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## Impact of Modern Milk Processing Plant on Small-Scale Dairy Farming: Some Observations from Shimla, Himachal Pradesh

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### Abstract

Livestock sector within agriculture and Dairy sector within livestock sector has been experiencing tremendous growth in recent years in India and in Indian states where agriculture is the major sector. However, Indian dairy sector is being dominated by marginal and small farmers and they are still dependent on traditional routes for marketing of their milk. Therefore, the present study attempted to find out benefits that the dairy farmers are getting if they are linked to a modern milk processing plant. The study is based on 60 small-scale dairy farming households, selected randomly, from village Duttanagar, tehsil Rampur, Shimla, Himachal Pradesh. Analysis of survey data revealed that farmers linked to Duttanagar milk plant are performing better than the farmers who are selling their produce to nearby households. From the analysis of economics of dairy farming, the study found that both gross and net returns from dairy farming are significantly higher for farmers linked to the plant which further adds strength to the argument that small-scale dairy farmers need to be linked to modern marketing channels to make their dairy farming remunerative and sustainable.

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### Introduction

India has the distinction of being the largest milk producer in the World. As per national dairy board of India data, India's total milk production in the year 2017 stood at 176.3 million tonnes and its share in world's total milk production in the same year was 21 per cent which was higher than USA's share of 11 per cent. Share of agriculture and allied sector in the gross value added (GVA) in India, in 2017-18, was 17.2 per cent and share of GVA (livestock sector) in total GVA was 4.9 per cent. And the share of livestock sector in total GVA of India has shown an increasing trend since 2011-12. Total value of livestock sector in the same year stood at rupees

1043656 crore. Therefore, in the overall economy in general and in the agriculture and allied sector in particular, livestock sector is emerging as a major sector which has the potential to uplift a large number of persons out of poverty (Birthal & Taneja, 2006; Ojha, 2007). Livestock assumes greater importance given the declining average land size owned by Indian farmers. Agriculture as a source of livelihood cannot be sustainable in the sense that a majority of farmers who cultivate on such a small piece of land would be poor (Chand *et al.*, 2011). Further, per capita availability of milk in grams per day in India has steadily risen from 225 grams in February 2013 to 394 grams in 2018-19. This increase is despite increase in the population which

speaks volume about the growth of India's dairy sector. According to livestock census of India, out of the total of 535.8 million livestock species in India in 2019, percentage shares of adult female cattle, adult female buffalo, and total bovines were at 27 per cent, 18 per cent, and 56 per cent, respectively. Sustained economic growth and a fast growing urban population has increased significantly demand for animal food products (Parthasarathy Rao & Birthal, 2008). Furthermore, demand for animal food products are particularly increasing in developing countries (Delgado *et al.*, 1999). However, India's livestock sector is dominated by marginal and small farmers and they are resource poor. Marginal and small farmers contribute the maximum to the total milk production in India. A recent study using NSSO unit level data estimated that, in India, marginal and small farmers contributed 73.1 per cent of total milk production and share of these two categories of farmers in total milk producing households were at 79.1 per cent in 2013 (Kumar *et al.*, 2018). And average annual milk production of marginal, small, medium, and large farmer households stood at 441 litres, 624 litres, 858 litres, and 1277 litres, respectively. Further, percentage shares in total marketed quantity of milk of marginal, small, medium, and large farm households were estimated at 53.2 per cent, 22.4 per cent, 15.7 per cent, and 8.7 per cent, respectively. These clearly suggest that marginal and small farm households are the backbone of India's dairy sector. But one major problem that these farmers are facing is that of marketing of milk due to which they are not able to reap the benefits from ever-growing demand for animal food products. A dominant share of milk produced are still marketed through traditional channels (Kumar *et al.*, 2011, 2018; Kumar & Staal, 2010). In this context, one vital question can be asked and that is are dairy farmers who are linked to modern milk processing units to draw higher revenue than those who are still selling their produced milk through traditional channels or directly to households. This paper attempts to answer this very question. The result will not only throw light on the benefits (if any) accrued to small scale dairy farmers of being linked to modern marketing channels but also allow policy makers to focus and promote that channel of marketing of milk which benefits farmers.

The paper consists of four sections besides the introductory section. The immediately following section deals with sample selection criteria, data sources and variables used in the study. Third section gives a perspective of dairy sector of Himachal Pradesh, a developed north-western Himalayan state of India. In the

fourth section, results from primary survey are discussed. The last section of the study and the last section consist of conclusion and policy prescription.

