

**Evaluation of Integrated Dairy Development
Project (IDDP) in Non-operation Flood,
Hilly and Backward Areas:
A Study in Sikkim**

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PREFACE

The present study was undertaken at the instance of Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, Krishi Bhavan, New Delhi as a coordinated study, the act of coordination being vested upon the Agro-Economic Research Centre for North-East India, Assam Agricultural University, Jorhat, Assam. Initially the study proposal and outline of the project were prepared by programme evaluation organization of the planning commission for evaluation of IDDP in some of the states of the country. The Department of Animal Husbandry and Dairying, Ministry of Agriculture laid down the objectives and methodology of the study. The coordinating centre, AERC Jorhat, modified the study design considering the local conditions and took the final shape for undertaking the study in north-east region. The study was designed to review the working of integrated dairy development project (IDDP) in non-operation flood, hilly and backward areas in north-eastern region (Meghalaya, Arunachal Pradesh, Mizoram and Sikkim. The present study is an attempt to evaluate the performance of IDDP project in the state of Sikkim.

In order to exploit the vast potential of dairy sector in the country, the National Dairy Development Board (NDDB) launched the Operation Flood (OF) programme on July 1, 1970 and has contributed significantly in creating and strengthening the basic infra-structure for development of India's dairy industry. However, in the non-OF areas there was no concerted efforts to develop dairying except some sporadic measures undertaken by the state governments. Keeping in view the importance of developing the dairy sector in non-operation flood, hilly and backward areas of the country, the Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India had launched the Integrated Dairy Development Project (IDDP) in North-Eastern States including the state of Sikkim, for stimulating milk production, procurement and marketing with provisions of working capital and manpower development. Out of four districts in the state of Sikkim, the East, West and South districts of the state are included in the Operation Flood Programme. Thus with a view to have a uniform Dairy Development across the districts in the state, IDDP Project has been introduced in the north district of the state. The Government of India during the 8th Five Year Plan had sanctioned Integrated Dairy Development Project for implementation of the same in Non-Operation Flood, Hilly and Backward Areas, under the centrally sponsored plan scheme in the north district. This evaluation study has thus been conducted in north district of the state of Sikkim.

The study is based on both primary and secondary data. For collection of Primary data 2 sets of schedules/ questionnaire are used, one set being used for collection of grass root level data from the beneficiary households and the other for collection of data from non-beneficiary households. Thus, both beneficiary and non-beneficiary households were selected for

collection of primary data. In all, sample size of the study constitutes 48 covering 36 beneficiary and 12 non-beneficiary households of North District of the state of Sikkim.

The study revealed that under the project, assistance was provided to the targeted beneficiaries of the region who are relatively disadvantaged having lower incomes and higher incidence of unemployment. The implementing agency followed the stipulated norms in the identification of beneficiaries. Evidently, it was found that the scheme was drawn at large for the benefit of small and marginal farmers. Further, the study observed that beneficiary families belong to the disadvantaged group of population viz. scheduled tribe having low educational background up to primary and middle school standard.

The benefits provided under the project have several components. Apart from induction of milch animals, the project contains the provision for providing technical inputs of feed and fodder kits for better milk production, providing equipments like milk cans, etc.

So far as the impact of IDDP in terms of growth of milch animals is concerned, after the introduction of IDDP, altogether the 36 sample beneficiary households have newly introduced 26 milch cattle. Of the total addition of milch cattle 46.15 per cent constituted crossbred animals and 53.85 per cent are indigenous cows. Genetically, crossbred cows have larger yield potential and thus offered substantially higher productivity of milk.

The programme of IDDP with its co-operative network seems to have been successful in increasing the rate of commercialization of milk production by providing an assured market outlet for milk to targeted beneficiaries. IDDP programme has provided a dependable alternative channel for disposal of marketable surplus of milk at prices, which are considered fair for the producers.

As a measure of profitability of investment in dairy units by breeds of milch animals, the overall benefit cost ratios (BCR) worked out at 1.14 having the estimated figure of 0.94 for local cows and 1.41 for crossbred cows. Thus investment in dairy activity is found to be economically viable in the study area.

As regards generation of income by the dairy farms of the beneficiary farmers, the proportion of income from dairying to total income from all sources worked out to 51.47 per cent. Dairying, thus contributed the major as a source of income for the beneficiary farmers. Noticeably, the share of income from dairy increased with the increase in the size of holding of milch animals. Of the total income from dairying, about 93.94 per cent is derived from production of milk.

The dairy sector provided employment opportunities to the beneficiary farmers ranging from 55.98 percent to 71.84 per cent of the total working man-days depending on the size of milch animals with an overall average of 58 per cent for all the dairy farms together.

Overall, the programme of IDDP has had a positive impact on milk production, ensuring the year-round dependable market for produced milk, generation of income and employment resulting in socio-economic development of the people in the study area. The calculated

accrued benefits from the programme exceeded the total cost creating a strong foundation for future growth and development of dairy activity in the region. The infrastructure so painstakingly created under the programme in the field of procurement, processing and marketing together with providing assured prices to the producer have all contributed to the changing dairy scenario to give momentum to dairy development in the selected region of the state of Sikkim.

The study team associated with the project consisted of Dr. Jiban Kumar Ghosh, Mr. Vivekananda Datta and Mr. Ashok Sinha. Dr. Jiban Kumar Ghosh provided supervisory input and shouldered the responsibility of drafting the report. The field investigation and tabulation works were done jointly by Mr. Vivekananda Datta and Mr. Ashok Sinha. At the stage of field investigation, the study team was keenly assisted by Mr. Fazlul Haque Khan. Munshi Abdul Khaleque and Sri Nityananda Maji took all the pains for word processing who also helped in compilation of data at the computer. The secretarial assistance was received from Sarbasri D. Mondal, H. Roy, P. Das, A. R. Patra and P. Hazra. I offer my thanks to all of them.

On behalf of the centre, the undersigned takes the opportunity to thank the officials of the Department of Animal Husbandry, Livestock Fisheries and Veterinary Services, Government of Sikkim and the officers of the IDDP district of the state for their kind help and cooperation in carrying out the study. I am especially thankful to Mr. L. T. Bhatia, Joint Director, Department of Animal Husbandry, Livestock Fisheries and Veterinary Services, Government of Sikkim and Mr. B. B. Subba, Joint Director, AHLF & VS Department, North District, Mongan, Sikkim who extended whole-hearted support to the study team and spared time to give us the necessary information. I also take this opportunity to thank the sample respondents in the study area of the state of Sikkim for their cooperation at the time of collecting primary data. Finally, my thanks are due to Dr. T. N. Saikia, the then In-charge, AERC, Jorhat for his helpful coordination in conducting the study.

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CHAPTER – I

Introduction

Importance of Dairying in India:

It is hardly possible to over-emphasize the importance of the country's livestock in general, dairying in particular as the exclusive source of animal food and nutrition for the country's population and above all, as substantial source of income and employment for rural population, especially the rural poor. Indian agrarian condition is characterized by increasing number and fragmentation of holdings. The average size of the holding of the farmers are among the lowest in the world. Despite falling share of agriculture to gross domestic product, the workforce dependent upon agriculture continues to be as high as 64.8 per cent. Besides the increasing trend of mechanization in agriculture has tended to cut-down the demand for labour. Given low absorptive capacity of the industrial sector, the only possible way to augment income and employment of the small farmers is to encourage adopting subsidiary enterprises like dairy farming which can be easily carried on these farms. Dairying acquires special significance in the hill areas on economic ground. Due to poor productivity of the crop sector, low availability of per capita arable land and lack of other income generating avenues there is heavy economic dependence of households on animal husbandry activities. Thus next to crop husbandry, the most likely programme for extensive support has been animal husbandry, particularly dairying sector, which has got the largest employment potential in India, being the source of livelihood for the landless and people below poverty line, since time immemorial.

An important feature of India's dairy sector is the predominance of small-scale milk producers owning one or two milch animals each. Another characteristic feature of India's dairying is that milk production and crop production on most of the farms are complementary enterprises; the milch animals are fed on crop residues and milch animal dung is used as manure for crops. This complementary keeps the costs of both crop production and milk production relatively low and thereby affords a competitive edge to the Indian farmer vis-à-vis her counterparts in other countries. Moreover in case of dairying there is greater degree of indoor activity and offers much scope for employment of family labour, especially, women and children.

Public Investment in Dairying:

After Independence, with the initiation of Five Year Plans, dairying has progressively been receiving more and more emphasis and getting greater allocation

of funds. The growing realization has been that promotion of dairying not only contributes towards national health building but also creates substantial employment opportunities. The actual expenditure in terms of rupees on dairying was of the order of Rs.77.8 million during the First Five Year Plan which increased to Rs1307.51 million during the Eighth Five Year Plan. The proposed outlay on dairy development in the Ninth Five Year Plan (1997-2002) was Rs.4850 million (Singh, 2000).

Dairy Development in India:

The performance of Indian dairy sector over the past three decades has been quite impressive. Milk production grew at the rate of 4.5 percent per annum to reach the level of 74.7 million tonnes during 1998-99 (IIM, Ahmedabad, 2002) and India emerged as the largest producer of milk in the world. The annual milk production was 17 million tonnes in 1950-51; 20 million tonnes in 1960-61; 22.5 million tonnes in 1970-71; 31.6 million tonnes in 1980-81; 53.9 million tonnes in 1990-91; 78.3 million tonnes in 1999-00 and 88.1 million tonnes in 2003-04. Based on available data for the year 2003-04, the increase in milk production was mainly contributed by buffaloes (54.47 per cent) cows (39.70 per cent) and goats (4.21 per cent). The annual compound growth rate in milk production during the decade of 50's stood at 1.64 per cent and declined to 1.15 per cent during the next decade (Singh, 2000). However the growth rate in milk production picked up from 1970-71 onwards owing to increased emphasis put on Animal Husbandry and Dairying with the launching of Operation Flood programme in 1970. The growth rate in milk production in the 70's decade was 3.40 per cent which picked up to 5.76 per cent during the decade of 1980's and subsequently to 6.8 per cent in 1990's.

The average per capita availability of milk increased steadily from 112 gm per day in 1973-74 to 231 gm per day in 2003-04. This is however still below the World average of 285 gm per day. Again, although milk production has grown at a faster rate over the past three decades, milk yield per animal is very low which is one of the lowest in the world. As against the world average of 2021 kg per animal per year India's milk yield worked out to 795 kg (Dang et.al, 2004). In the era of liberalization, India despite recording substantial progress in the dairy sector is a minor player in the world market. However the government of India is making efforts to increase the productivity of milch animals and thus to increase the per capita availability of milk through the introduction of Dairy Development Programmes.

Dairy Development Programmes in India: A Brief Resume

Sincere attempts have been made by the Government of India since independence for the cause of dairy development. Besides the efforts of Department of Animal Husbandry, a number of programmes viz, Key Village Scheme (KVS), Intensive Cattle Development Project (ICDP) and Operation Flood(OF) were launched. Of these Operation Flood(OF) is the biggest dairy development programme drawn up by National Dairy Development Board(NDDDB) which was established in 1965.

The **key Village Scheme** aims at systematic multiplication of available superior germ-plasm in selected areas with the ultimate object of increasing milk production and the working efficiency of the cattle population. It was taken up in August 1952. Under the scheme a “Key Village Block” was established comprising of one artificial insemination centre covering 4 (four) villages having a population of above 500 cows and/or she-buffalows fit for breeding and milk supply. A target of 150 artificial insemination centres and 600 Key Village Units was set up for the First Five Year Plan. During the First Five Year Plan, by the end of 1955-56, 144 artificial insemination centres and 574 Key Village Units were established. Although, the principal aim of the Key Village Scheme is to produce a sufficient number of superior bulls, only 268 approved bulls were made available from Key Village Blocks during 1955-56. During the Second Five Year Plan, some new Key Village Blocks were taken up and 114 Key Village Blocks established in the First Plan were expanded. In all by the end of the Second Plan about 2000 Key Village Units were established. By 1960, 670 artificial insemination centres had been set up.

During the Third Plan period it was realized that cattle development programmes started in the earlier plans could not make much impact on improvement of stock due to lack of sufficient inputs and absence of tie-up of the production programmes with proper marketing systems. An area development approach for cattle development popularly known as **Intensive Cattle Development Project (ICDP)** was therefore formulated in the Third Five Year Plan. The introduction of Intensive Cattle Development Project during the Third Five Year Plan represents a significant development. A new cattle breeding policy was evolved during the Third Plan period in areas covered by Intensive Cattle Development Project (ICDP) and in key village blocks. The programme included improved methods of breeding, pure breeding being confined to outstanding indigenous breeds with a view to improving the quality of milch cattle. Simultaneously, the programme involved upgradation of indigenous cattle with recognized Indian breeds. Earlier the cattle development programmes taken up in small and scattered areas could not make much impact on account of insufficient

inputs, improper attention on feed and fodder development and inadequate coverage of cattle population. The ICD project was conceived to rectify these shortcomings and the programme thus included improved methods of breeding, provision of feed and fodder and disease control.

Initially the Central Government accorded a high priority to these schemes namely, the Key Village Scheme (KVS) and Incentive Cattle Development Project (ICDP). Later both these schemes were transferred to the state. During the mid-sixties it was felt that the dairy development programmes of the country could be best served by effectively linking up milk sheds with major urban markets. The Annand provided a good example. The National Dairy Development Board was set up by the Government of India in 1965 with the major objective of providing, on a non-profit basis, any technical services which implementing agencies might require in building up their dairy projects. The project “**Operation Flood**” was conceived and formulated by the NDDDB during the Fourth Five Year Plan period and the project was initiated in July 1970. The project is basically milk production enhancement programme aiming ultimately at a broad basis of accelerated development for dairy industry in the country.

Launched in July; 1970, **Operation Flood Programme** contributed significantly to the modernization and development of India’s dairy industry. Over the years OF has developed the basic infra-structure in the sphere of procurement, processing, transport, storage and marketing of milk and milk products, compounding of cattle feed, animal health care and breeding services, manufacturing of dairy machinery, equipments and other materials, education and training of rural managers, farmers and members of Boards of Directors of Co-operative Dairy Unions and Federations. Thus launching of OF marked the beginning of a new era in the history of dairy development in India.

Review of Literature:

A good deal of research in livestock Economics has been done during the post-independence period with milk production and dairying receiving particular attention. The issues covered in the literature includes (a) changes in size and composition of bovine population and their pattern of utilization; (b) milk production and dairying; (c) economics of milk production technology; (d) milk production functions; (e) integrated crop and livestock production; (f) livestock and environment; (g) demand, consumption and trade in livestock products; (h) labour utilization in dairying and impact of dairy development projects. However, post-facto economic evaluation of the policies, programmes and projects have hardly been undertaken except that of the Operation Flood Programme. Very few literature are available with regard to

evaluation studies of earlier programmes like Key Village Scheme, Intensive Cattle Development Project, etc. We thus give a brief review of the studies conducted in the field of livestock economy and dairying including the evaluative studies of the dairy development programmes undertaken in the past. First of all, we make a short review of the landscape of plain research on livestock and dairying.

A. Review of Plain Studies on Livestock and Dairying:

There is a general feeling that in most of the regions in the Country, the lactating efficiency and milk yield of cows and she-buffaloes have improved, with the buffalo milk yield increasing at a faster rate than that of cow (Prakash et.al, 1995.). Some specific aspects of dairy enterprise are examined by Dutta and Murlidhar (1995) where it has been shown that in the agriculturally forward district, dairying is adopted as a means of generating steady income round the year whereas in resource scarce district, dairy enterprise acted as an insurance of crop failure. The importance of dairying as a source of income and employment is highlighted in a number of studies. Sharma and Sharma (1995) showed that dairy enterprise adopted by the farmers in Himachal Pradesh enabled them to increase the household income as well as to reduce the risk. Sing et.al (1995) also highlighted the importance of dairying for the small and marginal farmers. Dairy farming as a tool for income generation and employment creation has been emphasized by Atibudhi (1995) and Singh (1995). The contribution of dairying however, varied across size classes of landholdings being increased with the decrease in farm size (Ehahal and Singh, 1995).

A few studies have attempted to look at various dimensions of milk production using farm-level data. Grover and Mehta (1995) showed that the returns from milk production are negative if imputed value of family labor and interest on capital is considered. In their study it has been noted that rearing of milch cattle was not a profitable venture based on total cost (cost C2). The returns based on cost A (which does not cover the cost components like interest on the value of milch cattle and cattle-sheds and imputed value of family upkeep labour) i.e. business income turned out to be a little positive. While studying the economics of dairy enterprise with crossbred cows in Pune district; Khodaskar (1995) found positive net income earned by the dairy farmers even if imputed wages of family labour are included and he thus concluded that dairy enterprise is profitable. Sharma and Singh (1994) in his study on economics of milk production conducted in humid temperate zone of Himachal Pradesh revealed that crossbred cows and graded Murrah buffaloes had an edge in terms of returns over non-descript cows and local buffaloes respectively, owing to their higher milk yields. Singh et. al. (1996) in their study in Punjab, showed that dairying is highly profitable in urban area following semi-urban and rural areas.

Judged by benefit cost ratio and internal rate of return, profitability of dairying is an increasing function of size. Further the pay back period for dairying is found to be just three to four years. The study has also shown that although buffaloes continue to be popular and major supplier of milk, remarkable strides are being achieved in the popularization of cross breeding causing from the development of infrastructure in the form of veterinary hospitals/ clinics and A.I. centers. Grewal and Rangi (1980) report that the population of buffaloes has almost doubled in the Punjab state between 1961 and 1978, whereas the cow population has remained stagnant. This change in the composition of bovine milch stock lends support to superior buffalo milk production technology on rural farms in the state. While, comparing the performance of high-yielding buffaloes and crossbred cows at improved level of technology, they observed higher net returns in the case of crossbred cows. There is thus the general agreement with the premise that the crossbred animal emerges as a more economical and more efficient milk-producing animal.

Some other studies attempted to examine the contribution of cross breed technology and animal feeding including management practices in the growth of milk production. Singh et.al.(2000) in their study based on national level secondary data revealed that higher growth rate in milk production in the country was mainly due to increase in productivity and not because of merely increase in number of milk animals. The study further revealed that increase in cattle milk production was basically due to contribution of crossbreed cattle and thus the study calls for increasing the proportion of crossbreed population in the country so as to achieve better growth rate in milk production. Reddy and Subramanyan (2002) in their study made an attempt to explain yield gap comparing feeding pattern and management practices followed under dairy farms at the experimental station conditions and the same followed by the farmers at the village level. The study reveals that the sound management practices and increased input use (better feeding) are the factors responsible for the yield gap in crossbreed cows and Murrah buffaloes. The decomposition of the yield gap into its contributory factors reveals that the contribution of management accounted for 33 per cent of the change in milk production of crossbreed cows consequent upon a shift from farmer-level practices to farm-level practices. In the case of Murrah buffaloes, the contribution of management is as low as 3.4 per cent while the contribution of feed is as high as 33.6 per cent of the total gain in milk production. Thus, both management and feed are considered important for enhancing the milk productivity of crossbreed cows while only feed appeared to be important in the case of Murrah buffaloes. The economic analysis of milk production has suggested that income from farm-bred animals is higher despite higher maintenance cost, than the income from farmer-bred animals. Further it is

found that increase in the maintenance cost especially the expenditure on feed would increase the returns from dairying. Kumar and Singh (1980) explores the contribution of technological change on milk production by comparing the production processes of sahiwal and cross-bred cows. Using Cobb-Douglas type of production function, the contribution of technological change to the total change in milk production is estimated to be 36 per cent as against an increased use of feed inputs for cross-bred cow contributes about 34 per cent to the total change in milk yield. They, thus claimed that better feeding is an equally important instrument for increasing the milk yield along with genetic development through cross-breeding programme. Again, on examining whether, feed input has a once-for-all influence on dairy production, employing distributed lag model the study finds that feed factor has current and most powerful residual effect on milk production.

B. Review of Evaluative Studies:

Assessment and evaluation of the impact of dairy development programmes is essential not only for identifying the bottlenecks but also for measuring quantitatively the returns to the massive public investment made in such programmes. Reddy (1980), while studying the impact of the dairy development programme implemented by the Small Farmers' Development Agency (SFDA) on its beneficiaries in visa-khapatnam district of Andhra Pradesh found that non-beneficiary households earned higher average incomes per milch animal than the beneficiary households and attributes the failure of dairy development programme of SFDA to the improper selection of beneficiary households without examining their aptitude towards dairying. Shah (1980), in his paper maintains that significant improvement in capacity utilization of dairy plants and market share realization has been accomplished by operation Flood-I. However, the working of operation Flood-I in regard to production and distribution of technical inputs was not found to be very satisfactory. An evaluation of **Key Village Scheme (KVS) and Intensive Cattle Development Project (ICDP)** in Chingleput district (Tamil Nadu) has been attempted by Pandey et al.(1980). They found favourable impact of both the dairy development programmes viz. Key Village Scheme and ICDP project in respect of response indicators of number of animals maintained per household, average daily milk yield per milch animal and annual gross income of the household. Gadre and Sapate (1980) observe that dairy farming has been successfully conducted by beneficiaries of dairy development programme in Akola district (Maharashtra). They found that the contribution of income through dairy is more than two fold in case of beneficiaries. In respect of return per rupee of investment, positive returns are observed in the case of the beneficiaries only. They thus concluded that introduction of the dairy development programme has had a positive impact considered from all angles. Chowdry and Prasad (1980), while

studying the economic impact of Dairy development programme on rural Economy employed Break-even point and regression analysis. They found the positive regression co-efficient and lesser actual output as compared to break-even output implying that the possibility still existed to increase the net income through dairy. Shukla et al.(1995) examined the impact of Operation Flood Programme on production, consumption and marketed surplus of milk and on income and employment generation on different categories of milk producers by comparing the programme and non-programme areas in Kanpur – Dehat district of Uttar Pradesh. Their findings suggested that the productivity of milch animals, production of milk and the marketed surplus were higher in the programme area compared to the non-programme area. On the whole, their assessment is that the programme had a positive effect on income and employment.

Sharma (1995), examined the reasons behind the low coverage of dairy cooperatives in Uttar Pradesh and found that the dairy co-operative members had satisfactory level of awareness of testing of milk, price fixation, etc. but were not adequately aware of the input services from the co-operatives.

Thomas and Mani (1995), made an attempt to make a farmer-oriented evaluation of input service management of Anand pattern dairy Co-operatives of Trissur district (Kerala) created under Operation Flood Programme. The analysis with eight satisfaction parameters showed that the farmers were satisfied to a considerable extent on three of the factors viz price of feed, mode of collecting payment and attitude of societies' officials and staff but on all other factors (feed availability, choice of preferred brand, quality of feed, convenience of supply time and supply in convenient quantity) they were dissatisfied in varying degrees. The study thus goes on to argue that the input service management in dairy co-operatives under operation flood programme failed to attract farmers to such services.

Shiyani and Singh (1997) attempted to examine empirically, the contribution of dairy co-operatives to the income of member milk producers based on data from four dairy co-operatives selected randomly from Junagadh District Co-operative Milk producer's Union in Saurashtra region. The study finds positive contribution of dairy co-operatives in that the members of dairy co-operatives enjoyed higher gains in maintaining the buffaloes as compared to the gains realized by the non-members.

Mahalle and Galgalikar (1980) studied the Comparative Economics of rearing of cross-bred and pure-bred heifers by small farmers in the Integrated Cattle Development Project area of Akola district of Maharashtra State. The study observed comparatively lower cost of rearing of cross-bred as compared to pure-bred heifers.

The profits or net income worked out to be higher per cross-bred in comparison with pre-bred heifers.

The Integrated Dairy Development Project (IDDP):

With a view to exploiting the vast potential of dairy development in India, the National Dairy Development Board (NDDB) launched the Operation Flood (OF) programme in the year 1970. The programme played the key role in bringing about the transformation in dairy sector in the country. Under this programme, the approach of linking the potential milk sheds in the country with the milk unions had yielded substantial results in the form of increased production of milk, making increased availability of milk to the urban consumers and above all, in the form of remunerative prices to the rural milk producers through the mechanism of milk producers' cooperatives. However, the Operation Flood programme was taken up only in potential districts. In the non-operation flood areas, there was no concerted efforts to develop dairying except a few sporadic measures taken by the state governments. The efforts are particularly lacking in North-Eastern States, hilly and backward regions in other states.

Keeping in view the need for developing dairying in the north-eastern states and backward and hilly regions in other states, the Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India had launched the Integrated Dairy Development Project (IDDP) in non-operation flood, hilly and backward areas of the country during the Eighth Five Year Plan (1992-97) with the following objectives.

- i) Development of milch cattle and milk production.
- ii) Procurement, processing and marketing of milk in a cost effective manner.
- iii) Ensuring remunerative prices to milk producers.
- iv) Generating additional income and employment avenues and
- v) Improving nutritional and socio-economic status of people in backward regions.

The project in a state is area specific to take care of the specific requirements of the area. In the project area, existing infrastructure facilities available with the Animal Husbandry and Dairy Department are taken into account before arriving at the components to be funded under the project. Depending on the availability of various infrastructural facilities, some or all the components listed below are considered for financing under the project.

- i) Milk processing and marketing
- ii) Milk procurement.
- iii) Provision of technical inputs.
- iv) Manpower development.
- v) Provision of working capital.

Assistance under the project is mainly given for the formation of dairy cooperative societies, purchase of milk testing equipments, furniture, procurement of milk, construction of dairy and chilling plants, input supplies and training of farmers and functionaries involved in the implementation of the project.

The IDDP is a Central Sector Scheme and assistance to states is given in the form of 100% grant-in-aid. The assistance covers both recurring and non-recurring expenditure of approved components. Recurring expenditure has been allowed under the project taking into account the fact that the project areas are in backward regions of the country and that the targeted groups of the project in non-OF areas are relatively disadvantaged having lower incomes and higher incidence of unemployment.

The project is supposed to be implemented in the states mainly by the State Animal Husbandry Departments. One of the essential conditions of the project is that dairy cooperative societies should be organized at the village or a group of villages level. This would enable the implementing agency to provide greater support in the form of extension and supply of inputs, animal health services and marketing and overall guidance and supervision. The village society will be affiliated to the district level cooperative society. The district society may in turn seek affiliation to the state level cooperative federation in course of time. These clusters are supposed to emerge as centers of excellence and thereby motivate other villages to take up dairy development as a source of supplementary income and employment.

The guidelines of the project stipulate that a technical management committee shall be constituted at the state level under the Chairmanship of Secretary in-charge of dairy development. This committee will have officers from the state government department concerned, a representative each of the department of Animal Husbandry and Dairying, Government of India, planning Commission and NDDM as members. The Committee is entrusted with the responsibility of monitoring the implementation of the project at the state level.

Keeping in view the need for developing dairying in non-operation flood, backward and hilly areas in North-Eastern states, the IDDP has been implemented in

Arunachal Pradesh, Meghalaya, Mizoram and Sikkim. The present study evaluates the performance of IDDP project in the state of sikkim while the other North-Eastern States are covered by the Agro-Economic Research Centre for North-Eastern India, Jorhat.

Objectives of the Study:

The present study has been undertaken to conduct evaluation of the Integrated Dairy Development Project (IDDP) with the following objectives:

1. To assess the impact of IDDP in generation of additional employment and income to the different categories of beneficiaries.
2. To assess the impact of IDDP in terms of genetic improvement of cattle through selective breeding/cross breeding and in making availability of feed and fodder.
3. To assess the impact of IDDP on milk production and in development of marketing and processing infrastructure in the Project area.
4. To assess whether the implementing agencies followed the guidelines in selection of beneficiaries, imparted training through dairy extension services amongst the farmers.
5. To study the problems faced by the implementing agencies in execution of the project as per guidelines laid down by the Department of Animal Husbandry.
6. To suggest policy implications.

Data Base, Methodology, Sampling Design & Coverage of the Study:

The Government of India during the 8th Five Year Plan had sanctioned Integrated Dairy Development Project for implementation of the same in Non-Operation Flood, Hilly and Backward Areas, under the centrally sponsored plan scheme in north district of Sikkim. The East, West and South districts of the state are included in the Operation Flood Programme. Thus with a view to have a uniform Dairy Development across the districts in the state, IDDP Project has been introduced in the north district. Since only one district, viz. North district is covered by the IDDP in Sikkim, the study has been conducted in north district of the state of Sikkim.

