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Economic Analysis of Cost and Returns of Milk Production, Extent of Adoption of Recommended Management Practices on Sample Dairy Farms in Bikaner District of Rajasthan

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Abstract- An economic analysis of sample Dairy farms has been presented through studying their costs and returns. The average cost of production per litre milk was ` 14.27 and the average net return per litre of milk was ` 8.28. The input-output ratio was worked out 1.58 at overall level. The cost C was ` 1867599.61 per dairy farm and 333449.99 per milch animal and the net income was ` 1053011.60 per dairy farm and ` 18803.77 per animal. It was 10.50 litre, 11.53 and 15.80 litre for buffalo, Jersey cow and Holstein Friesian cow, respectively. In term of milk production as well as production traits, the Holstein Friesian and Jersey cows were more superior to buffaloes and local cows. Average milk production per lactation was ` 129374 liters per dairy farm and 4173 liters per animals. Out of total milk production, 7.47 per cent was consumed as fluid milk and 7.79 per cent used in processing for ghee, Dahi at home and remaining 84.74 per cent milk was sold as fluid milk. In general, 9.96 per cent milk was sold to the consumers directly, 19.35 per cent to the Hotel/Halwaies and 70.69 per cent milk was sold to the dairy plants.

The annual consumption of feed and fodder per dairy farm was 238.27 q concentrates, 740.41 q green fodder, 1189.17 q dry fodder and 5.03 q salt. The annual consumption of fed per animal was 7.74 q concentrates 24.76 q green fodder 39.69 q dry fodder and 0.18 q salt.

The constraints for the lack of management practices adoption were non availability of green fodder inadequate quantity for purchasing, high cost of feed and fodder, lack of space in Dairy farms, lack of awareness, among all dairy owners about scientific management practices and some dairy owners feel not necessary about management practices. Most of the dairy owners were practicing scientific management practices such as feeding of green fodder, cleaning of animals and animal shed and health practices adopted partially and few management practices such as dry fodder, salt and watering, deworming and treatment were adopting fully and dehorning, hoof treaming, artificial insemination and vaccination practice were not adopted by majority of dairy owners.

Keywords: average cost, average net return, net income, lactation, consumers and adoption etc.

I. INTRODUCTION

Indian Agriculture has been the main stay of Indian economy as 64 per cent of the population depends on it. This sector plays a crucial role in the economic development of the country. At present Agriculture and allied sector contribute nearly 14.6 per cent of country's GDP at 1999-00 prices. One of the most significant changes in India's agricultural economy over the past three and half decades has been the rising contribution of livestock sector in the agricultural gross domestic product (Ag.GDP). Between 1970 and 2008, the share of livestock in Ag GDP has risen from 17 per cent to 29 per cent. Dairying accounts for more than two-third of the live stock output and is largely responsible for the rising importance of the livestock sector in the country. India has emerged as the world's largest milk producer and milk producing continues to grow at a fairly high rate. Despite livestock forms an integral part of rural India. Farmers not only produce food grains but also manage Livestock. Farmer's income, agriculture and rural economy are heavily dependent on livestock. Infect livestock is a major instrument of production of small farmers. India has the largest cattle population in the world. Almost every rural household in India, whether landed or landless, owns livestock.

Dairying in India occupies a prominent place in rural life and provides not only subsidiary occupation and nutritional standards but is also a source of organic manures and draught power. Livestock sector contributes about 4.0 per cent of the total GDP and 23 per cent of the agricultural GDP in the year 2008-09. Milk is an important commodity not only as a source of dairy industrial raw material but also a nutritive food for the people. Milk has been considered nearly a complete food for the infants and growing children. India continues to be the largest producer of milk in the world. The estimate of the milk production in 2011-12 is 127.9 million ton ne and is likely to reach 133.7 Mt this year

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making a per capita availability of milk at national level has increased from 260 gram per day in 2007-08 to 290 gram per day in 2011-12 against 265 g per day per capita recommended by World Health Organization (WHO). The total meat production from cattle, buffalo, sheep, goat, pig and poultry is estimated to be 5.51 Mt, egg production is 66.45 billion 2011-12 and meat is likely to reach 5.9 Mt and egg is likely to climb to 72.5 billion in 2012-13.

