

CHAPTER VI

ECONOMICS OF LIVESTOCK PRODUCTION IN NORTH SIKKIM

6.1 Introduction.

Livestock rearing is an age old and integral part of India's rural economy. Agriculture and livestock go side by side and are deemed as the most dominant features of rural India which provide substantial employment to millions of our rural population. Thus there is an immense significance of livestock in India's rural economy. The various livestock products such as meat, milk, skins, wool, pashmina hairs and bones etc. carry high economic values and contribute substantially to national income. Animal by-products of various kinds such as offals and blood obtained from animal, dung and urine etc. do also possess high commercial values thereby adding to gross national product. Livestock accounts for as much as 10 percent of our Gross National Product (GNP), the cash equivalent being approximately Rs. 15,000 crores or more²⁹. As far as the details of the contributions of livestock to the national income are concerned, it has also been found out that cattle and buffaloes being the most important components of the total livestock contribute significantly to the gross National Product, the share of which stands at a staggering 80 percent of the total livestock products in the country. The rest of the livestock that contribute about 20 percent to the GNP include mostly poultry birds, sheep and goats and other livestock. The energy component of the livestock in the form of dung as a source of fuel and draught power derived from cattle and buffaloes is a very significant contribution to various agricultural operations in the rural areas of the country. It has been worked out that 193 millions of cattle population in the country produce as much as 37,000 mega

²⁹ Anonymous. Processing and Marketing of Meat, Milk and Milk product. Paper presented at (Conference of State Ministers of Animal Husbandry and Dairying. Department of Agriculture and cooperation and Indian Council of Agricultural Research, New Delhi, November 27-28, 1986. p 114 - 118).

watts of power for agricultural production³⁰. The overall draught power is assessed at Rs. 5000 crores.

6.2. Organization & Characteristics of Sikkimese Economy: A Historical Profile.

As the present chapter deals with the economics of livestock rearing and production in North Sikkim, it will be pertinent to draw up a brief history of Sikkimese economy in general and its rural economy in particular prior to going into the details of the study. As far as the past economic scenario of the state is concerned, there is hardly any written document that exists to date. Therefore, very little is known regarding the past economic scenario of this tiny Himalayan state. In view of a typical geographical setting in the Himalayas though pastoralism has historically been an element of Sikkim's rural economy and domestication and rearing of animals are the primordial occupation of the people nevertheless, its economic organization at different time period is found to be characteristically different which could well be split up into distinct phases while drawing up a brief historical profile of Sikkimese economy. The various aspects under review thus, incorporate the history of Sikkimese economy, the Sikkimese economy in transition, the economic scenario of the state prior to its merger with Indian union, the present status of livestock economy in Sikkim in general, the details of fund allocation under different plans and the physical achievements under State Animal Husbandry sector during 1954 to 1974, the post merger economic scene, the subsequent fund allocation and the role of animal Husbandry in the economic development of the state and finally the contribution of animal Husbandry sector to the State's gross income. The economic history of Sikkim could therefore be divided into five distinct periods which incorporate the periods of the Lepchas, the Bhutias, the British and

30. Bhat P.N. An overview of cattle productivity paper presented at (National Symposium on Animal productivity. Hindustan Lever Research Foundation. Bombay, April 17-18, 1987. p. 19-20).

the Indian protectorate and lastly the period starting from Sikkim's merger with Indian Union to become the 22nd State until now.

There is no definite account of the Lepchas of Sikkim in earlier writings except that Lepcha society was semi-nomadic and tribal in character due to the primitive mode of acquisition of food.³¹ The domestic animals played an important role in the lives of the Lepchas. The animals especially oxen were killed during socio-religious celebrations of birth, marriage and death and were sacrificed in almost all the religious ceremonies of the community known as "mun". The cattles were considered as the chief sign of wealth and a person with 20 herds of cattles was considered a rich man³². Thus, their main food consisted of domesticated as well as wild animals that they could kill or find dead. They also ate a great variety of forest produce chiefly tubers of different wild yams and various bamboo shoots and nettle leaves etc. During this period the inevitable rule of the Lepcha economy was from each according to his ability, to each according to his work. The Lepcha period ended in 1642 and there was no change in the social set up till then.

From the year 1642 Bhutias started coming in and they brought with them the Tibetan ideas and customs. They introduced feudal society with a monarch as its head and the land was the main pillar of socio-economic structure. It is interesting to note that the Tibetans brought with them the domestic animals like yaks, sheep, pashmina type of goats which became sources of food and woollen clothing for the people living in high altitudes. The agricultural production during this period was quite meagre and thus, there was no significant change in the economy of Sikkim till the year 1889.

31. Debnath J.C. Evaluation of the Sikkimese Economy during the British period. *Indian Journal of Hill Economy*. Vol2 1992, p. 20-37.

32. Gorger, G. *The Lepchas of Sikkim*. New Delhi, Cultural Publishing House, 1984. p.83-111

Sikkim's economy began after the establishment of British control after 1889³¹. Proper taxation, revenue and budgetary systems were established subsequently. This helped the State in improving communication system which greatly contributed to the Indo-Tibetan trade in later years. The concept of private property evolved in the process thus sowing the seed of capitalist elements. Gradually the introduction of Indian rupee started modernising the economy in Sikkim. Side by side, there was the existence of primitive media of exchange like pigs, hens and other livestock. Another major event which changed the Sikkimese economy was the influx of Nepalis in 19th century. "Sikkim's economy during British period can thus be termed as a feudal economy with increasing capitalist elements". The British control over Sikkim came to an end in 1947³¹.

The Indian government after signing the Indo-Sikkim Treaty of 1950 started taking interest towards the development of Sikkim and following the visit of Late shree Jawaharlal Nehru the then Prime Minister of India in April 1952, the First Seven-year Development plan of Sikkim (1954-60) was introduced under the chairmanship of Chogyal Late Palden Thondup Namgyal. It was he who laid the foundation of Development plans of Sikkim. Prior to first plan there was no organized effort to develop animal husbandry scheme in the State though the state enjoys all appropriate natural conditions and has enormous potentiality/scope for developing such a promising and economically viable sector as has already been pointed out. The details of fund allocation under different plans and the physical achievements under Animal Husbandry sector are given in the next page.

31. Debnath J.C. Evaluation of the Sikkimese Economy during the British period. Indian Journal of Hill Economy. Vol2 1992, p. 20-37.

Details of plan	Fund allocation (Rs.)	physical achievement
1st plan (1954-61)	2.90 lakhs	<p>Tadong livestock farm was established and 16 Australian Jereys alongwith 6 nos. of large white yorkshire pigs were introduced.</p> <p>Poultry section was started with the introduction of exotic breed like Rhode Island Red and white leg horn to produce chicks for improving the local stock</p> <p>A Veterinary Hospital at Deorali and a dispensary at Namchi was opened to look after the health of animals.</p>
2nd plan (1961-66)	24.00 lakhs	<p>Cattle strength at Tadong farm was increased to 35 cows and Landrace pig breed was introduced. The poultry section was improved with a breeding cum rearing shed and incubators were installed. The strength of the veterinary hospital at Deorali was further expanded by adding a reserach cell for disease investigation. Pure Jersey and Sindhi bulls were distributed to the progressive dairy farmer for breeding. A sheep breeding. Farm was started at Dentam.</p>

3rd plan (1966-71)	18.80 lakhs	The third plan period carried on the schemes of the second plan without much difference.
4th plan (1971-76)	31.00 lakhs	The Tadong livestock farm was further expanded.

Source: Compiled by self from Annual plan of A.H. & V.S. Department.
Government of Sikkim.