Data Base:

The study is based on both primary and secondary data. For secondary materials the study draws upon the sources like quinquennial livestock census for the state of Sikkim and data furnished by Department of Animal Husbandry and Veterinary Services, Government of Sikkim. For collection of secondary level

information, 3 sets of schedules are used viz. the state level schedule, the district level schedule, and schedules and questionnaires for collection of required information from the milk producer's Co-operatives Societies functioning under IDDP. For collection of Primary data 2 sets of schedules/ questionnaire are used, one set being used for collection of grass root level data from the beneficiary households and the other for collection of data from non-beneficiary households. Farmer's level data are collected by personal interview method.

Sampling Design:

Multi-stage stratified random sampling technique is used for selection of society and beneficiary and non-beneficiary farmers in a scientific way. From the North district of the state of Sikkim, the list of societies under IDDP is collected and is arranged them in 3 Strata in an ascending order depending upon the production/procurement of milk. From each Strata one society is selected randomly for intensive study.

In the 2nd.Stage, list of beneficiary households of the selected societies is obtained and from each list 12 (twelve) households are selected randomly to collect primary data on various aspects of IDDP including the performance. In selecting beneficiary households due care is taken to select the small and marginal farmers, agricultural labourers, SC/ST households and women beneficiaries who are relatively disadvantaged having lower incomes and employment. Thus altogether 36 beneficiaries numbering 12 each from the 3 selected societies are selected at random for the purpose of interview.

For control group, the non-beneficiary households from the same cluster of villages in which the sample society is located are selected. The non-beneficiary members comprise of two groups – one, owner of milch cattle and the other, non-owner of milch cattle. A sample of 2 non-beneficiary households with milch animals and 2 non-beneficiary households from non-owner of milch animals are selected at random from each of the selected societies. Thus altogether 12 non-beneficiary households are covered in the study. In all, sample size of the study constitutes 48 covering 36 beneficiary and 12 non-beneficiary households of North District of the state of Sikkim.

Organization of the Study:

The study is divided into five chapters. The first chapter presents the introductory observation, which spells out the background, objectives, data base methodology, sampling design and coverage of the study. Chapter – II presents the Socio-Economic Profile of the Sample IDDP beneficiary and non-beneficiary

households. Chapter – III is devoted to analyze the implementation aspects of the scheme of IDDP in the state of Sikkim along with a brief background information about the state. Chapter – IV presents economic analysis of Integrated Dairy Development Project and studies the impact of the project on the household Economy. Finally. Chapter – V recapitulates overall findings of the study and provides the broad policy implications emerging from the study.

CHAPTER – II

Socio-Economic Profile of the Sample Beneficiary and Non-Beneficiary Households

The success of development programme undertaken by the government would depend on a number of factors comprising of structural, contextual and management. The first one, called structural believes that it is primarily the strategy, which determines the performance of the programme – success or failure. The second, which may be called contextual emphasizes the importance of the context – socio-economic, political etc under which the programme has been in operation which to a large extent affect the performance of the programme. The third one is management-oriented which argues that it is the quality of management and leadership, which matter a lot in achieving the success of the programme. This chapter presents contextual variables representing socio-economic profile of beneficiary and non-beneficiary households, the context under which the programme of IDDP is being organized in North district of the state of Sikkim. Based on the primary level data, beneficiary and non-beneficiary respondents are classified by age, sex, educational attainment, occupational status and operational land size groups. With a view to understanding the Socio-economic background of the sample beneficiaries and non-beneficiaries, an attempt was made to collect information on the above socio-economic parameters.

A. Socio-Economic Characteristics of Beneficiary Households:

Sample Beneficiaries by Caste, Tribe and Sex:

The sample beneficiaries consisted of 33 males and 3 females (table-2.1). The selected district i.e. North District of the state of Sikkim constitutes more than 55 per cent of the total tribal population comprising of Lepchas, Bhutias and Sherpas. Notably, in our sample, all the sample beneficiaries belonged to schedule tribe.

Composition of Population by Age and Sex:

The classification of population by age groups across sexes gives an idea of the availability of workforce as well as the dependency ratio in the family which matters a lot in influencing the choice of dairying vis-à-vis crop enterprise. Dairying is an enterprise without holidaying and requires constant attention. There is also a greater degree of indoor activity in case of dairying which offers greater scope for family members to participate in the work. Hence it seems reasonable to think that farm families with greater availability of family labour are better placed to take up dairy enterprise. It would therefore be pertinent to discuss the composition of population by age across sexes.

Table – 2.1**Distribution of Sample Beneficiaries According to Caste, Tribe and Sex**

Caste/Tribe	Sexes		
	Male	Female	Total
General	0	0	0
S.T.	33 [91.67]	3 [8.33]	36 [100.00]
S.C.	0	0	0
Others	0	0	0
Total	33	3	36
Percent	[91.67]	[8.33]	[100.00]

Note: Figures within brackets indicate percentages to total.

Data Source: Survey Data.

The distribution of the population of the sample beneficiaries is presented in table 2.2. It can be seen that total population in 36 sample beneficiaries is 205 of which 112 (54.63 per cent) are males and 93 (45.37 per cent) are females. Of the total population covered by the sample beneficiary families, 104 (50.73 per cent) persons are below 15 years of age and 101 (49.27 per cent) are above 15 years of age. The average family size works out to 6 persons in the sample beneficiary households. Across sexes, of the total male population, 53 (47.32 per cent) are below 15 years of age and the rest 59 (52.68 per cent) are above 15 years of age. In contrast, for females, out of the total, persons below 15 years of age numbered 51 (54.84 per cent) while 42 persons (45.16 per cent) are above 15 years of age.

Table - 2.2**Distribution of Population of the Sample Beneficiary Families According to Sex and Age**

Sex	Below 15 yrs.	Above 15 yrs.	Total
Male	53 (47.32)	59 (52.68)	112 (54.63)
Female	51 (54.84)	42 (45.16)	93 (45.37)
Total	104 (50.73)	101 (49.27)	205 (100.00)

Note : Figures within brackets indicate percentages to the total population.

Data Source: Survey Data.

Educational Status of the Sample Beneficiaries:

Table – 2.3 presents the educational status of the sample beneficiary respondents by age group and sex. The table reveals the extent of literacy and standard of education of the beneficiary respondents. The table shows that 19.44 per cent of the beneficiary respondents are illiterate and the rest about 80.00 per cent are literate with varying educational qualification upto post-matric standard and above. Beneficiary

respondents upto matric standard constituted 8.33 per cent while the beneficiaries with post-matric and above standard accounted for a meager of 2.78 per cent. Thus the majority of respondents are having educational background upto primary and middle school level (36.11 per cent) standard.

Economic Status:

Table – 2.4 gives an idea of the economic status of the sample beneficiary population. In defining economic status, the system of classification adopted is the three-fold classification into earner, earner-dependent or helper and non-working dependent similar to the classification used by 1951 census. This classification is better than two-fold classification into earners and dependents because the latter system does not take into account the extent of earning in relation to the subsistence needs of the earners. Of course the present classification involves the subjective element but it is not at all a shortcoming because the concept of level of living itself somewhat subjective. There is therefore every reason to prefer this classification particularly in the context in which dependency and not working status is the central point. Thus in order to study the economic status, the beneficiary population are classified by earner, earner-dependent or helper and dependent or non-worker. The person defined as earner who is productively engaged in economic activity or employed in some government, semi-government and private institutions. The earner dependent or helper is one who casually assist in economic activity of the household. These category of workers include young children of adolescent age (i.e. below age of 15 years) not attending school and also the students participating casually in some gainful activities. Aged persons casually assisting household activities are also included in this category. The dependent or non-worker are classified as minor children, physically handicapped, disabled persons and aged persons who are unable to participate in any productive activity.

The economic status of the sample beneficiary population (table – 2.4) reveals that earner population constitute 41.46 per cent of the total beneficiary population as against the dependent or non-working population of 45.37 per cent. The earning dependent or helper accounts for 13.17 per cent of the total beneficiary population. The distribution of population by sex and economic status shows that of the 85 persons in the earner category 49 are males and 36 are females. In the category of earning dependents, of the 27 persons, 10 are males and the rest 17 are females. Taking both of these categories together it appears that in the beneficiary households there are 59 earning males and 53 earning females. It is thus obvious that females make significant contribution towards the earning of the household. The non-earning dependents numbered 53 males and 40 females.

Table – 2.3

Distribution of Beneficiary Respondents According to Age, Sex and Educational Status

Age Group In Years	Illiterate			Literate			Primary			Middle			Matric passed			Post Matric & above			Total		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
15-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-35	1	0	1	2	1	3	1	1	2	5	0	5	2	0	2	0	0	0	11	2	13
																					[36.10]
35-45	1	0	1	2	0	2	2	0	2	0	0	0	0	1	1	0	0	0	5	1	6
																					[16.67]
45-55	2	0	2	5	0	5	2	0	2	1	0	1	0	0	0	1	0	1	11	0	11
																					[30.56]
55-65	3	0	3	2	0	2	1	0	1	0	0	0	0	0	0	0	0	0	6	0	6
																					[16.67]
65 & above	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	7	0	7	11	1	12	6	1	7	6	0	6	2	1	3	1	0	1	33	3	36
Percentage	[19.44]	0	[19.44]	[38.55]	[2.38]	[33.33]	[16.67]	[2.78]	[19.44]	[16.67]	0	[16.67]	[5.55]	[2.78]	[8.33]	[2.78]	0	[2.78]	[91.67]	[8.33]	[100.00]

Note : 1. Figures within brackets indicate percentages to the total population.

Data Source: Survey Data.

Table – 2.4**Distribution of Population of Beneficiary Households According to Economic Status.**

Economic Status	Male	Female	Total
Earners	49 [57.65]	36 [42.35]	85 [41.46]
Earners-Dependent or Helper	10 [37.04]	17 [62.96]	27 [13.17]
Dependent or Non-worker	53 [56.99]	40 [43.01]	93 [45.37]
Total	112 [54.63]	93 [45.37]	205 [100.00]

Note : Figures in brackets indicate percentages to the total population.

Data Source: Survey Data.

Occupational Status:

The purpose of this section is to give an account of the occupational status of the beneficiary respondents. However, a number of conceptual difficulties arise in judging the occupation as well as principal occupation of a person, which should be clarified at the very outset. The first problem relates to the criterion used for judging the occupation of a person. The two alternative criteria commonly used are income and employment. In rural surveys, the income criterion is easier to apply than the employment criterion, for the simple reason that estimates of income derived by an individual from a pursuit can be made more easily and accurately than those of the amount of employment he finds in it. Thus in the case of a person having more than one pursuit, the one that gives him the largest income (more than 50 per cent) has been considered in determining primary occupation. The problem however still remains whose subsidiary occupations are sometimes as important as the principal ones and this raises the second difficulty. The system, thus adopted in the study is to classify occupation of an individual not as principal and subsidiary but as primary and secondary.

The first step is to analyze occupational pattern according to the primary occupation of the respondent. It appears from table –2.5 that 27.78 per cent of the beneficiary respondents belonged to the classes of cultivators of land or farmers, 22.22 per cent were agricultural labourers, thus making a total of 50 per cent engaged in agricultural occupations. Beneficiary respondents reported to be employed in Animal Husbandry stood at 22.22 per cent. Among the non-agricultural occupations, trade or business employed 19.44 per cent of the respondents while respondents engaged in service constituted a meager of 8.33 per cent.

The importance of secondary occupations (subsidiary occupation) in the rural economy is well recognized and makes separate analysis imperative. The procedure adopted is the same as that for primary occupations; the basis of allocation has been

Table – 2.5

Distribution of Occupational Status of the Beneficiary Respondents by Age and Sex

Age Group In Years	Primary												Secondary												Total											
	Animal Hus.			Cultivation			Wage earner			Trade/Business			Service			Total			Animal Hus.			Cultivation				Trade/Business			Total							
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T		M	F	T	M	F	T	M	F	T		
15-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-35	1	0	1	2	1	3	1	1	2	5	0	5	2	0	2	11	2	13	6	2	8	4	0	4	1	0	1	11	2	13						
35-45	2	0	2	1	0	1	2	0	2	0	0	0	1	0	1	6	0	6	2	0	2	4	0	4	0	0	0	6	0	6						
45-55	2	0	2	5	0	5	2	0	2	2	0	2	0	0	0	11	0	11	7	0	7	4	0	4	0	0	0	11	0	11						
55-65	3	0	3	1	0	1	2	0	2	0	0	0	0	0	0	6	0	6	5	0	5	1	0	1	0	0	0	6	0	6						
65 & above	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	8	0	8	9	1	10	7	1	8	7	0	7	3	0	3	34	2	36	20	2	22	13	0	13	1	0	1	34	2	36						
Percentage	[22.2] [0 2]			[2.78] [27.78]			[2.7] [19.44] [8] [22.22]			[19.44] [0] [19.44]			[8.3] [8.33] [0] [3]			[5.5] [100.0] [94.44] [6] [0]			[5.56] [55.56] [61.11]			[36.11] [0] [36.11]			[2.7] [2.7] [8] [0] [8]			[5.56] [100.00] [94.44] [] []								

Data Source: Survey Data.

the pursuit of the individual beneficiary respondent and not the household. The distribution of respondents by secondary occupations has thus been shown in the same table (table – 2.5). Among the secondary occupations, the most important is Animal Husbandry (61.11 per cent), followed in order by cultivation (36.11 per cent) and trade or business (2.78 per cent). What follows therefore is that Animal Husbandry is the major source of supplementary income of the rural households in the selected district of the state of Sikkim.

Among the economic resources of a household, land occupy a place of importance which is no less important than manpower. As an economic resource, the former is much more scarce than the latter. On the social side, to own land is considered as the mark of esteem which not only determines the economic status of a household but also it expresses social status as well. By structure of land holdings we generally mean two different types of distributions, namely the distribution of owned land and the distribution of operated land. The total land owned by a household constitute household's ownership holdings while total land cultivated by households constitutes operational holdings, the size distribution of which are called as the distribution of ownership and the distribution of operational holdings respectively. Thus operational holdings are different from ownership holdings but are more meaningful in the context of dairying. Dairy farm units having some amount of operational land can perform well and yields better economic returns where dairy farm is combined with agriculture using surplus farm family human labour and by-product or crop residue from agriculture. Moreover, dairy enterprise as an adjunct to crop enterprise would result in an efficient and economic utilization of capital, land, livestock, labour and other resources available with the farmer. In the context of dairying, however what is more relevant is the size of operational holdings, the size distribution of which is presented in the following paragraphs.

Operational Holdings:

The operational holding by farm size groups is depicted in table – 2.6. The operational nature of the farm units reveals that entire operational holdings are devoted to agriculture, the size distribution of which truly reflects the distribution of agricultural landholdings. The table shows that the marginal (below 1.00 ha), small (1.00 – 2.00 ha) and semi-medium (2.00 – 4.00 ha) sized holdings form the bulk of the total holdings and area operated. These three classes combinedly account for 97.22 per cent of the total holdings and 82.34 per cent of the total area operated. In other words, only 2.78 per cent of the total holdings operated 17.66 per cent of the total area making thereby the average size of holdings 1.10 ha for all the size classes together.

The average area of holdings of the smallest size class is 0.42 ha as against 7.00 ha for the biggest size class (4.00 – 10.00 ha).

Table - 2.6

Distribution of Operational Area of Beneficiary Households According to Size Groups

Size Group	Households	Agriculture Area (ha)	Horticulture Area (ha)	Land allocated to growing of Fodder (grass)	Total Area (ha)
Below 1 ha.	19 [52.78]	8.15 [20.56]	0	0	8.15 [20.56]
1-2 ha.	12 [33.33]	14.48 [36.55]	0	0	14.48 [36.55]
2-4 ha.	4 [11.11]	10 [25.23]	0	0	10 [25.23]
4-10 ha.	1 [2.78]	7 [17.66]	0	0	7 [17.66]
10 & above	0	0	0	0	0
Total	36 [100.00]	39.63 [100.00]	0	0	39.63 [100.00]

Note: Figures within brackets indicate percentage to the total area.

Data Source: Survey Data.

B. The Socio-Economic Characteristics of the Non-Beneficiary Households:

In this section, an attempt has been made to discuss the socio-economic profile of the sample non-beneficiary households randomly chosen as a control group of farmers. Table – 2.7 gives the distribution of non-beneficiary respondents classified by caste, tribe across sexes. It can be seen that non-beneficiary respondents entirely belonged to schedule tribes, exactly similar to beneficiary respondents.

Table – 2.7

Distribution of Sample Non-Beneficiaries according to caste, tribe and sex

Caste/Tribe	North District, Sikkim		
	Male	Female	Total
General	0	0	0
S.T.	12 [100.00]	0	12 [100.00]
S.C.	0	0	0
Others	0	0	0
Total	12	0	12
Percent	[100.00]		[100.00]

Note: Figures within brackets indicate percentages to total.

Data Source: Survey Data.

Composition of Non-Beneficiary Population by Age and Sex:

The age distribution of population of non-beneficiary families across sexes is shown in table – 2.8. It shows that the population is composed of 42 males and 27 females, females thus forming 39.13 per cent of the total population. A comparison of the distribution of males and females in different age groups reveals interesting feature in that the share proportions of males and females are the same in all the age groups. The average size of family of all the non-beneficiary respondents together works out to 5.75.

Table – 2.8
Distribution of Population of the Sample Non-Beneficiary Families
According to Sex and Age

Sex	Below 15 yrs.	Above 15 yrs.	Total
Male	14 (33.33)	28 (66.67)	42 (60.87)
Female	9 (33.33)	18 (66.67)	27 (39.13)
Total	23 (33.33)	46 (66.67)	69 (100.00)

Note : Figures within brackets indicate percentages to the total population.

Data Source: Survey Data.

Educational Levels of Non-Beneficiary Respondents:

Table – 2.9 shows the distribution of non-beneficiary respondents by age, sex and educational status. It appears that 25 per cent of the non-beneficiary respondents are illiterate. Of the remaining, 33.33 per cent are able only to read and write. The balance 41.67 per cent had some amount of systematic schooling, 25 per cent having education upto the primary standard and 16.67 per cent upto the middle standard. The table further shows that illiteracy among the respondents confined to the age group 45 – 55 whereas persons able to read and write belonged mostly to the age group 35 – 45. Persons having systematic schooling fall in the age group ranging from 35 to 65.

Economic Status of Non-Beneficiary Population:

Table – 2.10 gives the distribution of population of non-beneficiary households by economic status of members. It appears that 43.48 per cent of the total population are earners, 27.54 per cent earning dependents and the rest 29.98 per cent non-earning dependents. Economic status of population by sexes shows that of the 30 persons in the category of earners, 18 (60 per cent) are males and 12 (40 per cent) are females. In the category of earning dependents, of the 19 persons, 10 (52.63 per cent) are males and 9 (47.37 per cent) are females. Taking both of these categories together it appears that among the non-beneficiary population there are 28 (57.14 per cent) earning males and 21 (42.86 per cent) earning females.

Table – 2.9
Distribution of Non-Beneficiary Respondents According to Age, Sex and Educational Status

Non-Beneficiary Households

Age Group In Years	Illiterate			Literate			Primary			Middle			Matric passed			Post Matric & above			Total			
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	
15-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-45	0	0	0	3	0	3	1	0	1	2	0	2	0	0	0	0	0	0	6	0	6	6
45-55	3	0	3	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	5	0	5	5
55-65	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	1	1
65 & above	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	0	3	4	0	4	3	0	3	2	0	2	0	0	0	0	0	0	12	0	12	12
Percentage	[25.00]	0	[25.00]	[33.33]	0	[33.33]	[25.00]	0	[25.00]	[16.67]	0	[16.67]	0	0	0	0	0	0	[100.00]	0	[100.00]	[100.00]

Note : 1. Figures within brackets indicate percentages to the total population.

Data Source: Survey Data.

Table – 2.10**Distribution of Non-Beneficiary Population According to Economic Status**

Economic Status	Male	Female	Total
Earners	18 [60.00]	12 [40.00]	30 [43.48]
Earners-Dependent or Helper	10 [52.63]	9 [47.37]	19 [27.54]
Dependent or Non-worker	14 [70.00]	6 [30.00]	20 [28.98]
Total	42 [60.87]	27 [39.13]	69 [100.00]

Note : Figures in brackets indicate percentages to the total population.

Data Source: Survey Data.

Occupational Status of the Non-Beneficiary Respondents:

The occupational status of the non-beneficiary respondents is shown in table – 2.11. The table shows the preponderance of cultivation (41.67 per cent) as the primary occupation followed by trade/ business (33.33 per cent) and animal husbandry (25 per cent). Among the secondary occupations, the dominant one is cultivation (50 per cent) followed by equally important ones viz. Animal Husbandry and Trade/ Business.

Operational Holdings of the Sample Non-Beneficiaries:

The size distribution of operational holdings of the sample non-beneficiary respondents is presented in table – 2.12. The use characteristics of operational land reveal that the entire operational holdings are classed as agriculture and are devoted to crop production activity. The pattern of distribution of operational holdings reveals the preponderance of smaller holdings (70 per cent) inclusive of small and marginal followed by semi-medium holdings (30 per cent). In terms area occupied by farm holdings, semi-medium holdings constitute the major (52.24 per cent) followed by small (29.85 per cent) and marginal (17.91 per cent). Considering all the size classes together average size of holding for the non-beneficiary respondents works out to 1.34 ha. as against 0.60 ha for the smallest size class (marginal) and 2.33 ha for the highest size class (semi-medium holdings).

To sum up, beneficiary families belong to the disadvantaged group of population viz. scheduled tribe having low educational background up to primary and middle school standard. Dairying, as principal occupation is reported by 22.22 per cent of beneficiary farmers, while among secondary occupations, dairying constituted the major. Thus in the selected area, dairying is still undertaken as supplementary enterprise. In terms of landholding status, beneficiary households in the main

Table – 2.11
Distribution of Occupational Status of Non-Beneficiary Respondents by Age and Sex

Age Group In Years	Primary									Secondary									Total														
	Animal Hus.			Cultivation			Wage earner	Trade/Business			Service	Total			Animal Hus.			Cultivation			Trade/Business			Total									
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T		M	F	T	M	F	T	M	F	T	M	F	T		
15-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-45	1	0	1	2	0	2	0	0	0	2	0	2	0	0	0	5	0	5	1	0	1	3	0	3	2	0	2	6	0	6			
45-55	2	0	2	3	0	3	0	0	0	1	0	1	0	0	0	6	0	6	2	0	2	2	0	2	1	0	1	5	0	5			
55-65	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0	1	0	1			
65 & above	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	0	3	5	0	5	0	0	0	4	0	4	0	0	0	12	0	12	3	0	3	6	0	6	3	0	3	12	0	12			
Percentage	[25.00]	0	[25.00]	[41.67]	0	[41.67]	0	0	0	[33.33]	0	[33.33]	0	0	0	[100.00]	0	0	[25.00]	[25.00]	[50.00]	[50.00]	[25.00]	[25.00]	[25.00]	[25.00]	[50.00]	[100.00]	[100.00]	[100.00]			

Data Source: Survey Data.

Table – 2.12**Distribution of Operational Area of Non-Beneficiary Households
According to Size Groups**

Size Group	No. of Households	Agriculture Area (ha)	Horticulture Area (ha)	Land allocated To growing of Fodder (grass)	Total Area (ha)
Below 1 ha.	4	2.40 [17.91]	0	0	2.40 [17.91]
1-2 ha.	3	4.00 [29.85]	0	0	4.00 [29.85]
2-4 ha.	3	7.00 [52.24]	0	0	7.00 [52.24]
4-10 ha.	0	0	0	0	0
10 & above	0	0	0	0	0
Total	10	13.40 [100.00]	0	0	13.40 [100.00]

Note: Figures within brackets indicate percentage to the total area.

Data Source: Survey Data

belonged to marginal and small (86.11 per cent) with landholdings of two hectares or less. Non-Beneficiary households displayed the similar characteristics particularly in terms of educational background and landholding status. As a whole, the characteristic feature of dairying in the study area is the pre-dominance of small-scale milk producers characterized by the dominance of small and marginal landholders.

CHAPTER-III

Implementation of IDDP in Sikkim

This chapter analyzes the implementation aspects of the scheme of IDDP in the state of Sikkim. The chapter starts with providing a brief background information of the state and proceeds to analyze the implementation aspects of IDDP after presenting the status of animal husbandry and dairying in the state.

Introducing the State:

Sikkim joined Indian Union in 1975. It is one of the smallest states in India and is located in the North-Eastern part of India lying in the Eastern Himalaya between 27 to 28 North latitude and 88 to 89 East longitude. Spread over an area of 7096 sq.km., the state is surrounded by Tibet in North-East, Bhutan in the South-East and Darjeeling District of West Bengal in the south. Sikkim is wholly a hilly state having varied elevation ranging from 300 to 800 meters above mean Sea level.

Sikkim has been divided into 4 districts for administrative purpose, viz. District East with its headquarter at Gangtok, District West at Gyalshing, District North at Mangan and District South at Namchi and divided into 9 regions with 5 sub-regions for agricultural development purposes. The state has 453 revenue blocks, 166 gram panchayet, 27 police stations and 109 post offices.

The state is entirely mountainous and covered with dense forest where sal, simal, bamboo and other trees thrive. Sikkim had several hundred varieties of orchids and is frequently referred to as 'botanist's paradise'.

The climatic information of Gangtok, the capital of the state, taken at 1756 metre above mean sea level for the period 1955-70, the mean annual rainfall varies from 2000 mm. to 5000 mm, with intensity ranging from drizzling shower to torrential rains. The greater part of rainfall is received between April-May to September, with peak in around July. The temperature varies with altitude and slope aspect. The trend of decrease in temperature with increase in an altitude holds good everywhere.

Demographic Features:

The salient features of the population of the state of Sikkim will be evident from table-3.1. According to 2001 census, the state has a population of 5.40 lakhs with an area of 7096 sq.km. About 88.90 per cent of total population live in rural areas and the rest are urban population which accounted for 11.10 per cent of total population. The density of population in the state works out at 76 persons per sq.km. As per 1991 census, the proportions of scheduled caste and scheduled tribe population were of the

order of 5.93 and 22.36 per cent respectively. The total workforce (main workers) as per 2001 census constituted 39.31 per cent in relation to the total population. Marginal workers make up 9.41 per cent of total population while the rest 51.28 per cent are classified as non-workers of the state. The proportion of cultivators among total workers as per 2001 census accounted for 49.91 per cent and the corresponding share of agriculture labourers in total working population is estimated to be 50.09 per cent.

Table – 3.1
Demographic Features of the state of Sikkim

Description	Year	Unit	Particulars
1. Population	2001	Number	540493
2. Urban Population	2001	Percent of total population	11.10
3. Literacy rate	2001	Percent of total population	69.68
4. Density of population	2001	Number per sq.km.	76
5. Scheduled castes	1991	Percent of total population	5.93
6. Scheduled tribes	1991	Percent of total population	22.36
7. Main workers	2001	Percent of total population	39.31
8. Marginal workers	2001	Percent of total population	9.41
9. Non-workers	2001	Percent of total population	51.28
10. Cultivators	2001	Percent of total population	49.91

Data Source: 17th Indian Livestock Census Sikkim, 2003, Department of Animal Husbandry, Livestock, Fisheries and Veterinary Services, Government of Sikkim.

Land Use and Irrigation:

Tables-3.2 gives the broad land use pattern of the state. The state has a large forest area, which constitutes the major occupying 79.57 per cent of total area of the state. Forest is administered as reserve forest by the forest department of the state government. There is not much land, which could be made available for agricultural purpose. The overall area available for agricultural operations is limited to 15.50 per cent of the geographical area of the state. The state has meager irrigational facilities of 0.30 per cent of geographical area being served by minor irrigation sources. The only source of irrigation is the spring water. The practice of irrigating the crop is mostly confined to paddy, cardamom and vegetables. The irrigation for other crops is limited mainly due to the risk of soil erosion.

Table - 3.2
Land use and Irrigation in Sikkim

Description	Unit	Area	% of Geographical Area
Total Geographical Area	Sq. km	7096	-
Cultivated Area	Hectare	109963	15.50
Reserve Forest Area	Hectare	564593	79.57
Area Covered by Minor Irrigation Schemes	Hectare	2166.50	0.30

Data Source: 17th Indian Livestock Census Sikkim, 2003, Department of Animal Husbandry, Livestock, Fisheries and Veterinary Services, Government of Sikkim.