India is the 'Oyster' of the global dairy industry. As India enters an era of economic reforms in general and agriculture particularly the livestock sector is positioned to be a major growth area. The fact that dairying could play a more constructive role in promoting rural welfare and reducing poverty is increasingly being recognized, e.g., milk production alone involves more than 70 million producers, each raising one or two cows/ Buffaloes. Cattle also serve as an insurance cover for the poor households, because they can be sold during times of distress. The need for food items especially for milk and product in India is increasing rapidly due to several factors like increasing population, urbanization, income levels, awareness about nutritive value and also the changes in tastes and preferences. The World Bank study has projected the demand for milk in India at 350 million tones by 2020. It has been observed in the FAO Evaluation Committee report that dairy development in India offers a unique advantage over industrialization or crop husbandry development. This premise is based on the spread effect of dairy development, which is more evenly distributed as compared to the other two alternatives because it specially benefits the weaker sections. Most of the cultivating households, irrespective of the size of their land holding, own their milch animals. Cattle rearing continue to be an integral part of Indian agricultural scene. Milk production in the country was stagnant during the 1950s and 1960s; annual production growth was negative in many years. The annual compound growth rate in milk production during the first decade after independence was about 1.64 per cent, during the 1960s, this growth rate declined to 1.15 per cent. During the late 1960s, the Govt. of India initiated major policy changes in the dairy sector to achieve self- sufficiency in milk production. Producing milk in rural areas through producer cooperatives and moving processed milk to urban demand centers become the cornerstone of the government dairy development policy. This policy initiative gave a boost to dairy development and initiated the process of establishing the much-needed linkages between rural producers and urban consumers.

In global context, the performance of the Indian dairy sector appears impressive in term of livestock population and total milk production but extremely poor in term of productivity. The input-output relationship in milk production has been studied and the compared

comprising cost of milk production is fairly well established. These components are feed, labour, capital, cost of animals, and cost of technical input. The average milk productivity per year per cow increased from 731 kg in 1989-91 to about 1,044.10 kg in 1999. Although average annual milk production per animal has improved substantially, it is far below the world average (2071 kg per year) and that of countries such as Israel (8785 kg), the United States (8,043 kg) and Denmark (6565kg). The available data on milk yield indicate that average productivity went up substantially in the case of cows during the 1970s and 1980s. There is an increase in the yield of buffaloes also, but it is less sharp than that of cows. A key factor accounting for the sharper increase in cow milk yield is the increasing proportion of crossbred cows.

As in milk production and availability, there are wide inter-state variations in milk yields. In general, buffaloes have higher yields than indigenous cows, but crossbred cows are more productive than either indigenous cows or buffaloes. In 2000-01, the average productivity of local cows is highest in Haryana. The Indian dairy industry is poised for dramatic growth in the coming decades. The population growth, urbanization, income growth, high income elasticity of demand and changes in food habits that fuelled the increase in milk consumption are expected to continue well into the new millennium, creating a veritable livestock revolution, environmental sustainability, public health and ethical concerns about the treatment of animals.

Indian Arid zone, where livestock rearing is generally main occupation of rural masses, consists of 12 per cent of country's geographical area and 61 per cent of India's arid zone is Rajasthan. Climate of this zone is not suitable for crop rising. Annual rainfall here is below 300 mm per year, that too irregular during monsoon season, which often leads to wide spread drought conditions. The milk production is influenced to a great extent by the feeding pattern, the quality of feed and the ingredients in the feed. The feeds and fodder accounts for 50 to 75 per cent of the total cost depending upon the condition under which the milch animals are kept for milk production. Feed consists of green fodder, including pasture grass and tree lopping, dry fodder, concentrates and balanced cattle feed. During the 1950s and 1960s, India was one of the largest importers of dairy products, importing over 40 per cent of milk solids in dairy industry. The commercial import of milk powder reached its peak at about 53 thousand tonnes in 1963-64 (Kannitkar, 1999). This caused alarm to policy makers and a decision was made to achieve self-sufficiency in milk production. The major step forward, came in mid-sixties with the establishment of the National Dairy Development Board (NDDB) to see over dairy development in the country. The Operation Flood Program, one of the world's largest and most successful dairy development programmers,