### **Sample Selection, Data Sources and Methods**

The study is primarily based on survey data. The area chosen purposively for the survey is village Duttnagar, tehsil Rampur, district Shimla. This village was chosen for the study because the Duttnagar milk plant is operating from this village and we were able to find two groups of dairy farmers as per the need of our study. One group consist of those farmers who are directly linked to the plant in the sense that it is the plant who procure milk from these farmers. The other group is formed by those farmers who are neither directly nor indirectly linked to the plant. Sample farmers are selected from both groups for a comparative analysis of economics of dairy farmer. Thus the study is based on two categories of dairy farmers. Dairy farmer category-1 (here after DF-1) are linked to the modern milk processing plant and Dairy farmer category-2 (here after DF-2. Duttnagar plant is procuring milk from nearby villages spread in the radius of 15 to 20 kms. Therefore, in the stage of selection of villages, all villages in this radius were taken into account. Two lists of villages were prepared on the basis of linkage (or no linkage) with the firm. Then one village from each list was selected through lottery method of simple random sampling. Accordingly, village Kharga was selected from which 30 dairy farmers for DF-1 were selected through lottery method of simple random sampling and through same method 30 farmers for DF-2 were selected from village Bonda.

Primary data were collected on such variables as costs and returns of dairy farming in the month of January, 2020 through a pre-tested schedule. In particular, data were collected for variables such as input costs of dairy farming, production of milk, usage of produced milk, and marketable surplus. Imputed value of self-consumption of milk and own labour was calculated at the selling price of respective group of farmers. A comparative analysis of economics of dairy farming of both groups is done in the study using primary data with a special focus on finding out the benefits that the farmers are getting by the linkage with the milk plant.

### **Milk Production in Himachal Pradesh**

Economy of Himachal Pradesh is primarily an agrarian economy and the agriculture sector of the state is known for its diversification into high value cash crops like

fruits and off season vegetables. If we refer to table-1, it can be seen that share of agriculture & allied sector in the total GVA of the state has been declining whereas share of livestock in total GVA of agriculture sector has been increasing, albeit marginally, in recent years. Dairy sector has played a huge role in the increasing importance of livestock sector in the agriculture sector of the state. In recent years, total cow & buffalo milk production, and daily milk yield of cows and buffalos has been increasing. For example, total cow milk production in the state was recorded at 949.016 thousand tonnes in 2018-19 from the level of 858.328 thousand tonnes in 2015-16. Similarly, buffalo milk production had reached 399.411 thousand tonnes in 2018-19 from 380.495 thousand tonnes in 2015-16. And the increase in total milk production has been primarily due to increase in daily milk yield of both cow and buffalo.

Daily milk yield of cow has increased from 3708 grams in 2015-16 to 4237 grams in 2020-21. In terms of percentage, there has been an increase of 14.2 per cent in the daily yield of cow milk from 2015-16 to 2020-21. Similarly, daily milk yield of buffalo has increased from 3619 grams in 2015-16 to 3968 grams in 2018-19 and in terms of percentage growth in yield was 9.6 per cent. It can again be seen from table-1 that this significant growth in yield is due to the fact that farmers are now choosing exotic/crossbred cattle over indigenous/non-descript cattle. Compared to the year 2012, there has been a growth of 8.64 per cent in the number of exotic/crossbred cattle in 2019 in the state and in the same period percentage growth of indigenous/non-descript cattle was recorded at negative 34.86 per cent. However, there has been a negative growth rate in the number of buffalos in the state in the period 2012 and 2019. Therefore, increase in buffalo milk production in the recent years can be attributed to the growth in the daily yield of buffalo milk. Now that dairy farmers in Himachal Pradesh are preferring exotic/crossbred cattle over indigenous variety and both total production of milk as well as daily milk yield are on an increasing trend path, linking these farmers to modern marketing channels is all the more important to ensure them better return.