Operational holdings:

Table-3.3 gives the number and area of operational holdings according to size groups. The marginal (below 1.00ha) and small (1.00ha-2.00ha) form the bulk of the total holdings. Operational holdings belonging to marginal and small account for 79.07 per cent of the total operational holdings of the state and closely corresponds to all India average (80.30 per cent). This indicates that the state is dominated by marginal and small holdings. The share of marginal and small holdings in total operated area of the state of Sikkim is 32.88 per cent as against all India average of 36.03 per cent. The per cent contributions of medium sized holdings, namely, semi-medium and medium are 13.95 and 6.98 respectively. In the large size class the number is negligible. As per Agricultural Census 1995-96, the average size of the holding in the state of Sikkim was 1.66 ha as against the all India average of 1.41 ha. (table-3.4).

Table – 3.3
Number and area of Operational holding (1995-96) in Sikkim vis-a-vis All India

(Number in 000)
(Area in '000 ha)

Major size groups	Sikkim				All India			
	Number	Percent	Area	Percent	Number	Percent	Area	Percent
Marginal	24	55.81	10	13.70	71179	61.58	28121	17.21
Small	10	23.26	14	19.18	21643	18.72	30722	18.82
Semi-medium	6	13.95	18	24.66	14261	12.34	38953	23.84
Medium	3	6.98	18	24.66	7092	6.14	41398	25.34
Large	Neg.	-	13	17.80	1404	1.22	24163	14.79
All Holdings	43	100.00	73	100.00	115580	100.00	163357	100.00

Source: Agricultural Statistics at a Glance, 2003, Ministry of Agriculture, Government of India, New Delhi

Table – 3.4
Average size of holding (1995-96) in Sikkim vis-a-vis All India

(In hectare)

Major size groups	Sikkim	All India
Marginal	0.42	0.40
Small	1.40	1.42
Semi-medium	3.00	2.73
Medium	6.00	5.84
Large	-	17.21
All Holdings	1.66	1.41

Source: Agricultural Statistics at a Glance, 2003,
Ministry of Agriculture, Government of India, New Delhi

Status of Agriculture:

Agricultural activities form a predominant component in the development effort in Sikkim, given the fact that more than 80 percent of total population is dependent on agriculture. Against the state's total geographical area, about 13 percent is cultivable and though irrigation has been spreading, rain fed farming accounts for nearly 80 percent of the cultivated area. The terrain conditions are such that very little flat land is really available, and soil erosion caused by the heavy downpour during the monsoon period aggravates the problems considerably. Over the years there has been perceptible shift in land use patterns in favour of fruits, spices, off-season vegetables, production of seed and table potato, development of floriculture and other minor commercial crops to suit the prevailing agro-climatic conditions at varied altitudes. (Annual Plan – 1996-97, Sikkim).

Rain fed farming is a predominant feature in Sikkim with negligible area under assured irrigation. Erratic rains and sloppy terrains do not help much in retaining soil moisture for a long period. Improved rain fed/dry land farming practices therefore need special attention for enhancing the productivity of limited land resources.

State's economy is basically agrarian. Food grains production while important in itself play a somewhat secondary role in the state's agricultural development. The main emphasis has been on cash crops like cardamom, ginger, turmeric as well as tuber crops like potato and tapioca. Production of fruits like orange, lime, lemon, peach, plum etc. and vegetable production have also been given due importance. Thus, the principal crops grown in the state include maize, rice, wheat, potato, and large cardamom, ginger and orange. Potato and off-season vegetables are other cash crops. With small area available for cultivation, the scope for increasing production through area expansion is limited. Thrust in agriculture development therefore has been to maximize productivity per unit of area. Emphasis, at

present is being given for development of commercial and horticulture crops. Floriculture is also being promoted.

Infra-structural facilities:

Infrastructure plays the key role in promoting overall development of an economy. Good infra-structural facility not only ensures smooth flow of inputs and outputs but also facilitates higher accessibilities to knowledge. Within the group of infrastructure, road transport is crucial. It enhances the size of the income multipliers through providing benefit to the trading activity. Road length in the state of Sikkim is 2383 km. (India, 1993). Among other infrastructures, there are 5 health centres, 24 primary health centres, 1474 schools inclusive of primary, junior high and others, 2 degree colleges. Other infrastructure called co-operative societies numbered 439. The details of available health care facilities to cater to the health needs of livestock are shown in table-3.5. It can be seen that the state has a number of veterinary hospitals, dispensaries and stockman centres addressing the problems of farmers, particularly targeting the marginal farmers of the state (17th Indian Livestock Census, Sikkim 2003). The state has a network of 13 veterinary hospitals, 24 veterinary dispensaries, 64 stockman centres, 4 livestock checkpoints and 54 Artificial Insemination (AI) centres.

Table – 3.5
Infra-structural facilities available in the state

Infrastructure :	Number
1. Health Centres/Hospitals	5
2. Primary Health Centres	24
3. Schools (Pre., Pry., JH., SS.)	1474
4. Degree College	2
5. Co-operative Societies	439
Veterinary Institutions:	
a. State Veterinary Hospital	1
b. Veterinary Hospitals	12
c. Veterinary Dispensaries	24
d. Stockman Centres	64
f. Livestock Check Posts	4
g. Number of A.I. Centres	54

Data Source: 17th Indian Livestock Census Sikkim, 2003, Department of Animal Husbandry, Livestock, Fisheries and Veterinary Services, Government of Sikkim.

Status of Animal Husbandry and Dairying in Sikkim:

In a pre-dominantly rural economy such as Sikkim, animal husbandry activities form an extremely important element to bring about substantial improvements in living standards. As noted above, the overall area available for agricultural operations is limited to about 15 per cent of the geographical area of the state due to substantial area being barrens, mountain and forest (80 per cent). With the increasing population; the per capita land availability has been essentially declining. It is therefore, imperative that supplementary sources of income should be developed in order to provide not only the much needed support to the rural families but also to make available in increasing quantities protein-rich food items such as milk, egg and meat.

The livestock production is the endeavor of small and marginal farmers (17th Indian Livestock Census, Sikkim, 2003). The contribution of the livestock sector to the state Net State Domestic Product (NSDP) is 8.5 per cent (source: 17th Indian Livestock Census, Sikkim, 2003). Sikkim with its pleasant weather offers an excellent environment for rearing high yielding cows. Thus rearing of cattle is an age old and integral component of the agricultural activities in Sikkim.

The livestock sector acquires special significance in hill areas like Sikkim on economic and ecological grounds. Due to poor productivity in the crop husbandry sector, low availability of per capita arable land and lack of other income generating avenues, there is heavy economic dependence of households on animal husbandry activities. This is reflected by the fact that 80 per cent of the domestic product come from agriculture and animal husbandry in the state of Sikkim while livestock rearing alone has contributed 8.5 per cent of the state's GDP (source: 17th Indian Livestock Census, Sikkim, 2003). Coming to ecological aspect it is usually asserted that livestock pressure in hill states is excessive which is a major cause of ecological degradation (Shah, 1982). There is therefore the need to reduce biotic pressure of livestock on natural resources by replacing less or unproductive animals with improved stock. It is therefore necessary to understand the existing stock and composition of livestock in the context of both economic and ecological grounds. We thus now proceed to examine the growth, composition and intensity of different categories of livestock in the state of Sikkim.

The importance of animal husbandry and dairying in the state could be studied in terms of budgetary allocation of resources towards animal husbandry and dairying. The budgetary allocation of resources in Sikkim for the animal husbandry and dairy sector presented in table-3.6. It can be seen that allocation of resources for the dairy sector was to the extent of 10.13 per cent of the total allocation of resources to animal husbandry livestock, fisheries and veterinary services during 2005-2006 at current

prices. The expenditure on dairy development varied over the years as is evident from table-3.7. Data pertaining to the period 2000-2001 to 2006-2007 revealed that expenditure on dairy development increased consistently from Rs.34.44 lakhs in 2000-2001 to Rs.65.00 lakhs in 2006-2007 accompanied by large jump (Rs.175 lakhs) during the year 2002-2003 (table-3.7).

Table - 3.6

Actual expenditure by heads of development in Animal Husbandry, Livestock, Fisheries and Veterinary Services during 2005-2006 at current prices.

Heads of Development	Actual Expenditure (Rs. in lakhs)	Percentage share
1. Direction and Administration	71.27	11.11
2. Veterinary Services and Animal Health	225.53	35.16
3. Cattle Development	96.37	15.02
4. Poultry Development	3.26	0.51
5. Sheep and Wool Development	1.00	0.16
6. Piggery Development	13.49	2.10
7. Other Livestock Development	7.00	1.09
8. Feed and Fodder Development	55.72	8.69
9. Extension and Training	23.59	3.68
10. Investigation and Statistics	8.97	1.40
11. Other Expenditure	13.22	2.06
12. Animal Research	57.04	8.89
13. Dairy Development	65.00	10.13
Grand Total	641.46	100.00

Source: Annual Report 2005-06, Department of Animal Husbandry, Livestock, Fisheries & Veterinary Services Government of Sikkim

Table-3.7

Year wise budget allocation in dairy development

(Rs. in lakhs)

Sl. No.	Particulars	Years						
		2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1.	Salary & Wages	13.85	14.00	55.00	29.26	28.00	57.00	60.00
2.	Others Sikkim Milk Union Limited	20.59	25.00	120.00	20.00	22.00	8.00	5.00
	Total	34.44	39.00	175.00	49.26	50.00	65.00	65.00

Note : The CSS allocation is excluded.

Source: Department of Animal Husbandry, Livestock, Fisheries & Veterinary Services, Government of Sikkim, Gangtok

The composition of livestock in important categories in each district and at the state level of Sikkim for the year 1997 and 2003 is shown in table – 3.8. It can be seen that livestock population in the state of Sikkim increased from 5.13 lakhs in 1997 to about 6.87 lakhs in 2003 (table – 3.8) recording a compound growth rate of about 6 per cent (table – 3.9) per annum. Bovine (cattle and buffaloes) population constituted 23.47 per cent of the total livestock in 2003 as against the share of 28.11 per cent in 1997 during the inter-census period 1997-2003. The cattle population constitute the major which accounts for 98.69 per cent of total bovine population. More importantly, no change is noticed in respect of the share of cattle population in total bovine population during the inter-census period 1997-2003. Across the districts of Sikkim, except for the North District of Sikkim, livestock population has increased both in absolute and percentage terms during the period 1997-2003. Bovine population and cattle population show similar trend both in absolute and percentage terms in all the districts except the north during the same period.

Compound Growth Rate:

Besides tabular analysis, compound growth rates were computed to indicate an increase or decrease in livestock population of differing composition during the inter-census period 1997-2003.

As is evident from table – 3.9, livestock population in the state of Sikkim grew at the annual rate of 6.01 per cent during the inter-census period 1997-2003 while the growth of bovine population was at the rate of 2.26 per cent during the corresponding period. Within bovine population, cattle population increased at the rate of 2.26 per cent per annum while population of buffaloes grew at the rate of 2.21 per cent. The relatively higher positive growth rate of cattle population (2.26 per cent) as compared to buffaloes (2.21 per cent) indicates that the farmers are in favour of rearing cattle in comparison with buffaloes. Across the districts, although both the livestock and bovine population have positively increased in south, east and west districts, north district exhibited decreasing trend. The cattle population increased in all the districts except north with the highest increase observed in south (29.44 per cent). In the north district, cattle population decreased by 15.55 per cent per annum during 1997-2003 inter-census period.

At the state level, indigenous cattle has tended to decrease by 2.66 per cent per annum (table-3.9). Contrarily, there has been noticeably positive growth (9.13 per cent) in the case of crossbred cattle. Across the districts, negative growth is observed for indigenous cattle in all the districts except for the south and thus recorded overall negative growth rate at the state level. Likewise crossbred cattle have shown positive growth rate in all the districts except for the north and accordingly, at the state level.

Table-3.8**District wise bovine live-stock population in Sikkim as per 16th. & 17th. Live-stock Census – 1997 & 2003**

District/State.	Cross Breed Cattle		Indigenous Cattle		Total Cattle		Buffaloes		Total Bovine Population		Total Livestock Population		Total Bovine Population as % of Livestock Population		Total Cattle Population as % of total Bovine Population	
	1997	2003	1997	2003	1997	2003	1997	2003	1997	2003	1997	2003	1997	2003	1997	2003
East Sikkim	23362	31191	27069	20346	50431	51537	323	435	50754	51972	164632	177324	30.83	29.31	99.36	99.16
North Sikkim	15248	7801	22002	8198	37250	15999	204	56	37454	16055	134608	79862	27.82	20.10	97.01	96.97
South Sikkim	2629	22965	9451	20927	12080	43892	61	140	12141	44032	52341	210534	23.19	20.91	99.45	99.65
West Sikkim	10303	17842	32169	29792	42472	47634	1311	1487	43783	49121	161171	218928	27.16	22.44	99.51	99.68
State Total	51542	79799	90691	79263	142233	159062	1899	2118	144132	161180	512752	686648	28.11	23.47	98.68	98.69

Data Source: Livestock Census, Sikkim for the respective years

Table-3.9**Annual Compound Growth Rate of different types of Livestock Population in Sikkim (2003 over 1997)**

Districts/ State	(Per cent)					
	Crossbreed cattle	Indigenous cattle	Total cattle	Buffaloes	Total Bovine population	Total Livestock population
East Sikkim	5.95	-5.55	0.43	6.13	0.47	1.50
North Sikkim	-12.54	-18.30	-15.55	-22.78	-15.58	-9.92
South Sikkim	54.28	17.23	29.44	18.07	29.39	32.10
West Sikkim	11.60	-1.52	2.32	2.55	2.33	6.32
State Total	9.13	-2.66	2.26	2.21	2.26	6.01

Data Source : Figures are estimated on the basis of data obtained from Livestock Census, Sikkim for the respective years

This reflects the fact that by and large, the number of crossbred cattle has tended to increase over the period and indeed people seem to have shifted for rearing crossbred cows over indigenous cattle for milk production.

Cattle rearing are an important enterprise amongst the farmers in Sikkim. Ninety per cent of the farmers of Sikkim rear cattle and other livestock as the majority of farmers are small and marginal (Annual Report, 2005-2006, Government of Sikkim). Over the years there has been an increasing trend towards rearing of crossbred cows.

The Department of Animal Husbandry Livestock, Fisheries & Veterinary Services, Government of Sikkim has specific cattle breeding policy. The policy has been to upgrade the indigenous animal using jersey breed. The policy envisages the crossbreeding programme with high yielding crossbred jersey with the locally available breed mostly SIRI thereby maintaining 50-62.5% blood of exotic jersey blood. For these programme, the extensive work on genetic up-gradation either by natural services (use of breeding bulls for natural services) and artificial insemination is being carried out. For artificial insemination, the state at present has 53 mobile AI centers which are regularly refilled at an interval of 21 days (Annual Report, 2005-2006, Government of Sikkim).

Extension and training wing of the department has been doing hard to bridge the gap between the farmers and the new technologies by organizing awareness camp in various places of the state, providing training to unemployed youth and own beneficiaries etc. During the year 2005-2006, extension and training cell has conducted 12 numbers of awareness programmes on livestock and poultry management and production at various villages throughout the state with the objective to disseminate knowledge. A total of 1092 farmers participated in the programme of which 833 were males and 259 were females (Annual Report, 2005-2006, Government of Sikkim).

It has been increasingly realized that green fodder production is one of the most important single factor on which the success of animal husbandry programme depends. In the state of Sikkim a total of 1,62,392 hectare constituting about 22 per cent of total area of Sikkim (Source - Annual Report, 2005-2006, Government of Sikkim) is available for fodder production and pasture development.

Dairying in Sikkim:

The typically non-viable farmers, their sub-marginal holdings do not fully employ the available family labour and hence the potential solution lies elsewhere than merely in crop husbandry. For the large class of sub-marginal farmers and

landless labourers, the remedy lies in the provision of supplementary occupations and other employment opportunities. Thus both occupations and employment have to be integrated. Dairying is an activity where such integration is possible. The farming classes have been rearing milch animals since traditional times. Recently, planners and policy makers advocate dairying particularly for ameliorating the economic conditions of the weaker section of the society i.e. small and marginal farmers and also the landless classes. However, before we discuss the economic and employment aspects of dairy enterprise presented in the chapter to follow, it would be pertinent to give a brief background information about dairying in the state. Under this, we would briefly discuss the information relating to the population of milch animals, their breeds, and production of milk.

Composition of Bovine Population in the State:

Bovine is reared for economic purposes like work and for milk. Female buffaloes and cows are close substitutes of each other as far as milk production is concerned. Milk production is the primary consideration in maintaining cows and female buffaloes. However, cows are also important sources of supply of male calves which are the source of animal draught power in future. The data on the number of in-milk cows and buffaloes are available for 2003 obtained from livestock census of Sikkim and are presented in table – 3.10. Disaggregating livestock into bovine and ovine, it is found that bovine constituted 23.47 per cent, while ovine population (Sheep and goats) accounted for 18.88 per cent of the total livestock population. Population of in-milk bovine which includes lactating buffaloes and cows shared 25.53 per cent in total bovine population. Cattle constitutes the major (98.69 per cent) in total bovine. Again, while the share of in-milk cows in total in-milk bovine accounted for 98.66 percent, the proportion of buffaloes in-milk in total in-milk bovine constituted only 1.33 per cent. Obviously, cows are preferred more than buffaloes and are the main source of milk production in the state of Sikkim. Probable reason might be that the buffaloes are less suited in the state than cows due to hilly topography.

Table-3.10
Composition of bovine population in the state of Sikkim

	Composition	Percentage
1.	Bovine in total livestock	23.47
2.	Ovine (Sheep & Goats) in total livestock	18.88
3.	Cattle in total bovine	98.69
4.	In-milk cows in total in milk bovine	98.66
5.	In-milk buffaloes in total in milk bovine	1.33
6.	In-milk bovine in total bovine	25.53

Data Source: Figures are estimated from the data obtained from Livestock Census, Sikkim

Composition of Milch Animal Herd:

Primary function of cattle in India, historically has been for producing male calves. Thus most of the indigenous breeds of cattle are poor producers of milk. Attempts to improve on the quality of indigenous cattle breeds through cross breeding became widespread only in recent years. Now crossbreeding of cattle is an important component of the strategy for increasing milk production.

Data on population of she-cattle, she-buffaloes, in-milk cattle, in-milk buffaloes for the state of Sikkim are available from livestock census (2003) and are presented in table-3.11. It is evident that a significant proportion of adult females are dry common to both cattle and buffaloes. Again, the percentage share of females in-milk are relatively greater among buffaloes than among cows. Animals in milk among adult females in case of she-buffaloes stood at 36.89 per cent in the state as against the figure of 29.96 per cent for cattle. The ratio of cows to she-buffaloes is observed to be 1.35 in case of in-milk animals and 1.10 for both the in-milk and the dry categories together.

Table-3.11
Composition of Milch Animal Herd in the state of Sikkim (2003)

A.	Animals in milk as per cent of total adult (above 2½ years) Females	
i.	Cow	29.96
ii	She-buffaloes	36.89
B.	Ratio of Cow to She-buffalo	
i.	In milk	1.35
ii.	Total	1.10

Data Source: Figures are estimated from the data obtained from Livestock Census, Sikkim

Table-3.12
Population of Cross-Bred Females in the state of Sikkim (2003)

A.	Cross-bred Cattle	
	0 – 1 year	10730 (19.07)
	1 – 2½ year	9110 (16.19)
	2½ year and above	
a)	In milk	23189 (41.22)
b)	Dry	9880 (15.14)
c)	Not even calved once	3023 (5.37)
	Total Females	56249
B.	Indigenous	
	0 – 1 year	10049 (21.72)
	1 – 2½ year	6921 (14.96)
	2½ year and above	
a)	In milk	17409 (37.63)
b)	Dry	9271 (20.04)
c)	Not even calved once	2412 (5.21)
	Total Females	46257

Note: Figures in brackets denote percentages

Data Source: Livestock Census, Sikkim, 2003

High quality milch cattle breeds have a lower age of first calving, longer lactation length and shorter inter-calving interval. Therefore as the proportion of high quality breeds in the she-cattle population increases, the proportion of animals in-milk will also tend to increase. Data on female cattle population by crossbred and indigenous breeds are shown in table 3.12. It can be seen that among indigenous cattle, females over 2½ years and in-milk recorded 37.63 per cent while those for crossbred cattle the proportion worked out at 41.22 per cent.

Growth in Milk Production:

The need to obtain reliable estimates of milk production in India began to be increasing felt right from the inception of planning. In order to obtain reliable estimates of milk production, scientifically designed sample surveys were begun by the Institute of Agricultural Research Statistics at the instance of Ministry of Agriculture. These surveys were carried out in different years and in different states. However, the Ministry of Agriculture did not do the surveys on an annual basis till 1977-78. Moreover, all the states did not participate in the All-India Survey. Thus till 1977-78 there was no reliable estimates on milk production on year to year basis. Unfortunately, the annual estimates of milk production released by the Ministry of Agriculture have several shortcomings including non-comparability of data over time. In spite of such limitations, researchers had to depend on these estimates. As supplementary source, state level data is available to evaluate trends in milk production. Here again, in the state of Sikkim we have limited information. Annual estimates of milk production in the state of Sikkim are available from 2002-03 onwards. In spite of data limitations, we have attempted to analyze the trend in milk production in the state of Sikkim on the basis of available data. Milk production data are available according to plan periods from the Fifth Five Year Plan. Year wise breakup is available for the Tenth Five Year Plan from the year 2002-03.

The estimated milk production during the plan periods according to five year plans are presented in table-3.13. It can be seen that during the Fifth Five Year Plan period average annual milk production was 10.95 thousand metric tonnes and it increased to 37 thousand metric tonnes annually during the 9th Five Year Plan period registering an increase of 8.81 per cent per annum. During the 8th Five Year Plan period (1992-97), annual milk production was of the order of 34 thousand metric tonnes when the scheme of IDDP was launched. It increased to 48 thousand tonnes in the year 2005-2006 (table-3.14) and thus increased at the rate of 3.17 per cent per annum since the launching of IDDP programme in the state. The steady progress in milk production in the state obviously due to increased emphasis laid on the animal husbandry and dairy development programmes including IDDP.

The increase in milk production was mainly contributed by cows. As recorded for the year 2005-06, about 99 per cent of the total milk production in the state of Sikkim was contributed by cattle (table-3.15). The average per capita availability of milk increased from 132 ml. per day during the 5th Five Year Plan period to 243 ml. per day during the 9th. Five Year Plan period (table-3.16).

Table - 3.13
The growth in production of milk during the different Five Year Plans

(In '000 metric tonnes)

Plans	Milk Production (annual)
5 th .Plan	10.95
6 th .Plan	19.00
7 th .Plan	27.00
8 th .Plan	34.00
9 th .Plan	37.00

Source: Annual Report 2005-06, Department of Animal Husbandry, Livestock, Fisheries & Veterinary Services
Government of Sikkim

Table - 3.14
The growth in production of milk during 10th. Plan (year wise)

(In '000 metric tonnes)

10 th .Plan	Milk Production
2002-03	38.00
2003-04	40.00
2004-05	46.00
2005-06	48.00
2006-07	50.00 (anticipated)

Source: Department of Animal Husbandry, Livestock, Fisheries & Veterinary Services,
Government of Sikkim, Gangtok

Table - 3.15
Total milk production for the year 2005-2006 (in kg.)

Sl. No.	Districts	Indigenous cattle milk (in kg.)	Crossbreed cattle milk (in kg.)	Buffalo milk (in kg.)	Total milk (in kg.)
1.	North (Mangan)	1256080.48	2655033.78	1367.50	3912481.76
2.	East (Gangtok)	2818623.75	16517264.39	19087.08	19354975.22
3.	West (Gyalshing)	4030923.83	9366474.39	81354.78	13478753.00
4.	South (Namchi)	2318276.34	933174.43	14092.22	11668542.99
	State (Sikkim)	10423904.40	37874947.00	115890.58	48414741.00

Source: Annual Report 2005-06, Department of Animal Husbandry, Livestock, Fisheries & Veterinary Services
Government of Sikkim

Table - 3.16
The per capita availability of milk during 5th.,6th.,7th.,8th . and 9th Five Year Plans

Plans	Milk availability (in ml.)
5 th .Plan	132
6 th .Plan	148
7 th .Plan	163
8 th .Plan	213
9 th .Plan	243

Source: Annual Report 2005-06, Department of Animal Husbandry, Livestock, Fisheries & Veterinary Services
Government of Sikkim

Integrated Dairy Development Project: A Brief resume

The animals kept by the farmers are still non-descript type having slow growth, negligible production in terms of milk, late maturity etc. This situation calls for an integrated programme of cattle development to increase the productivity of local animals through cross breeding, introduction of exotic stock, spread of artificial insemination facilities, improved feed and fodder management practices etc.

The Integrated Dairy Development Project is in operation in the North District of Sikkim. The other districts Namely, the east, west and south districts of the state are included in the operation Flood Programme which was started in the year 1980. The north district of the state is hilly and backward areas and in order to have a uniform dairy development programme in the state, Integrated Dairy Development Project is being implemented under the centrally sponsored plan scheme of the Government of India.

In the year 1993-94, the Government of Sikkim received a grant of Rs. 217 lakhs from the Government of India for undertaking Dairy Development Programme in the north district. After successful implementation of the project, the second project was sanctioned by the Government of India. The second project considered as first phase of the project was implemented from 1994-95 and continued upto 1999-2000. During the first phase of the project, 25 Dairy Co-operative Societies (DCS) have been organized, out of this 20 were functional with a farmer membership of over 600 and milk procurement was about 850 liter per day. The third project considered as 2nd phase of the project started from 2000-2001 and covered the period of five years from 2000-01 to 2004-05. Thus since inception the Project has completed two phases of work known as IDDP phase I & IDDP phase II.

Administrative set up for Implementation of IDDP in Sikkim:

The IDDP project entails the provision of monitoring committee constituted for effective implementation of the project. The guidelines stipulate that a technical

management committee shall be constituted at the state level under the Chairmanship of Secretary in-charge of dairy development. This committee will have officers from the state government department concerned, a representative each of the department of Animal Husbandry and Dairying, Government of India, Planning Commission and NDDDB as members. The Committee is entrusted with the responsibility of monitoring the implementation of the project at the state level.

The project is implemented by the State Animal Husbandry and Veterinary Department, Government of Sikkim. The Joint Director (Dairy), Department of Animal Husbandry, Livestock, Fisheries & Veterinary Services has been appointed as nodal officer (Chief Executive) for the project. For implementation of IDDP in Sikkim, a Technical Management Committee (TMC) was constituted at the state level for monitoring the progress of the project. The Committee consisted of the following officials of the government of Sikkim as well as representative of the government of India. The TMC at the state level constantly monitors the progress of the project.

**Administrative Set up for Implementation of IDDP in Sikkim:
State Level Technical Management Committee**

1.	Principal Secretary, Animal Husbandry and Veterinary Services Department, Govt. of Sikkim	:	Chairman
2.	Joint Secretary, Dairy, Govt. of India or Representative from Govt. of India	:	Member
3.	Commissioner cum Secretary, Govt. of Sikkim	:	Member
4.	Secretary, Finance, Govt. of Sikkim	:	Member
5.	Principal Director, Animal Husbandry and Veterinary Services, Govt. of Sikkim	:	Member
6.	Director of Industry, Govt. of Sikkim	:	Member
7.	Registrar, Co-Operative Society, Govt. of Sikkim	:	Member
8.	Financial Adviser, Animal Husbandry and Veterinary Services, Govt. of Sikkim	:	Member
9.	Executive Engineer (C.E.W), Animal Husbandry and Veterinary Services, Govt. of Sikkim	:	Member
10.	Joint Director (Dairying), Animal Husbandry and Veterinary Services Department, Govt. of Sikkim	:	Nodal Officer

In addition to the state level TMC there is an implementing committee at district level to workout the modalities for implementation of the project in the concerned district. In fact the district level committee monitors the performance of IDDP at the district level and helps TMC in effective implementation of the project.