was launched in 1970. Its main thrust was to organize farmers' cooperatives in rural areas and link them with urban consumers. Operation Flood has led to the modernization of India's dairy sector and has created a strong network for procurement, processing and distribution of milk by the cooperative sector. In 1989, the Government of India launched the Technology Mission on Dairy Development (TMDD) program to support and supplement the efforts of Operation Flood and to enhance rural employment opportunities and income generation through dairying.

There are large inter-regional and inter-state variations in milk production as well as per capita availability in India. About two-third of national milk production comes from Uttar Pradesh, Punjab, Rajasthan, Madhya Pradesh, Maharashtra, Gujarat, Andhra Pradesh and Haryana. However, there have been some shifts in milk production share of different states. In 2007-08, U.P. was the largest milk producer in the country with about 18.8 Mt of milk, followed by Rajasthan (9.95 Mt), Punjab (9.3 Mt), M.P. (6.1 Mt), Maharashtra (6.0 Mt) and Gujarat (5.6 Mt). Major milk producing regions in country have good resource endowment and infrastructure. The eastern region is lagging behind in term of dairy development. The average per capita availability of milk during 2007-08 was highest in Punjab (962 g per day), followed by Haryana (632 g per day), Rajasthan (408 g per day). The average per capita consumption of milk and dairy product is lowest in rural areas than in urban areas, even though milk is provide by rural areas. Rajasthan state occupies third rank (9.49 Mt) next only to Uttar Pradesh and Andhra Pradesh in milk production in the country and fourth rank (399 g per day) next only to Punjab, Haryana and Gujarat in per capita per day milk availability in 2008-09. The state has 6.6 per cent of cows and 7.18 per cent of buffaloes of the total in the country and contributes about 9 per cent of the total milk production.

Thus study was undertaken to find out profitability of milk production, feeding pattern, supply pattern and adoption of scientific management practices for milch animals with three specific objectives of the study are:

1. To study investment, feeding and milk supply patterns on sample dairy farms.
2. To study the cost and returns of milk production on sample farms and,
3. To study the extent of adoption of recommended management practices and constraints faced in adoption on sample farms.

II. MATERIAL AND METHODS

Bikaner district of Rajasthan was selected purposively. The paper was exploratory in nature and primarily aims to know the investment, feeding and milk

supply patterns, cost and returns of milk production, recommended management practices and constraints. For the selection of dairy farms, a complete list of all dairy farms operating in Bikaner was obtained and five dairy farms having herd size of more than 20 milch animals were selected randomly, and the primary data were collected through personal interview method on pre-structured and pretested schedules from selected dairy farms for the year 2010-11. The collected data regarding cost components, milk production, consumption, investments and marketed surplus etc. were analyzed by using simple tabular analysis, averages, percentage and ratios. The cost and returns analysis was carried out on the basis of different cost concepts as given below:-

a) Analysis of data

i. Analytical techniques

a. Cost and Returns Analysis

The cost and returns analysis was carried out on the basis of different cost concepts as given below:-
Dairy farming costs (D-costs) -

1. D-cost A = Cost of feed, fodder, concentrates, up-keep lab our (hired), medicines, veterinary and other costs and depreciation on livestock, livestock equipments and cattle-shed.
2. D-cost B = D-cost A + interest on fixed investment on dairy animals, shed, equipments etc.
3. D-cost C = D-cost B + imputed value of family lab our.

b. Dairy Incomes

1. Dairy Gross Receipts (DGR) = Value of milk + Value of dung.
2. Dairy Farm Business Income (DFBI) = D.G.R. – D-cost A.
3. Dairy Family Lab our Income (DFLI) = D.G.R. – D-cost B.
4. Dairy Net Income (DNI) = D.G.R. – D-cost C.

