_i G_i R_i}{G_y} - S_i \quad \dots(4)$$

III

RESULTS AND DISCUSSION

Structural Transformation of Integration of Crop-Dairy Animals in India

Crop-dairy farming is a traditional practice in Indian agriculture. In particular, symbiotic operations of crop production and dairy farming have been practiced widely from the primitive time. Crop production provides a range of residues and agro-industrial by-products that can be utilised by dairy animals. The scale of operations carried out on a farm being closely related to the size of holdings, it is likely that the latter would have some bearing on the size of livestock reared on it. The structure of milk production is largely based on low input and low-to-moderate output which fits into the resource endowments of small producers in terms of ownership of land, family endowment as also with common property resources. The farmers' perception about input use and its outcome is usually traditional. However, certain regions of the country and certain segments of rural population have taken up dairying progressively as a means of employment. The traditional farms of dairy enterprises have given way to commercial farms with escalation in average production, bringing in modernity in farm practices and use of dairy farm power and mechanisation. But, the inclusiveness of dairy sector motivated the policy makers to promote the smallholders dairy farming in India.

The effect of land fragmentation on agriculture has worried policymakers for a long time because it is expected to have a negative effect. In the last four decades from 1971-72 to 2002-03 many changes have taken place in the agricultural system, especially, in terms of fragmentation of land holdings and distribution of dairy animals. This kind of structural transformation posed serious problems while opening opportunities for smallholder dairying. The outcome of this land fragmentation would be differently felt across different categories of dairy farms. For instance, some medium and large landholdings have been changed to small and marginal

landholdings and that take upon dairying progressively to secure the household livelihood. The relationship between dairy animal keeping and land holdings are presented through Table 1. Based on different relationship, following four distinct patterns of distribution of operational land holdings and *in-milk* bovine dairy animals were categorised namely:

- (a) Diffusion: *in-milk* population decreasing but land holdings are increasing,
- (b) Augmentation: *in-milk* population and land holdings are increasing,
- (c) Attrition: *in-milk* population increasing but land holdings are decreasing,
- (d) Degeneration: *in-milk* population and land holdings are decreasing.

Diffusion Pattern

Table 1 indicates that the landless category demonstrates a diffusion pattern. It means that *in-milk* bovine population has decreased from 8.10 per cent to 0.88 per cent of total population during 1971-72 to 2002-03, but the number of operational land holders has increased over the same period from 27.41 per cent to 31.90 per cent. In the landless category diffusion patterns is due to the land fragmentation. Along with this *in-milk* bovine animals are also distributed but to a lesser extent than the operational landholders. This pattern is a threat to the Indian dairy sector because

TABLE 1. STRUCTURAL CHANGES IN THE OPERATIONAL HOLDINGS AND IN-MILK BOVINE FROM 1971-72 TO 2002-03 IN INDIA

Category	Distribution of <i>in-milk</i> bovine*				Distribution of operational holdings			
	1971-72	1981-82	1991-92	2002-03	1971-72	1981-82	1991-92	2002-03
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Landless	2.49 (8.10)	1.27 (4.94)	1.22 (2.90)	0.32 (0.88)	15.59 (27.41)	18.11 (26.10)	20.35 (21.79)	32.46 (31.90)
Marginal	6.18 (20.08)	7.99 (31.15)	18.50 (43.91)	19.19 (52.03)	18.73 (32.93)	28.53 (41.11)	45.11 (48.30)	47.98 (47.15)
Small	5.99 (19.46)	4.83 (18.83)	9.15 (21.72)	7.21 (19.56)	9.36 (16.46)	10.06 (14.50)	13.26 (14.20)	11.45 (11.25)
Semi-medium	6.75 (21.94)	5.45 (21.24)	7.25 (17.21)	5.37 (14.55)	7.34 (12.90)	7.36 (10.61)	9.06 (9.70)	6.39 (6.28)
Medium	6.55 (21.27)	4.63 (18.06)	4.67 (11.09)	3.73 (10.11)	4.61 (8.10)	4.37 (6.30)	4.58 (4.90)	2.96 (2.91)
Large	2.81 (9.14)	1.48 (5.79)	1.34 (3.18)	1.06 (2.88)	1.25 (2.20)	0.97 (1.40)	1.03 (1.10)	0.51 (0.50)
All	30.78	25.65	42.12	36.89	56.88	69.4	93.39	101.75
Herfindahl index	0.19	0.22	0.28	0.34	0.23	0.27	0.31	0.34

Source: The authors' estimates based on NSSO Report on Livestock ownership across operational land holding classes in India, 2002-03.