Implementation Committee at the District Level

1. Principal Director, Animal Husbandry and Veterinary Services Department, Govt. of Sikkim	: Chairman
2. Joint Director (Dairying), Animal Husbandry and Veterinary Services Department, Govt. of Sikkim	: Member
3. Executive Engineer (C.E.W), Animal Husbandry and Veterinary Services Department, Govt. of Sikkim	: Member
4. Finance and Accounts Officer, Animal Husbandry and Veterinary Services Department, Govt. of Sikkim	: Member
5. District Animal Husbandry and Veterinary Officer	: Member
6. Deputy Director (Dairying)	: Member
7. Asstt. Dairy Development Officer	: Member
8. Joint Director (North, South and West District)	: Project Officer

Physical and Financial Performance of the Project:

The fact that there has been a marked rise in milk production and per capita per day availability of milk in the state is evident from our foregoing analysis. Against the background of previous analyses we will now try to bring out the extent to which IDDP has contributed to the growth in milk production.

The basic concept behind the project is to increase the rate of commercialization of milk production by providing on the one hand, an assured market for milk to the rural producers by linking rural milk sheds with urban milk markets and on the other side, to extend to them technical inputs and services like artificial insemination for crossbreeding and upgrading of milch animals. Supply of cattle feed and fodder, veterinary care etc for enhancing the productivity of milch animals are the special features of the programme. For this a chain of procurement, processing and marketing network and infrastructure facilities for extending inputs and services to milk-producers were established. The organizational structure for implementing these tasks was the formation of dairy co-operative societies at the village or a group of villages level with milk producers as primary members. Under the project, beneficiary families are supposed to be organized into co-operatives on voluntary basis to facilitate extension and supply of inputs, animal health services and marketing support. The components eligible for financing under IDDP include (i) milk processing and marketing, (ii) milk procurement, (iii) provision of technical inputs, (iv) manpower development and (v) provision of working capital.

The project envisages the assistance for the formation of dairy co-operative societies, purchase of milk testing equipments, furniture, procurement of milk, construction of dairy and chilling plants, input supplies and training of farmers and functionaries involved in the implementation of the project. The assistance covers both recurring and non-recurring expenditure of approved components.

As regards the progress of IDDP project, the first phase of the project was completed in 1999-2000. Table-3.17 sets out the silent features of IDDP phase-I. By the end of phase-I, 25 village level dairy co-operative societies (DCSs) have been organized against target of 30, out of which 20 were functional with a farmer membership of 610. These co-operatives procured 1000 litres of milk per day against a target of 2000 litres and thus had achieved 50 per cent of target. The average liquid milk marketed through milk co-operatives by the end of phase-I was 1000 litres per day against a target of 2500 litres of liquid milk per day and accordingly the achievement stood at 40 per cent against the target fixed. The targets were fully achieved in respect of construction of milk chilling and processing plants. During first phase of the project it was proposed to set up one processing plant of 5000 litres capacity per day and one chilling plant of 1000 litres capacity. The target was fully achieved during the 1st. phase completed in 1999-2000.

Physical targets and achievements of IDDP during phase-II of the programme are presented in table-3.18. As of January 31,2005 (towards the end of phase-II), 30 village level dairy co-operative societies (DCS) as against the target of 50 have been organised and were in operation in north district of the state of Sikkim with the total farmers membership of 1000. Two milk chilling centers with the capacity of 500 LPD each were established. By the end of January, 2005 average milk procurement was of the order of 1500 LPD, about 55.56 per cent less than the target fixed. One milk processing plant with the capacity of 2000 LPD was established. The average liquid milk marketed through milk co-operatives as on January,2005, was 1500 LPD as against the target of 3375 LPD. The achievement, thus in this regard was 44.44 per cent of the target. As against the target of 3, one Heifer Shed-cum-Feed Godown was also set up during phase-II of the project.

The total investment of the 2nd.phase of the project as of January,2005 was 266 lakhs (table – 3.19). In the allocation of funds among various activities, 112.22 lakhs i.e. about 42.19 per cent was given for building up milk processing and marketing capacity. Milk production enhancement programme got 96.74 lakhs i.e. 36.37 per cent of the allocation. A some of Rs.46.62 lakhs i.e. 17.53 per cent was spent on milk procurement. Manpower development received 2.25 lakhs i.e. 0.85 per cent of the

allocation and the remaining was spent on working capital like purchase of cattle feed, purchase of heifers etc.

Table-3.17
Physical Performance of the IDDP Project (Phase-I)

Components		(1995-'96 to 1999-'00)		Achievement as percent of target
		Target	Achievement	
1	Organisation of Co-operatives			
a)	DCS Organised (No.)	30	25	83.33
b)	DCS Functional (No.)	0	20	-
c)	Farmer Membership (No.)	1117	610	54.61
2	Milk Procurement And Marketing			
a)	Daily Average Milk Procurement(LPD)	2000	1000	50.00
b)	Daily Milk Marketing(LPD)	2500	1000	40.00
3	Milk Chilling And Processing			
a)	Establishment of Processing Plants			
I)	Number	1	1	100.00
II)	Capacity(LPD)	5000	5000	100.00
b)	Establishment of Chilling Plants			
I)	Number	1	1	100.00
II)	Capacity(LPD)	1000	1000	100.00

Data Source : Animal Husbandry & Veterinary Services Department, Government of Sikkim.

Table - 3.18
Physical Targets and Achievements Under IDDP (North District, Sikkim) Phase - II

Sl. No	Particulars	EOP Targets	Units	Achievment as on 30.06.2004	Achievment as on 31.01.2005	Achievment as % of target
1.	DCS Organised	50	Nos.	26	30	60.00
2.	DCS Functional	50	Nos.	26	30	-
3.	DCS Membership	2250	Nos.	800	1000	44.44
4.	Milk Chilling Plants	1000	LPD	2	2	100.00
	a) Mentam Chilling Plant	500	LPD	1	1	100.00
	b) Phidang Chilling Plant	500	LPD	1	1	100.00
5.	Milk Processing Plant					
	Pegong Plant	2000	LPD	0	1	100.00
6.	Heifer Shed-cum-Feed Godown	3	Nos.	1	1	33.33
7.	Average Milk Procurement	3375	LPD	1200	1500	44.44
8.	Average Milk Marketing	3375	LPD	1200	1500	44.44

Remarks: Civil Works of Milk Chilling & Processing Plant 100% Completed except Commissioning

Data Source: Department of Animal Husbandry, Livestock, Fisheries and Veterinary Services, Government of Sikkim

Table - 3.19

Component-wise Financial Performance of the IDDP Project (IInd. Phase): 2000-01 to 2004-05

Rs. in Lakhs

Sl.No.	Component	EOP Target	Achv. as on 31.03.04 (Cum.)	Achv. as on 31.01.05 (Cum.)
1	Milk Processing & Marketing			
	Capital Expenditure			
1.1	Civill Works			
a)	Chilling Plant	24.00	48.02	48.02
b)	Dairy Plant	15.53	0	0
1.2	Purchase of Plant & Machinery			
a)	Chilling Plant	16.00	58.25	59.25
b)	Dairy Plant	29.75	0	0
	Sub-Total (1.1 + 1.2)	85.28	106.27	107.27
1.3	Erection and Commission			
a)	Chilling Plant	1.80	0	0
b)	Dairy Plant	3.50	0	0
c)	Consultancy Charges @ 5%	2.25	2.25	2.25
1.4	Contingency & Technical Services @ 5%	0.75	0	0.75
1.5	Pre-operative Expenses	0.45	0	0.45
1.6	Personal Computers	1.50	0	1.50
1.7	Effluent Treatment plant	15.00	0	0
1.8	Milk Kiosk	5.00	0	0
	Sub-Total (1.3 to 1.8)	30.25	2.25	4.95
1.9	Total (1.1 to 1.8)	115.53	108.52	112.22
2.0	Milk Procurement			
A.	Capital Expenditure			
2.1	Purchase of Milk Cans	3.00	1.49	1.49
2.2	Purchase of Vehicle	3.50	5.14	5.14
2.3	Audio Visual Kit	1.50	3.00	3.00
2.4	Capital Investment for DCS	4.50	3.50	4.00
	Sub-Total (2.1 to 2.4)	12.50	13.13	13.63
B.	Recurring Expenditure			
2.5	MGT-Grants to DCS	5.40	10.39	10.59
2.6	Propulsion charges of Vehicle	2.50	1.70	5.70
2.7	MGT-Grants to Milk Union	20.00	8.70	10.70
2.8	Chemicals for milk testing	7.50	1.00	6.00
2.9	Subsidy for Transport	9.72	0.00	0.00
	Sub-Total (2.5 to 2.9)	45.12	21.79	32.99
	Total 2.1 to 2.9)	57.62	34.92	46.62
3.0	Input Services			
A.	Capital Expenditure			
3.1	Cattle Feed Store	15.00	7.00	7.00
3.2	LN2 Accessories	10.50	0.00	6.00
3.3	LN2 Containers	7.00	7.55	7.55
3.4	Mobile for A.I Services	1.20	0.32	0.32
3.5	Bull for Natural Service	5.00	0.45	0.45
3.6	Shed for Heifer Farms	6.00	2.21	2.21
	Sub-Total (3.1 to 3.6)	44.70	17.53	23.53

Contd.....

Contd.... Table - 3.19

Sl.No.	Component	EOP Target	Achv. as on 31.03.04 (Cum.)	Achv. as on 31.01.05 (Cum.)
B.	Recurring Expenditure			
3.7	Maintenance of NS bulls	1.20	0.00	0.00
3.8	A.I Services	7.50	0.00	0.00
3.9	Transport subsidy on Cattle Feed	5.00	0.00	1.00
3.1	Distribution of Fodder Minikits	10.00	8.47	10.47
3.11	Farmers Level Fodder Demonstration	10.00	4.00	8.00
3.12	Heifer Rearing Cost	45.00	10.00	20.00
3.13	Organization of Cattle Show/Exhibition	4.00	0.00	4.00
3.14	Induction of Cattle/Purchase/Insurance	40.00	28.74	29.74
	Sub-Total (3.7 to 3.14)	122.70	51.21	73.21
	Total (3.1 to 3.14)	167.40	68.74	96.74
4.0	Manpower Development			
4.1	Total Recurring Expenditure (Training Cost)	7.02	2.25	2.25
5.0	Total Capital Expenditure (all components)	172.73	139.18	149.38
6.0	Total Recurring Expenditure (all components)	174.84	75.25	108.45
7.0	Total (5.0+6.0)	347.57	214.43	257.83
8.0	Working Capital			
8.1	Purchase Price of Milk	7.09	3.37	3.37
8.2	Purchase of Cattle Feed	8.10	4.80	4.80
8.3	Revolving Fund for Purchase of Heiffers	5.40	0.00	0.00
	Total Working Capital	20.59	8.17	8.17
	Total Project Cost	368.16	222.60	266.00

Data Source : Department of Animal Husbandry & Veterinary Services, Government of Sikkim

Note: 1. Total cost of the project approved by the Government of India for implementation of the project during the period starting from 2000-01 to 2004-05(II nd Phase) is Rs. 368.16 lakhs

2. Grants-in-aid released by the Government of India to State Government as on 31.1.2005 amounts to Rs. 277.34 lakhs

3. Fund released by the State Government to implementing agency as on 31.01.05 amounts to 277.34 lakhs

Performance of Dairy Co-operative Societies:

Based on the success of dairy co-operatives in Kaira district of Gujarat during the fifties and sixties, co-operatives as an instrument of dairy development has been well accepted in India. Dairy co-operatives now have a three-tire structure with milk producer's co-operatives societies at the village levels, a union at the district level and a federation at the apex/state level. The structure is both horizontally and vertically integrated and is owned and controlled by member-milk producers. Integration of production, procurement, processing and marketing functions is the important ingredient of the dairy co-operatives. Provision of all necessary inputs and services to member-producers at reasonable, often subsidized rates is also the important feature of dairy co-operatives.

The accepted policy of the Government of India to foster and promote dairy development through a network of co-operatives is reflected in the provision contained in IDDP project for dairy development in non-operation flood areas. In fact, one of the essential conditions of the project is that dairy co-operative societies should be organized at the village or a group of village level. The village society will be affiliated to the district-level co-operative society. The district society in turn seek affiliation to the state-level co-operative federation. The guidelines of the project envisage that beneficiary families should be organized into co-operatives on voluntary basis to facilitate extension and supply of inputs, animal health services and marketing support. Accordingly, milk producer's co-operative societies receiving benefits under only IDDP form the sample frame. In all, three dairy co-operative societies are covered in the study namely Nampatam MPCS, Ringhim DUSS and Chandey MCS hereafter referred to as Society No.1, 2 and 3 respectively in north district of Sikkim. The present section presents the performance of the selected dairy co-operative societies in implementing the scheme of IDDP in the north district. For the purpose, society level information was collected through structured questionnaire. To start with it gives a brief profile of the selected societies and then proceeds to analyze the organizational structure and activities performed by the societies at the farmers level.

Brief Profile of the Selected Societies:

The horizon of activities of the societies extended to two villages each in Nampatam MPCS (Society No.1) and Ringhim DUSS (Society No.2) and three in Chandey MCS (Society No.3). In terms of area coverage Society No.1 extends its activities over an area of 175 sq.km.(table-3.20) while the area coverage of Society No.3 is estimated as 250sq.km. Society No.2 covers an area of 150sq.km. The sample societies are located at a distance ranging from 4-6km.from the headquarter. The composition of population of villages covered by the societies revealed that population served by the societies are entirely disadvantaged population namely, scheduled tribes. Farm member households of the society constituted 65.71 per cent, 60.87 per cent and 64.21 per cent of total households in Society No.1, 2 and 3 respectively. The level of literacy ranged from 40 to 50 per cent. (table-3.20)

The total livestock and dairy animal population within the area covered by the societies are presented in table-3.21. The three societies had total livestock population of 365, 610 and 316 numbers in Society No.1, 2 and 3 respectively of which cattle population constituted 24.66 per cent, 69.67 per cent and 55.70 per cent respectively. Size of cattle per household numbered 2.57, 3.69 and 1.85 for Society No.1, 2 and 3 respectively. Average size of crossbred cows numbered 2.28 for Society No.1, 2.17 for Society No.2 and 0.47 for Society No.3 as against the figures of indigenous cows

Table-3.20**A Brief Profile of Milk Producers' Co-operative Society, Sikkim North District, Mangan**

Sl. No.	Name of MPCS	Year of formation	Villages covered by the society	Total area of villages covered in sq. km.	Distance of society from district H.Q. (km.)	Population of Villages covered by the society as per 1991 census				Number of households	Farm member households		Literacy Rate (percentage)
						SC	ST	Others	Total		No	percent	
1.	Nampatam MPCS	1994	2	175	6	-	350	-	350	35	23	65.71	40
2.	Ringhim DUSS	1994	2	150	5	-	325	-	325	115	70	60.87	45
3.	Chandey MCS	1994	3	250	4	-	575	-	575	95	61	64.21	50

Data source: Society-level data obtained through canvassing society level schedule prepared for the study.

Table-3.21**Livestock Status of the Villages covered by the Societies**

Sl. No	Name of MPCS	Cows (Number)						Buffaloes		Sheep & Goat		Total Livestock		Percentage of cattle to total livestock
		Crossbreed		Indigenous		Cows		Total	Per household	Total	Per household	Total	Per household	
		Total	Per household	Total	Per household	Total	Per household							
1.	Nampatam MPCS	80	2.28	10	0.28	90	2.57	-	-	275	7.86	365	10.43	24.66
2.	Ringhim DUSS	250	2.17	175	1.52	425	3.69	-	-	185	1.61	610	5.30	69.67
3.	Chandey MCS	45	0.47	131	1.38	176	1.85	-	-	140	1.47	316	3.33	55.70

Data source: Society-level data obtained through canvassing society level schedule prepared for the study.

of 0.28, 1.52 and 1.38 for the three societies respectively. Thus with regard to ownership of cattle and crossbred cows Society No.1 and 2 are relatively advanced in comparison with the other Society No.3. Markedly, the average size of crossbred cows is comparatively higher for Society No.1 and 2.

Organisational Structure of the Selected Societies:

Under IDDP, the strategy has been to promote dairy development on co-operative lines. Emphasis has therefore been laid on milk production in the project area through a network of co-operatives linked with processing and marketing of milk. To carry out the various activities, in the field of procurement, processing and marketing of milk and providing technical inputs and services, DCSs have developed an organizational set up. Thus before analyzing the performance, we present the organization set up of the selected dairy co-operatives in the following paragraphs.

It is evident (table-3.22) that DCS membership in the selected societies increased since their inception. At the time of survey, total members of the societies numbered 33, 50 and 49 in societies 1, 2 and 3 respectively while the corresponding figures at the time of inception of the societies were 19, 25 and 40 and thus recorded annual growth rate of 7.36, 10.00 and 2.25 per cent respectively. The plausible reason for the growth of membership could be the provision of various facilities contained in IDDP, like technical inputs and services and assured marketing outlets for their milk. All these invariably encouraged the milk producers to enroll themselves as the members of the dairy co-operatives. The performance of DCSs in terms of growth of membership may therefore be rated as satisfactory.

The composition of member households comprised of both landed and landless. Landed members are mostly from the lower category of land holdings, mainly small and marginal and the rest came from medium sized land holdings. To carry out their various activities DCSs have developed an organizational set up comprising of president, secretary, treasurer and attendant. At the society level, the milk received from the member producers of milk is measured for quantity and tested for fat and solids not fat (SNF) content. Milk pricing system takes into account both fat content and SNF in milk. Fat and SNF contents of milk are assessed when milk is delivered by the producer at the collection center. General body meeting is organized every month with a view to monitoring the progress the project

The scheme of IDDP envisaged financial assistance to the milk producer's co-operative societies under different components of the scheme as shown in table-3.23. It can be seen that as on 31.03.2001, a sum of Rs.54,000 was provided to each selected society towards financial assistance to make available the benefit of the

Table – 3.22
Organizational Characteristics of Selected Societies

Sl. No.	Item	Society-I	Society-II	Society-III
1.	Year of formation of the society	1994	1994	1994
2.	Number of total membership	33	50	49
3.	Enrolment of members at the time of inception of society	19	25	40
4.	Composition of membership			
	a) Landless	-	-	-
	b) Small farmers	23	35	-
	c) Medium farmers	-	-	23
	d) Large farmers	-	-	-
	e) Others (non-land members)	10	15	26
5.	Composition of office bearer			
	a) President	1	1	1
	b) Secretary	1	1	1
	c) Tester	1	1	1
	d) Attendant	1	1	1
6.	Frequency of general body meet	Monthly	Monthly	Monthly

Data Source: Society- level information obtained from Joint Director, AHLF & VS Department, North district, Mongan, Sikkim.

Table-3.23
Financial Assistance provided to the Society under IDDP

Assistance provided to the society as on 31.03.2001			
Items	Name of the societies		
	Nampatam MPCS	Ringhim DUSS	Chandey MCS
1.Purchase of Milk Cans	Rs.37500 (69.44)	Rs.37500 (69.44)	Rs.37500 (69.37)
2.Furniture	Rs.10500 (19.44)	Rs.10500 (19.44)	Rs.10500 (19.43)
3.Milk Testing Equipments	Rs.5500 (10.19)	Rs.5500 (10.19)	Rs.5500 (10.18)
4.Chaff Cutter	-	-	-
5.First-Aid Box	Rs.500 (0.93)	Rs.500 (0.93)	Rs.550 (1.02)
Total	Rs.54000 (100.00)	Rs.54000 (100.00)	Rs.54050 (100.00)

Note: Figures in the brackets indicate percentages to total.

Data Source: Society level information obtained from Joint Director, AHLF & VS Department, North district, Mongan, Sikkim.

scheme to the milk producing members of the society. The financial assistance comprised of purchasing milk cans (about 69 per cent) followed by financing purchase of furniture (about 19 per cent) and milk testing equipments (about 10 per cent).

Table-3.24

Facilities provided under IDDP

Assistance provided under IDDP to members as on 31.03.2001			
Items	Name of the societies		
	Nampatam MPCS	Ringhim DUSS	Chandey MCS
1. Infertility camps organized in the village (Nos.)	3	2	-
2. Artificial insemination (Nos.)	15	12	-
3. Vaccination (Nos.)	175	150	-
4. Development of fodder plots (Nos)	10	8	50
5. Distribution of fodder kits (Nos.)	150	125	-

Note: Society-wise aggregate data regarding induction of C.B. animals were not available at the time of survey.

Data Source: Society level information obtained from Joint Director, AHLF & VS Department, North district, Mongan, Sikkim.

The scheme envisaged financing of only one crossbred cow to those who were already having a cow. Society-level aggregate data regarding induction of crossbred animals were not available at the time of survey. Farm-level investigation however revealed that financial assistance in the form of bank loan and subsidy were provided to the farmer members, the details of which are presented next in the following analyzes in this chapter. Apart from providing milch cows, the societies provided to the members a package of inputs and services necessary for enhancing milk production. The package includes technical inputs and services inclusive of animal health care in the form of extending vaccination facilities and artificial insemination facilities, development of fodder plots, distribution of fodder kits and organizing infertility camps. The details regarding the extension of benefit provided to the members of the society as on 31.03.2001 are shown in table-3.24.

The project provides for training of beneficiaries and functionaries associated with the implementation of the project. For successes for dairy development programmes, trained human resource having various kinds of skills and expertise is a pre-requisite. For facilitating the process of dairy development, persons with

specialised training in animal husbandry, veterinary science and dairying are needed. To achieve it, the scheme entails provision of recurring expenditure for training of milk producers in upkeep of crossbreed animals, the nutrition and system of hygienic

Table-3.25
Training Programmes Organized under IDDP

Sl. No.	Name of the Societies	District level training conducted			
		Name	Duration (days)	No. of programmes organized	No. of persons trained
1.	Nampatam MPCS	1) Clean milk production	2	1	35
		2) Vety. first aid	1	3	45
		3) Management of cattle	4	2	25
		4) Awareness camp	1	1	55
		5) Farmer induction training	-	-	75
		6) Training of local farmers	-	-	25
		7) Training of MPCS staff	-	-	7
2.	Ringhim DUSS	1) Clean milk production	2	1	30
		2) Vety. first aid	1	2	40
		3) Management of cattle	3	2	35
		4) Awareness camp	1	1	50
		5) Farmer induction training	-	-	70
		6) Training of local farmers	-	-	20
		7) Training of MPCS staff	-	-	6
3.	Chandey MCS	1) Clean milk production	2	5	93
		2) Vety. first aid	2	10	100
		3) Management of cattle	2	15	100
		4) D.C.S. Awareness camp	3	9	25
		5) Farmer induction training	-	-	150
		6) Training of local farmers	-	-	35
		7) Training of MPCS staff	-	-	55

Note: Training was conducted during the year 2001-02

Data Source: Society-level information obtained from Joint Director, AHLF & VS Department, North district, Mongan, Sikkim.

milk production etc. Table 3.25 presents the details of training courses organized, duration of training programmes conducted and the number of people trained under

various programmes of IDDP at the society level. The training includes the items of cleaning milk production, veterinary. first aid, management of cattle, awareness camp, farmer induction training, training of local farmers and training of MPCS staff. In terms of weightage given to the different courses of training, management of cattle occupy the major followed by veterinary first-aid. Persons involved in the training accounted for the major in farmer induction training followed by those involved in the organization of awareness camp (table 3.25).

Table - 3.26
Month-wise procurement of milk during 2000-01

Year/ Month	Nampatam MPCS		Ringhim DUSS		Chandey MCS	
	Members contributing milk (Nos. per day)	Quantity procured (in litres per day)	Members contributing milk (Nos. per day)	Quantity procured (in litres per day)	Members contributing milk (Nos. per day)	Quantity procured (in litres per day)
April	19	25	35	49	15	35
May	19	35	37	55	20	25
June	20	36	28	57	25	40
July	16	40	27	59	25	39
August	19	41	30	60	25	35
September	70	45	28	71	30	45
October	22	44	33	75	20	50
November	23	38	31	65	35	51
December	25	45	24	61	27	52
January	18	47	27	80	30	54
February	23	40	29	81	29	59
March	15	49	33	90	23	60
Monthly average (per day)	24.08	40.42	30.17	66.92	25.33	45.42
Monthly average (per day) before schedule canvassing	35	60	38	155	30	127

Data Source: Society-level information obtained from Joint Director, AHLF & VS Department, North district, Mongan, Sikkim.

Milk producers' co-operative societies worked as a source of milk disposal of the farmer member households. It can be viewed from table – 3.26 that on an average, members which were supplying milk to the society numbered 24 per day within a month in society number 1 as against the figures of 30 and 25 for the societies numbering 2 and 3 respectively. During the year 2000 – 2001, monthly average procurement of milk by the selected societies was of the order of 40 liters per day for society number 1, 66 liters for society number 2 and 45 liters for society number 3. Notably, however milk procurement per day per society decelerated as compared to the position existed before schedule canvassing.

Implementation of the Scheme at the Beneficiary-Level:

The present section intends to examine the implementation aspect of the project at the beneficiary level.

Size of Animal Units:

As is evident, under the scheme, purchase of crossbred milch cows in unit of one animal was assisted to the farmer members of the society who were already having a cow. A total of 19 milch animals (cows) were provided to 19 beneficiaries out of a total of 36 who accounted for 52.22 per cent of the total sample beneficiaries (table–3.27). Inducted cows were in 1st lactation order. The lactation cycle of milch cattle provided under the scheme was reported to be a duration of 415 days of which 230 days represented in-milk period and the dry period was a duration of 185 days.

Table - 3.27

State of milch animals provided under IDDP

State of animals	Recipients of milch animals	
	Number of recipients	Percent of total sample beneficiaries
1.Dry	-	-
2.In-milk (1 st lactation)	19	52.72
3.Heifer	-	-

Data Source: Survey data

Identification of Beneficiaries:

The project envisaged providing assistance to the targeted beneficiaries of the region who are relatively disadvantaged having lower income and higher incidence of unemployment. Evidently it was found that the scheme was drawn at large for the benefit of small and marginal farmers. Out of a total of 19 animals assisted under

IDDP project, 15 (78.94 per cent) were provided to small and marginal farmers (table-3.28). Thus the implementing agency followed the stipulated norms in the identification of beneficiaries.

Table - 3.28

Distribution of milch animals provided under IDDP by landholding groups

Landholding groups (ha.)	Number of milch animals	Percent of milch animals
Below 1.00 (Marginal)	8	42.10
1.00 – 2.00 (Small)	7	36.84
2.00 – 4.00 (Semi-medium)	2	10.53
4.00 – 10.00 (Medium)	2	10.53
10.00 and above (Large)	-	-
Total	19	100.00

Data Source: Survey data

Unit Cost:

Apart from induction of milch animals, the project has several other components namely provision for providing technical inputs of feed and fodder kits for better milk production, providing equipments like milk cans, etc. Unit cost of investment under the scheme of IDDP thus included (a) cost of one crossbred cow (b) cost of construction of shed and (c) cost of equipments. The dairy unit cost of investment is shown in table-3.29. The survey data revealed that the average actual unit cost of investment (table-3.29) was Rs.10,755 covering cost of one milch animal (Rs.7105), cowshed (Rs.3500) and cost of equipment (Rs.150).

Table - 3.29

Unit cost of investment under IDDP scheme

Components of investment	Value (Rs.)
1.Milch cows (unit of one animal)	7,105.00
2.Cow shed	3,500.00
3.Equipments (milk cans)	150.00
4.Others	-
Total	10,755.00

Data Source: Survey data.

Data obtained from the field survey revealed that cost of investment financed under IDDP includes (a) the cost of unit of one milch animal (b) cattle-shed (c) dairy equipments (milk cans). However the same beneficiary did not receive all the

components. From table-3.30 it can be seen that about 58.33 per cent of sample beneficiaries each from society no.1 and 2 received crossbred milch cow in unit of one animal which were partly on 50 per cent subsidy and partly on 100 per cent subsidy. The proportion of sample beneficiaries receiving milch animals accounted for 41.67 per cent for society no.3 of which 25 per cent on 50 per cent subsidy and 16.67 per cent on 100 per cent subsidy. While in majority of cases, beneficiary received milch animals, in some other cases they received assistance for the construction of cattle-shed. The proportion of such households accounted for 16.67 per cent for society no.1, 25 per cent for society no.2 and 8.33 per cent for society no.3. However all the sample beneficiaries were provided with fodder kits free of cost for enhancing milk production.