After the creation of a separate Department of Animal Husbandry and Veterinary services in 1974, various scientifically based livestock production schemes were launched to suit the peculiar agro-climatic conditions, geographical profile, cultural traditions and the food habits of people of the region. The basic aim was largely to encourage the farmers to take up these schemes as sources of their livelihood. The financial and physical targets achieved during Vth, VIth, VIIth, and VIIIth Five year plan periods are given in the next page.

A. Financial Target and Achievements. (Rs. in lakhs).

Animal Husbandry	Dairy Dev. & Vety. Services.	Dairy Dev	Total
1. Vth Five year plan (1976-80) Actual.	235.54	27.81	263.35
2. VIth Five year plan (1985-90) Actual.	511.46	87.10	598.56
3. VIIth Five year plan 1980-90 Actual.	878.16	96.71	974.87
4. VIIIth Five year plan 1992-1997 Target.	1200.00	150.00	1350.00

Period from 1990 to 1992 was treated as rolling or plan holiday period.

B. Physical Target and Achievement in important sectors only.

SI. No.	Five year plans.	Milk production (in tons)	Egg production (in millions)	wool production (in Lakh kgs.)
1.	Vth Five year plan (1976-80)Actual.	10.95	1.25	0.23
2.	VIth Five year plan (1985-90) Actual.	19.00	3.50	0.26
3.	VIIth Five year plan 1980-90 Actual.	27.00	12.00	0.30
4.	VIIIth Five year plan 1992-1997 Target.	35.00	18.00	0.36

Source: Department of A.H. & V.S. Department. Government of Sikkim. 1994.

As indicated earlier, with the creation of an independent Animal Husbandry and Veterinary services Department in 1974 a number of livestock farms and veterinary hospitals were established. Primary importance was given to the animal health sector which was complementary to the extension wings like the development of cattle, poultry piggery, sheep and goat and other livestock on one hand and the development of feed, fodder and dairy on the other. In addition, the department is running a training centre for stockman, a disease investigation laboratory and a feed analysis laboratory. Today the staff consists of 72 gazetted officers, 156 para-veterinarians and 246 other supporting staff. Presently animal Husbandry and Veterinary services department avails the following infrastructure.

Table 6.1
Details of Animal Health Centres in North Sikkim.

INSTITUTIONS	All Sikkim (Hospital)	North Sikkim
Veterinary institutions.	11	3
Dispensaries	25	6
Stockman Centre	55	6
Livestock Farms	9	2
Disease Check posts	4	nil

Source: Prepared by self

Thus Animal Husbandry and Veterinary services department is well established in the State.

6.3. Contribution of animal husbandry sector to state's gross income.

The survey report on the state's income conducted by the Bureau of Economics of Sikkim reveals that the relative share of the primary sector in real terms comprising agriculture and its allied activities i.e. Animal Husbandry, Forestry, Fishery and Mines and Geology, accounts for 51.60 percent of the total net domestic product of the state during 1980-81 and it has increased upto 53.44 per cent during 1982-83. However, the contribution of livestock to the NDSP started declining from 1983-84 and reached 50.96 per cent during 1986-87. The trend and share of contribution of the agriculture and allied sector to NDSP from 1987-88 onwards and the share of contribution of Animal Husbandry alone to the NDSP are presented in Table 6.6. As regards the contribution of the Animal Husbandry sector to the

NDSP, the share was 9.18 percent in 1988-89 which has declined to 4.73 per cent in 1991-92 over a period of 3 years.

Table 6.2

Contribution of Total Agriculture sector vis-a-vis the Animal Husbandry sector to the State's Income

Year	Current Price	
	Total Agriculture sector (% share)	Animal Husbandry sector alone (% share)
1987-88	49.80	5.81
1988-89	48.80	9.18
1989-90	49.70	6.99
1990-91	46.51	5.88
1992-92	45.26	4.73

Source: Sikkim State Bureau of Economics and Statistics. 1993.

It will be seen from Table 6.2 that the decline in the share of contribution of Animal Husbandry to states income has been 2.19 per cent during 1988-89 to 1989-90, 1.11 per cent during 1989-90 to 1990-91 and 1.15 per cent during 1990-91 to 1991-92. However, there is no separate figure available for North sikkim. It could be inferred from the above Table that there is a declining trend in the contribution of income derived from Animal Husbandry to the total income of agricultural sector in a period of 3 years. The economic census conducted by the State Bureau of Economics and Statistics in 1990 revealed that the number of identified enterprises (agricultural and non-agricultural taken together) was 10686 employing as many as 47296 persons. Of these, agricultural enterprises are in account for

numbers which 689 or 6.45 percent of the total enterprises. On the employment side, agricultural enterprises employ 2587 persons or 4 percent of total employed in all enterprises. The distribution of enterprises and employment in agriculture and non-agricultural sectors in North Sikkim is presented in Table 6.3.

Table 6.3

Enterprises and employment in North Sikkim

Enterprises			Employment		
Agricultural	Non-Agricultural	Total	Agricultural	Non-Agricultural	Total
25	856	875	29	3262	3291

Source: Economic Census Report Vol.I Bureau of Economics and Statistics, Govt. of Sikkim, 1990.

Thus out of the total 689 agricultural enterprises, 25 numbers or 3.63 per cent are found in north sikkim. As far as employment scenario is concerned, out of 1927 persons 29 (i.e. 1.50 percent) are employed in North Sikkim.

The total agricultural enterprises and employment in terms of percentage in the State are presented in Table 6.4.

Table 6.4
Distribution of enterprises at three digit level of National Industrial
Classification.

Industrial Group	Description	Percentage share of total Enterprises (%)	Agricultural Enterprises Employment (%)
020	Cattle breeding, rearing production of milk	75.62	63.07
039	Agricultural Services	10.01	19.88
058	Forestry & logging	5.08	3.60 and 059

Source: Report on Economic Census, Vol. I Bureau of Economics & Statistics Govt. of sikkim.1990.

Table 6.4 indicates that as much as 75.62 percent of total agricultural enterprises are found in Animal Husbandry sector i.e. in cattle breeding rearing and production of milk. The districtwise data relating to the contribution of Animal Husbandry to the total agricultural sector in terms of percentages are not available. As far as the generation of employment is concerned, animal husbandry employs a substantial percentage of the total employment in agriculture and animal husbandry together the percentage being 63.07 percent.

Keeping the above discourses in view, the objective of the present Chapter is to throw light on the economics of livestock farming in North Sikkim which is traditionally known for its age old pastoral economy.

The first part of the chapter deals primarily with the economics of livestock production in India with special emphasis on their productivity and growth pattern and the contri-

bution of the same to the national income. The second part, while highlighting the significance of livestock in the economy of North Sikkim discusses the economics of livestock farming in the region. The analysis is based on data and information procured during field investigation in the area under study. The last part of the Chapter, being the concluding remarks however, emphasises the ways and means in stepping up the livestock production in this formidable hill region in a commercial scale.

As has been said earlier the data and information for the present study have been procured both from primary and secondary sources. The data so procured have been analysed with the help of small statistical tables.