### **Economics of Small-Scale Dairy Farming**

From the survey data, it is found that that majority of dairy farmers linked to Duttanagar dairy plant (that is DF-1) are from SC category. Further, a sizeable percentage of these farmers are from general category and around 15 per cent are from OBC category. Unlike this, majority of

dairy farmers not linked to Duttanagar dairy plant (that is DF-2) are from general category. And sizeable percentages of these farmers are from Scheduled Caste and Scheduled Tribe category. Only 5 per cent of households of DF-2 are from Other Backward Castes category. However the situation is different in so far as income status of sample households is concerned. In DF-1, although majority of households were from APL category, around 40 per cent were also from BPL category. But, in DF-2, an overwhelming majority of dairy farmers are from APL category. All households under DF-1 are from Hindu religion; but 85 per cent and 15 per cent of households under DF-2 are from Hinduism and Buddhism, respectively.

Sample households under both categories, on the basis of their operated land, are marginal and small farming households. It was found that, in category DF-1, out of 30 households, 50 per cent were having operated land below 1 hectare and rest 50 per cent had operated land between 1 and 2 hectares. But, in category DF-2, majority were from small farmer category. Therefore, on the basis of sample results, we can safely comment that dairy farming, in the study area, is practiced by marginal and small farmers and not by medium and large farmers. And this may be due to the fact that marginal and small farmers do not generate enough income from crop cultivation and therefore they have to earn supplementary income from dairy activities. As possession of cows is the main asset for these dairy farmers, some select details of owned cows of both groups of farmer are presented in Table 2.

From Table 2, we can see that, farmers linked to Duttanagar milk plant own more number of cows as compared to farmers not linked to the plant. Further, majority of households in DF-1 own 2 or three cows and only 5 per cent of households have 4 cows. But in DF-2, majority of households own only 1 cow although there were 25 per cent of households who had 2 cows. The observed difference in ownership of number of cows between two groups can be explained by the fact that farmers under DF-1 are under profit motive and they constantly try to experience economies of scale. Another factor is that they have assured buyer in the form of Duttanagar milk plant. Therefore, they practice dairy farming with higher number of cows. However, this cannot be said for DF-2 farmers as their buyers are not fixed and change very often. Also, the major reason of doing dairy farming for DF-2 is to meet household consumption needs. Unlike popular belief, farmers in DF-1 have larger percentage of local breed cows when

compared to farmers of DF-2. 60 per cent of total cows of DF-1 are Jersey cows and rest are local breed cows; whereas 90 per cent of total cows of DF-2 are of jersey breed. The major reason for having a significant percentage of local breed cows by DF-1 is that they make sure to have at least one local breed cow in the case their total possession of cows touch two. And we have already seen that majority of these farmers own either 2 or 3 cows and therefore they have higher percentage of local breed cows as compared to farmers of DF-2. And majority of households responded that productivity of jersey breed cows are higher than local breed cows but purchasing cost of local breed cow is lower than that of jersey breed cow. Average age of cows of DF-1 is smaller as compared to that of cows of DF-2. And in case of both groups, cows give milk for about 10 months in a year.

One of the major initial expenditure made by dairy farmers is on purchasing Cows which is presented in table-3. And, as expected, price of jersey breed cow is much higher than that of local breed cow. Again price of both breeds of cows are higher in case of DF-1 as compared to DF-2. This is because farmers in DF-1 constantly strive for profit and hence they purchase those cows which are relatively more productive. And a productive cow has a higher price in comparison to a relatively lesser productive cow. This argument is true for both breeds of cows and it explains why price of both varieties of cows are higher in case of DF-1. In so far as present value is concerned value of jersey cows of DF-1 is higher than that of DF-2. And value of local cows of DF-1 is lower than that of DF-2. This is because it is considered that condition of local cows of DF-2 are better than those of DF-1 as they are not over exploited by running after profit motive.

Details of average costs of other inputs of dairy farming are shown in Table 4. It is evident that farmers linked to Duttanagar plant are able to practice dairy farming with minimum costs as average total costs are significantly lower for DF-1 in comparison to DF-2. The major cost items for DF-1 are dry fodder, green fodder, mineral mixture, labour, and concentrate. Similar is the case for DF-2 although they spent less percentage of their total cost on mineral mixture and concentrate when compared to the expenditures on same items by DF-1. For both group of farmers, veterinary costs are not significant as it consist of roughly 1.5 per cent of total costs. One item of expenditure where there is significant difference is dry fodder and expenditure on this item is significantly higher for DF-2 in comparison to DF-1. It can be derived

from the above that higher productivity of DF-1 is dependent on higher expenditure on concentrate and mineral mixture. It is worth noting here that farmers collect green fodder from their own field as well fields of relative who do not own cattle. Green fodder is also collected from nearby forest areas. Farmer collect green fodder by using their own labour and also by taking help from some of their close relatives. When green fodder is dried and stored for winters then it is terms as dry fodder. Month of October is used for the collection of green grass. In a unique way green fodders are stored for winters on trees which are termed as 'tollli'. In the case of any shortage of fodder in winters, farmers buy these fodders from nearby villages or from their relatives.