Notes: Figures in parentheses indicate percentage of all.

*Bovine=Cattle and Buffalo.

Herfindahl index is used as a measure of concentration. It is in the form $\sum S_i^2$, where S is the share of the i th category in all. The index takes values in the range of 0 to 1. A value of 0 indicates zero concentration and a value of 1 indicates maximum concentration (Gollop and Monahan, 1991).

dairy animals in this category reduced drastically. It may be inferred that the farmers in this category are unable to continue with dairy farming on less than 0.002 ha of land as it is not sufficient to provide enough crop residues to their herd. Rise in landless farmers in the agrarian society and their withdrawal from milk husbandry is an issue of concern. It could be inferred that returns to dairy farming might be unfavourable as compared to opportunity costs of labour even in the rural areas. It was found that the landless farmers were in a disadvantaged position due to high input cost and associated risks in market access to inputs (Datta and Dadhich, 2007). As a consequence the landless households could be moving away from dairy farming to off-farm employment, but off-farm income has a stabilising effect on agricultural employment as opposed to driving away people from agricultural landscape. Since most of the rural workforce in India work in the informal sector where livelihood from off-farm is not certain and secure (Second National Commission on Labour, 2002; Ellis, 1998 and Wadood and Russell, 2006), it would lead to more social and income insecurity among the rural masses in the long run. So, there is need to address the labour reform in the informal sector otherwise poverty would never decline in India.

Augmentation Pattern

Augmentation pattern leads the *marginalisation* of farm households. Overall in the marginal category, land holders was increased from 32.93 to 47.15 per cent in the period 1971-72 to 2002-03 and *in-milk* bovine population also increased in this category from 20.08 to 52.03 per cent. The augmentation pattern indicated that farmers in the marginal category pursue dairying as an income generation activity, because they are integrated with the fragile crop production system. This is the major category which holds the highest share of *in-milk* bovine population. The production of milk in India is mostly governed by the marginal category of operational landholders. In different land categories over the years (1971-72 to 2002-03) *in-milk bovine* animal per household differed substantially. *In-milk* bovine animals per household were decreasing in all the categories of households except the marginal category. Nonetheless, the landless, medium, semi-medium and large categories show drastic decrease and in small category it was reduced marginally (0.64 to 0.63). So, integration of the marginal categories of the households with dairying is essential, as has been accomplished through the Operation Flood Programme.

Attrition

The attrition pattern means *in-milk* bovine population has marginally increased from 19.46 to 19.56 per cent whereas the numbers of landholders in small category has reduced from 16.46 to 11.25 per cent during 1971-72 to 2002-03. This indicates that more pressure is created over the years on the land resources to rear the dairy

animals in this category. The households of this category continue taking up dairy farming as one of the important livelihood activity with the combination of crop production.

Degeneration

The number of operational land holdings and *in-milk* bovine population followed degeneration pattern in the semi-medium, medium and large categories. The number of operational landholders as well as *in-milk* population decreased between the period 1971-72 and 2002-03. Over the years the operational holdings of semi-medium, medium and large categories have fragmented into small and marginal categories.

The semi-medium category of farm households has drastically reduced from 12.90 per cent to 6.28 per cent as also *in-milk* bovine decreasing from 21.27 to 14.55 per cent. The same pattern was found to be observed in the medium category where, the number of operational holdings has reduced around three times and *in-milk* bovine animals two times. In the large category operational holdings have reduced from 9.14 to 2.88 per cent and *in-milk* bovine animals have decreased from 2.20 to 0.50 per cent. The degeneration of land holders and number of *in milk* bovine animals in all the three categories have decelerated and moved towards the small and marginal categories. The marginalisation of these categories has implications on dairying. Neither it resembled a movement towards commercialisation nor towards a viable specialised dairying.

Overall, our estimated figure indicated that *in-milk* bovine population fell partly from 30.78 million in 1971-72 to 25.65 million in 1981-82. This fall was sharply recovered in 1991-92 with the estimated increase of *in-milk* bovine population to the tune of 42.12 million. However, the *in-milk* bovine population has again declined to 36.89 million in 2002-03. Milk production in the year 1971-72 was 22.5 MT, increased to 32.5 MT in 1981-82 while *in-milk* bovine population had reduced. It suggested that productivity of *in- milk* animals contributed to increase in milk production. Such productivity gain was somehow slow in the subsequent period (1991-92), when milk production was around 55.62 MT vis-à-vis *in-milk* bovine population of 42.12 million. The productivity gain was however much pronounced in the period 1991-92 to 2002-03 when milk production stood at 86.15 MT against a reduction of 5.23 million *in-milk* animals. In the recent period productivity of *in-milk*¹ bovines have increased which contributed to increase in national milk production.