6.4. ECONOMICS OF LIVESTOCK PRODUCTION IN INDIA

6.4.1. Productivity of Indian Livestocks.

India has about 14 per cent of world's cattle and 50 percent of world's buffalo population. In terms of global milk production, buffaloes and cattles have special significance which contribute as much as 65 percent and 3.16 per cent respectively to the total world milk production. An extensive crossbreeding programme in dairy cattle with exotic semen has been lauched by the National Dairy Research Institute Karnal through All India Co-ordinated Research Project (AICRP), Indo-swiss and Indo-Danish Projects, Military dairy Farms and other Re-search Institutes. The results indicate that out of the exotic breed namely, Friesian, Brown Swiss and Jersey etc. the Friesian Crosses give the best results irrespective of indigenous breed and the prevailing agro-climatic conditions. In addition, the National Dairy Research Institute (Karnal) has produced two breeds of cattle

namely "Karen Swiss" and "Karen Fries" which give 3,200 litres and 3500 litres of milk per lactation respectively. As compared to the aforesaid cow varieties, the indigenous milch cow called Sahiwal gives an appreciable quantity of milk that amounts to as much as 1,600 litres per lactation. The work carried out by the Kerala Livesock Development and Milk Marketing Board under the Indo-Swiss project has been assessed by N. D. R. I, Karnal 1975. The results of the survey undertaken by National Dairy Research Institute, Karnal (1975) in Kerala on the performance of the Brown-Swiss crossbred cows vis-a-vis the indigenous local Keralean cows under field conditions has been shown in Table 6.5.

Table 6.5

Performance of Brown swiss and Indigenous Cross Cows of Kerala

SI.No.	Economic Trait	Brown Swiss Crossbred cow	Indigenous cow
1.	Age at first calving	31 months	54 months
2.	Calving interval	466 days	542 days
3.	Lactation yield	1727 litres	600 litres
4.	Production cost per litre of milk	Rs. 1.26	Rs. 2.38

Source: Indo-swiss project, Kerala (1984).

A glance at Table 6.5 reveals that the crossbred Brown-Swiss cow is more economical than that of the local cow. It not only calves at a young age of 31 months, but calving interval is also shorter than that of the local cows. It may thus be noted that the calving intervals for crossbred Brown Swiss cow and the local cows in terms of days are 466 and 542 days respectively. Moreover, the milk yield per lactation is found to be more

than that of local cows. At the same time, the unit cost of production per litre of milk in case of the former is almost 50 percent less than the latter. Under similar conditions elsewhere in the country, particularly where the environment is congenial the cross breeding results well indicate that the Holstein-Friesian crosses, perform the best, followed by Brown Swiss/ Red Dane and Jersey Crosses. A comparative statement of performances of exotic, superior Indian cows, crossbred cows and buffaloes etc. is presented in Table 6.6

Table 6.6

Performances of Exotic Superior, Indigenous and Crossbred Cows and Buffaloes.

SI.No.	parameter	Exotic (Holstein)	Native (Sahiwal)	Crossbred Cows	Murrah Buffaloes
1.	Age at first calving (months)	30	40	29	41
2.	First lactation milk production (Ltr.)	3,900	1,800	2,900	1,744
3.	Cost of milk production per litre (Rs.)	1.60	1.95	1.26	1.49

Source : Chatterjee, A.K. & Acharya, R.M.³³

It will be seen from Table 6.6 that the crossbred cows not only calve at an early age of 29 months, but its milk yield in first lactation is over one and half times more than superior Indian

33. Chatterjee A.K. and Acharya R.M. Heading 21st Century. In (Gupta P.R. and Mathur, R.K. eds Dairy India 1992 Delhi. Devararsons Stylish Press, 1992. p. 4-24.

not only calve at an early age of 29 months, but its milk yield in first lactation is over one and half times more than superior Indian Sahiwal milch breed cow and Murrah buffaloes. The cost of milk production per litre of milk is also found to be relatively less in case of crossbred cows than the other varieties such as exotic Holstein and native Sahiwal etc.

The above findings indicate that since the performance of the crossbred cows is relatively better than that of the other varieties, the cross breeding programme with exotic animal can successfully improve the genetic breed of the milch cattles in the prevailing agro-climatic conditions of the region. The adoption of such scientific innovations can thus enhance the prospects of milk production in the region thereby improving the economic conditions of the rural farmers. As for as sheep and wool development programme is concerned the Central Sheep and Wool Research Institute has, however developed breeds known as "Avikalin" for superior carpet manufacturing with annual wool production of 2 kg. and "Avivastra" for apparel wool with annual greasy wool production of 2.5 kg. The all India Coordinated Research Project on sheep breeding has also developed breeds capable of producing 30 kgs. live weight at six months of age. In so far as goats are concerned, the National Dairy Research Institute, Karnal has developed a goat breed that is capable of yielding as high as 300 litres of milk per lactation. These findings in the field of livestock breeding indicate that the tremendous economic potential livestock farming possesses in India through the genetic improvement of indigenous livestock breeds needs further research and investigation in a broader perspective. This would help the country dispose off the unproductive lots of livestock within a specified time frame. As per the survey carried out by Prasad (1990) it has been found that India possesses about 100 million do-

mestic animals with an annual maintenance cost of Rs. 1,800 crores and out of these only a meagre 16 million breedable cows will be required to yield an estimated 6.5 million metric tonnes (MMT) of milk by the turn of the century³⁰.

6.4.2. Economics of Livestock Production.

Before setting up a livestock farm, at the very outset, a proper assesment of the techno-economic feasibility survey of the project is deemed very essential. As livestock products are highly perishable, the backward and forward linkages for the supply of input services and marketing etc. have to be established on priority basis. A study conducted by All India coordinated Project on Economics of milk production under Intensive Dairy farming conditions (1972-1976) found that under Indian conditions, mixed farming system consisting of various components such as forage, milk and cash crop productions has to be recommended to the farmers instead of Dairy farming alone. Under Intensive dairy farming system, Indias milk production thus began to rise after 1970. By crossing almost 30 million tonnes mark in 1980 it reached as high as 57.7 million tonnes in 1991 with the development of chilling and processing technologies all over the country at the instance of National Dairy Development board under the Operation Flood programmes.

A number od dairy activities have thus emerged as commercial ventures all over the country. These include high producing cattles and buffloes under intensive feeding, production of quality animals feed and fodder, animal health care centres and so on. Work carried out in Bangalore for the past 11 years to compare the profitability of Dairy farming and crop farming has reported that the overall profit is much higher in

30. Bhat P.N. An overview of cattle productivity paper presented at (National Symposium on Animal productivity. Hindustan Lever Research Foundation. Bombay, April 17-18, 1987. p. 19-20).

case of dairy farmer than that of crop husbandry. Table 6.7 presents a comprehensive and comparative picture of the income and profit and loss account of the crop farming and animal farming over a period of 11 years. The study has, however, been undertaken by scientists as referred below.

Table 6.7

Income and profit/loss account from dairy/crop production by four categories of farmers in Bangalore District over 11 years.

Categories of Farmers	Dairy Farming	Crop Farming
Marginal : Income	4,734	2,216
Profit/Less(is Rs.)	196	-1,726
Samall : Income	5,748	3,618
Profit/Loss (in Rs.)	1,702	-181
Medium : Income	8,194	7,160
Profit/Loss (in Rs.)	3,715	-710
Large: Income	11,337	21,255
Profit/Loss (in Rs.)	3,728	6,228
Overall: Income	6,983	6,693
Profit/Loss (in Rs.)	2,226	178

(-) sign signifis loss.