Table - 3.30

Milch Animals Inducted and Other Benefits provided under IDDP

Name of the society	Milch animals inducted (one cow each)						Assistance for cattle-shed		Other Benefits			
	No.of households received			Percentage of households received			No. of house holds received	Percentage of house holds received	Milk Cans		Fodder Kits	
	On 100% subsidy	On 50% subsidy	Total	On 100% subsidy	On 50% subsidy	Total			No. of house holds received	Percentage of house holds received	No. of house holds received	Percentage of house holds received
Nampatam MPCS	3	4	7	25.00	33.33	58.33	2	16.67	5	41.67	12	100.00
Ringhim DUSS	2	5	7	16.67	41.67	58.33	3	25.00	5	41.67	12	100.00
Chandey MCS	2	3	5	16.67	25.00	41.67	1	8.33	7	58.33	12	100.00

Data Source: Survey data

Loan and Subsidy Component of the Scheme:

Financing the cost of investment was partly in the form of subsidy and partly with bank loan. Loan component of the scheme for financing milch animal varied across the societies while for financing cattle-shed it stood uniformly at 50 per cent (table-3.31). The share of loan component accounted for 25.51 per cent for society no. 1, 37.03 per cent for society no.2 and 28.12 per cent for society no.3. As a whole, the share of bank loan in financing of investment ranged from 28.95 per cent to 38.89 per cent across the societies (table-3.31).

Table-3.31
Financing investment under IDDP

Name of the society	Cost of			Subsidy			Bank Loan		
	Milch Animals	Cattle Shed	Total	Milch Animals	Cattle Shed	Total	Milch Animals	Cattle Shed	Total
Nampatam MPCS	49,000	8,000	57,000	36,500	4,000	40,500	12,500 (25.51)	4,000 (50.00)	16,500 (28.95)
Ringhim DUSS	54,000	9,000	63,000	34,000	4,500	38,500	20,000 (37.03)	4,500 (50.00)	24,500 (38.89)
Chandey MCS	32,000	4,000	36,000	23,000	2,000	25,000	9,000 (28.12)	2,000 (50.00)	11,000 (30.56)

Data Source: Survey data

Note : Figures in brackets indicate percentages of total cost.

Composition of Milch Animal Herd Maintained by Sample Beneficiaries:

Most of the studies on livestock economy in India indicated dominance of cattle as a source of draught power and relatively high degree of dependence on buffaloes as a source of milk. Some other studies (e.g. Mishra, 1970) emphasized growing importance of buffaloes from the point of view of milk production. The present study however reveals a different picture in that cattle is the only source of milk in the area selected for the study. Again, ownership of cattle is largely concentrated in small and marginal holdings. Table-3.32 shows species of milch animal herd across the size classes of land holdings. It can be seen that of the total sample beneficiary farmers selected for the study, 86.11 per cent are small and marginal who owned 82.67 per cent of total milch cattle. It is thus imperative to suggest that dairy farming in the study area is characterized by small scale milk producers being concentrated amongst the small and marginal farmers.

Table-3.33 shows the distribution of milch animals according to breeds. It is found that milch animals kept by the sample beneficiary farmers are still in major indigenous type having low milk yield potential. Out of 75 milch cattle possessed by the beneficiary households, only 32.00 per cent are crossbreed cows and 68.00 per cent are indigenous cows. Thus upgrading of non-descript cows through crossbreeding with high yielding native breeds should have received as much attention as crossbreeding through artificial insemination. The provision of supplying technical inputs and services under the integrated dairy development programme would thus be effective and instrumental in dairy development in the study area.

Table - 3.32**Distribution of Milch Cattle Owned by the Beneficiary Farmers by Farm Size Groups**

Farm Size Groups (hectare)	No. of H.H.	Milch Cattle (Nos.)	She Buffaloes (Nos.)
Below 1.0	19 (52.78)	36 (48.00)	0 -
1.0 – 2.0	12 (33.33)	26 (34.67)	0 -
2.0 – 4.0	4 (11.11)	6 (8.00)	0 -
4.0 – 10.0	1 (2.78)	7 (9.33)	0 -
10.0 and above	0 -	0 -	0 -
Total	36 (100.00)	75 (100.00)	0 -

Data Source: Survey data

Table – 3.33**Distribution of Milch Cattle According to Breed**

Farm Size Groups (hectare)	Milch Cattle	
	Crossbreed	Indigenous
Below 1.0	10 (27.78)	26 (72.22)
1.0 – 2.0	8 (30.77)	18 (69.23)
2.0 – 4.0	3 (50.00)	3 (50.00)
4.0 – 10.0	3 (42.86)	4 (57.14)
10.0 and above	0 -	0 -
Total	24 (32.00)	51 (68.00)

Data Source: Survey data.

So far as the impact of IDDP on the growth of milch animals is concerned, member beneficiaries increased the proportion of crossbreed cows after introduction of IDDP in north district of Sikkim. Table-3.34 shows milch animals newly introduced by the sample beneficiary households under the aegis of IDDP. It can be seen that after becoming the member of the dairy co-operative societies under IDDP, altogether 26 numbers of milch animals have been newly introduced by 36 sample beneficiary households of which 46.15 per cent are crossbreed cows and 53.85 per cent are indigenous cows. The combined average price of milch cattle stood at Rs.5461.54.

Table – 3.34

New Introduction of Milch Animal After Becoming Co-operative Member Under IDDP by Size Group of Milch Animals

Size Group of Milch Animals	No. of H.H.	Introduction of New Animals								
		Cows			Buffaloes			Total milch animals newly introduced		
		No.		Total Value Rs.	No.		Value Rs.	No.		Value Rs.
		Crossbreed	Indigenous		Cross breed	Indigenous		Cross breed	Indigenous	
Below 5.0 Nos.	34	8 [0.24]	12 [0.35]	104000	0	0	0	8 [0.24]	12 [0.35]	104000
5.0 -10.0 ,,	2	4 [2.00]	2 [1.00]	38000	0	0	0	4 [2.00]	2 [1.00]	38000
10.0 - 20.0 ,,	0	0	0	0	0	0	0	0	0	0
20.0 - 30.0 ,,	0	0	0	0	0	0	0	0	0	0
30.0 - 40.0 ,,	0	0	0	0	0	0	0	0	0	0
40.0 & above	0	0	0	0	0	0	0	0	0	0

Data Source: Survey data

Table –3.35

Initial Investment in Dairy Farms by size group of Milch Animals in North District, Sikkim

(Value in Rs.)

Size group of Milch Animals	Item of Investment					
	No. of H.H.	Cattle Shed and Store	Value of Milch Animals	Equipment for Feeding/ Watering	Miscellaneous Expenditure	Total
Below 5 Nos.	34	84000 (737)	375800 (3296)	9050 (79)	15705 (137)	484555 (3699)
5 – 10 Nos.	2	10000 (588)	45800 (2694)	850 (50)	2400 (141)	59050 (451)
10 – 20 Nos.	-	-	-	-	-	-
20 – 30 Nos.	-	-	-	-	-	-
30 – 40 Nos.	-	-	-	-	-	-
40 and Above	-	-	-	-	-	-
Total	36	94000	421600	9900	18105	543605
Overall average Investment per unit of cattle population		717	3218	76	138	4150

Data Source: Survey data

Note : Figures in brackets indicate the average investment per unit of cattle population.

Pattern of Investment in Dairy Farms of Beneficiary Households:

The pattern of investment in dairy farms comprised of cattle-shed of milch animals, stores, equipments for feeding watering and miscellaneous other items of expenditure, Table-3.35 presents the initial investment in dairy farms by the beneficiary farmers. It is evident that the overall investment in dairy farms of 36 sample beneficiaries was of the order of Rs.543605 of which 17.29 per cent was in cattle-shed and stores, 77.56 per cent in milch animals, 1.82 per cent in equipments for feeding, watering and 3.33 per cent on miscellaneous items. The average investment per household in dairy enterprise worked out at Rs.15100. Noticeably, investment per household increased with the increase in the size of milch animal from Rs. 14251 with less than 5 numbers of milch animal to Rs. 29525 when the size of milch animal herd increased up to 10 numbers. It appears therefore that higher investment in dairy unit is closely associated with larger investment in milch animals. In terms of per unit of cattle population, average investment worked out at Rs. 4150 being declined consistently with the increase in the size of milch animal.

To sum up, the livestock sector acquires special significance in hill areas like Sikkim. Due to poor productivity in the crop husbandry sector, low availability of per capita arable land and lack of other income generating avenues, there is heavy economic dependence of households on animal husbandry activities. This is reflected in the fact that 80 per cent of the domestic product come from agriculture and animal husbandry in the state of Sikkim while livestock rearing alone has contributed 8.5 per cent of the state's GDP. The budgetary allocation of resources for the dairy sector was to the extent of 10.13 per cent of the total allocation of resources to animal husbandry livestock, fisheries and veterinary services during 2005-2006 at current prices.

Livestock population in the state increased from 5.13 lakhs in 1997 to about 6.87 lakhs in 2003 and thus recorded annual compound growth rate of about 6 per cent. Bovine population constituted 23.47 per cent of the total livestock as per livestock census 2003 and the cattle population accounted for the major with their share being 98.69 per cent in total bovine population. Cattle is the major source of milk production in the state where the ratio of cows to she-buffaloes among in-milk animals stood at 1.35.

Annual milk production during the 8th five year plan (1992-97) was of the order of 34 thousand metric tonnes when the scheme of IDDP was launched. It increased to 48 thousand tonnes in the year 2005-2006 and thus recorded annual increase of 3.17 per cent since the launching of IDDP in the state. Markedly, the increase in milk production was mainly contributed by cows.

Launched in 1993-94 in north district of the state of Sikkim with a grant of Rs.217 lakhs from the Government of India, the IDDP has completed two phases of work. IDDP phase-I, was implemented from 1994-95 and continued upto 1999-2000. The second phase of the programme covered the period of five years from 2000-01 to 2004-05. Thus since the inception of IDDP in 1993-94, it has completed two phases known as phase-I and phase-II. By the end of phase-II, IDDP has contributed in creating and strengthening the basic infrastructure for procurement, processing and marketing of milk, for cattle feed, for provision of animal health care and breeding services and for education and training of farmers and functionaries involved in the implementation of the project. As of January 31, 2005(by the end of phase-II) 30 village-level dairy co-operative societies have been established with the total membership of 1000 village milk producers. Two milk chilling plants with the capacity of 500 LPD each and one milk processing plant with the capacity of 2000 LPD were established. The average liquid milk procurement and marketing was of the order of 1500 LPD respectively.

The guidelines of the project envisage that beneficiary families should be organized into co-operatives on voluntary basis to facilitate extension and supply of inputs, animal health services and marketing support. Accordingly, milk producer's co-operative societies receiving benefits under only IDDP formed the sample frame. In all, three dairy co-operative societies are covered in the study namely Nampattam MPCS, Ringhim DUSS and Chandey MCS hereafter referred to as Society No.1, 2 and 3 respectively in north district of Sikkim.

At the time of survey, total members of the societies numbered 33, 50 and 49 in societies 1, 2 and 3 respectively while the corresponding figures at the time of inception of the societies were 19, 25 and 40 and thus recorded annual growth rate of 7.36, 10.00 and 2.25 per cent respectively. The plausible reason for the growth of membership could be the provision of various facilities contained in IDDP, like technical inputs and services and assured marketing outlets for their milk. All these invariably encouraged the milk producers to enroll themselves as the members of the dairy co-operatives.

The composition of member households comprised of both landed and landless. Landed members are mostly from the lower category of land holdings, mainly small and marginal and the rest came from medium sized land holdings. To carry out their various activities DCSs have developed an organizational set up comprising of president, secretary, treasurer and attendant.

The scheme envisaged financing of one crossbred cow to those who were already having a cow. Apart from providing milch cows, the societies provided to the

members a package of inputs and services necessary for enhancing milk production. The package includes technical inputs and services inclusive of animal health care in the form of extending vaccination facilities and artificial insemination facilities, development of fodder plots, distribution of fodder kits and organizing infertility camps. The project provides for training of beneficiaries and functionaries associated with the implementation of the project. The training included the items of cleaning milk production, veterinary. first aid, management of cattle, awareness camp, farmer induction training, training of local farmers and training of MPCS staff.

So far as the impact of the scheme at the beneficiary level is concerned, under the scheme, purchase of crossbred milch cows in unit of one animal was assisted to the farmer members of the society who were already having a cow. A total of 19 milch animals (cows) were provided to 19 beneficiaries out of a total of 36 who accounted for 52.22 per cent of the total sample beneficiaries. Inducted cows were in 1st lactation order. The lactation cycle of milch cattle provided under the scheme was reported to be a duration of 415 days of which 230 days represented in-milk period and the dry period was a duration of 185 days.

The project envisaged providing assistance to the targeted beneficiaries of the region who are relatively disadvantaged having lower income and higher incidence of unemployment. Evidently it was found that the scheme was drawn at large for the benefit of small and marginal farmers. Out of a total of 19 animals assisted under IDDP project, 15 (78.94 per cent) were provided to small and marginal farmers. The implementing agency, thus followed the stipulated norms in the identification of beneficiaries.

Apart from induction of milch animals, the project has several other components namely provision for providing technical inputs of feed and fodder kits for better milk production, providing equipments like milk cans, etc. Unit cost of investment under the scheme of IDDP thus included (a) cost of one crossbred cow (b) cost of construction of shed and (c) cost of equipments. The survey data revealed that the average actual unit cost of investment was Rs.10,755 covering cost of one milch animal (Rs.7105), cowshed (Rs.3500) and cost of equipment (Rs.150). However the same beneficiary did not receive all the components. It is observed that about 58.33 per cent of sample beneficiaries each from society no.1 and 2 received crossbred milch cow in unit of one animal which were partly on 50 per cent subsidy and partly on 100 per cent subsidy. The proportion of sample beneficiaries receiving milch animals accounted for 41.67 per cent for society no.3 of which 25 per cent were on 50 per cent subsidy and 16.67 per cent on 100 per cent subsidy. While in majority of cases, beneficiary received milch animals, in some other cases they received

assistance for the construction of cattle-shed. The proportion of such households accounted for 16.67 per cent for society no.1, 25 per cent for society no.2 and 8.33 per cent for society no.3. However all the sample beneficiaries were provided with fodder kits free of cost for enhancing milk production.

Most of the studies on livestock economy in India indicated dominance of cattle as a source of draught power and relatively high degree of dependence on buffaloes as a source of milk. The present study however reveals a different picture in that cattle is the only source of milk in the area selected for the study. Again, ownership of cattle is largely concentrated in small and marginal holdings. It is observed that of the total sample beneficiary farmers selected for the study, 86.11 per cent are small and marginal who owned 82.67 per cent of total milch cattle. According to breeds, majority of milch animals kept by the sample beneficiary farmers are still indigenous type having low milk yield potential. Out of 75 milch cattle possessed by the beneficiary households, only 32.00 per cent are crossbreed cows and 68.00 per cent are indigenous cows.

The overall investment in dairy enterprise comprised of cattle-shed of milch animals, stores, equipments for feeding watering and miscellaneous other items of expenditure. It is evident that the initial investment in dairy farms of 36 sample beneficiaries was of the order of Rs.543605 of which 17.29 per cent was in cattle-shed and stores, 77.56 per cent in milch animals, 1.82 per cent in equipments for feeding, watering and 3.33 per cent on miscellaneous items. The overall average investment per household in dairy enterprise worked out at Rs.15100. Noticeably, investment per household increased with the increase in the size of milch animal from Rs. 14251 with less than 5 numbers of milch animal to Rs. 29525 when the size of milch animal herd increased up to 10 numbers. In terms of per unit of milch animal, average investment stood at Rs. 4150 being declined consistently with the increase in the size of milch animal.

CHAPTER - IV

Economic Analysis of Integrated Dairy Development Project and It's Impact on Household Economy

Farmers have been rearing milch animals since traditional times along with maintaining crop husbandry. Milch animals were kept to meet partly the requirement of domestic milk consumption and partly to meet the needs of draught power. In the past, there was virtually no market for milk. The situation however has got changed during recent years. The milk market has come up and dairy enterprise is believed to be employment intensive and income generating avenue for the farmers. The planners and policy makers started advocating dairying as a means for ameliorating the economic conditions of the weaker sections of the society inclusive of small-marginal farmers and landless classes. Apart from Operation Flood (OF) programme, the biggest dairy development programme in India, the implementation of integrated approach of IDDP to the production, procurement, processing and marketing of milk along co-operative lines and its networking of milk from producer to consumer has now been treated as an instrument for dairy development in non-operation flood areas. However, despite the efforts made by the government, dairying may not turn out to be a sound economic alternative under the prevailing situation of input and output prices for this enterprise. For a landowning farmer, dairying becomes a competitive enterprise with crop husbandry. The situation however is different in areas where the scope for agricultural development is limited. In the study area of the state of Sikkim, the agricultural land base is poor and the scope for further expansion of agriculture is also extremely limited. In such an area, dairy enterprise competes with all the limited resources at the disposal of the farmers i.e land, labour, capital and even management. It is therefore necessary to analyze the economic and employment aspects of dairying, particularly in the context of hill areas like Sikkim. The present chapter is thus devoted to study the economics of dairy enterprise in the state of Sikkim based on grass root level data obtained from sample beneficiary and non-beneficiary farmers in the north district of sikkim. The role of the integrated dairy development project in enhancing milk production and thereby improving the level of household income and at the same time generating employment in the surveyed area of Sikkim is also highlighted.

Part - I

Beneficiary Households:

Incidence of Milch Animals and Animals in Milk:

The quantum of milk production would depend on population of milch animals, the proportion of animals in-milk and productivity per milch animal. Table 4.1 shows number of milch animals owned by the sample farmers, animals in milk and milk production by species of milch animals across size group of milch animals. It can be seen that a total of 36 sample farmers possess 75 milch cattle of which 56 (74.67 per cent) numbers are in milk and produces 8867 liters of milk per month. The per day production of milk per milch cattle worked out to be 5.28 liters. Buffalo as a source of milk production is not observed in the herd composition of milch animal. Milk yield from an milch animal varied, across size groups of milch animals. It is discernible that milk yield decreased with the increase in the size of milch animal holding.

Table – 4.1 A
Distribution of production of milk per month by size group of milch animals (Preceding month of sources)

Size group of Milch animals (Nos.)	H.H.	Milch animals (nos.)		Milk producing animals (Nos.)		Milk production (in Ltrs.)	
		Cows	Buffaloes	Cows	Buffaloes	Cows	Buffaloes
Below 5.0	34	63	0	48	0	7755 [5.39]	0
5.0 to 10.0	2	12	0	8	0	1112 [4.63]	0
10.0 to 20.0	0	0	0	0	0	0	0
20.0 to 30.0	0	0	0	0	0	0	0
30.0 to 40.0	0	0	0	0	0	0	0
Above 40.0	0	0	0	0	0	0	0
All size groups	36	75	0	56	0	8867 [5.28]	0

Note: Average milk production per cow per day is shown in brackets.

Data Source: Survey Data.

Table-4.1B shows milk production by breeds and size groups of milch animals of sample beneficiary farmers. As noted earlier, milch animals are entirely cattle population. It can be seen that of the total number of 75 milch animals possessed by 36 sample farmers, 51 numbers (68 per cent) are indigenous cows the rest 24 numbers (32 per cent) are crossbreed cows. Of the total indigenous cows 72.55 per cent are in-milk and produced 39468 liters of milk per annum and thus for indigenous cows, per

day per cow production of milk is worked out at 2.92 liters. The proportion of crossbreed cows in-milk accounted for 79.17 per cent and produced 66936 liters of milk per annum. In case of crossbreed cows, the per day per cow production of milk is estimated at 9.65 liters. It is thus observable that crossbreed cows are superior to those of indigenous cows in terms of productivity of milch animals. The discrepancy in milk yield across indigenous and crossbreed cows is usually attributed to low genetic production potential of indigenous cows. However, apart from differences in genetic potentialities, milk yield per milch animal depends on a number of factors. Thus in order to arrive at the broad determinants of milk production, we have taken recourse to production function analysis using some key input variables affecting milk production. The following form of production function is fitted to the grass root level data obtained from beneficiary households.

Table - 4.1B

Milk production by breeds and size groups of Milch Animals owned by the Sample Farmer Beneficiary Households (North District, Sikkim)

Size group of Milch Animal	Nos. of H.H.	Nos. of Milch Animals (Cattle)		Cattle Animals in Milk						Buffaloes	
		Indigenous	Cross breed	Indigenous		Crossbreed		Total		Nos	Milk Production (in Ltrs.)
				Nos. in Milk	Milk Production (in Ltrs.)	Nos. in Milk	Milk Production (in Ltrs.)	Nos. in Milk	Milk Production (in Ltrs.)		
Below 5 Nos.	34	43	20	31	32635 (2.88)	17	59626 (9.61)	48	90402 (5.16)	-	-
5 – 10 Nos.	2	8	4	6	6833 (3.12)	2	7310 (10.01)	8	16002 (5.48)	-	-
10 – 20 Nos.	-	-	-	-	-	-	-	-	-	-	-
20 – 30 Nos.	-	-	-	-	-	-	-	-	-	-	-
Above 30	-	-	-	-	-	-	-	-	-	-	-
Total	36	51	24	37	39468 (2.92)	19	66936 (9.65)	56	106404 (5.28)	-	-

Note : Figures in brackets indicate per cow per day production of milk.

Data Source: Survey Data.

Functional Analysis to Understand Milk Production Relationships :

Milk Production Function:

The Model:

$$Y = f(X_1, X_2, X_3)$$

Where

Y = Value of milk yield per animal per day (Rs.)

X₁ = Feed cost per animal per day (Rs.)

X₂ = Human labour cost per animal per day (Rs.)

X₃ = Miscellaneous Expenditure per animal per day (Rs.)

Both linear and log-linear relationships were estimated and tested for goodness of fit by comparing respective co-efficient of determination(R²). Methodologically, first of all we have carried out single variable regression for each identified independent variable and then multiple regression equations were run by adding independent variables one after another. Regression equations were fitted for separately indigenous and crossbred cows in case of beneficiary households. The results of regression exercises are presented in the form of estimated equations furnished as under.

Estimated Regression Equations for Indigenous and Crossbred Cows Combined

1. Value of milk yield related to feed cost:

Functional Relation Fitted

Linear:

$$Y = a + bX + u_i$$

Where Y = Value of milk yield per animal per day

X = Value of feed cost per animal per day

Log-Linear:

$$\log Y = \log a + b \log X + u_i$$

Estimated Equation:

$$\text{Linear: } Y = - 5.4247 + 4.6759^*X \dots\dots\dots R^2 = 0.7577 \\ (0.4535)$$

$$\text{Log-Linear: } \log Y = 0.3740 + 1.2401^* \log X \dots\dots R^2 = 0.6819 \\ (0.1453)$$

* significant at 5 per cent level of significance

2. Value of milk yield related to human labour cost:

Functional Relation Fitted

Linear:

$$Y = a + bX + u_i$$

Where Y = Value of milk yield per animal per day

X = Value of human labour cost per animal per day

Log-Linear:

$$\log Y = \log a + b \log X + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -23.2369 + 17.0975^* X \dots\dots\dots R^2 = 0.5644 \\ (2.5761)$$

$$\text{Log-Linear: } \log Y = 0.6625 + 1.6347^* \log X \dots\dots\dots R^2 = 0.4922 \\ (0.2847)$$

* significant at 5 per cent level of significance

3. Value of milk yield related to misc. expenditure per animal per day:

Functional Relation Fitted

Linear:

$$Y = a + bX + u_i$$

Where Y = Value of milk yield per animal per day

X = Value of misc. expenditure per animal per day

Log-Linear:

$$\log Y = \log a + b \log X + u_i$$

Estimated Equation:

$$\text{Linear: } Y = 3.3686 + 26.6835^* X \dots\dots\dots R^2 = 0.4212 \\ (5.3647)$$

$$\text{Log-Linear: } \log Y = 1.4656 + 0.9235^* \log X \dots\dots\dots R^2 = 0.3620 \\ (0.2102)$$

* significant at 5 per cent level of significance

4. Value of milk yield related to feed cost and human labour cost:

Functional Relation Fitted

Linear:

$$Y = a_0 + a_1X_1 + a_2X_2 + u_i$$

Where Y = Value of milk yield per animal per day

X₁ = Value of feed cost per animal per day

X₂ = Value of human labour cost per animal per day

Log-Linear:

$$\log Y = \log a_0 + a_1 \log X_1 + a_2 \log X_2 + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -17.4920 + 3.6568^* X_1 + 6.0602^* X_2 \dots \dots \dots R^2 = 0.7926$$

(0.6068) (2.5710)

$$\text{Log-Linear: } \log Y = 0.3144 + 0.9913^* \log X_1 + 0.5449 X_2 \dots \dots \dots R^2 = 0.7092$$

(0.1998) (0.3099)

* significant at 5 per cent level of significance

5. Value of milk yield related to feed cost and Misc. Expenditure:

Functional Relation Fitted

Linear:

$$Y = a_0 + a_1X_1 + a_2X_2 + u_i$$

Where Y = Value of milk yield per animal per day

X₁ = Value of feed cost per animal per day

X₂ = Value of misc. expenditure per animal per day

Log-Linear:

$$\log Y = \log a_0 + a_1 \log X_1 + a_2 \log X_2 + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -9.6229 + 4.0534^* X_1 + 7.8470 X_2 \dots \dots \dots R^2 = 0.7807$$

(0.5511) (4.2184)

$$\text{Log-Linear: } \log Y = 0.4831 + 1.1037^* \log X_1 + 0.2254 X_2 \dots \dots \dots R^2 = 0.6952$$

(0.1837) (0.1878)

* significant at 5 per cent level of significance

6. Value of milk yield related to feed cost, human labour cost and Misc. expenditure:

Functional Relation Fitted

Linear:

$$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + u_i$$

Where Y = Value of milk yield per animal per day

X₁ = Value of feed cost per animal per day

X₂ = Value of human labour cost per animal per day

X₃ = Value of Misc. expenditure per animal per day

Log-Linear:

$$\log Y = \log a_0 + a_1 \log X_1 + a_2 \log X_2 + a_3 \log X_3 + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -17.7105 + 3.4748^* X_1 + 4.8824 X_2 + 4.7921 X_3 \dots \dots \dots R^2 = 0.7999$$

(0.6285) (2.7881) (4.4485)

$$\text{Log-Linear: } \log Y = 0.3791 + 0.9564^* \log X_1 + 0.4674 X_2 + 0.1161 X_3 \dots \dots \dots R^2 = 0.7121$$

(0.2108) (0.3409) (0.2018)

* significant at 5 per cent level of significance

Estimated Regression Equations for Indigenous Cows

7. Value of milk yield related to feed cost:

Functional Relation Fitted

Linear:

$$Y = a + bX + u_i$$

Where Y = Value of milk yield per animal per day

X = Value of feed cost per animal per day

Log-Linear:

$$\log Y = \log a + b \log X + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -51.0110 + 10.2574^* X \dots \dots \dots R^2 = 0.8275$$

(0.9011)

$$\text{Log-Linear: } \log Y = -1.0758 + 2.8356^* \log X \dots \dots \dots R^2 = 0.8126$$

(0.2621)

* significant at 5 per cent level of significance

8. Value of milk yield related to human labour cost:

Functional Relation Fitted

Linear:

$$Y = a + bX + u_i$$

Where Y = Value of milk yield per animal per day

X = Value of human labour cost per animal per day

Log-Linear:

$$\log Y = \log a + b \log X + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -16.2756 + 12.8018^* X \dots\dots\dots R^2 = 0.7565 \\ (1.3976)$$

$$\text{Log-Linear: } \log Y = 0.5619 + 1.6291^* \log X \dots\dots\dots R^2 = 0.7427 \\ (0.1845)$$

* significant at 5 per cent level of significance

9. Value of milk yield related to misc. expenditure per animal per day:

Functional Relation Fitted

Linear:

$$Y = a + bX + u_i$$

Where Y = Value of milk yield per animal per day

X = Value of misc. expenditure per animal per day

Log-Linear:

$$\log Y = \log a + b \log X + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -0.6250 + 23.6111^* X \dots\dots\dots R^2 = 0.8441 \\ (1.9525)$$

$$\text{Log-Linear: } \log Y = 1.3505 + 1.0987^* \log X \dots\dots\dots R^2 = 0.8610 \\ (0.0850)$$

* significant at 5 per cent level of significance

10. Value of milk yield related to feed cost and human labour cost:

Functional Relation Fitted

Linear:

$$Y = a_0 + a_1X_1 + a_2X_2 + u_i$$

Where Y = Value of milk yield per animal per day

X₁ = Value of feed cost per animal per day

X₂ = Value of human labour cost per animal per day

Log-Linear:

$$\log Y = \log a_0 + a_1 \log X_1 + a_2 \log X_2 + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -43.3647 + 7.2550^* X_1 + 4.4369 X_2 \dots \dots \dots R^2 = 0.8475$$