b) Definitions of the concepts used

i. Feeding cost

Information about the different kinds of feeds and foders (green fodder, dry fodder, concentrates and special ration) fed to cows and buffaloes during study period were collected. The total quantities of different feeds used and the cost incurred per animal per day were calculated on the basis of respective market prices.

ii. Labour cost

The expenditure on wages paid to permanent and casual laborers engaged in various operations related to dairy animals was obtained from milk producers. The value of hired labour was considered at prevailing market rate paid by the milk producers. The

family labour was charged at the wage rate of permanent labourer prevailing in the study area.

c) *Miscellaneous expenses*

Under this head certain items like veterinary and breeding expenses, electricity charges, water charges and other routine expenses were included.

i. *Fixed cost*

The depreciation on value of animals, capital investment like cow-shed and equipments and interest on fixed capital were included the fixed cost.

ii. *Depreciation on animals*

The depreciation charges were worked out by the Straight Line Method. The productive life of the cows and buffaloes was considered as 13 years. The depreciation on the value of milch animals having age 5 or above 5 years was calculated at the rate of 8 per cent per annum (R. K. Acharya, 1992).

d) *Depreciation on capital investment*

This component of cost included the depreciation on items like cattle-shed and equipments. Depreciation was calculated at the rate of 2.5 per cent per annum (Rani Karuna, 2005).

e) *Interest on fixed capital*

The interest on owned fixed capital comprising value of assets and animals was worked out at the prevailing bank rate i.e. 8 per cent per annum. The interest on working capital was not taken into account as the milk producers get daily income from milk.

f) *Total cost*

The total cost of maintenance of cow and buffalo included the cost of all items viz., feed, fodder, Labour, miscellaneous items and depreciation on animals, cattle-shed and equipments, interest on fixed capital.

g) *Net cost*

The net cost was calculated by deducting income from dung and value of calf from the total cost.

h) *Lactation-length*

The lactation-length is a period for which milch animal remains in milk.

i) *Dry-period*

The interval from the end of lactation period to the next calving is known as dry-period.

j) *Inter-calving period*

Inter-calving period is the simple arithmetic sum of lactation length and dry-period.

influence on the decision-making process and profitability of dairy enterprise. The important socio-economic characters are presented below:

The occupational distribution of sample households is shown in Table 1. It was observed that 50 per cent family members are dependent are not involved in any occupational work. Among other family members those are engaged in occupational work were recorded 50-50 per cent in dairying activities and other work respectively. Therefore, only 25 per cent families were associated with dairying.

a) *Occupation*

Table 1 shows the total number of cattle maintained, milch animals maintained, number of milch animals maintained at different dairy farms. The table reveals that out of total 280 animals, 155 were milch and 125 were calves. On an average, each dairy farm had 56 animals. Out of which 31 were milch and 25 were calves. In general, each dairy farm had 55.35 per cent milch animals, with 44.64 per cent calves. The number of cattle maintained by dairy owner's recorder varied from 34 to highest 84, out of 155 total milch animals, there were 8 buffaloes, 30 local, 71 Holstein Friesian and 46 Jersey cows. On an average, each dairy farm had 31 total milch animals out of which the number of Holstein Friesian cow was found highest (45.80 per cent) in all milch animals. The next more popular cow maintained by dairy owners was Jersey (29.69 per cent). However; Buffalo was maintained by only 5 per cent of dairy owners.

In this section socio-economic profile of the sample households has been described. The socio-economic characters of dairy owners have a profound influence on the decision-making process and profitability of dairy enterprise. The important socio-economic characters are presented below:

b) *Maintenance cost*

The result of maintenance cost of cow and buffalo of per animal for a year on different dairy farms are presented in Table 2. The result indicated that feed was the major cost components in total variable cost followed by labour cost. Among the feed and fodder item Dry fodder was the major feed items for all types of milch animals followed by concentrates. In relation to types of milch animals the higher quantity feed and fodder was fed to Holstein Friesian cow by all dairy owners ranged from 55 to 65 per cent followed by Jersey cow 54 to 64 per cent of the total cost items. Cost on total variables was also recorded higher on Holstein Friesian cow followed by buffalo. The study revealed that the per litre cost of milk production was found minimum on Holstein Friesian cow ranging from `10.61 to `15.47 and higher on Buffalo about `21.00 followed by local cow ranging from `19.92 to Rs. 21.24.