Source: Chatterjee, A.K. & Acharya, R. M.³³

It will be seen from Table 6.3. that crop farming does

33. Chatterjee A.K. and Acarya R.M. Heading 21st Century. In (Gupta P.R. and Mathur, R.K. eds Dairy India 1992 Delhi. Devararsons Stylish Press, 1992. p. 4-24.

not appear to be productive particularly in case of marginal, small and medium farmers. These farmers have not derived any profit from crop farming, rather the loss incurred by them in crop farming varies in terms of rupees between as low as 181 to as high as 1726 for small and marginal farmers respectively. It is thus observed that except large farmers who normally can carry the risks of weather etc. and go in for commercial farming, all other categories of farmers have incurred loss. The reason of such loss may be attributed to the fact that the above categories of farmers have not carried any risk. As capital investment and the introduction of modern innovations are pre requisites to achieve better yield in crop farming, small and marginal farmers do not find such farming as economically viable in view of their socio-economic conditions despite the fact that introduction of modern technology at farm level is neutral to scale. However, the large farmers in view of their social status and better economic conditions have made crop farming a commercial venture and therefore introduction of modern technology has been profitable for them. As far as dairy farming is concerned, the marginal, small and medium farmers have not incurred any significant losses as compared to crop farming. The profit in case of Dairy farming varies between as low as Rs. 196 to as high as Rs. 3728 for marginal and large farmers respectively. As a matter of fact, the income of medium and small farmers also seem to be much better. The income from dairy farming varies between as low as Rs. 4734 /- to as high as Rs. 11,337 /- for marginal and large farmers respectively. The over all profit derived from dairy farming appears to be quite significant when compared with crop farming. Similar kind of studies have also been conducted by the Punjab Agricultural University where satisfactory returns from cow yielding have been obtained, the quantity of milk being 5000 litres per lactation along with a suitable cropping combination i.e. wheat,

rice and sugarcane adopted in the region. The findings have been presented in Table 6.8. Which include returns from dairy and crop farming in terms of rupees per hectare.

Table 6.8
Return from Commercial Crops and Dairy Farming

SI. No.	Type of farming	Return per hectare (in Rs.)
1.	Dairy farming with 5,000 litres per lactation producing cow prices Rs. 2.00 per litre	13,700.00
2.	Using best strain of wheat rice with optimum fertiliser dose	9,600.00
3.	With sugarcane farming	8, 250.00

Source: Annual report, Punjab Agricultural University (1992).

A glance at Table 6.8 shows that dairy farming appears to be almost one and half times more profitable in terms of cash than commercial crop farming where wheat and rice make the best crop combination with optimum fertiliser application as a scientific method. As far as sugarcane farming is concerned, it will be seen from the above table that the return from sugarcane farming amounts to Rs. 8250.00 only per hectare whereas the return from dairy farming is Rs. 13,700.00 per hectare which is more than one and half times the return from sugarcane. It could however be inferred that dairy farming with the introduction of modern technology is more profitable than that of crop farming.

With the encouraging results achieved in milk production by the introduction of frozen semen technology and embryo transfer technology in India, the goal to achieve the production target of 5,000 litre per lactation would not be far away when livestock farming in India would emerge as a full fledged agro-based business like other developed countries such as U.S.A., Australia and New Zealand where livestock farming is considered profitably as the most important commercial enterprise.

6.4.3. Milk Marketing and Processing System.

With a view to providing employment to the rural population and enhancing the production of milk, the National Dairy Development Board was created in 1965 to transfer the spirit of "Anand" from Gujarat to other States of India. The unique system of 'Anand' pattern is that the milk is produced, collected, processed and marketed by the producers themselves. The National Dairy Development Board launched a mammoth Operation Flood project on Anand pattern in 1970 and the third phase of the project is in operation at present. The most significant contribution of the Co-operative dairying is to link the village farmers producing milk to the urban consumers through the National Milk Grid. The milk is collected from the villages, processed and moved to cities in insulated trucks and rail tankers like other developed countries such as U.S.A., Australia and New Zealand etc. The Operation Flood projects over the last two decades, have engaged over 7 million dairy farmers in 60,000 milk producers co-operatives and have earned an income to the tune of Rs.1,200/- crores from dairy sector³⁴. By the end of the third phase of the Operation completed in 1994, it is proposed that over 8 million farm producer families will be engaged in this economic pursuit.³³

33. Chatterjee A.K. and Acarya R.M. Heading 21st Century. In (Gupta P.R. and Mathur, R.K. eds Dairy India 1992 Delhi. Devararsons Stylish Press, 1992. p. 4-24.

34. Patel, A. Twentyfive years of National dairy Developments Board. In (Gupta P.R. and Mathur, R. K. eds. Dairy India 1992 Delhi Devararsons Stylish Press, 1992. p. 49-50.

6.5. ECONOMICS OF LIVESTOCK PRODUCTION IN NORTH SIKKIM.

As has already been said that promotion of livestock carries immense economic significance in the state, it will be meaningful to carry out an empirical investigation concerning the economics of livestock production in the area under study.

North Sikkim being a part of the high Himalayam range enjoys the appropriate geographical conditions for the growth and development of livestock. There is tremendous scope for developing livestock on commercial scales thereby generating both employment and income. As commercial farming has to be economically sound and viable, what needs to be done in North Sikkim is to develop a sound infrastructural base such as improved accountability and terms of adequate transport and communication; institutional development, such as banking and cooperative and so on. Introduction of modern innovation is also another aspect of livestock development programmes in the region. Because crossbreeding programmes as a technological breakthrough has revolutionised the production pattern of livestock in the country. As for instance the crossbred animals i.e. crosses between superior Indian livestock with that of related exotic livestock are found to be not only superior in productivity of such items as milk, meat and wool but also cost effective in terms of production of these items. The cost of production of the said items is supposed to be far lower than that of the indigenous livestock. Thus, as per current statistics livestock accounts for as much as 10 percent of the country's gross national product under the prevailing socio-economic and physical conditions. The main findings in chapter indicate that the technological advancement in livestock sector in this part of Sikkim is still at a very low level. However, if an appropriate strategy for

raising the level of production of livestock in the region is evolved, the prospect of this livestock farming as a commercial venture could be definitely bright in future.

Keeping the above discourse in view, this second part of the chapter is a modest attempt to throw light on the overall economics of livestock farming in North Sikkim. The study is primarily based on field investigations carried out in the area at different points of time. As has already been explained in chapter I the field investigations have been carried out by direct interview with the farmers through structured questionnaires. The principal objectives of the study are as follows:

1. To economically assess the farmers depending on livestock for their sustenance as livestock is their main source of income
2. To ascertain the concentration of such farmers in different eco-logical zones of the area with a view to studying their pattern of distribution..
3. To study the main economic traits of three different livestock i.e. yak, local cattle and crossbred cattle giving milk.
4. To study the relative cost of production of milk of the above animals such as yak, local cattle and crossbred cattle giving milk.
5. To attempt a comparative analysis between livestock farming and agricultural farming in Lachung Valley.
6. To high light the distributional pattern of income and expenditure of the farmers of Dry High Zone in the region as a case study.

6.5.1. Generation and distribution of Income from Livestock farming.

As indicated in chapter I, 25 percent of the total villages and 25 percent of the households in north sikkim were covered to in the household survey at random to determine the impact of livestock farmings on the overall economy of the people of north sikkim. Out of the total 827 households covered in the survey as many as 594 accounting for 71.83 per cent of the total receive income mainly from livestock rearing and the rest i.e. 233 households or 28.17 percent do not receive any income from such economic enterprise (Table 6.9).

Table 6.9

Distribution of households depending on livestock as the main source of income in North Sikkim.

Zone	Households depending on livestock for sustenance		Households not depending on livestock for sustenance		Total.	
	No.	%	No.	%	No.	%
Dry High Zone	30	100	-	-	30	100
Continental Zone	205	85.42	35	14.85	240	100
Subtropical Zone.	359	64.45	198	35.55	557	100
TOTAL	594	71.83	233	28.17	827	100

It will be seen from table 6.9 that as the altitude from subtropical zone to dry High Zone increases the percentage of dependence on livestock farming for economic sustenance of the

people also increases steadily. Thus in the sub-tropical zone as much as 64.45 percent of the farmers depend on livestock for sustenance; as one goes higher up in the continental zone it is found that more than 85 percent of the total household take out their living from livestock farming. Similarly in the Dry High zone the dependence on livestock for economic sustenance of the household is 100 percent.

Distribution of Income.