(1.8419) (2.4043)

$$\text{Log-Linear: } \log Y = -0.6482 + 2.0114^* \log X_1 + 0.5599 X_2 \dots \dots \dots R^2 = 0.8317$$

(0.5425) (0.3260)

* significant at 5 per cent level of significance

11. Value of milk yield related to feed cost and Misc. Expenditure:

Functional Relation Fitted

Linear:

$$Y = a_0 + a_1X_1 + a_2X_2 + u_i$$

Where Y = Value of milk yield per animal per day

X₁ = Value of feed cost per animal per day

X₂ = Value of misc. expenditure per animal per day

Log-Linear:

$$\log Y = \log a_0 + a_1 \log X_1 + a_2 \log X_2 + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -30.1389 + 5.3814^* X_1 + 13.5582^* X_2 \dots \dots \dots R^2 = 0.9189$$

(1.0992) (2.5053)

$$\text{Log-Linear: } \log Y = 0.2196 + 1.3093^* \log X_1 + 0.6858^* X_2 \dots \dots \dots R^2 = 0.9127$$

(0.3339) (0.1257)

* significant at 5 per cent level of significance

12. Value of milk yield related to feed cost, human labour cost and Misc. expenditure:

Functional Relation Fitted

Linear:

$$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + u_i$$

Where Y = Value of milk yield per animal per day

X₁ = Value of feed cost per animal per day

X₂ = Value of human labour cost per animal per day

X₃ = Value of Misc. expenditure per animal per day

Log-Linear:

$$\log Y = \log a_0 + a_1 \log X_1 + a_2 \log X_2 + a_3 \log X_3 + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -28.4563 + 4.5427^*X_1 + 1.6259X_2 + 12.8311^*X_3 \dots \dots \dots R^2 = 0.9213$$

(1.4610) (1.8545) (2.6497)

$$\text{Log-Linear: } \log Y = 0.3119 + 1.0868^* \log X_1 + 0.1986X_2 + 0.6544^*X_3 \dots \dots \dots R^2 = 0.9148$$

(0.4358) (0.2475) (0.1325)

* significant at 5 per cent level of significance

Estimated Regression Equations for Crossbreed Cows

13. Value of milk yield related to feed cost:

Functional Relation Fitted

Linear:

$$Y = a + bX + u_i$$

Where Y = Value of milk yield per animal per day

X = Value of feed cost per animal per day

Log-Linear:

$$\log Y = \log a + b \log X + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -27.7669 + 6.4511^*X \dots \dots \dots R^2 = 0.8601$$

(0.7843)

$$\text{Log-Linear: } \log Y = 0.0268 + 1.5459^* \log X \dots \dots \dots R^2 = 0.8370$$

(0.2057)

* significant at 5 per cent level of significance

14. Value of milk yield related to human labour cost:

Functional Relation Fitted

Linear:

$$Y = a + bX + u_i$$

Where Y = Value of milk yield per animal per day

X = Value of human labour cost per animal per day

Log-Linear:

$$\log Y = \log a + b \log X + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -25.7328 + 18.4914^*X \dots\dots\dots R^2 = 0.6164 \\ (4.3985)$$

$$\text{Log-Linear: } \log Y = 0.7949 + 1.4753^* \log X \dots\dots\dots R^2 = 0.6040 \\ (0.3601)$$

* significant at 5 per cent level of significance

15. Value of milk yield related to misc. expenditure per animal per day:

Functional Relation Fitted

Linear:

$$Y = a + bX + u_i$$

Where Y = Value of milk yield per animal per day

X = Value of misc. expenditure per animal per day

Log-Linear:

$$\log Y = \log a + b \log X + u_i$$

Estimated Equation:

$$\text{Linear: } Y = 17.5000 + 18.9583^*X \dots\dots\dots R^2 = 0.8043 \\ (2.8197)$$

$$\text{Log-Linear: } \log Y = 1.5409 + 0.6748^* \log X \dots\dots\dots R^2 = 0.8153 \\ (0.0968)$$

* significant at 5 per cent level of significance

16. Value of milk yield related to feed cost and human labour cost:

Functional Relation Fitted

Linear:

$$Y = a_0 + a_1X_1 + a_2X_2 + u_i$$

Where Y = Value of milk yield per animal per day

X₁ = Value of feed cost per animal per day

X₂ = Value of human labour cost per animal per day

Log-Linear:

$$\log Y = \log a_0 + a_1 \log X_1 + a_2 \log X_2 + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -32.3621 + 5.6544^* X_1 + 3.4291 X_2 \dots \dots \dots R^2 = 0.8682$$

(1.2933) (4.3795)

$$\text{Log-Linear: } \log Y = 0.0677 + 1.3365^* \log X_1 + 0.3006 X_2 \dots \dots \dots R^2 = 0.8467$$

(0.3359) (0.3773)

* significant at 5 per cent level of significance

17. Value of milk yield related to feed cost and Misc. Expenditure:

Functional Relation Fitted

Linear:

$$Y = a_0 + a_1X_1 + a_2X_2 + u_i$$

Where Y = Value of milk yield per animal per day

X₁ = Value of feed cost per animal per day

X₂ = Value of misc. expenditure per animal per day

Log-Linear:

$$\log Y = \log a_0 + a_1 \log X_1 + a_2 \log X_2 + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -14.3117 + 4.1950^* X_1 + 7.9175 X_2 \dots \dots \dots R^2 = 0.8952$$

(1.4240) (4.3278)

$$\text{Log-Linear: } \log Y = 0.6479 + 0.8974^* \log X_1 + 0.3363^* X_2 \dots \dots \dots R^2 = 0.8923$$

(0.3357) (0.1485)

* significant at 5 per cent level of significance

18. Value of milk yield related to feed cost, human labour cost and Misc. expenditure:

Functional Relation Fitted

Linear:

$$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + u_i$$

Where Y = Value of milk yield per animal per day

X₁ = Value of feed cost per animal per day

X₂ = Value of human labour cost per animal per day

X₃ = Value of Misc. expenditure per animal per day

Log-Linear:

$$\log Y = \log a_0 + a_1 \log X_1 + a_2 \log X_2 + a_3 \log X_3 + u_i$$

Estimated Equation:

$$\text{Linear: } Y = -13.2759 + 4.2245^* X_1 - 0.4448X_2 + 8.1763X_3 \dots \dots \dots R^2 = 0.8953$$

(1.5345) (4.8347) (5.3577)

$$\text{Log-Linear: } \log Y = 0.6825 + 0.9210^* \log X_1 - 0.1077X_2 + 0.3630X_3 \dots \dots \dots R^2 = 0.8932$$

(0.3626) (0.3910) (0.1835)

* significant at 5 per cent level of significance

As judged by R², the estimated linear equation gave the best fit. The following analyses therefore present the results of linear equation estimate using different input variables at a time. We begin our analysis with single variable regressions run for indigenous and crossbreed cows pooled together with value of milk yield per animal per day as the dependent variable and each of the explanatory variables taken at a time. As follows from the single regression equation estimates the independent variables taken under consideration are having positive sign and found statistically significant. Of them the variable which explain a large part of the variance in milk yield is feed input. It explained 75 per cent (eq_n-1) of the variation in milk yield followed by human labour input (56 per cent in eq_n-2) and miscellaneous expenditure comprising of veterinary charges and cost of medicines per animal per day (36 per cent in eq_n-3). Thus as judged by the explanatory power of the regression equation (R²), feed input appeared to have dominated in explaining the variation in milk yield. The response co-efficient for the feed variable is estimated to be 4.67 and turned out to be statistically significant.

Combining the independent variables one after another representing different factors we finally arrived at the multiple regression equation with three independent variables (equation-6). Interestingly when milk yield per milch animal is regressed both on feed input cost and expenses of human labour, the estimated equation (eq_n-4)

gave the better explanatory power (0.7926) as compared to the individual estimate for each of the independent variables. With the inclusion of third variable that is, miscellaneous expenditure per milch animal per day, the explanatory power of the regression equation slightly improved (0.7999 in equation-6). Finally, the estimated response co-efficient of feed input alone turned out to be statistically significant (equation-6). Evidently, thus feed input appeared as single variable featured prominently in all the regression equations whether run singly or jointly with other variables and appeared to be statistically significant. All these implied that feed input is the crucial variable affecting milk production.

Single variable regression equations individually run for crossbred cows further revealed the dominance of feed input in explaining the observed behavior of milk yield. This is evident from the fact that feed input cost yielded the better explanatory power in the single regression equation estimated for crossbred cows ($R^2 = 0.8601$ in equation – 13) as compared to other inputs. The estimated R^2 for other inputs viz. human labour cost and miscellaneous expenditure figured 0.6164 and 0.8043 respectively.

For indigenous cows, feed input variable appeared to be the next important factor after miscellaneous expenditure affecting milk yield in terms of explanatory power of the regression equation. The estimated response co-efficient for feed input variable obtained from single variable regression equation stood at 10.2574 (eq_n-7) as against the corresponding figures of 12.8018 (eq_n-8) for human labour input and 23.6111 (eq_n-9) for miscellaneous expenditure. Although all these co-efficients turned out to be statistically significant, miscellaneous expenditure gave the highest value of R^2 (0.8441) followed by feed input (0.8275) and human labour input (0.7565).

In case of crossbred cows, feed input with the inclusion of miscellaneous expenditure variable gave best fit and explained larger part of the variation in milk yield ($R^2 = 0.8952$ in eq_n-17). Notably, however the explanatory power did not improve even when milk yield is regressed simultaneously on all the three input variables ($R^2 = 0.8953$ in eq_n-18). Interestingly, in all the estimated regression equations, the response co-efficient for feed input singly turned out to be statistically significant whether milk yield is regressed singly on feed or with other variables.

For indigenous cows, feed input cost along with miscellaneous expenditure gave the better explanatory power (0.9189 in eq_n-11) of the regression equation. The explanatory power did not improve even when milk yield is regressed simultaneously on all the three inputs ($R^2 = 0.9213$ in eq_n-12) taken under consideration. Notably, the estimated response co-efficient for feed input and miscellaneous expenditure variable always appeared to be statistically significant (eq_n-11 and eq_n-12) whether the

regression equation is run with both of these independent variables or additionally with the inclusion of third variable viz. human labour input. Thus for indigenous cows, along with feed input, veterinary services came to be featured in the regression equation.

The above analyses suggest that feed input is the crucial variable affecting milk production common to both indigenous and crossbreed cows, the response of feed input being larger for crossbreed cows. Evidently, thus crossbreed cow emerges as a superior milk-producing animal and with adequate feeding it is possible to exploit full genetic potential of crossbreed cows and to achieve overall success of crossbreeding technology advocated under IDDP. However, whether feed input has a once-for-all influence on milk production is an important question. Many studies in the past have made significant inroads to the problem employing distributed lag model and claimed that feed input has its carry over and cumulative effects on milk production. The milk yield potential of feed input in a particular lactation stage of cows depends on the current feeding as well as past feeding during the preceding lactation stages. In other words, the realistic formulation of feed-milk relationship requires the adoption of distributed lag model which is not attempted in the study lack of cross-section time series feed, milk data on milch cows and thus the residual or cumulative effects of feed on milk production is not explored.

Production and Utilization of Milk:

Because of the perishable nature, milk is a commodity that has to be marketed daily. In the absence of an organized marketing system, a major portion of the milk production was used for home consumption. However, under the aegis of IDDP, organization of dairy cooperative societies at the primary milk producers' level have offered assured market outlet of milk to the milk producers. As per the terms and conditions of the project, beneficiary families should be organized into co-operatives on voluntary basis to facilitate extension and supply of inputs, animal health services and marketing support. It is the obligation of the beneficiary families to supply milk produced by the member beneficiaries to the village milk co-operative societies. With the implementation of IDDP, marketing of milk is not a problem. In this context, it would be pertinent to examine the pattern of disposal of milk production, which is presented in the following paragraphs.

It is evident that of the total production of milk produced by the sample dairy farmers, 19.53 per cent is used for home consumption and the rest are sold (table – 4.2). The quantum of milk supplied to the society for sale accounted for 69.27 per cent and the remaining 11.20 per cent were sold to private sources. Across size groups of milch animals, the quantum of milk used for home consumption varied from 18.18 per

cent to 19.72 per cent. Proportion of milk supplied to the society also varied across the size groups of milch animals ranging from 66.68 per cent to 69.64 per cent. Notably, the proportion of milk output supplied to the society decreased with the increase in the size of milch animals owned by the sample beneficiaries. Correspondingly, the volume of milk output marketed at private sources increased from 10.64 per cent to 15.14 per cent with the increase in the size of milch animals. Quality determinations (FAT and SNF content of milk) form the basis at which milk is priced and paid to the milk producers. The rate per liter of milk offered by the society is Rs. 7.50 while price received by the society from the milk union is Rs. 9.25. In the open market, the rate per liter of milk is Rs. 10.00. This indicates that member milk producers are getting lower prices to the extent of about 33.33 per cent as compared to the market price while contributing milk to the village co-operative society. However, although producer price of milk (Rs. 7.50) is lower than the market price, it covers the estimated average cost of production of Rs. 7.19 per liter of milk. Of course, producer price paid by the societies does not provide a reasonable mark-up. The member milk producers however recovered losses emanating from lower price of milk through securing benefit under IDDP in the form of obtaining milk enhancing inputs and technical services free of costs or at subsidised rates. Moreover at the end of the year, a certain portion of surplus generated by the societies is paid to the member producers on a pro-rata basis as bonus in proportion to the quantity of milk sold. As is evident from society level data, the only drawback on the part of society is the delay in payment to the member milk producers against the supply of milk, which has prompted them to sell a part of the marketable surplus of milk to the private sources.

Table – 4.2

Total annual production and utilization of milk by size group of milch animals

Size group of milch animals (Nos.)	H.H.	Annual milk production (Ltrs.)	Qty. used for home consumption	Qty. marketed (Ltrs.)	
				Sold to Society	Sold to other sources
Below 5.0.	34	93060	18352 [19.72]	64806 [69.64]	9902 [10.64]
5.0 to 10.0	2	13344	2426 [18.18]	8898 [66.68]	2020 [15.14]
10.0 to 20.0	0	0	0	0	0
20.0 to 30.0	0	0	0	0	0
30.0 to 40.0	0	0	0	0	0
Above 40.0	0	0	0	0	0
All sizes	36	106404	20778 [19.53]	73704 [69.27]	11922 [11.20]

Note : Figures in brackets indicate percentages of total annual milk production.

Data Source: Survey Data.

Table – 4.3 indicates per month average production of milk produced and marketed before and after launching of IDDP by size groups of milch animals. It appears that for all the sample beneficiaries together, per month total production of milk increased by 64.81 per cent with the launching of IDDP from 5380 liters of production per month realized before launching of IDDP to 7135 liters obtained after launching of IDDP. The proportion of milk output marketed has also shown increasing trend. It was 72.77 per cent before launching of IDDP, which increased to 80.47 per cent after lunching of IDDP.

Table – 4.3
Per month average production of milk and marketed before and after launching of IDDP by size group of milch animals.

(Production in ltrs.)

Size group of milch Animals (Nos.)	H.H.	Before launching of IDDP		After launching of IDDP	
		Total Production Of Milk	Production Marketed	Total Production of Milk	Production Marketed
Below 5.0	34	5065	3690 [72.85]	7755	6225 [80.27]
5.0 -10.0	2	315	225 [71.43]	1112	910 [81.83]
10.0 - 20.0	0	0	0	0	0
20.0 - 30.0	0	0	0		0
30.0 - 40.0	0	0	0		0
40.0 & above	0	0	0		0
Total	36	5380	3915 [72.77]	8867	7135 [80.47]

Note : Figures in brackets denote percentages of total production.

Data Source: Survey Data.

Needless to say, milk yield is the main component of milk production which carries the economic significance in context of dairy farming which ultimately brings return to the milk producers in dairy enterprise. Table - 4.4 brings production and disposal pattern of milk classified by the quantum of production of milk per day. It appears that quantum of milk retained for home consumption varied from 14.49 per cent to 24.11 per cent showing no consistent pattern across the size classes of milk production per day. This indicates that proportion of milk used for home consumption entirely depended upon requirement of the dairy farm family which in turn depends upon size of the family. The proportion of milk production sold to the society varied from 65.22 per cent to 81.08 per cent across the classes of size of milk production. It

however varied inversely with the increase in the size of milk production per day and correspondingly the proportion of milk marketed at private sources increased with the size of milk production per day varying from 4.46 per cent to 16.30 per cent.

Table – 4.4
Production and disposal of milk (average per day) according to the
quantum of production of milk.

(Production in Ltrs, Value in Rs.)

Milk production level/day	H.H.	Qty. Produced	Home Consumption	Disposal			
				Sold to Society		Sold to other sources	
				Qty.	Value	Qty.	Value
Below 5.0 ltrs.	5	18.5	3.5 [18.92]	15 [81.08]	112.5	0	0
6.00-10.00	19	112.5	27.5 [24.11]	80 [71.43]	600	5 [4.46]	50
11.00-15.00	8	92.0	17.0 [18.50]	60 [65.22]	450	15 [16.30]	150
16.00-25.00	4	69.0	10.0 [14.49]	48 [69.56]	360	11 [15.95]	110
26.00-35.00	0	0	0	0	0	0	0
36.00 and above	0	0	0	0	0	0	0

Note: Figures in brackets denote percentage of quantum of total milk production.

Data Source: Survey Data.

Economics of Investment in Dairy Enterprise:

In studying the economics of dairy enterprise, attempt has been made to work out the benefits accruing to the selected beneficiaries. The benefits comprised of two components of income viz annual milk production and the estimated value of youngstock. Value of cow dung is not considered, as there is no demand for cow dung in the study area. As a measure of profitability of investment in dairy units, benefit cost ratio criterion is employed. Accordingly, benefit-cost ratios by breeds of milch animals are estimated, which are presented in the following analyses.

Annual Income from Dairy Enterprise:

In order to study the economics of dairy farming, we have taken into account two components of income from dairying viz. milk production accrued and the estimated value of young stock. Table – 4.5 shows the annual income of dairy farms obtained from milk production and young stock classified by size groups of milch animals. A close look at the table reveals that of the total income from dairying, about 93.94 per cent is derived from production of milk and 6.06 per cent from the estimated value of young stock. Breed-wise, the proportion of income derived from each component dose not vary much. The contribution of milk is of the order of 94.10 per

cent for indigenous cattle and 93.79 per cent for cross-breed cattle. Accordingly, the estimates of income derived from young stock stood at 5.90 per cent for indigenous cattle and 6.21 per cent for cross-breed cattle.

Table – 4.5
Annual Income from Dairy Farms (including youngstock) by size group of Milch Animals (North Sikkim)

Size Group of Milch Animals	No. of H.H.	Indigenous			Cross-Breed			Grand Total		
		Value of Milk	Value of Young stock	Total	Value of Milk	Value of Young stock	Total	Value of Milk	Value of Young stock	Total
Below 5.0 Nos.	34	313572.00	20800.00	334372.00	373158.00	24500.00	397658.00	686730.00	45300.00	732030.00
5.0 -10.0 ..	2	85200.00	4200.00	89400.00	45200.00	3200.00	48400.00	130400.00	7400.00	137800.00
10.0 - 20.0 ..	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.0 - 30.0 ..	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Above 30 Nos.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	36	398772.00 (94.10)	25000.00 (5.90)	423772.00 (100.00)	418358.00 (93.79)	27700.00 (6.21)	446058.00 (100.00)	817130.00 (93.94)	52700.00 (6.06)	869830.00 (100.00)

Note: Figures in brackets indicate percentages of total.

Data Source: Survey Data.

Expenditure on Dairy Farms:

The estimated expenditures incurred on different items by the sample dairy farmers are considered for estimating costs and return from dairy enterprise. The components of total cost are separated into fixed and variable costs. In computing costs, farmers' own resources is valued at market prices prevailing in the study area.

Cost Concepts:

Fixed Costs:

Fixed costs are those which do not vary in the short run period and remain unaltered whatever may be the level of milk production. In the present study, the fixed cost includes depreciation on fixed assets like milch animals cattle-shed and stores, the utensils and other equipments used like feeding and watering buckets and interest on fixed capital. The deprecation on fixed assets has been calculated by straight-line method. Assuming the productive period of 10 years and considering zero scrap value for milch animals, the deprecation on milch animals is taken as 10 per cent. The

depreciation on cattle-shed and stores and also on equipments is calculated at the rate of 10 per cent assuming their life span as 10 years with occasional repairing. It is however mentionable that in case of young stock and calves, the appreciated value calculated at the rate of 10 per cent is considered. The interest on fixed capital comprising of value of cattle-shed, stores, milch animal and equipments like feeding and watering buckets, milk cans, utensil etc. are estimated at the rate of 3.5 per cent per annum.

Variable Costs:

The variable costs comprised of feeding expenses, expenses on veterinary items, human labour and miscellaneous other costs of rope, electricity, repairing charges of cattle-shed, stores, transportation costs of feed and feed supplements computed at the rate of 1 per cent of the total expenditure incurred.

Annual Expenditure on Dairy Farms:

Based on the above concept of costs, annual expenditure on dairy farms has been estimated and is presented in table – 4.6. It is discernible that fixed cost constituted 9.92 per cent of which depreciation on milch animal accounted for the major (5.51 per cent) followed by interest on capital cost (2.36 per cent) and then comes depreciation on cattle shed, storage and equipments (1.36 per cent).

Under the head variable cost, feed cost is the main constituent with its share being 58.41 per cent in total expenditure on dairy. The next in importance is the expenditure on human labour (20.68 per cent) followed by the expenses on veterinary charges including the cost of medicines. Taking all the components, total variable cost comes to 90.08 per cent. It is thus revealing that expenditure on feed and labour costs are the major items of cost in dairy activity and this pattern of expenditure does not vary across breeds of milch animals (table – 4.6).

Benefit Cost Ratio Analysis:

Based on the estimates of expenditure on dairying and benefit derived from dairying, attempt has been made to work out Benefit Cost Ratio (BCR) by breeds of milch animals. The estimates of BCR of sample dairy farms by breeds of animals are presented in table - 4.7A. The overall BCR for indigenous and crossbred cows pooled together is estimated at 1.14 while separately, it is 0.94 for local cows and 1.41 for cross breed cows. Thus dairying by and large turns out to be a viable economic activity.

Table – 4.6
Annual Expenditure on Dairy Farms in North District, Sikkim

	Local Cows with Youngstock	Crossbreed with Youngstock	Total	Percentage to Total Cost
A. Fixed Cost:				
1) Depreciation on Animals @10% Per Unit	19340.00 219.77	22820.00 530.70	42160.00 321.83	5.51
2) Appreciation on young animals @10% (-) Per Unit	2500.00 28.41	2770.00 64.42	5270.00 40.23	0.69
3) Depreciation on Cattle Shed, Storage and Equipments @10% Per Unit	6979.00 79.31	3410.00 79.31	10389.00 79.31	1.36
4) Interest on Capital Cost @3.5% Per Unit	9211.65 104.68	8893.50 206.82	18105.15 138.21	2.36
Total Fixed Cost Per Unit	38030.96 432.17	37893.75 881.25	75924.71 579.58	9.92
B. Variable Cost:				
1) Total Feed Cost Per Unit	277200.00 3150.00	169850.00 3950.00	447050.00 3412.59	58.41
2) Expenditure on Human Labour Per Unit	89900.00 1021.60	68400.00 1590.70	158300.00 1208.40	20.68
3) Veterinary Charges & Cost of Medicines Per Unit	25575.00 290.63	28500.00 662.79	54075.00 412.79	7.07
4) Misc.Cost(1% of the total expenditure) Per Unit	3926.50 44.62	2667.50 61.99	6594.00 50.33	0.86
5) Interest on Variable Cost @3.5% Per Unit	13881.12 157.74	9429.61 219.29	23310.73 177.94	3.05
Total Variable Cost Per Unit	410483.92 4664.59	278847.26 6484.82	689331.18 5262.07	90.08
Total Cost (A+B) Per Unit	448514.88 5096.76	316741.01 7366.07	765255.89 5841.65	100.00

Data Source: Survey Data.

Table – 4.7A
Estimate of B.C.R. by Breed of Milch Animals, North District, Sikkim

Breeds	Annual Gross Income (Milk & Value of Youngstock)	Annual Expenditure	B.C.R.
Indigenous	423772.00	448514.88	0.94
Crossbreed	446058.00	316741.01	1.41
Total	869830.00	765255.89	1.14

Note: Estimates are based on survey data.

Table 4.7B
Financial Rate of Return on Dairy Enterprise

Item	Estimate (percentage)
Based on acquisition cost of milch animals	19.62
Based on total investment	12.96

Note: Estimates are based on survey data.

Financial rate of return on dairy enterprise of the beneficiary farmers is worked out and presented in table 4.7B. The two separate estimates based on acquisition cost of milch animals and total investments are made. The financial rate of return is estimated at 19.62 per cent when calculated on the basis of acquisition cost of milch animal. The corresponding estimate based on total investment is worked out at 12.96 per cent. Thus considering the actual cost of investment at the rate of 3.5 per cent per annum, dairy enterprise is considered to be financially viable.

Generation of Employment:

Although agriculture is mainstay of livelihood of the majority of rural population, its development alone can not take care of the problem of rural poverty. The current strategy is therefore on attacking rural poverty by way of promoting income and employment opportunities and accordingly, facilitating empowerment of the rural poor. In general, the scope of employment opportunities for the people living in hill areas is limited. The launching of IDDP in north district of Sikkim is an attempt in promoting dairy activity with the basic objective of ensuring generation of employment and income and thereby improving the level of living of the rural people. The basic concept is to provide assured employment and income through developing dairy farming activity.

Based on grass-root level data obtained from sample beneficiaries of IDDP, attempt has been made to estimate the employment days generated by dairy activity undertaken by the beneficiaries with the assistance of IDDP. Table – 4.8 shows the

generation of employment by size groups of milch animals. Generation of employment in terms of man-days depicted in the table reveals that the dairy sector provided employment opportunities ranging from 55.98 per cent to 71.84 per cent of the total working man-days depending on size of milch animals with an overall average of 58 per cent for all the dairy farm units together.

Table – 4.8
Generation of Employment (Mandays) by dairy Enterprise by size groups of milch animals in North District, Sikkim

Size Groups	Agriculture	Other allied activities		Dairy	Total	Percent of dairy sector employment to total employment
		Farm	Non-Farm			
Below 5 Nos.	9400	2190	4120	19985	35695	55.98
5 - 10 Nos.	820	210	430	3725	5185	71.84
10 - 20 Nos.	0	0	0	0	0	0
20 - 30 Nos	0	0	0	0	0	0
30 - 40 Nos.	0	0	0	0	0	0
Total	10220	2400	4550	23710	40880	58.00

Data Source: Survey Data.

Generation of Income from Dairy Enterprise:

Table - 4.9 shows the annual income of the beneficiary farmers obtained from various sources classified by size groups of milch animals. Total income per household from all sources is estimated at Rs. 46945.27 of which Rs. 13283.33 (28.30 per cent) is derived from agriculture proper, Rs. 24161.94 (51.47 per cent) from dairy and Rs. 9500.00 (20.24 per cent) from other sources. Thus dairy constituted the major source of income for the beneficiary farmers. Notably, for the beneficiary farmers, the share of income from dairy increased with the increase in the size of holding of milch animals. The share of income from dairy varied from 51.29 per cent to 52.50 per cent across the size groups of milch animals.

Table – 4.10 reveals annual income of sample beneficiary households obtained from different sources classified by size of farm. It appears that per household income from dairy activity increased with the increase in the size of farm. This indicates that crop husbandry acted as an adjunct to animal husbandry contributing to the increase in income with the increase in the size of farm.

Table – 4.9
Income of the Sample Households by Size Groups of Milch Animals
(Income in Rs.)

Size Group of Milch Animals (Nos.)	No. of H.H.	Sources of Income				
		Agriculture	Dairy	Income from Other Sources	Total	% of dairy sector to total
Below 5.00	34	438200 [12888.23]	739430 [21747.94]	264000 [33000.00]	1441630 [42400.88]	51.29
5 -10	2	40000 [20000.00]	130400 [65200.00]	78000 [39000.00]	248400 [124200.00]	52.50
10 - 20	0	0	0	0	0	0
20 - 30	0	0	0	0	0	0
30 & above	0	0	0	0	0	0
Total	36	478200 [13283.33]	869830 [24161.94]	342000 [9500.00]	1690030 [46945.27]	51.47

Note : Figures in brackets indicate per household income from various sources
Data Source: Survey Data.