As regards level of disparity, about 72.47 per cent of *in-milk* bovine animals were reared by landless, marginal and small operational land holdings while the other three categories (semi-medium, medium and large) accounted for 27.53 per cent in 2002-03. However, it is interesting to note that the concentration ratio has increased over the years. The share of landless, marginal and small categories in *in-milk* bovine population has increased from 47.64 per cent in 1971-72 to 72.47 per cent in 2002-03. The *Herfindhal Index*, a technical measure of concentration, increased from 0.19

to 0.34 in case of *in-milk* bovine animals and from 0.23 to 0.34 in case of operational holdings during 1971-72 to 2002-03.

Structure of the Indian Dairy Sector

In the Indian context, dairy has become more inclusive as compared to crop production in the sense that dairying has involved majority of the vulnerable segments of the society for livelihoods. The estimated figures of total farm households in India was around 89 million in the year 2002-03, out of which 68 per cent households was engaged in the dairy farming. Nearly 60.66 million households in India have been associated with dairying, and about 89 per cent of them belonged to landless, marginal and small landholders (less than 2 ha). It is also interesting to observe from Table 2 that about 54 and 16 per cent of milch dairy animals are owned by marginal and small farm households respectively while they own 51.62 per cent of agricultural resources. Similarly the households, who were landless also kept about 13 per cent of milch animals. The marginal farmers contribute more than half of national milk production. It is also interesting to note that the distribution of dairy animals was far more even among the farm households than that of farm land suggesting that with efficient input and output support services, dairying can serve as a major economic activity for the small, marginal and landless farmers. The largest contributor of the countries' milk production was marginal category households; they are producing 52.17 per cent of Indian milk. Combine landless, marginal and small dairy households producing 77.34 per cent of country milk production. Medium and large category households were holds 48.37 per cent of land resources but their contribution in country milk production only 22.67 per cent vis-à-vis landless,

TABLE 2. HOUSEHOLD LEVEL DISTRIBUTION PATTERN OF THE DAIRY ANIMALS IN INDIA

Particulars (1)	Landless (2)	Marginal (3)	Small (4)	Medium (5)	Large (6)	All (7)
Estimated sample households keeping dairy animals (No. in millions)	9.30	35.74	8.65	6.64	0.33	60.66
Total estimated sample household (No. in millions)	17.33	53.43	10.72	7.60	0.37	89.44
Per cent of household keeping dairy animals	53.64	66.90	80.73	87.37	90.33	67.82
Per cent of milch dairy animals hold by households	12.76	53.65	16.32	16.08	1.18	100
Per cent contribution to the total milk production	7.71	52.17	17.46	20.84	1.83	100
Per cent of land held by households	0.012	29.28	22.34	40.41	7.96	100

Source: The authors' estimates based on unit level data of NSSO 59th Round on Situation Assessment Survey of Farmers.

Note: Landless: 0 to 0.002 ha., Marginal: 0.0021 to 1.00 ha., Small : 1.01 to 2.00 ha., Medium : 2.01 to 10.00 ha. and Large : \geq 10.001 ha.

marginal and small category holds 51.63 per cent land but contributing 77.34 per cent in country milk production. From this discussion it is inferred that, the future of Indian milk production lies in the hands of smallholder (less than 2 ha) dairy farmers.

Dairy Income as a Source of Rural Livelihood

In the rural areas there were four major sources of income (receipts) like crop, off-farm, dairy farming and livestock farming (excluding dairy). Correlation analysis suggested that there was a low (positive) correlation between the income from off-farm and dairy farming (0.028), other livestock (0.022) and crop sector (0.021) at the household level. Somehow, this relationship suggested that by promoting the basket of income generating activities (off-farm and agricultural) at the household level we can increase the household income without conflict. From Table 3, it is clear that landless households earned about 43 per cent of their income from livestock out of which about 41 per cent income was exclusively from dairying. If we compare the non-livestock keeping farm households versus livestock keeping farm households, then it is observed that majority of the non-livestock keeping households depended on off-farm source of income which were uncertain and seasonal.