As far as generation and distribution of income from livestock farming are concerned data and information relating to expenditure incurred on different heads such as rearing of livestock, marketing and sale of livestock products etc. were gathered with the help of structured questionnaires through direct interview with the farmers. The total expenditure on livestock for each household was calculated by adding expenses on different heads such as feed and fodder, medicines, depreciation cost of the animals, rent on area devoted to farming, daily wages of the labours engaged in the farming and so on. Similarly, the total market value of the various products derived from livestock was calculated for each household on annual basis. The total annual income/profit/loss derived from livestock farming was thus worked out by finding out, the difference between the total expenditure and the total market value of the products. Unit cost of production of milk etc. and the unit sale price of the same have also been found out to gain an understanding about the relative profit/loss of the livestock products in north Sikkim.

An analysis of distribution of income of the households thus derived has been presented zonewise. Table 6.10 presents distribution of income from livestock zonewise. For the purpose, arbitrary class intervals of income varying from Rs. 1000 to above

Rs. 10,000/- from livestock farming has been prepared as is shown in table 6.10. The following picture emerges as regards the levels of income of the farm households.

Table 6.10

Distribution of household according to different levels of family income from livestock farming in north sikkim.

Family Income per annum.	Distribution in three zones.						Total No. of household		Level of income
	Dry High Zone		Continental upper Zone		Sub-tropical Zone		No.	%	
	No.	%	No.	%	No.	%			
<Rs. 1000	00	00	14	6.83	64	17.83	78	13.13	Low
Rs. 1001 to Rs. 5000	00	00	50	24.39	168	46.79	218	36.70	moderate
Rs. 5001 to Rs. 10,000	00	00	58	28.29	77	21.45	135	22.73	high
>Rs. 10,001	30	100	83	40.48	50	13.93	163	27.44	very high
TOTAL :	30	100	205	100	359	100	594	100	

It will be seen from table 6.10 that out of 594 from households surveyed covering the three important climatic zones in north Sikkim such as subtropical zone continental zone and dry high zone, a substantial percent age share derive moderate income (Rs.1001-5000) from livestock farming. accounting for as much as 36.70 percent of the total households followed by house-

holds having very high (10,001) and high income (5001 to 10,000). These households account for 27.44 percent and 22.73 percent respectively. However, as low as 13.13 percent of the households receive low income from livestock rearing. These households earn income from livestock farming which is below Rs. 1000 per annum. Keeping the above distributional pattern of income among the farm households in north Sikkim in view, it will be interesting to throw light on the zonewise distribution of income among the households.

1. Dry High Zone.

In the dry high zone of Lhonak, Muguthang and Chho-Lhamo region, all the 30 households surveyed depend exclusively on livestock for their livelihood and receive income invariably above Rs. 10,000/- per annum.

2. Continental Upper zone.

Out of the 205 households having livestock farming in this zone 122 are from Lachen and 83 from Lachung. As far as Lachen is concerned all the households depend on livestock for sustenance. The entire area is rugged and steep, hence there is hardly any flat land available for cultivation. The major source of income of the inhabitants is livestock. It will be seen from table 6.10 that the percentage of farmers earning income between Rs. 100/- to Rs. 5000/- accounts for 24.39%. Similarly the share of farmers receiving income between Rs. 5000/- and Rs. 10,000/- stands at as much as 28.29%. It is interesting to note that a large number of farm households earn income normally above Rs. 10,000/-. These farmers constitute of as much as 40.48% of the total households.

In Lachung area such farm scenario appears to be somewhat different. Out of the 118 households surveyed, 35 households or 29.66% were not found to be depending on livestock for their economic sustenance. It will therefore be worthwhile to discuss the distribution pattern of income of the rest 83 households with reference to the above arbitrary class interval of income in rupees. The following table presents the distribution of income from livestock in Lachung area. It will be seen from table that as much as 11.86 percent of the households receive income i.e less than Rs. 1000/-. The proportions of households receiving income ranging between Rs. 1000/- to Rs. 5000/-, Rs. 5000/- to Rs. 10,000/- and above Rs. 10000/- are 27.97%, 21.19% and 9.32% percent respectively. It is quite interesting to note that in this area as the range of income keeps increasing the corresponding share of households in terms of percentage decreases. Meaning thereby relatively less number of households have high income from livestock. A substantial share of households have only moderate farm income from livestock [27.97%]. The annual income ranges between Rs. 1000/- to 5000/-. It could be largely be attributed to the fact that as compared to Lachen, Lachung is relatively less undulating and flat. Therefore cultivation of off season vegetables namely cabbage and potatoes etc. are very popular in this area and hence people are found to be more dependent on agriculture farming than livestock farming. As a matter fact, agriculture and livestock go hand in hand in this particular area.

3. Sub-tropical Humid zone.

In the sub-tropical humid zone as many as 13 villages covering 557 households were surveyed. And it was found that as many as 198 households accounting for as much as 35.55 percent receive no income from livestock. Relatively higher concentra-

tion of households receiving no income from livestock are from village kazor, Ramthang, Gnon-Samdong and Singhik, the percentages being 73.19, 73.68, 56.25 and 55.93 respectively. However, all the 44 households surveyed at Mangan receive income from livestock farming only.

A glance at table 6.10 and Appendix X reveals that the share of households receiving income below Rs. 1000/- from livestock farm constitutes of as much as 17.83 percent of the total. Maximum farm households are from Chungthang accounting for 27.78 percent of the total followed by Kabi with 24.10 percent. Thus these households could be termed as having low income from livestock. Similarly, the households receiving income in the range of Rs. 1000/- to 5000/- are 168 in number and from 30.16% of the total. The highest number of farmers are however, from Tingda and Naga Namgor villages. Therefore, the level of income for these households could be termed as moderate. Then comes the range of income varying between Rs. 5000 to Rs. 10,000. As many as 77 households accounting for percent of the total fall in this category. Relatively higher percentages of farm households are from village Pak shep followed by Kabi. So the households earning income between Rs. 5000% to Rs. 10,000% could be termed as high income group farmers. As far as the highest category of income ie. Rs. 10,000above is concerned, there are as many as 50 households accounting for percent of the total. It is further observed that maximum number of households in this income bracketed are from Mangan accounting for 68.18% of the total. This is followed by Singhik from where 13.56 percent of the households have been interviewed. From the above analysis it could be inferred that the low percentage of the farmers depending on livestock farming for their economic sustenance in this zone could be mainly attributed to the fact that a relatively higher propor-

diverted for growing cereal crops like paddy, maize and millet etc. and also for growing high value cash crops like cardamom and ginger etc. from which the cash return is always high. It has been thus estimated that more than 50 percent of the cultivable land is under cardamom farming in North Sikkim. The livestock in this zone are there fore mainly reared for supplementing family income by selling the products and also for supplying manure & bullock power etc.

6.5.2. STUDY OF ECONOMIC TRAITS OF DAIRY ANIMALS IN NORTH SIKKIM.

Ever since the merger of sikkim with India in 1975 measures have been taken and necessary conditions/infrastructures have been developed for diffusion of modern innovations in animal husbandry sector with a view to augmenting animal productivity by introducing such programmes as cross breeding etc. in the north district of the state. The infrastructure so developed in animal husbandry sector in the state therefore consists of mostly bull rearing centres, animal health care centres, a net work of artificial insemination centres and commissioning of five litre liquid nitrogen plant for storing frozen semen that was established in 1987 etc. Such development in crossbreeding programmes have brought in significant changes in cattle breeding practices and have contributed significantly in strengthening the breed composition of cattles in the region. This has been very aptly discussed in Chapter 3, The modern trend of technology in the region indicates that the introduction of cross breeding programme in particular has made significant impact on the overall economy of the region. Thus the farmers are gradually going in for adoption of improved cattle breeding practices.