Maintenance cost per dairy farm per year on various cost components is also presented in table 3.

III. RESULTS AND DISCUSSION

In this section socio-economic profile of the sample households has been described. The socio-economic characters of dairy owners have a profound

The study revealed that dry fodder and concentrates was the major cost components on all dairy farms. Green fodder accounted only of 7 to 8 per cent of the total cost due to less availability of green fodder in the study area. Labour cost contributed about 32 per cent of the total cost. Cost per litre was recorded minimum on dairy farm 4 (₹ 13.18) and highest on dairy farm 2 (₹ 15.69).

c) *Cost and returns from milk production*

Total cost and returns of per milch animal per year is presented in Table 4. The analysis indicated that all breeds of milch animals maintained were profitable at all the dairy owners. The minimum returns per liter was recorded 0.86 from local cow to maximum 11.81 from Holstein Friesian. Similarly, the input-output ratio was also found minimum (1.04) in local cow and maximum 2.11 in Holstein Friesian cow. The study reveals that the buffalo was not much profitable even in comparison to local cows. The input output ratio was recorded only 1.20 to 1.21 in case of both dairy owners having buffaloes in their dairy farms. Thus the study revealed that cows were superior to buffaloes in generating income on all dairy farms.

The cost and returns per dairy farm was also worked out by multiplying the number of milch animals maintained respective breed and cost and returns occurred on per milch animal and presented in Table 5. The total cost and quantity of milk yield per dairy farm depend upon the total number of milch animals maintained on each dairy farm. It can be observed from the table that cost per liter (13.18 to 15.69) of milk production was not much differ among all the dairy farms. Returns per liter on milk production was highest recorded on dairy farm 4 (₹ 9.26) and minimum on dairy farm 2 (₹ 6.94). Similarly input-output ratio was also found highest (1.70) on dairy farm 4 and minimum on dairy farm 2 (1.44).

The overall average return per dairy farm on per liter milk production was observed ₹ 8.28 and input output ratio was recorded 1.58 at overall level. This reveals that the all dairy farm are in profitable conditions.

d) *Dairy farming costs and incomes*

Cost and returns on per dairy farm according to various cost-concepts is presented in Table 6. The table shows that the on an average, cost A, was ₹ 1235920.70 in the study area. The cost B was worked out to be ₹ 1266837.50 per dairy farm. The cost C was estimated to be ₹ 1867599.61 per dairy farm. The gross receipts included receipt from milk production and dung produced. On an average, the gross returns were ₹ 2920611.16 for each dairy farm. The farm business income which was obtained after deducting cost A from gross returns was ₹ 1684690.40 per dairy farm. Family labour income (cost B deducted from gross receipts) was ₹ 1653773.71 per dairy farm. The net income, which was obtained after deducting cost C from gross

receipts, was ₹ 1053011.60 for each dairy farm. On an average cost A, cost B and cost C per animal were ₹ 22070.01, ₹ 22622.10 and ₹ 33349.99 respectively. Per animal gross receipts, farm business income, family labour income and net income were ₹ 52153.77, ₹ 30083.75, ₹ 29531.67 and ₹ 18803.77, respectively. Dairy farm no. 1 had low cost and low income. Dairy farm No. 2 had the highest costs and returns (Cost C- ₹ 2738167.65 and net income- ₹ 1210763.3), because it had the highest number of animals.