Table – 4.10
Total annual income of the sample households by farm size groups.

Farm Size (ha.)	(Income in Rs.)							
	Agriculture		Dairy		Other Sources		Total	% of dairy sector to total
	H.H.	Income	H.H.	Income	H.H.	Income		
Below 1	9	157000 [8263.16]	19	479850 [25255.26]	10	342000 [34200.00]	978850 [51518.42]	49.02
1-2	12	180000 [15000.00]	12	243166 [20263.83]	0	0	423166 [35263.83]	57.46
2-4	4	116200 [29050.00]	4	101273 [25318.25]	0	0	217473 [54368.25]	46.57
4-10	1	25000 [25000.00]	1	45541 [45541.00]	0	0	70541 [70541.00]	64.56
10 & above	0	0	0	0	0	0	0	0
Total	26	478200 [13283.33]	36	869830 [24169.94]	10	342000 [34200.00]	1690030 [46945.28]	51.47

Note: Figures in the brackets indicate per household annual income.
Data Source: Survey Data.

Part - II

Non-Beneficiary Households:

Methodologically, assessing the impact of the project involves two kinds of comparisons, one is a comparison of the beneficiary members of IDDP in terms of the situations before and after introduction of IDDP; the second is a comparison of beneficiary members with those of non-beneficiaries. The present study chooses the first one in studying the impact of IDDP on the beneficiary households while the second one is chosen to compare the performance beneficiary members vis-à-vis non-beneficiaries in respect of certain indicators of dairy development.

In order to assess the impact of IDDP, it was proposed to select the non-beneficiary/ non-member from the same village or cluster of villages in which the sample society is located. The non-member non-beneficiary households are divided into owners of milch animal and non-owners of milch animals. Two from each groups are selected randomly constituting a sample of 4 non-member non-beneficiary households from each selected society. Thus altogether 12 non-member non-beneficiary households chosen from 3 selected societies are covered by the study. A separate set of schedules and questionnaire are canvassed for collection of grass root level data from the non-beneficiary households.

Table 4.11 shows the possession of milch animals by the sample non-beneficiary farmers and milk production by species of milch animals across size groups of milch animals. It is found that 6 non-beneficiary farmers who are owners of milch animals out of a total of 12 possessed 17 milch animals comprising of 13 (76.47 per cent) cows and 4 buffaloes (23.53 per cent). In-milk animals are entirely cows and numbered 11. The total milk produced by 11 cows is 1110 liters per month and thus the average per day per cow milk production is 3.36 liters.

Table 4.12 shows the milk production by breeds classified by farm size of milch animals of non-beneficiary farmers. In the sample, 6 non-beneficiary farmers possessed 13 milch cattle of which 11 (84.62 per cent) are in-milk. In-milk cattle comprised of 6 indigenous (54.55 per cent) and 5 (45.45 per cent) crossbreed cows. The total annual milk production of indigenous cows is 3376 liters while for crossbreed cows stood at 9829 liters. The average per day per cow milk production is 1.68 liters for indigenous cows and 5.39 liters for crossbreed cows.

Table – 4.11
Distribution of production of milk per month by size group of
Milch animals (Preceding month of sources)

Milch animals	H.H.	Milch animals (nos.)		Milk producing animals		Milk production (in Ltrs.)	
		Cows	Buffaloes	Cows	Buffaloes	Cows	Buffaloes
Below 5.0 nos.	6	13	4	11	0	1110 [3.36]	0
5.0 to 10.0 Nos.	0	0	0	0	0	0	0
10.0 to 20.0 Nos.	0	0	0	0	0	0	0
20.0 to 30.0 Nos.	0	0	0	0	0	0	0
30.0 to 40.0 Nos.	0	0	0	0	0	0	0
Above 40.0	0	0	0	0	0	0	0
All size groups	6	13	4	11	0	1110 [3.36]	0

Note: Figures in brackets indicate milk production per cow per day.

Data Source: Survey Data.

Table – 4.12
Milk Production by Breeds and Size Groups of Milch Animals owned by the
Sample Non-beneficiary Households in North District, Sikkim

Size group of Milch Animals	No. of H.H.	No. of Milch Animals (Cattle)	Animals in Milk (Cattle)						
			Indigenous		Crossbreed		Total	Buffaloes	
			Cows in Milk (Nos.)	Annual Milk Production (in Ltrs.)	Cows in Milk (Nos.)	Annual Milk Production (in Ltrs.)	Annual Milk Production (in Ltrs.)	Nos.	Annual Milk Production (in Ltrs.)
Below 5 Nos.	6	13	6	3676 (1.68)	5	9829 (5.39)	13505 (3.36)	-	-
5 – 10 Nos.	-	-	-	-	-	-	-	-	-
Total	6	13	6	3676 (1.68)	5	9829 (5.39)	13505 (3.36)	-	-

Note: Figures in brackets indicate per cow per day production of milk.

Data Source: Survey Data.

Production and Utilization of Milk:

Table 4.13 shows animal size group-wise production and utilization of milk of non-beneficiary households. It is seen that non-beneficiary households produced 13505 liters of milk in their dairy units. Of the total production of milk 43.24 per cent are used for home consumption and 56.76 per cent are marketed at private sources. Evidently, the proportion of milk output marketed appears to be significantly less than the beneficiary farmers.

Table – 4.13
Total annual production and utilization of milk by size group of milch animals.

Size group of milch animals	H.H.	Annual milk Production (Ltrs.)	Qty. used for home consumption	Qty. marketed (Ltrs.)	
				Sold to Society	Sold to other sources
Below 5.0 nos.	6	13505	5840 [43.24]	0	7665 [56.76]
5.0 to 10.0 Nos.	0	0	0	0	0
10.0 to 20.0 Nos.	0	0	0	0	0
20.0 to 30.0 Nos.	0	0	0	0	0
30.0 to 40.0 Nos.	0	0	0	0	0
Above 40.0	0	0	0	0	0
All sizes	6	13505	5840 [43.24]	0	7665 [56.76]

Note : Figures in brackets indicate percentages of total annual milk production.
Data Source: Survey Data

Table - 4.14 brings production and disposal pattern of milk of non-beneficiary farmers classified by the quantum of production of milk per day. It appears that quantum of milk retained for home consumption varied from 26.92 per cent to 81.82 per cent across the size classes of milk production per day. It however varied inversely with the increase in the size of milk production per day and correspondingly the proportion of milk marketed at private sources increased with the size of milk production per day varying from 18.18 per cent to 73.08 per cent.

Table – 4.14
Production and disposal of milk (average per day) according to the quantum of production of milk.
(Production in Ltrs, Value in Rs.)

Milk production level/day	H.H.	Qty. Produced	Home Consumption	Disposal			
				Sold to Society		Sold to other Sources	
				Qty.	Value	Qty.	Value
Below 5.0 ltrs.	3	11	9 [81.82]	0	0	2 [18.18]	20
6.00-10.00	3	26.0	7 [26.92]	0	0	19 [73.08]	190
11.00-15.00	0	0.0	0.0	0	0	0	0
16.00-25.00	0	0.0	0.0	0	0	0	0
26.00-35.00	0	0	0	0	0	0	0
36.00 and above	0	0	0	0	0	0	0

Note: 1. Figures in brackets indicate percentages to total production.
2. Prices per litre are Rs.7.50/- in case of society and Rs.10.00/- for others.
Data Source: Survey Data

Table – 4.15 shows the annual income of dairy farms of the sample non-beneficiary farmers classified by size group of milch animals. It is revealing that of the total income of Rs.139010 from dairying, about 90.94 per cent is derived from production of milk and 9.06 per cent on the estimated value of young stock. Breed-wise, the proportion of income derived from milk accounted for 88.17 per cent for indigenous cows and 92.40 per cent for cross-breed cows. Accordingly, the estimates of income derived from young stock stood at 11.83 per cent for indigenous cattle and 7.60 per cent for cross-breed cattle.

Table – 4.15

Annual Income from Dairy Farms (including youngstock) by size group of Milch Animals (North Sikkim)

Size Group of Milch Animals	No. of H.H.	Indigenous			Cross-Breed			Grand Total		
		Value of Milk	Value of Young stock	Total	Value of Milk	Value of Young stock	Total	Value of Milk	Value of Young stock	Total
Below 5.0 Nos.	6	42470.00	5700.00	48170.00	83940.00	6900.00	90840.00	126410.00	12600.00	139010.00
5.0 -10.0 ..	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.0 - 20.0 ..	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20.0 - 30.0 ..	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Above 30 Nos.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	6	42470.00 (88.17)	5700.00 (11.83)	48170.00 (100.00)	83940.00 (92.40)	6900.00 (7.60)	90840.00 (100.00)	126410.00 (90.94)	12600.00 (9.06)	139010.00 (100.00)

Note: Figures in brackets indicate percentages of total.

Data Source: Survey Data

Annual Expenditure on Dairy Farms:

The annual expenditure on different items of costs incurred by the sample non-beneficiary farmers in the dairy units is estimated and presented in table-4.16. The table reveals that of the total expenditure on dairy enterprise, variable cost is estimated at 88.75 per cent of which feed cost accounted for the major (54.46 per cent) followed by expenditure on human labour (22.81 per cent) and then comes the expenses on veterinary charges (7.60 per cent). It is thus revealing that expenditure on feed and labour costs are the major items of cost in dairy activity and this pattern of expenditure does not vary across breeds of milch animals (table – 4.16). So far as fixed costs are concerned, depreciation on animals shared 6.18 per cent of total cost followed by interest on capital cost (2.68 per cent) and depreciation on cattle shed, storage and equipments (1.48 per cent). According to the breed of milch cattle, the

estimated per unit maintenance cost for crossbreed cows is markedly higher than indigenous cows.

A comparison of estimate of maintenance cost per unit of indigenous cows maintained by the beneficiary and non-beneficiary farmers reveals that per unit cost does not vary much. In case of crossbreed cows, maintenance cost per unit of milch animal varied across the animals possessed by the beneficiary and non-beneficiary farmers. This is because of the fact that the feed cost and veterinary charges are higher by 11.27 per cent and 10.04 per cent respectively for the beneficiary farmers as compared to the non-beneficiary farmers. The package of technical inputs and services inclusive of animal health care provided under IDDP invariably contributed to incur higher expenditure on such items for the enhancement of milk production. Accordingly, this has got reflected in per day milk production per milch cattle where it is found noticeably higher for beneficiary farmers (5.28 liters in table 4.1A) as compared to non-beneficiary farmers (3.36 liters in table- 4.11)

Benefit Cost Ratio Analysis:

Based on the estimates of expenditure on dairying and benefit obtained from dairying, Benefit Cost Ratios (BCR) for the non-beneficiary farmers are worked out separately for indigenous breed and crossbreed cows. The estimates of BCR by breeds of animals are presented in table-4.17. The estimated BCR for indigenous cows is found to be less than 1 similar to the estimate obtained for beneficiary farmers while in case of crossbreed cows the BCR is estimated to be greater than 1 which stood at 1.18 as against the figure of 1.41 for beneficiary farmers. The overall average BCR for non-beneficiary farmers is worked out at 1.00 which implies that benefit is just equal to cost and leaves no margin in dairy farms maintained by non-beneficiary farmers.

The overall BCR analysis indicates that dairy farming with crossbreed cows is remunerative. This is evidenced by the comparative estimates of BCR for the beneficiary and non-beneficiary farmers. Thus efforts under IDDP in promoting dairy activity through the induction of crossbreed milch animals is invariably promising and instrumental for dairy development. Given the fact that indigenous cows have very low genetic production potential, there exists hardly any scope for making traditional dairy farming based on indigenous cows economically viable. The crossbreeding through Artificial Insemination(AI) would be the effective instrument in transforming dairy units into viable economic units. The provisions contained in IDDP like induction of crossbreed milch animals and crossbreeding through Artificial Inseminations(AI) have offered the most promising means of increasing milk production and thus turning the dairy units into viable ones. Simultaneously, however

the adaptability of crossbreed cows suited to the local condition and farmers access to adequate and quality feed and fodder supply should receive much attention.

Table – 4.16
Annual Expenditure on Dairy Farms in North District, Sikkim

	Local Cows with Youngstock	Crossbreed with Youngstock	Total	Percentage to Total Cost
A. Fixed Cost:				
1) Depreciation on Animals @10% Per Unit	3470.00 266.92	3090.00 462.73	8560.00 356.67	6.18
2) Appreciation on young animals @10% (-) Per Unit	570.00 43.85	690.00 62.73	1260.00 52.50	0.91
3) Depreciation on Cattle Shed, Storage and Equipments @10% Per Unit	1107.00 85.20	937.00 85.20	2044.00 85.17	1.48
4) Interest on Capital Cost @3.5% Per Unit	1601.95 123.23	2109.45 191.77	3711.40 154.64	2.68
Total Fixed Cost Per Unit	6749.60 519.20	8826.73 802.43	15576.33 649.01	11.25
B. Variable Cost:				
1) Total Feed Cost Per Unit	36400.00 2800.00	39050.00 3550.00	75450.00 7143.75	54.46
2) Expenditure on Human Labour Per Unit	12352.00 950.20	19255.00 1750.50	31607.00 1316.96	22.81
3) Veterinary Charges & Cost of Medicines Per Unit	3903.25 300.25	6625.30 602.30	10528.55 438.69	7.60
4) Misc.Cost(1% of the total expenditure) Per Unit	526.55 40.50	649.30 59.03	1175.85 48.99	0.85
5) Interest on Variable Cost @3.5% Per Unit	1861.36 143.18	2332.89 213.89	4194.25 174.76	3.03
Total Variable Cost Per Unit	55043.16 4234.08	67932.92 6175.72	122976.08 5124.00	88.75
Total Cost (A+B) Per Unit	61792.64 4753.28	76761.85 6978.35	138554.49 5773.10	100.00

Data Source: Survey Data

Table – 4.17
Estimated B.C.R. by Breed of Milch Animals, North District, Sikkim

Breeds	Annual Gross Income (Milk & Value of Youngstock)	Annual Expenditure	B.C.R.
Indigenous	48170.00	61792.64	0.78
Crossbreed	90840.00	76761.85	1.18
Total	139010.00	138554.49	1.00

Note: Estimates are based on survey data.

Generation of Employment:

Dairying is one of the most important economic activity, particularly in hill areas. Apart from ensuring nutrient supplies to the farm families maintaining dairy farms, dairying offers promising employment opportunities and yields income. The attempt thus has been made to work out the employment potentials created by dairy activity pursued by the non-beneficiary households similar to the exercise done for beneficiary households.

The generation of employment by size group of milch animals is presented in table-4.18. Generation of man-days of employment depicted in the table reveals that the dairy sector provided employment opportunities to the extent of 43.03 per cent of the total working man-days with holding milch animals upto 5 numbers.

Table – 4.18
Generation of Employment (Man-days) by dairy Enterprise by size groups of milch animals in North District, Sikkim

Size Groups	Agriculture	Other allied activities		Dairy	Total	Percent of dairy sector employment to total employment
		Farm	Non-Farm			
No milch animal	4600	775	1750	0	7125	0
Below 5 Nos.	2600	825	1175	3475	8075	43.03
5 - 10 Nos.	0	0	0	0	0	0
10 - 20 Nos.	0	0	0	0	0	0
20 - 30 Nos	0	0	0	0	0	0
30 - 40 Nos.	0	0	0	0	0	0
Total	7200	1600	2925	3475	15200	22.86

Data Source: Survey Data

Generation of Income from Dairy Enterprise:

Table-4.19 shows the annual income of the beneficiary farmers obtained from various sources classified by size groups of milch animals. Total income of non-beneficiary households from all sources is estimated at Rs. 608010.00 of which Rs. 288000.00 (47.37 per cent) is derived from agriculture proper, Rs. 139010.00 (22.86 per cent) from dairying and Rs. 181000.00 (29.77 per cent) from other sources. It is thus indicative that non-beneficiary farmers have not adopted dairy farming as a commercial proposition, not even as a primary occupation. Non-beneficiary households having the size of milch animals upto 5 numbers obtained 40.53 per cent of total annual income from dairying.

Table-4.19
Income of the Sample Households by Size Groups of Milch Animals

Size Group of Milch Animals	No. of H.H.	Sources of Income				% of dairy sector to total
		Agriculture	Dairy	Income from Other Sources	Total	
No milch animal	6	184000 [46000.00]	0	81000 [27000.00]	265000 [44166.67]	-
Below 5.00 Nos.	6	104000 [17333.33]	139010 [23168.33]	100000 [33333.33]	343010 [57168.33]	40.53
5 - 10 Nos.	0		0	0	0	-
10 -20 Nos.	0		0	0	0	-
20 - 30 Nos.	0		0	0	0	-
30 & Above	0		0	0	0	-
Total	12	288000 [28800.00]	139010 [23168.33]	181000 [30166.67]	608010 [50667.50]	22.86

Note: Figures in brackets indicate per household income from various sources

Data Source: Survey Data

Table – 4.20 reveals annual income of sample non-beneficiary households obtained from different sources classified by size of farm. It appears that per household income from dairy activity increased with the increase in the size of farm being varied between 16.28 per cent and 35.85 per cent across the size classes of land holdings with an overall average of 22.86 per cent.

Table –4.20
Total annual income of the sample households by farm size groups.

Farm Size	Dairy		Agriculture		Other Sources		Total	% of dairy sector to total
	H.H.	Income	H.H	Income	H.H.	Income		
Below 1 ha.	2	40250 [20125.00]	4	74000 [18500.00]	4	133000 [33250.00]	247250 [41208.33]	16.28
1-2 ha.	1	26100 [26100.00]	3	84000 [28000.00]	2	48000 [24000.00]	158100 [52700.00]	16.51
2-4 ha.	3	72660 [24220.00]	3	130000 [43333.33]	0	0	202660 [67553.33]	35.85
4-10 ha.	0	0	0	0	0	0	0	-
10 & above	0	0	0	0	0	0	0	-
Total	6	139010 [23168.33]	10	288000 [28800.00]	6	181000 [30166.67]	608010 [50667.50]	22.86

Note: Figures in brackets indicate per household annual income.

Data Source: Survey Data.

To sum up, launching of IDDP in North district of Sikkim has encouraged milch animal rearing through induction of cross-breed milch animals under the programme along with providing a complete package of inputs and services necessary for enhancing milk production. The programme has also produced positive impact on milk production through increasing the number as well as productivity of milch animals.

Evidently, milch animals are entirely cattle population in the study area. Of the total number of milch cattle possessed by beneficiary farmers, 74.67 per cent are in milk. Breed-wise, 68 per cent are indigenous cows and the rest 32 per cent are crossbred cows. Milk yield from an milch animal varied according to breeds. For indigenous cows, per cow per day production of milk is worked out at 2.92 liters while the corresponding figure in the case of crossbred cows stood at 9.65 liters.

Genetically, crossbred cows have larger yield potential and thus offered substantially higher productivity of milk. However, apart from differences in genetic potential, milk yield per milch animal is largely affected by feeding of milch animals. This has been documented by the results of the production function exercises done in the study with the help of grass root level data for the beneficiary farmers. The results demonstrated that feed input is the crucial and only variable affecting milk production common to both indigenous and crossbred cows having larger positive response of milk production to feed input for crossbred cows. The implication has been that

crossbred cows are the most promising means of increasing milk production and for achieving the full potentials of crossbred cows, they are to be better fed and accordingly, the targeted beneficiaries are to be provided with adequate access to quality feed including balanced cattle feed and fodder supplies for milch animals throughout the year.

The pattern of disposal of milk production for beneficiary farmers revealed that a major portion of the milk production was supplied to the society for sale which accounted for 69.27 per cent. A portion of the milk (19.53 per cent) was used for home consumption commensurate with the requirement in the family and the remaining 11.20 per cent were sold to private sources. The programme of IDDP with its co-operative network seems to have been successful in increasing the rate of commercialization of milk production by providing an assured market outlet for milk to targeted beneficiaries. IDDP programme has provided a dependable alternative channel for disposal of marketable surplus of milk at prices which are considered fair for the producers. Considering both Fat and solids-not-fat (SNF) contents of milk, producer prices are set at levels which covered the actual cost of production of a liter of milk. Although producer price paid by the societies has remained lower than market prices, member milk producers have recovered losses by obtaining milk enhancing inputs and technical services free of costs or at subsidised rates, from the programme of IDDP. Besides, at the end of year, member producers are paid bonus on a pro-rata basis in proportion to the quantity of milk sold by the milk producers to the societies.

In studying the economics of dairy enterprise, attempt has been made to work out the benefits accruing to the selected beneficiaries. The benefits comprised of two components of income viz annual milk production and the estimated value of youngstock. Value of cow dung is not considered as there is no demand for cow dung in the study area. As a measure of profitability of investment in dairy units, benefit cost ratios by breeds of milch animals are estimated. The overall BCR worked out at 1.14 with the estimated figure of 0.94 for local cows and 1.41 for crossbred cows. Thus investment in dairy activity is found to be economically viable in the study area.

The financial soundness of dairy units is examined by working out the Financial Rate of Return (FRR). The financial rate of return on investment in the acquisition of a crossbred cow works out to 19.62 per cent. The figure stood at 12.96 per cent while reckoned on total investment. This substantiates the financial viability of investment in dairy units.

As regards generation of income by the dairy farms of the beneficiary farmers, the proportion of income from dairy to total income from all sources worked out to 51.47 per cent. Dairying, thus constituted the major source of income for the

beneficiary farmers. Noticeably, the share of income from dairy increased with the increase in the size of holding of milch animals. Of the total income from dairying, about 93.94 per cent is derived from production of milk.

The dairy sector provided employment opportunities to the beneficiary farmers ranging from 55.98 percent to 71.84 per cent of the total working man days depending on the size of milch animals with an overall average of 58 per cent for all the dairy farms together.

In case of non-beneficiaries, milk yield from an milch animal was markedly lower as compared to the same accrued by the beneficiaries. Non-beneficiaries in the absence of their access to dairy co-operative societies for their market outlet of milk, are found to have consumed a sizeable proportion of milk production in their family. Moreover, marketed proportion of milk output was entirely handed over to the private sources. Notably, the proportion of milk output marketed was markedly less than the beneficiary farmers. The comparative experiences of beneficiary and non-beneficiary farmers have thus manifested the role of dairy co-operatives created under IDDP in increasing the rate of commercialization of milk production by providing an assured market for milk to the milk producers.

As a source of income, the dairy farming contributed the least for the non-beneficiary farmers. As evidenced by the overall estimate of benefit cost ratio, dairying did not turn out to be a sound economic alternative for non-beneficiary farmers. The observed common feature for both the beneficiary and non-beneficiary farmers however, is that dairying with crossbred cows is a profitable proposition. Given the fact that indigenous cows have very low genetic production potential, there exists hardly any scope for making traditional dairy farming based on indigenous cows economically viable. The diffusion of crossbreeding technology through Artificial Insemination (AI) would be the effective instrument in transforming dairy units into viable economic units. The implementation of the provisions contained in IDDP like induction of crossbreed milch animals and crossbreeding through Artificial Inseminations (AI) have offered the most promising means of increasing milk production and thus making the dairy units into viable ones.

CHAPTER -V

Summary and Policy Conclusions

Importance of Dairying in India:

It is hardly possible to over-emphasize the importance of the country's livestock in general, dairying in particular as the exclusive source of animal food and nutrition for the country's population and above all, as substantial source of income and employment for rural population, especially the rural poor. Indian agrarian condition is characterized by increasing number and fragmentation of holdings. The average size of the holding of the farmers are among the lowest in the world. Despite falling share of agriculture to gross domestic product, the workforce dependent upon agriculture continues to be as high as 64.8 per cent. Besides the increasing trend of mechanization in agriculture has tended to cut-down the demand for labour. Given low absorptive capacity of the industrial sector, the only possible way to augment income and employment of the small farmers is to encourage adopting subsidiary enterprises like dairy farming which can be easily carried on these farms. Dairying acquires special significance in the hill areas on economic ground. Due to poor productivity of the crop sector, low availability of per capita arable land and lack of other income generating avenues there is heavy economic dependence of households on animal husbandry activities. Thus next to crop husbandry, the most likely programme for extensive support has been animal husbandry, particularly dairying sector, which has got the largest employment potential in India, being the source of livelihood for the landless and people below poverty line, since time immemorial.

An important feature of India's dairy sector is the predominance of small-scale milk producers owning one or two milch animals each. Another characteristic feature of India's dairying is that milk production and crop production on most of the farms are complementary enterprises; the milch animals are fed on crop residues and milch animal dung is used as manure for crops. This complementary keeps the costs of both crop production and milk production relatively low and thereby affords a competitive edge to the Indian farmer vis-à-vis her counterparts in other countries. Moreover in case of dairying there is greater degree of indoor activity and offers much scope for employment of family labour, especially, women and children.

In order to exploit the vast potential of dairy sector in the country, the National Dairy Development Board (NDDB) launched the Operation Flood (OF) programme since 1970. In the non-OF areas there was no concerted efforts to develop dairying

except some sporadic measures undertaken by the state governments. Keeping in view the importance of developing the dairy sector in non-operation flood, hilly and backward areas of the country, the Department of Animal Husbandry and Dairing, Ministry of Agriculture, Government of India had launched the Integrated Dairy Development Project (IDDP) in North-Eastern States including the state of Sikkim, for stimulating milk production, procurement and marketing with provisions of working capital and manpower development. The present study is an attempt to evaluate the performance of IDDP project in the state of Sikkim.

Objectives of the Study:

The present study has been undertaken to conduct evaluation of the Integrated Dairy Development Project (IDDP) with the following objectives:

1. To assess the impact of IDDP in generation of additional employment and income to the different categories of beneficiaries.
2. To assess the impact of IDDP in terms of genetic improvement of cattle through selective breeding/cross breeding and in making availability of feed and fodder.
3. To assess the impact of IDDP on milk production and in development of marketing and processing infrastructure in the Project area.
4. To assess whether the implementing agencies followed the guidelines in selection of beneficiaries, imparted training through dairy extension services amongst the farmers.
5. To study the problems faced by the implementing agencies in execution of the project as per guidelines laid down by the Department of Animal Husbandry.
6. To suggest policy implications.

Data Base, Methodology, Sampling Design & Coverage of the Study:

The Government of India during the 8th Five Year Plan had sanctioned Integrated Dairy Development Project for implementation of the same in Non-Operation Flood, Hilly and Backward Areas, under the centrally sponsored plan scheme in north district of Sikkim. The East, West and South districts of the state are included in the Operation Flood Programme. Thus with a view to have a uniform Dairy Development across the districts in the state, IDDP Project has been introduced in the north district. The evaluation study has thus been conducted in north district of the state of Sikkim.

The study is based on both primary and secondary data. For secondary materials the study draws upon the sources like quinquennial livestock census for the state of Sikkim and data furnished by Department of Animal Husbandry and Veterinary Services, Government of Sikkim. For collection of secondary level information, 3 sets of schedules are used viz. the state level schedule, the district level schedule, and schedules and questionnaires for collection of required information from the milk producer's Co-operatives Societies functioning under IDDP. For collection of Primary data 2 sets of schedules/ questionnaire are used, one set being used for collection of grass root level data from the beneficiary households and the other for collection of data from non-beneficiary households. Farmer's level data are collected by personal interview method.

Multi-stage stratified random sampling technique is used for selection of society and beneficiary and non-beneficiary farmers in a scientific way. From the North district of the state of Sikkim, the list of societies under IDDP is collected and is arranged them in 3 Strata in an ascending order depending upon the production/procurement of milk. From each Strata one society is selected randomly for intensive study.

In the 2nd.Stage, list of beneficiary households of the selected societies is obtained and from each list 12 (twelve) households are selected randomly to collect primary data on various aspects of IDDP including the performance. In selecting beneficiary households due care is taken to select the small and marginal farmers, agricultural labourers, SC/ST households and women beneficiaries who are relatively disadvantaged having lower incomes and employment. Thus altogether 36 beneficiaries numbering 12 each from the 3 selected societies are selected at random for the purpose of interview.