Keeping the above discourse in view it will be meaningful to examine the economic traits of livestock that are reared for production of milk as such traits have great commercial implications such as achieving higher productivity in milk and milk product etc. which are the direct source of cash return to the farmers. Particularly therefore, milk giving stage is considered as one of the most important selection traits.

The other traits largely incorporate the reproduction capacity of the animals, the growth vitality and disease resistance capacity of the animals and over and above the capacity of the animal to tolerate cold condition.

PROCEDURE.

With a view to determining the economic production traits of the existing livestock in north Sikkim, three different important milk giving livestock have been selected. These animals include yak, local sericow and crossbred cows. Data and information concerning the economic production traits of the animals have been collected during field investigation in the area. With the help of structured questionnaire schedules through direct interview with the farmers the following economic trait parameters have been taken into consideration while interviewing the farmers.

1. Age at Puberty- The earliest age at which a yak or cow is capable of reproduction or the age at first oestrus.
2. Age at first calving.
3. Gestation period -This is the period spanning between the date of successful service and the subsequent calving date.
4. Service period - This is the period that starts from the date of calving and ends at the date of successful service.

5. Lactation Length - This has been calculated as the length of time starting from the date of calving till the date of drying.
6. Dry Period - This is the period between the date of drying and the subsequent date of calving.
7. Calving Interval - This is the duration between two successive calvings.
8. Number of days taken to reach peak yield.
9. Total milk yield per lactation.

Based on survey data, the above parameters of yak, local cow and crossbred Jersey cows have been assessed and estimated. The findings are as follows.

RESULTS.

1. Economic Traits of yaks.

The economic traits of yaks that largely incorporate the age of maturity or puberty, age at first calving, service period, lactation length, dry period, calving interval, number of days taken to reach peak yield, total milk yield per lactation, hair yield, life span and climatic adaptation of yaks have been presented in Table 6.11

Table 6.11

Economic traits of yak under local rearing condition in north Sikkim.

SI. No.	Economic Traits of Yak	Range	Average
1.	Age at Puberty (days)	1095 -1460	1277.5
2.	Age at first calving (days)	1365 -1730	1537.5
3.	Gestation period (days)	260 - 270	265.0
4.	Service period (days)	155 - 450	302.5
5.	Lactation Length (days)	225 -233	229.0
6.	Dry period (days)	235 -300	268.0
7.	Calving interval (days)	450 -720	480.0
8.	No. of days taken to reach peak yield	10 -12	11.0
9.	Total milk yield per lactation (ltrs.)	650 (-) 680	665
10.	Hair yield in (kg.)	0.500 -1.00	0.750
11.	Life Span	16-18	17
12.	Adaptation	High altitude	

It will be seen from the table 6.11 that yak normally reaches the age of puberty within a range varying between 1095 to 1460 days. Therefore it has been calculated that the average number of days taken by the animal to reach puberty are 1277.5 days or three and half years to reach puberty. The average gestation period as has been recorded during the survey spans for 265 days having a range varying between 260 to 270 days. Similarly, gestation period of 260 days have also been recorded for the yaks of Nepal Himalays.³⁵ However, gestation period spanning as long

35. Joshi, D.D., YAK and Chauri Husbandry in Nepal. Tankleswar Tahachal: Kathmandu, K.D. Joshi, 1982. p. 67-83.

as 285(-) 11days for the yaks of east Sikkim ³⁶ and 252 days for Indian yaks in general ³⁷ have been recorded.

SERVICE PERIOD.

The service period i.e. the period from the date of calving to the date of successful service, ranges between 155 days to 450 days i.e. between 5 months to 15 months with an average of ten months. It implies that most of the yaks are conceived after approximately ten months or one year of calving. According to local people, service in the same year is normally avoided owing to two important reasons. First, there is a great scarcity of feed and fodder coupled with environmental problems during winter and second the yaks usually stop giving milk after four months of pregnancy. The oestrus cycle of 21 days with 16 hours oestrus duration has been recorded in yaks of Nepal³⁵ and oestrus cycle of 17 days in yaks of India.³⁷

LACTATION LENGTH.

The lactation length or the period of milk production commences from the date of calving and continues till the date of drying. In North Sikkim, as per the data and information gathered during field survey (Table - 6.11) the average lactation length is found to be of 229 days, with a narrow range varying between 225 to 233 days. The lactation length of 180 days and 171 days have however been recorded in yaks of Nepal and India respectively. From the above, it could be concluded that yaks of sikkim give milk for a longer duration than that of Nepal³⁵ and other parts of India³⁷.

35. Joshi, D.D., YAK and Chauri Husbandry in Nepal. Tankleswar Tahachal: Kathmandu, K.D. Joshi, 1982. p. 67-83.

36. Sinha, S.b. and Bhutea, D.N. Yak breeding in Sikkim Sikkim Veterenary Journal Vol.1(2), 1983. p. 9-11.

37. Narang, M.P. and Deodderi, D. YAK of Manipal

DRY PERIOD.

Dry period is the period starting from the date of drying to subsequent calving. This period usually commences from the date of ceassation of lactation length. It will be seen from table that dry period in yaks of North Sikkim ranges between 235 to 300 days with an average of 268 days or nine and half months.

CALVING INTERVAL.

A glance at table 6.11 reveals that calving interval or the duration between two successive calving in the yaks of north sikkim ranges between 450 days to 720 days with an average of 480 or 16 months. similar calving interval of 14 months and 22.17 months have been recorded in yaks of India³⁷ and Nepal.³⁵

No. of days taken to reach peak yield.

According to data and information gathered from field investigations in verious parts of North Sikkim, it has been found that yaks in the region normally take 10 to 12 days to reach peak yield after calving.

Milk yield per lactation.

It will be observed from table 6.11 that yaks in the study area give milk varying between as much as 650 litres to 680 litres with an average of 665 litres per lactation. Average milk yield as low as 200 litres in Indian yaks ³⁷ and as high as 720 litres in yaks of Nepal³⁵ have been recorded. In North Sikkim milking is done once a day at dawn.

35. Joshi, D.D., YAK and Chauri Husbandry in Nepal. Tankleswar Tahachal: Kathmandu, K.D. Joshi, 1982. p. 67-83.

37. Narang, M.P. and Deoddorj; D. YAK of Mangalia and India Asian Livestock Vol. 15 (2) 1990.p.

HAIR YIELD.

As far as the hair of the animal is concerned, the hair of this animal has immense economic value and fetches good price from the market. It will be seen from table 6.11 that the production of hair per yak per annum ranges between half a kilogram to one kilogram. While interviewing the farmers in the selected village of the study area it has been confirmed that normally two types of hairs are collected from the body of a live yak i.e. the inner fine hair which is locally known as "Khulo" and the long rough hair Known as "Chupa". While the former is normally used for blanket weaving the latter is used for making yak tent and ropes etc.

Economic traits of local and crossbred cows in North Sikkim.

The economic traits which largely include the age at puberty, the age at first calving, gestation period, service period, lactation length, dry period, calving interval, number of days taken to reach peak yield and total milk production per lactation are deemed as the most important indicators achieving higher object far as as the milk giving livestock are concern. Therefore it is felt imperative that the above economic traits of milk giving animals such as cows, and yaks are studied in greater details with special emphasis on the natural habitat of the area and the availability of feed, fodder and other requirements of the animals. For the purpose, field investigations have been conducted in the study area to procure information on the above aspect the data and information so gathered with the help of structured questionnaires through direct interview with the farmers have been processed and analysed. The following table illustrates the economic traits of local and Jersey cross bred cows under local rearing conditions in the area.