TABLE 3. DIFFERENT SOURCES OF INCOME AND EXPENSES PER MONTH BY THE DAIRY FARMERS FOR THEIR LIVELIHOOD ACTIVITIES DURING 2002-03

Particulars (1)	<i>(per cent)</i>									
	Landless		Marginal		Small		Medium		Large	
	LKH (2)	NLKH (3)	LKH (4)	NLKH (5)	LKH (6)	NLKH (7)	LKH (8)	NLKH (9)	LKH (10)	NLKH (11)
Expenses										
Off farm	1.17	44.00	0.43	1.57	0.16	0.39	0.06	0.18	0.03	0.11
Dairy farming	81.64	-	48.71	-	33.08	-	27.67	-	16.34	-
*Livestock farming	12.26	-	8.33	-	6.93	-	4.71	-	3.36	-
Crop	4.93	56.00	42.53	98.43	59.82	99.61	67.56	99.82	80.27	99.89
Total ()	359	12	1011	339	2089	999	4395	1841	10999	3092
Receipts										
Off farm	53.84	98.21	35.30	62.72	16.42	30.6	22.30	13.32	26.22	46.57
Dairy farming	40.58	-	26.79	-	20.56	-	12.21	-	7.54	-
*Livestock farming	2.25	-	2.06	-	1.43	-	1.04	-	0.22	-
Crop	3.33	1.79	35.85	37.28	61.59	69.94	64.45	86.66	66.01	53.43
Total ()	1014	1168	8667	2094	4684	3552	9832	5155	33755	14005

Source: The authors' estimates based on unit level data of NSSO 59th Round on *Situation Assessment Survey of Farmers*.

Notes: *Livestock farming excluded dairy farming.

LKH=Livestock Keeping Households, NLKH= Non-Livestock Keeping Households.

Another observation from Table 3 is that at the household level, the landless and marginal farmers spent maximum amount in dairying, while small, medium and large farmers do the same for crop production. This is related to relative asset distribution

across different types of productive assets and their uses and it is the livestock including dairy animals that ensure higher stability in family incomes and hence relatively larger expenditure. Table 3 also indicates that those households who keep animals in marginal category earn four times higher monthly incomes. The income from dairy farming varies widely across the different farm categories e.g., in landless category contribution around ₹ 412 per month (40.58 per cent) of total household income while farms in large category is ₹ 2545 per month (7.54 per cent). In comparison to landless farmers, the large farmers earned more than six times higher income from dairying, but income from dairying sustained the livelihood of landless families. Therefore, dairying has the potential to reduce rural poverty, as demonstrated through the analysis of unit level data of the NSSO. Three important points emerge out from the unit level data of the 59th NSSO (i) proportion of expenditure on livestock and dairying to total production expenditure of the households is inversely related to land ownership, (ii) proportion of household income from livestock and dairying to total family incomes of the households is also inversely related to land ownership, and (iii) dairying helps in poverty alleviation. Essentially, the NSSO data corroborates the significance of livestock and dairy incomes in the vulnerable segments of the farming community compared to large land owning classes of farmers.

Lessons from the Indian Dairy Sector towards the Inclusive Growth Process

How economic trends and government policies affect the distribution of income is a central topic in economic and policy analysis. In this section our study provides answers to some of these questions: What are the different sources of income inequality? Does a marginal increase in a particular income source increase or reduces the inequality? Is there income from dairy farming work as income equalizer effect in the rural economy? In order to examine the distribution pattern of the household income from different income sources, and to understand how those are correlated, source wise decomposition of Gini index was estimated by using Lerman and Yitzhaki (1985) method. The total income is divided into four sources of income: off farm, dairy farming, other livestock, and crop. The study identifies the contribution of each of the four sources of income to overall income inequality. The share of overall inequality contributed by each income source is also measured.

The Gini inequality of total household income was estimated at 0.8343 (Table 4) indicating that income distribution among different household levels was almost unequal. The analysis further established that in the total household income, the share of crop income was highest (85.29 per cent) followed by off farm (9.16 per cent) and dairy farm (5.08 per cent) income. It was observed that 1 per cent incremental increase in crop income will trigger total income inequality by 1.38 per cent with a caveat that other things are unchanged. The results of the study were supported by the Richard and He (1995) findings in Pakistan that income inequality among the rural