For control group, the non-beneficiary households from the same cluster of villages in which the sample society is located are selected. The non-beneficiary members comprise of two groups – one, owner of milch cattle and the other, non-owner of milch cattle. A sample of 2 non-beneficiary households with milch animals and 2 non-beneficiary households from non-owner of milch animals are selected at random from each of the selected societies. Thus altogether 12 non-beneficiary households are covered in the study. In all, sample size of the study constitutes 48 covering 36 beneficiary and 12 non-beneficiary households of North District of the state of Sikkim.

Main Findings:

Status of Animal Husbandry and Dairying in Sikkim:

In a pre-dominantly rural economy such as Sikkim, animal husbandry activities form an extremely important element to bring about substantial improvements in living standards. The overall area available for agricultural operations is limited to about 15 per cent of the geographical area of the state due to substantial area being barrens, mountain and forest (80 per cent). With the increasing population; the per capita land availability has been essentially declining. It is therefore, imperative that supplementary sources of income should be developed in order to provide not only the much needed support to the rural families but also to make available in increasing quantities protein rich food items such as milk, egg and meat.

In the State of Sikkim, the livestock production is the endeavor of small and marginal farmers (17th Indian Livestock Census, Sikkim, 2003). The contribution of the livestock sector to the state Net State Domestic Product (NSDP) is 8.5 per cent (source: 17th Indian Livestock Census, Sikkim, 2003). Sikkim with its pleasant weather offers an excellent environment for rearing high yielding cows. Thus rearing of cattle is an age old and integral component of the agricultural activities in Sikkim.

Allocation of State Budgetary Resources in Dairy Development:

The importance of animal husbandry and dairying in the state could be studied in terms of budgetary allocation of resources towards animal husbandry and dairying. It is observable that allocation of resources for the dairy sector was to the extent of 10.13 per cent of the total allocation of resources to animal husbandry livestock, fisheries and veterinary services during 2005-2006 at current prices. The expenditure on dairy development however varied over the years. Data pertaining to the period 2000-2001 to 2006-2007 revealed that expenditure on dairy development increased consistently from Rs.34.44 lakhs in 2000-2001 to Rs.65.00 lakhs in 2006-2007 accompanied by large jump (Rs.175 lakhs) during the year 2002-2003.

Growth and Composition of Livestock in the State of Sikkim:

The composition of livestock in important categories in the state of Sikkim reveals that livestock population in the state of Sikkim increased from 5.13 lakhs in 1997 to about 6.87 lakhs in 2003 recording a compound growth rate of about 6 per cent per annum. Bovine (cattle and buffaloes) population constituted 23.47 per cent of the total livestock in 2003. The cattle population constitute the major which accounts for 98.69 per cent of total bovine population. At the state level, indigenous cattle has tended to decrease by 2.66 per cent per annum. Contrarily, there has been perceptibly positive growth (9.13 per cent) in the case of crossbred cattle. Negative growth is observed for indigenous cattle in all the districts except for the south and thus

recorded overall negative growth rate at the state level. Likewise, crossbred cattle have shown positive growth rate in all the districts except for the north and accordingly, at the state level. This reflects the fact that by and large, the number of crossbred cattle has tended to increase over the period and indeed people seem to have shifted for rearing crossbred cows over indigenous cattle for milk production.

The data on the number of in-milk cows and buffaloes are available for 2003 obtained from livestock census of Sikkim. Disaggregating livestock into bovine and ovine, it is found that bovine constituted 23.47 per cent, while ovine population (Sheep and goats) accounted for 18.88 per cent of the total livestock population. Population of in-milk bovine which includes lactating buffaloes and cows shared 25.53 per cent in total bovine population. Cattle constitutes the major (98.69 per cent) in total bovine. Again, while the share of in-milk cows in total in-milk bovine accounted for 98.66 per cent, the proportion of buffaloes in-milk in total in-milk bovine constituted only 1.33 per cent. Obviously, cows are preferred more than buffaloes and are the main source of milk production in the state of Sikkim. Probable reason might be that the buffaloes are less suited in the state than cows due to hilly topography.

Data on population of she-cattle, she-buffaloes, in-milk cattle, in-milk buffaloes for the state of Sikkim are available from livestock census (2003). It is evident that a significant proportion of adult females are dry common to both cattle and buffaloes. Again, the percentage share of females in-milk are relatively greater among buffaloes than among cows. Animals in milk among adult females in case of she-buffaloes stood at 36.89 per cent in the state as against the figure of 29.96 per cent for cattle. The ratio of cows to she-buffaloes is observed to be 1.35 in case of in-milk animals and 1.10 for both the in-milk and the dry categories together.

High quality milch cattle breeds have a lower age of first calving, longer lactation length and shorter inter-calving interval. Therefore as the proportion of high quality breeds in the she-cattle population increases, the proportion of animals in-milk will also tend to increase. A close look at the data on female cattle population by cross bred and indigenous breeds reveals that among indigenous cattle, females over 2½ years and in-milk recorded 37.63 per cent while those for crossbred cattle the proportion worked out at 41.22 per cent.

Growth in Milk Production:

Milk production data are available according to plan periods from the Fifth Five Year Plan. Year wise breakup is available for the Tenth Five Year Plan from the year 2002-03. It can be seen that during the Fifth Five Year Plan period average annual milk production was 10.95 thousand metric tonnes and it increased to 37

thousand metric tonnes annually during the 9th Five Year Plan period registering an increase of 8.81 per cent per annum. During the 8th Five Year Plan period (1992-97), annual milk production was of the order of 34 thousand metric tonnes when the scheme of IDDP was launched. It increased to 48 thousand tonnes in the year 2005-2006 and thus increased at the rate of 3.17 per cent per annum since the launching of IDDP programme in the state. The steady progress in milk production in the state obviously due to increased emphasis laid on the animal husbandry and dairy development programmes including IDDP.

The increase in milk production was mainly contributed by cows. As recorded for the year 2005-06, about 99 per cent of the total milk production in the state of Sikkim was contributed by cattle. The average per capita availability of milk increased from 132 ml. per day during the 5th Five Year Plan period to 243 ml. per day during the 9th. Five Year Plan period.

Integrated Dairy Development Project in Sikkim:

The Integrated Dairy Development Project has been in operation in the North District of the State of Sikkim. The other districts namely the East, West and South districts of the State are covered by the Operation Flood programme executed in the year 1980.

In the year 1993-94, the Government of Sikkim received a grant of Rs. 217 lakhs from the Government of India for undertaking Dairy Development Programme in the north district. After successful implementation of the project, the second project was sanctioned by the Government of India. The second project considered as first phase of the project was implemented from 1994-95 and continued upto 1999-2000. During the first phase of the project, 25 Dairy Co-operative Societies (DCS) have been organized, out of this 20 were functional with a farmer membership of over 600 and milk procurement was about 850 liters per day. The third project considered as 2nd phase of the project started from 2000-2001 and covered the period of five years from 2000-01 to 2004-05. Since inception the Project has thus completed two phases of work known as IDDP phase I & IDDP phase II.

The project is implemented in the state by the State Animal Husbandry, Livestock, Fisheries and Veterinary Services Department, Government of Sikkim. The Joint Director (Dairy), Department of AHLF & VS has been appointed as nodal officer (Chief Executive) for the project. For implementation of IDDP in Sikkim, a Technical Management Committee (TMC) was constituted at the state level for monitoring the progress of the project. In addition to the state level TMC there is an implementing committee at district level to workout the modalities for implementation of the project in the concerned district. In fact the district level committee monitors

the performance of IDDP at the district level and helps TMC in effective implementation of the project.

Physical and Financial Performance of the Project:

The project envisaged the assistance for the formation of dairy co-operative societies, purchase of milk testing equipments, furniture, procurement of milk, construction of dairy and chilling plants, input supplies and training of farmers and functionaries involved in the implementation of the project. The assistance covers both recurring and non-recurring expenditure of approved components.

Launched in 1993-94 in north district of the state of Sikkim with a grant of Rs.217 lakhs from the Government of India, the IDDP has completed two phases of work. IDDP phase-I, was implemented from 1994-95 and continued upto 1999-2000. The second phase of the programme covered the period of five years from 2000-01 to 2004-05. Thus since the inception of IDDP in 1993-94, it has completed two phases known as phase-I and phase-II. By the end of phase-II, IDDP has contributed in creating and strengthening the basic infrastructure for procurement, processing and marketing of milk, for cattle feed, for provision of animal health care and breeding services and for education and training of farmers and functionaries involved in the implementation of the project. As of January 31, 2005 (by the end of phase-II) 30 village-level dairy co-operative societies have been established with the total membership of 1000 village milk producers. Two milk chilling plants with the capacity of 500 LPD each and one milk processing plant with the capacity of 2000 LPD were established. The average liquid milk procurement and marketing was of the order of 1500 LPD respectively.

The total investment of the 2nd phase of the project as of January, 2005 was 266 lakhs. In the allocation of funds among various activities, 112.22 lakhs i.e. about 42.19 per cent was given for building up milk processing and marketing capacity. Milk production enhancement programme got 96.74 lakhs i.e. 36.37 per cent of the allocation. A sum of Rs.46.62 lakhs i.e. 17.53 per cent was spent on milk procurement. Manpower development received 2.25 lakhs i.e. 0.85 per cent of the allocation and the remaining was spent on working capital like purchase of cattle feed, purchase of heifers etc.

Performance of Dairy Co-operative Societies:

The accepted policy of the Government of India to foster and promote dairy development through a network of co-operatives is reflected in the provision contained in IDDP project for dairy development in non-operation flood areas. In fact, one of the essential conditions of the project is that dairy co-operative societies should be organized at the village or a group of village level. The village society will be

affiliated to the district-level co-operative society. The district society in turn seeks affiliation to the state-level co-operative federation. The guidelines of the project envisage that beneficiary families should be organized into co-operatives on voluntary basis to facilitate extension and supply of inputs, animal health services and marketing support.

In the present study, milk producer's co-operative societies receiving benefits under only IDDP form the sample frame. In all, three dairy co-operative societies are covered in the study namely Nampatam MPCS, Ringhim DUSS and Chandey MCS hereafter referred to as Society No.1, 2 and 3 respectively in north district of Sikkim. For the purpose, society level information was collected through structured questionnaire. The organizational structure and activities performed by the societies at the farmers level are presented in the following paragraphs.

Organizationally, DCS membership in the selected societies increased since their inception. At the time of survey, total members of the societies numbered 33, 50 and 49 in societies 1, 2 and 3 respectively while the corresponding figures at the time of inception of the societies were 19, 25 and 40 and thus recorded annual growth rate of 7.36, 10.00 and 2.25 per cent respectively. The plausible reason for the growth of membership could be the provision of various facilities contained in IDDP, like technical inputs and services and assured marketing outlets for their milk. All these invariably encouraged the milk producers to enroll themselves as the members of the dairy co-operatives.

The composition of member households comprised of both landed and landless. Landed members are mostly from the lower category of land holdings, mainly small and marginal and the rest came from medium sized land holdings. To carry out their various activities DCSs have developed an organizational set up comprising of president, secretary, treasurer and attendant. General body meeting is organized every month with a view to monitoring the progress of the project.

The scheme envisaged financing of one crossbred cow to those who were already having a cow. Apart from providing milch cows, the societies provided to the members a package of inputs and services necessary for enhancing milk production. The package includes technical inputs and services inclusive of animal health care in the form of extending vaccination facilities and artificial insemination facilities, development of fodder plots, distribution of fodder kits and organizing infertility camps. The project provides for training of beneficiaries and functionaries associated with the implementation of the project. The training included the items of cleaning milk production, veterinary. first aid, management of cattle, awareness camp, farmer induction training, training of local farmers and training of MPCS staff. In terms of

weightage given to the different courses of training, management of cattle occupy the major followed by veterinary first-aid. Persons actually involved in the training accounted for the major in farmer induction training followed by those involved in the organization of awareness camp.

Milk producers' co-operative societies worked as a source of milk disposal of the farmer member households. It can be viewed that on an average, members which were supplying milk to the society numbered 24 per day within a month in society number 1 as against the figures of 30 and 25 for the societies numbering 2 and 3 respectively. During the year 2000 – 2001, monthly average procurement of milk by the selected societies was of the order of 40 liters per day for society number 1, 66 liters for society number 2 and 45 liters for society number 3. Notably, however milk procurement per day per society decelerated as compared to the position existed before schedule canvassing.

Implementation of IDDP Scheme at the Farmers' Level: Its Economy and Impact:

The project envisaged providing assistance to the targeted beneficiaries of the region who are relatively disadvantaged having lower incomes and higher incidence of unemployment. The present study observed that beneficiary families belong to the disadvantaged group of population viz. scheduled tribe having low educational background up to primary and middle school standard.

Dairying, as principal occupation is reported by 22.22 per cent of beneficiary farmers, while among secondary occupations, dairying constituted the major. Thus in the selected area, dairying is still undertaken as supplementary enterprise.

In terms of landholding status, beneficiary households in the main belonged to marginal and small (86.11 per cent) with landholdings of two hectares or less.

So far as the impact of the scheme at the beneficiary level is concerned, under the scheme, purchase of crossbred milch cows in unit of one animal was assisted to the farmer members of the society who were already having a cow. A total of 19 milch animals (cows) were provided to 19 beneficiaries out of a total of 36 who accounted for 52.22 per cent of the total sample beneficiaries. Inducted cows were in 1st lactation order. The lactation cycle of milch cattle provided under the scheme was reported to be a duration of 415 days of which 230 days represented in-milk period and the dry period was a duration of 185 days.

The implementing agency followed the stipulated norms in the identification of beneficiaries. The project envisaged providing assistance to the targeted beneficiaries of the region who are relatively disadvantaged having lower incomes and higher

incidence of unemployment. Evidently, it was found that the scheme was drawn at large for the benefit of small and marginal farmers. Out of a total of 19 animals assisted under IDDP project, 15 (78.94 per cent) were provided to small and marginal farmers.

Apart from induction of milch animals, the project has several other components namely provision for providing technical inputs of feed and fodder kits for better milk production, providing equipments like milk cans, etc. Unit cost of investment under the scheme of IDDP thus included (a) cost of one crossbred cow (b) cost of construction of shed and (c) cost of equipments. The survey data revealed that the average actual unit cost of investment was Rs.10,755 covering cost of one milch animal (Rs.7105), cowshed (Rs.3500) and cost of equipment (Rs.150). However the same beneficiary did not receive all the components. It is observed that about 58.33 per cent of sample beneficiaries each from society no.1 and 2 received crossbred milch cow in unit of one animal which were partly on 50 per cent subsidy and partly on 100 per cent subsidy. The proportion of sample beneficiaries receiving milch animals accounted for 41.67 per cent for society no.3 of which 25 per cent were on 50 per cent subsidy and 16.67 per cent on 100 per cent subsidy. While in majority of cases, beneficiary received milch animals, in some other cases they received assistance for the construction of cattle-shed. The proportion of such households accounted for 16.67 per cent for society no.1, 25 per cent for society no.2 and 8.33 per cent for society no.3. However all the sample beneficiaries were provided with fodder kits free of cost for enhancing milk production.

Most of the studies on livestock economy in India indicated dominance of cattle as a source of draught power and relatively high degree of dependence on buffaloes as a source of milk. The present study however reveals a different picture in that cattle is the only source of milk in the area selected for the study. Again, ownership of cattle is largely concentrated in small and marginal holdings. It is observed that of the total sample beneficiary farmers selected for the study, 86.11 per cent are small and marginal who owned 82.67 per cent of total milch cattle. According to breeds, majority of milch animals kept by the sample beneficiary farmers are still indigenous type having low milk yield potential. Out of 75 milch cattle possessed by the beneficiary households, only 32.00 per cent are crossbreed cows and 68.00 per cent are indigenous cows.

The overall investment in dairy enterprise comprised of cattle-shed of milch animals, stores, equipments for feeding watering and miscellaneous other items of expenditure. It is evident that the initial investment in dairy farms of 36 sample beneficiaries was of the order of Rs.543605 of which 17.29 per cent was in cattle-shed

and stores, 77.56 per cent in milch animals, 1.82 per cent in equipments for feeding, watering and 3.33 per cent on miscellaneous items. The overall average investment per household in dairy enterprise worked out at Rs.15100. Noticeably, investment per household increased with the increase in the size of milch animal from Rs. 14251 with less than 5 numbers of milch animal to Rs. 29525 when the size of milch animal herd increased up to 10 numbers. In terms of per unit of cattle population, average investment stood at Rs. 4150 being declined consistently with the increase in the size of milch animal.

So far as the impact of IDDP in terms of growth of milch animals is concerned, after the introduction of IDDP altogether, the 36 sample beneficiary households have newly introduced 26 milch cattle. Of the total addition of milch cattle 46.15 per cent constituted crossbreed animals and 53.85 per cent are indigenous cows.

Evidently, milch animals are entirely cattle population in the study area. Of the total number of milch cattle possessed by beneficiary farmers, 74.67 per cent are in milk. Milk yield from an milch animal varied according to breeds. For indigenous cows, per cow per day production of milk is worked out at 2.92 liters while the corresponding figure in the case of crossbred cows stood at 9.65 liters.

Genetically, crossbred cows have larger yield potential and thus offered substantially higher productivity of milk. However, apart from differences in genetic potential, milk yield per milch animal is largely affected by feeding of milch animals. This has been documented by the results of the production function exercises done in the study with the help of grass root level data for the beneficiary farmers. The results demonstrated that feed input is the crucial and only variable affecting milk production common to both indigenous and crossbred cows having larger positive response of milk production to feed input for crossbred cows. The implication has been that crossbred cows are the most promising means of increasing milk production and they need adequate and quality feed for achieving their full potentials. Therefore, the targeted beneficiaries are to be provided with adequate access to quality feed including balanced cattle feed and fodder supplies for milch animals throughout the year.

The pattern of disposal of milk production for beneficiary farmers revealed that a major portion of the milk production was supplied to the society for sale which accounted for 69.27 per cent. A portion of the milk (19.53 per cent) was used for home consumption commensurate with the requirement in the family and the remaining 11.20 per cent were sold to private sources. The programme of IDDP with its co-operative network seems to have been successful in increasing the rate of commercialization of milk production by providing an assured market outlet for milk

to targeted beneficiaries. IDDP programme has provided a dependable alternative channel for disposal of marketable surplus of milk at prices which are considered fair for the producers. Considering both Fat and solids-not-fat (SNF) contents of milk, producer prices are set at levels which covered the actual cost of production of a liter of milk. Although producer price paid by the societies has remained lower than market prices, member milk producers have recovered losses by obtaining milk enhancing inputs and technical services free of costs or at subsidised rates, from the programme of IDDP. Besides, at the end of year, member producers are paid bonus on a pro-rata basis in proportion to the quantity of milk sold by the milk producers to the societies.

In studying the economics of dairy enterprise, attempt has been made to work out the benefits accruing to the selected beneficiaries. The benefits comprised of two components of income viz annual milk production and the estimated value of youngstock. Value of cow dung is not considered as there is no demand for cow dung in the study area. As a measure of profitability of investment in dairy units, benefit cost ratios by breeds of milch animals are estimated. The overall BCR worked out at 1.14 with the estimated figure of 0.94 for local cows and 1.41 for crossbreed cows. Thus investment in dairy activity is found to be economically viable in the study area.

The financial soundness of dairy units is examined by working out the Financial Rate of Return (FRR). The financial rate of return on investment in the acquisition of a crossbred cow works out to 19.62 per cent. The figure stood at 12.96 per cent while reckoned on total investment. This substantiates the financial viability of investment in dairy units.

As regards generation of income by the dairy farms of the beneficiary farmers, the proportion of income from dairy to total income from all sources worked out to 51.47 per cent. Dairying, thus contributed the major as a source of income for the beneficiary farmers. Noticeably, the share of income from dairy increased with the increase in the size of holding of milch animals. Of the total income from dairying, about 93.94 per cent is derived from production of milk.

The dairy sector provided employment opportunities to the beneficiary farmers ranging from 55.98 percent to 71.84 per cent of the total working man days depending on the size of milch animals with an overall average of 58 per cent for all the dairy farms together.

Non-Beneficiary households displayed the similar characteristics as those of beneficiaries particularly in terms of educational background and landholding status. Thus as a whole, the characteristic feature of dairying in the study area is the predominance of small-scale milk producers characterized by the dominance of small and marginal landholders. In case of non-beneficiaries, milk yield from an milch animal

was markedly lower as compared to the same accrued by the beneficiaries. Non-beneficiaries in the absence of their access to dairy co-operative societies for their market outlet of milk, are found to have consumed a sizeable proportion of milk production in their family. Moreover, marketed proportion of milk output was entirely handed over to the private sources. Notably, the proportion of milk output marketed was markedly less than the beneficiary farmers. The comparative experiences of beneficiary and non-beneficiary farmers have thus manifested the role of dairy co-operatives created under IDDP in increasing the rate of commercialization of milk production by providing an assured market for milk to the milk producers.

As a source of income, the dairy farming contributed the least for the non-beneficiary farmers. As evidenced by the overall estimate of benefit cost ratio, dairying did not turn out to be a sound economic alternative for non-beneficiary farmers. The observed common feature for both the beneficiary and non-beneficiary farmers however, is that dairying with crossbred cows is a profitable proposition. Given the fact that indigenous cows have very low genetic production potential, there exists hardly any scope for making traditional dairy farming based on indigenous cows economically viable. The diffusion of crossbreeding technology through Artificial Insemination (AI) would be the effective instrument in transforming dairy units into viable economic units. The implementation of the provisions contained in IDDP like induction of crossbreed milch animals and crossbreeding through Artificial Inseminations (AI) have offered the most promising means of increasing milk production and thus making the dairy units into viable ones.

Policy Implications:

The findings of the study have some implications for the policy making in the dairy sector. The following are the policy implications emerging from the study.

The favorable bovine resource base indicates a lot of scope for dairy improvement in the north district. However, female crossbreed population is one of the lowest (8.52 per cent of state total) in the district. Although with introduction of IDDP, crossbreed population increased, the region is still lagging behind other three regions where the percentage share of crossbreed female population in the state ranged from 21.38 percent to 42.37 percent. As evidenced by survey data, at the farmers' level, of the total number of milch cattle possessed by beneficiary farmers, 68 per cent are indigenous cows and the rest 32 per cent are crossbred cows. The population of indigenous cows is so large that selective breeding will take enough time to raise milk production. There is no alternative therefore to crossbreeding for genetic improvement of cows. This indicates a lot of scope of dairy improvement through adoption of crossbreeding programme with larger coverage in the district. The IDDP programme

envisaged the provision for extending artificial insemination facilities to the farmer members apart from induction of crossbreed milch animals. However the diffusion of crossbreeding technology through A.I. under the programme has been extremely limited. What is needed therefore is that apart from the coverage of A.I Centres it is necessary to extend A.I. facilities to the farmers' doorstep. This would lead to gaining further momentum in the diffusion and adoption of crossbreeding technology. Accordingly, under the scheme more emphasis should be placed on building reproduction infrastructure. Alongside, crossbreeding through providing more artificial insemination services under the programme of IDDP needs greater emphasis **(Attn: Joint Director, Department of Animal Husbandry, Livestock, Fisheries and Veterinary Services, Government of Sikkim)**

Given the fact that indigenous cows have low genetic production potentials, the crossbreeding with high yielding exotic breeds has been very popular as a means of increasing milk production. This is what has been done under the programme of IDDP through extending artificial insemination services. Notably, however upgrading of local cows through natural services did not receive attention. In fact, the shortage of breeding bulls is one of the principal handicaps in implementing any dairy development programme. To overcome this difficulty the use of Artificial Insemination (AI) is extended. In the state of Sikkim, the state Bull Rearing Farm (BRF) is capable of providing bulls, which is a fraction of the numbers actually needed. Thus the IDDP scheme should provide for setting up of bull-rearing farms or the scheme should have the provision for subsidising the rearing of bull calves. The hill areas like Sikkim offer the scope for crossbreeding with exotic breeds. The IDDP scheme should therefore contain the provision for establishing exotic breeding farm for supplying bulls for the development of hill cattle. So far the shortage of bulls is being met up by bringing in high-yielding animals from other areas, which are in many cases found not suitable in the selected region. **(Attn: Department of Animal Husbandry, Livestock, Fisheries and Veterinary Services, Government of Sikkim)**

The organizational set-up under IDDP combines production, procurement, processing and marketing all within one structure. However as far as the impact of the project is concerned, relatively low prices are paid to the milk producers than the prices received by the society from the milk union and the market price. Obviously due to lower sale price of milk, the producers did not have incentives to increase milk production by better breeding, feeding and management of animals. The programme implementation thus involves a sort of imbalance in putting emphasis on processing and marketing vis-à-vis production technology. Dairy processing and marketing have to be given higher priority over dairy production technology for sustained

development of dairy activity. In other words, milk prices should be treated as an instrument for promoting dairy activity while providing subsidized inputs and services as incentives for enhancing milk production. The dairy co-operatives should play proactive role in setting producer prices of milk at levels competitive in the market. **(Attn: Joint Director, Department of Animal Husbandry, Livestock, Fisheries and Veterinary Services, Government of Sikkim)**

The pattern of organization of dairy co-operative Societies at the village level would need modification. It is observed that the size of the societies is small and on account of paucity of funds, the society is unable to undertake investment in equipment for chilling. The milk collection centers organized under IDDP, collect milk in the morning, while extra milk available during other part of the day produced by the milk producers is not procured in the absence of chilling equipments available with the society. Therefore societies need to be equipped with adequate fund for making investment in purchasing chilling equipment. **(Attn: Joint Director, Department of Animal Husbandry, Livestock, Fisheries and Veterinary Services, Government of Sikkim).**

The IDDP model of dairy development is based on crossbred milch animals, fed with grains, oilcake, balanced cattle feed with some amount of supplementary feeding of green fodder. In the selected area of the state of Sikkim, feed requirements of milch animals are partly met through collecting grass from the forest supplemented with some amount of green fodder cultivated in the field. Given the poor agricultural land base, the scope for growing green fodder in the field is limited. Moreover production of milk with the by-products from the agriculture sector is also limited. In the area, so long as maintenance of dairy activity competed minimally with the resources used for human food production, it would be able to maintain a balance with the carrying capacity of the available natural resources. Otherwise, it could lead to ecological degradation. This should be kept in mind while formulating dairy development plans in the study area. In the direction of minimizing the natural resource use for dairying, efforts should be undertaken to bring down the surplus or un-productive cattle population in the selected area to the level as low as possible. **(Attn:1. Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India, New Delhi, 2. Department of Animal Husbandry, Livestock, Fisheries and Veterinary Services, Government of Sikkim).**

As demonstrated by the results of regression exercises, feed input is the only factor affecting milk production common to both indigenous and crossbred cows having larger positive response of milk production to feed input for cross breed cows.

Crossbred animals need quality feed if their potentials is to be fully utilized. Accordingly, the targeted beneficiaries should have access to adequate quality feed and fodder supplies for their milch animals throughout the year. Due to hilly topography, the state of Sikkim experiences shortage of feed and fodder resources. Therefore, more stress should be laid on developing feed and fodder resources under the project. The state of Sikkim being entirely mountainous with a large forest cover (79.57 per cent of total area) possess immense potential for developing forest-based fodder resources rather than growing fodder on cultivated plots. The forest resource base endowed with fodder yielding plants would be instrumental for dairy development, which would make possible to increase fodder production without encroaching on any cultivated area specifically for feed production. It would be more promising for smallholder dairy farming system prevailing in the selected region. This calls for management of natural resource base available in the selected region with emphasis on planting fodder trees. Shortage of feed and fodder could partly be met through setting up fodder banks in suitable areas where the available grass production will be harvested and conserved. **(Attn:1. Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India, New Delhi, 2. Department of Animal Husbandry, Livestock, Fisheries and Veterinary Services, Government of Sikkim).**

Finally, the focus of dairy development should be shifted from its role as a source of supplementary income to a more contributing one. For this, the state government should make larger allocation of resources in the state budget towards the development of dairy farming in the region. **(Attn: Department of Animal Husbandry, Livestock, Fisheries and Veterinary Services, Government of Sikkim).**

To conclude, one could say that despite having certain limitations in the programme of IDDP, the programme by and large has had a positive impact on milk production, ensuring the year-round dependable market for produced milk, generation of income and employment resulting in socio-economic development of the people in the study area. The calculated accrued benefits from the programme exceeded the total cost creating a strong foundation for future growth and development of dairy activity in the region. The infrastructure so painstakingly created under the programme in the field of procurement, processing and marketing together with providing assured prices to the producer have all contributed to the changing dairy scenario to give momentum to dairy development in the selected region of the state of Sikkim.

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