Table 6.12

Economic traits of Local and Jersey Crossbred cows under local rearing condition in north Sikkim.

SI. No.	Economic Traits	Local Cow		Crossbred Cow	
		Range	Average	Range	Average
1.	Age at Puberty (days)	870-1470	1170	630-960	795
2.	Age at first calving (days)	1170-1770	1470	930-1290	1110
3.	Gestation period (days)	270-280	275	270-280	275
4.	Service period (days)	105-180	142.5	90-150	120
5.	Lactation length (days)	210-300	255	240-290	265
6.	Dry period (days)	125-210	167.5	60-120	90
7.	Calving interval (days)	335-510	422.5	300-410	355
8.	No. of days taken to reach peak yield	6-7	6.5	10-24	17
9.	Total milk yield per lactation (ltrs.)	850-1100	975	1440-2900	2170

Source : Prepared by self from field data.

AGE AT PUBERTY.

It will be seen from the Table 6.12 that the age at puberty or maturity of local cows ranges between 870 to 1470 days with an average of 1170 days which account for more than to almost three years. Thus the local cows take almost three years to reach the puberty age. However, in case of crossbred cows the age of maturity varies between 630 to 960 days with an average of 795 days which exceed 2 years. The age of puberty is therefore lower by almost one year in case of crossbreds than that of local cows.

AGE AT FIRST CALVING.

The age at first calving in case of local cows ranges between 1170 to 1770 days with an average of 1470 days or 4 years. The average age at first calving in case of crossbred heifers is 1110 days or 3 years. It is concluded that the crossbred heifers produce the first calf at age of 3 years where as the local cows produce the calf at the age of 4 years.

GESTATION PERIOD.

Gestation period as indicated earlier is the period starting from the date of successful service to the subsequent calving date. It is a species specific trait which can neither be influenced by environmental nor nutritional factors. In North Sikkim as per field survey, it is observed that there is no difference in gestation period of local and crossbred cows. The range of such period however, varies between 270 to 280 days with an average duration of 275 days. The gestation period of Sahiwal (Indian indigenous milk cow) has been recorded to be 286 days and that of Holstien Friesian 275 days.³⁸

SERVICE PERIOD.

Service period is the period that extends the date of calving to the date of successful service or conception. The importance of service period in dairy farming is enormous in view of the fact that as most of the economic traits are dependent on this single factor i.e. as to how soon the cow is conceived after calving. It has been found from the field survey (Table 6.12) that the average service periods are 142.5 days and 120 days in local and crossbred cows respectively. The

38. Thomas, C.K. and Sastry, H.R.S. Dairy Farm Management. In (Dai Thomas C.K. and Sastry, N.R.S. Dairy Bovine production. New Delhi. Kalyani publishers, 1991. p. 42-93.

range of period varies between 105 to 180 days in case of local cows and 90 to 150 days in case of crossbred cows. It can be inferred from the above that the local cows normally take longer time to conceive than that of the crossbred cows.

Lactation length.

Lactation length or period is another important economic trait which considerably influences the milk yield. The field survey result presented in Table 6.12 ranges between 210 to 300 days averaging at 255 days or eight and half months. In case of crossbred cows the range is between 240 to 290 days with an average of 265 days or approximately nine months. Thus, as far as this economic trait is concerned crossbred cows are found to be more productive and hence give milk for a longer period than that of local cows. The lactation length as reported in case of pure Jersey is between 287 to 417 days and in case of Indian cow (Tharparkar) the same varies between 274 to 286 days. Similarly lactation length of 9.22 months in local cows and 11.25 months in crossbred cows have been reported in Kerala.³⁹

Dry period.

The unproductive phase of the cattles otherwise called the dry period is the period that usually starts from the date of drying to date of successive calving. Normally a farmer would like to avoid this period which means additional expenditure for feeding and maintenance of the animals. In north Sikkim, the dry period of local cow varies between as many as 125 days to 210 days with an average of 167.5 days or approximately 6 months. However a range varying between 60 to 120 days with an average of 90 days is found in respect of cross-

39. George P.S. and Nair, K.N. Breeding and Economic Traits of milch cattle. In (George P.S. and Nair K.N. eds. Livestock Economy of Kerala. Trivandrum, Centre for development Studies.

bred cows. The above findings indicate that the dry period in case of crossbred cows is shorter by almost 3 months than that of the local cows.

CALVING INTERVAL.

As has been said earlier the calving interval is the duration between two successive calvings. As per the data procured through field investigation the calving interval in local cattle ranges between 335 to 510 days and in crossbred cattle the range is between 300 to 410 days. The average number of days are calculated to be 422.5 or 14 months and 355 or approximately 12 months for local cow and crossbred cows respectively. The duration of calving interval appears to be shorter in case of crossbred cows by about two months than local cows. In the State of Kerala the calving interval of 19.80 months in local cows and 16.89 months in crossbred cows have been reported³⁸. Similarly, calving interval between 439 to 580 days and 392 to 453 days have been reported in indigenous cattle Sahiwal and pure exotic Jersey cows respectively³⁸.

NO OF DAYS TAKEN TO REACH PEAK YIELD.

Number of days taken to reach peak yield is also an important economic trait in dairy animals. It has been found that the local cows normally take 6 to 7 days after calving to reach the peak yield. In case of crossbred animals, the time taken is still longer and the number of days varies between 10 to 24 days.

38. Thomas, C.K. and Sastry, H.R.S. Dairy Bovine Reproduction. New Delhi. Kalyani publishers, 1991. p. 42-93.

TOTAL MILK YIELD PER LACTATION.

It has been mentioned earlier that the total milk yield per lactation is the most important economic trait in a dairy enterprise as it is the direct source of economic return. Hence, profitability of dairy farming is mostly influenced by milk production per cow per lactation. The result of the field survey carried out in north Sikkim which is presented in Table 6.12 reveals that the milk production in crossbred cows ranges between 1440 litres to 2900 litres per lactation, while the milk production of local cows ranges between 850 to 1100 litres. In terms of average production per lactation the figure is 975 litres and 2170 litres for local cow and crossbred cows respectively. In terms of percentage, the yield of crossbred cow is over 220 percent higher than the local cows. Milk yield of 2162 to 2979 kgs. per lactation of Jersey crosses have also been reported³⁸.

From the above analysis it could be said that the milk yield of crossbred cows in north Sikkim are well comparable with all India figures.

6.5.3. ECONOMICS OF LIVESTOCK PRODUCTION.

From the field survey conducted in the study area it has been confirmed that a staggering 71.83 percent of the total farm house holds directly depend on livestock rearing for their economic sustenance while the rest 28.17 percent do not earn any income from livestock raising. Livestock farming is therefore the main source of income of more than 70 percent of the people inhabiting the region. Similarly from the studies on the economic traits of livestock it has been concluded that the animals with exotic blood inheritance are superior not only in production of

38. Thomas, C.K. and Sastry, H.R.S. Dairy Bovine Re-production. New Delhi. Kalyani publishers, 1991. p. 380-396.

milk but their lactation period is also longer. However, dry period and calving intervals of these animals are progressively shorter than the local cattles in the area. As the milk giving livestock such as local and exotic crossbred cows and yaks etc. contribute substantially to the family income of the farmers it will be meaningful to attempt a comparative analysis of the cost of production and the relative profit structure of the above livestock.

Keeping this objective in view it was proposed to carry out a comprehensive study on the economics of setting up of one cow unit of yak, local cow and crossbred cows each and compare the economics of production of the animals in terms of cost of production of milk in particular. The financial aspects thus covered pertain to the capital investment on various heads including cattle and yak sheds and cost of the animals. The recurring expenditures incorporate the fund required to run the day to day affairs of farming i.e. purchase of feed and fodder, labour costs etc. The farm return or income so derived is generally from the sale of products such as milk, milk products, manure and also from the sale of calves. Finally the cost of production of various items has been worked out taking the figures relating to expenditures incurred on different items into account.