IV. CONSUMPTION AND SUPPLY OF MILK

Milk production depends upon the size of herd, breed of animals maintained, calving period of milch animals and feeding and management practices adopted by the milk producers. The milk production by a household is consumed at home, sold to outsiders, converted into milk products like ghee, curd etc. The pattern of supply of milk depends upon quantity of milk produced, quantity of milk needed for family consumption, price of milk and milk products and availability of infra-structural facilities necessary for supply of milk.

a) *Supply of milk*

Whole quantity of milk produced is neither consumed at home nor supply of to the market. After meeting the requirement of the family consumption, remaining quantity of milk is either converted into milk products at home or it is supplied directly to the consumers or to the Halwaies/Hotels etc.

Supply of produced milk by the sample dairy farms is presented in Table 7. The table shows the total milk produced at all the sample dairy farms was sold in fluid form. The dairy owners were neither engaged nor interested in converting the milk into milk products for selling purpose. They converted milk in to various products such as Ghee, Dahi and for only their domestic need. Consumption of fluid milk at their home varied from 2 to 10 per cent among all dairy owners. Minimum (2 per cent) milk consumption was recorded in dairy farm 2 and maximum while production was recorded in dairy farm 3 (9.88 per cent) of their total milk production there was no any correlation in total milk production and milk consumption among dairy farms. The highest milk production (146774) was recorded in dairy farm but while consumption was 7.77 per cent. However the total milk production was recorded 112444 litre in dairy farm 3 but milk consumption was recorded highest 9.33 per cent in this dairy farm. In general, 7.47 per cent of total milk produced was consumed as fluid milk at home and 5.94 per cent converted into milk product whereas, 86.59 per cent milk was sold.

b) *Sale pattern of fluid milk*

The quantity of marketed milk according to place by various dairy farms is shown in Table 8 it was

observed that about 37 per cent of the total milk produced was sold within the dairy farm and about 63 per cent was marketed to the outside the dairy farm. Among the various dairy farms the quantity of milk sold within dairy farms was ranged about 23 to 43 per cent and milk sold outside from the dairy farms was recorded 56 to 76 per cent of the total produced milk. Dairy owners sold the re produced milk to various agencies as per quantity of milk produced and demand by various agencies.

From the Table 9 it can be observed that on an average maximum quantity of milk about 71 per cent was sold by producers to the private dairy plants for processing Ghee, Khoya, and Rasgulla. They sold only about 10 per cent milk to the consumer directly at the consumer's home as well as within the dairy farm and about 19 per cent of the total milk production they sold at Hotel/Halwaies. There was no any correlation observed among the milk production and milk sold to various agencies but it was revealed that all milk producers sold produced milk maximum quantity to the private dairy plant followed by Hotel/Halwaies and consumers directly. The quantity of milk sold various agencies by milk producers was revealed about 5 to 14, 10 to 23 and 63 to 83 per cent to consumers directly, Hotel/Halwaies and private dairy plant, respectively.

V. CONCLUSION

The study revealed that there was Holstein Friesian cow produced more quantity of milk than was produced by local cows. In general, Holstein Friesian cows maintained about 45 per cent of the total milch animals and 30 per cent Jersey cows. Annual cost of maintenance was estimated as Rs. 1769350.03 per dairy farm and Rs. 57075.81 per animal. In the total cost of maintenance, the feed and fodder accounted for the major share i.e. 59.52 per cent followed by labour cost (33.95 per cent), fixed cost (25.31 per cent) and miscellaneous expenses (1.15 per cent) on sample dairy farms. The average cost of production per litre milk was Rs. 14.27 and the average net return per litre of milk was Rs. 8.28. The input-output ratio was worked out 1.58 at overall level.

a) *Suggestions and Policy implications (Recommendations)*

1. There is need to motivate dairy owners for adoption of scientific management practices in rearing of milch animals for better health and performance.
2. In the context of various production traits Holstein Friesian and Jersey cows were more superior than buffalo and local cows. Hence, emphasis should be given towards increasing herd strength with these breeds.
3. There is an imperative need to give recommended doses of feed and fodder to increase milk production.

4. Looking to the average milk production of cows and buffaloes, it is recommended that better breeding practices should be made available to the milk producers of the study area so that milk yield can be improved.

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