One bundle of fodder is termed as 'Notti' by locals. Mineral mixture includes calcium, phosphorous, magnesium, iron, cobalt, vitamins, and fats. The mixtures help in increasing milk productivity and also keep cattle in good health. Farmers buy mineral mixtures from nearby market and they always buy in huge quantity. Majority of farmers gave once in a day the mineral mixture to their cattle. Concentrate is a mixture of maize, jowar, rice & wheat bran, gram, and husk. Farmers make these concentrate in their own home and very rarely buy from market. There are two farmers from the sample who made the mixture by themselves. For both group of farmers, labour cost is also significant. However, they employ their own labour and therefore, labour cost is imputed value of labour. Around 20 per cent of total cost is incurred on labour for both groups of farmers. Average production and marketed surplus of sample dairy farms are given in Table 5. Farmers of DF-1 produced almost 2 times the quantity of milk produced by DF-1. And as they are linked to the milk plant their percentage of self-consumption is also lower than farmers of DF-2. Daily marketed surplus created by farmers of DF-1 was recorded at 15.85 litres which was 72 per cent of the daily milk production. And this quantity was bought by plant at a price of 20 per litre.

Price for milk produced by DF-2 fetched 5 rupees higher per litre. Duttanagar milk plant offered lower prices as they provided assured market and other items like milk container and so on to the farmers. Farmers connected to plant were generating significantly higher monthly revenue from dairy farming. Also their per month cost of dairy farming is significantly lower than the farmers of DF-2. To be precise, by linking their farms to Duttanagar milk plant, farmers are earning net revenue of Rs 6757 per month which makes their farming sustainable. However, this is not true for farmers of DF-2.

**Table.1** Importance of Agriculture & Allied Sector, Bovine Animals, and Milk Production in Himachal Pradesh

Select Variables	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
GVA of agriculture and allied sectors (In Rupees Crore)	17047	18007	16105	17464	21891	19916
Share of GVA of agriculture & allied sectors in GVA of total economy (%)	15.89	15.33	12.72	12.48	14.33	13.62
Share of livestock in total GVA of agriculture	1.31	1.26	1.31	1.61	1.52	1.78
Per capita availability of milk (gram/day)	NA	531	570	NA	NA	NA
Daily milk yield of Cow (In grams)	3708	3753	4035	4237	NA	NA
Daily milk yield of Buffalo (In grams)	3619	3686	3780	3968	NA	NA
Total Cow Milk Production (In '000 tonnes)	858.328	903.799	949.726	1009.016	NA	NA
Total Cow Buffalo Production (In '000 tonnes)	380.495	377.848	395.474	399.411	NA	NA
Percentage growth of Exotic/crossbred cattle (Between 20th Livestock census, 2019 and 19th Livestock census, 2012)	8.64					
Percentage growth of Indigenous/Non-descript cattle (Between 20th Livestock census, 2019 and 19th Livestock Census, 2012)	-34.86					
Percentage growth of Buffalo (Between 20th Livestock census, 2019 and 19th Livestock census, 2012)	-9.7					

Note: NA implies Not Available

Source: Data contained in 2nd, 3rd, and 4th row are from Economics Survey of HP, 2020-21; 5th row are from Economic & Statistics Department, Government of HP; 6th to 9th row are from Statistical Abstract of Himachal Pradesh, 2018-19; and 10th to 11th row are from Department of Animal Husbandry, Government of Himachal Pradesh.

**Table.2** Dairy Farmer Group-Wise Details of Owned Cows of Sample Households

Type of Dairy Farmer	Number of Cows Owned (%)				Breed of Owned Cows (%)		Average Age of Cows (In Years)	Average Months in	
	1	2	3	4	Local	Jersey		Dry	Lactation
DF-1	0	55	45	5	40	60	5.9	2	10
DF-2	75	25	0	0	10	90	10.7	2	10

Note: (i) DF-1 and DF-2 represent Dairy Farmers Category-1 who are linked to Duttanagar Milk Plant and Dairy Farmers Category-2 who are not linked to Duttanagar Milk Plant, respectively; (ii) Total Number of Households Surveyed under DF-1 and DF-2 are 30 each.