households reduced by income from non-farm and livestock activities. However, income from agriculture, transfer, and rental increases the income inequality among the households. On the other hand, the income from off farm, dairy farm and other livestock source has a equalising effect on the distribution of total income for all categories of farm households, which otherwise corroborates the hypothesis of relative income equalising effect through dairying and livestock farming compared to distribution of incomes through crop. Why does income from crop sector make the largest contribution to overall income inequality? The explanation is that income from crop production was positively related with the land holdings as 50 per cent land was skewed towards medium and large category of households which contributed around 60-70 per cent of the total income (Table 3). Though the income share from dairy sector was smaller but its contribution towards rural livelihood was more secured than other sources. This re-emphasises the importance of dairying in farming system for its doubly beneficial social impact in improving incomes and reducing income inequality (Mandal *et al.*, 2010). It also confirms that growth through inclusive dairying does not worsen income distribution, but helps in reducing absolute poverty. For prioritising rural livelihood, the incorporation of dairy activity within different income sources is needed to achieve higher social benefits and distributive justice.

TABLE 4. DECOMPOSITION OF SOURCE-WISE HOUSEHOLD LEVEL INCOME INEQUALITY IN INDIA, 2003

Source (1)	Income share (2)	Gini of sources (3)	Correlation with rank of total income (4)	Percentage contribution to total inequality (5)	Source of inequality (6)	Marginal effect (7)
Off farm income	0.0916	0.977	0.8447	0.0906	0.0755	-0.001
Dairy farming receipts	0.0508	0.8675	0.7526	0.0398	0.0332	-0.011
Other livestock receipts except dairy	0.0047	0.9612	0.5376	0.0029	0.0024	-0.0018
Crop receipts	0.8529	0.8596	0.9863	0.8667	0.7231	0.0138
Total income		0.8343				

Source: The authors' estimates based on unit level data of NSSO 59th Round on *Situation Assessment Survey of Farmers*.

IV

CONCLUSIONS

The study observed that fragmentation of land has led to increase in the operational holdings across different categories in the last four decades. The operational land holdings are more concentrated (90 per cent) in smallholder (less than 2 hectare operational landholding). The smallholders account for around 52 per cent of land resources with about 83 per cent of milch animals. They are contributing around 77 per cent in the national milk production. This production system indicates

the dominance of smallholder dairy farming system in India and is moving towards more intensification. Therefore, it puts more pressure on feed and fodder resources.

Operation Flood Programme emphasis on developing smallholder-based dairy sector in the pre-liberalised era is justified on the ground that it realised the needs of the production base by the masses. Need of the day is to provide quality of efficient input and output support services as provided by the co-operatives (Amul model at Gujarat, Nandani Milk Federation at Karnataka Model), private sector (Nestlé) and contract dairy farming. In the recent years some new dairy development models have been implemented and scaled up by the co-operative sector like New Generation Cooperatives (Dairy Producer Companies) such as producer companies in Saurashtra and Kutch region in Gujarat as Mahi Producer Company and in Rajasthan as Payas producer company. Whereas, in Punjab group of progressive farmers started Punjab Progressive Dairy Farmers Association. In the liberalised economy, the replication and scaling up of these models largely depends on the governance, institutional support and market forces.

The study also revealed that the proportional expenses on dairying to total production expenditure at the household level is inversely related to land ownership whereas as income from dairying to total family income of the households is also inversely related to land ownership. Therefore, dairying has the capacity to reduce poverty at the household level and it should be an integral part of poverty alleviation programmes. The study revealed that 1 per cent incremental increase in crop income will trigger total income inequality by 1.38 per cent with a caveat that other things are unchanged. On the other hand, the income from off farm, dairy farm and livestock source has a equalising effect on the distribution of total income for all categories of farm households, which otherwise corroborates the hypothesis of relative income equalising effect through dairying and other livestock farming compared to distribution of incomes through crop. The income from dairy farming reduces the income inequality. It also confirms that growth through inclusive dairying does not worsen income distribution, but helps in reducing absolute poverty and inequality. Promotion of economic development and reduction of poverty will depend on the capacity of dairy farming to contribution to smallholder income and employment. In the liberalised era the researchable questions is therefore to search whether smallholder-based dairy sector is justifiable and if it is “yes”, then in what forms it will work? Should it follow the combination of co-operative or contractual or corporate format or each should work independently according to the needs and priority of the region/states?

Received December 2011.

Revision accepted April 2013.

NOTE

1. Milk productivity (kg/in-milk animal/day) has increased from 1.65 to 2.14; 5.57 to 6.87 and 3.46 to 4.57 vis-à-vis indigenous cow, crossbred cow and buffalo over the period 1992-93 to 2009-10.

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