Source: Primary Survey, January 2020

**Table.3** Breed-Wise Purchase Cost and Present Value of Cows

Variables	Breed of Cows	DF-1	DF-2
Purchase Cost	Jersey	10300	6900
	Local	1725	1500
Present Value	Jersey	17100	14350
	Local	2900	3500

Source: Primary Survey, January 2020

**Table.4** Input Costs of Sample Dairy Farmers

Inputs	Average Annual Input Costs for			
	DF-1		DF-2	
	Costs (Rs)	Percentage to Total Costs	Costs (Rs)	Percentage to Total Costs
Green fodder	5779	17.4	9450	18.7
Dry fodder	10225	30.9	18850	37.4
Concentrate	3103	9.3	3420	6.8
Mineral mixture	6967	21.4	8225	16.3
Labour	6346	19.2	9575	19.04
Veterinary expenditure	617	1.8	762.5	1.51
<b>Total cost</b>	<b>33037</b>	<b>100</b>	<b>50283</b>	<b>100</b>

Source: Primary Survey, 2020

**Table.5** Daily Production of Milk, Self-Consumption, and Marketable Surplus

Variables	Farmer Groups	
	DF-1	DF-2
<b>Milk Production Per Day (In ltrs)</b>	22.05	11.55
<b>Self-consumption Per Day (In litres)</b>	6.25	5.35
<b>Self-Consumption quantity to Total Milk Produced (%)</b>	28	46
<b>Marketed Surplus Per Day (In litres)</b>	15.85	6.2
<b>Percentage of Marketed Surplus to Total Production</b>	72	54
<b>Price (in Rs)/litre</b>	20	25
<b>Monthly Revenue from Selling of Milk (Rs)</b>	9510	4650
<b>Monthly Cost (Rs)</b>	2753	4190
<b>Monthly Net Revenue from Selling of Milk (Rs)</b>	6757	460

Source: Primary Survey, 2020

Their daily productivity, monthly gross revenue, and monthly net revenue is much lower compared to DF-1. These farmers are earning net revenue of only Rs 460 per month from their dairy practice. Therefore, directly linking dairy farmers to plants is having positive effects on their economic performance. It needs to be underlined that farmers of DF-1 sell the entire portion of marketed

surplus to plant as they produce for the plant. However, this is not true for DF-2. Around 35 per cent and 65 per cent of their marketed surplus are sold to households in neighbouring village and in immediate neighbourhood in the same village, respectively. There are some other benefits of linking farms to plant. For example, the farmers linked to the milk plant got milk containers from

the firm. They also did not go anywhere to sell milk as vans are being sent daily to door steps to pick up milk. All the farmers under DF-1 experienced increase in milk production after they were linked to the plant as they started to keep more number of cows and strived for economies of scale.

The biggest benefit they got from the plant is the assured daily market for the produced milk. Some 5 per cent households also got jobs in the plant. These are the main benefits that DF-1 got which was not the case with farmers under DF-2. Linkage of dairy farmers with the plant is also promoting digitalisation of payments as payment for milk is done by crediting the amount in the bank account of farmers. However, for DF-2, payment by buyers is made by cash.

### Policy Prescriptions

The objective of the study was to find out whether small-scale dairy farmers linked to modern milk processing plant are performing better in comparison to farmers who are selling their produce to neighbouring households. Analysis of economics of dairy farming revealed that, in comparison to farmers not linked to the plant, monthly costs are lower and monthly gross and net revenue from dairy farming are significantly higher for farmers linked to the plant.

Thus, the linkage with a modern milk processing plant has made the dairy farming profitable and sustainable. To add to it, farmers linked to the plant are getting some other benefits like free milk containers and procurement of milk from their door steps. This creates a strong case for policy makers to formulate policies so that large numbers of small scale dairy farmers are linked to modern milk processing units. Further, setting up a plant is another option in an area not having any modern processing plant. Overall, the study concludes that encouraging linking of farmers to modern milk processing plant has the potential to make small scale dairy farming remunerative and sustainable.

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