Methodology.

As has been discussed in chapter-I, data and informations concerning the expenditure and cash return from livestock farming have been collected with the help of structured questionnaires from the farm households. After selecting the different parameters of cost of milk production, the cost and return in terms of cash have been estimated as follows.

A. CAPITAL INVESTMENT.

As regards the capital investment, it was observed that the farmers generally start their cattle farming on a modest scale in the beginning and then expand their enterprise. The capital investment of such farmers was of two folds i.e. construction of cattle shed and purchase of animals. The zone wise details are given below.

DRY HIGH ZONE AND CONTINENTAL ZONE.

The yaks reared in these two zones are normally not provided with any housing facilities except the young animals which are housed in tents made of yak hair. The cost of these tents ranges between Rs. 9,000 to 11,000 and normally such tent is purchased for a herd of above 10 yaks. An average amount of Rs. 10,000/- has been assumed to be the cost of the tents while embarking on a cost/benefit analysis. The cost of one yak ranges between Rs. 4,000/- to Rs. 6,000/- with an average cost of Rs. 5,000/- per animal.

The cost of one young yak male or female yak varies between Rs. 900 to Rs. 1,100/-. Therefore an average amount of Rs. 1,000/- per calf of five to six months age has been taken into consideration in this present cost analysis.

SUB-TROPICAL ZONE.

As far as the sample households falling under subtropical zone are concerned, it will be observed that the capital investment in the farms is primarily on animal housing and purchase of animals. The cost of cattle housing per animal ranges between Rs. 1300 to 1500 with an average cost of Rs. 1400 per

local animal. However, the cost of housing for a crossbred cow is slightly more than that of the local. The cost of the shed varies between Rs. 1400/- to Rs. 1600. The average cost could thus be estimated at Rs. 1500 per animal. Switching over to the tune of capital investment on the purchase of local and crossbred animals, the prices vary between Rs. 3000 to 5000 and Rs. 8000/- to Rs. 10,000/- for the former and the latter respectively. The average cost of local and crossbred cows particularly Jersey crosses stand at Rs. 4,000/- and Rs. 9000/- respectively. These average figures have however, been taken into consideration for cost analysis here.

B. RECURRING COST/EXPENDITURE.

As the farm expenditures on different heads are a continuous process, there are a number of recurring expenditures which include largely, the feeding costs, labour wages, depreciation cost and interest on capital etc. The details concerning the cost of feed and fodder are presented below.

COST OF FEED AND FODDER.

The animal feeds according to the data collected from the field survey incorporate mainly different types of concentrates whether home grown or purchased from outside. The data on home grown concentrates were tabulated household wise and were valued at the existing market price. The cost of fodder included the cost of hays or dried fodder and green fodder. The following discussion highlights the cost components of fodders.

As has been said earlier in chapter-III the feed and fodder alone constitute between 60 to 70 percent of the cost of production of various livestock products. However, the data

and information collected during field survey in the area reveal that the practice of feeding balance feed to the livestock is not at all adopted by the farmers of North Sikkim and many of the farmers are not even aware of the balance feed. The types of feed ingredients fed to the livestock at different ecozones and their transportation cost could be summarised as follows:

1. Dry High Zone.

In the dry high zone all the feed ingredients are transported from either Lachung or Lachen. Only lactating yaks are fed with concentrates and dry fodder and the rest of the animals are served with salt only. However, during heavy snowfall, the animals are normally given dry fodder. The quantity, the types and rates of the various feed ingredients fed to the livestock are presented in Table 6.13

Table 6.13

Types of feed ingredients, quantity and the relative costs of the feed given to a lactating yak in dry high zone of north Sikkim.

Type of feed ingredients	Total quantity fed per annum in kg.	Proportion of feeding	Rate per quintal (Rs.)	Total cost in Rs.
1. Atta-wheat flour	80	30.78	800	640
2. Maize crushed	80	30.77	00	560
3. Mustard cake	80	30.77	650	520
4. Salt	20	7.68	400	80

As far as the feeding of fodder is concerned it is observed that fodder is given to the lactating yak at the rate of 3 kg. per day only during the winter months i.e. for a period of 4 to 6 months. Similar feeding schedule is also adopted by the farmers of the continental zone. As regards the feeding ingredients of farmers of sub-tropical zone, the main ingredients fed to the cows include maize, crushed mustard cake and salt. The rate per kg. of these feeds works out to be Rs. 5.50. Switching over to the feeding schedule of the livestock in this zone, one can observe the following procedures adopted by the farmers.

The crossbred cows are fed at the rate of 3 kg. of feed per day for 6 months and 2 kg. per day for next 3 months. So the total amount spent on feed could be calculated as follows for one cross bred cow for the whole year ($3 \times 6 \times 30 \times 5.50 + 2 \times 3 \times 30 \times 5.50 = \text{Rs. } 3960$). The local "Seri" cows are given at the rate 1 kg. per day for 6 months per lactation and then the feeding schedule is changed to 0.5 kg. of feed per day for next 2.5 months of lactation. Hence, the total amount spent on feed is ($1 \times 6 \times 30 \times 5.50 + 2.5 \times 0.5 \times 30 \times 5.50 = \text{Rs. } 1196.25$) per annum. In regard to dry fodder, both the animals i.e. crossbreds and local cows are fed with paddy straw during winter for 3 months. The cost of paddy straw is estimated at Rs. 1.50 per kg. The remaining months are fed with crop and jungle mixed dry fodder the value of which is estimated at 0.60 per kg. Hence the cost of dry fodder for crossbreds is Rs. 1215 i.e. ($3 \times 30 \times 5 \times 1.5 + 5 \times 30 \times 5 \times 0.60$). Similarly, for local cow the dry fodder requirement works out to be Rs. 1170 i.e. ($5 \times 30 \times 3 \times 1.5 + 5.5 \times 30 \times 5 \times 0.60$). Green fodder in the sub-tropical zone is fed usually at the rate of 20kg. per animal per day irrespective of breed. The rate per kg. is estimated at Rs. 0.50. The main sources are forest and cultivated lands. The estimated cost of green fodder per crossbred cow is Rs. 2650 i.e. ($20 \times 265 \times 0.50$).

Similarly for local cow the cost of feeding green fodder is Rs. 2550 i.e. $(20 \times 255 \times 0.50)$.

LABOUR COST.

The labour cost was determined on the basis of actual time spent by the labourer looking after the animals and the cost so recorded was worked out on the basis of actual wages paid. In case of animals looked after by the family members, the cost of labour was also determined on the basis of prevalent wage rate paid to the permanent labour. The details are given below:

In the dry high zone and continental zone, the yaks are mostly grazed in the lush alpine pasture and one adult labour usually looks after a group of above 10 yaks. The wages he is paid vary between Rs. 1455 to Rs. 3055 per annum and the average figure taken for consideration in this cost analysis is Rs. 2255/- per annum or Rs. 225.50 per yak per annum.

In the sub-tropical zone, the wages per animal works out to be Rs. 410.85 for local and Rs. 550.42 for crossbred animals.

DEPRECIATION ON ANIMALS.

As far as the depreciation cost on animals is concerned, the same has been calculated with the help of the commonly used method known as straight line method. It is therefore, assumed that the value of an animal appreciates upto the age of 5 years in the proportions i.e. 1; 3; 7 and 10. Thus if an animal is valued at Rs. 500/- at the age of one year, its value in the second, third, fourth and fifth years would be Rs. 1.500/-, Rs. 2,500/-, Rs. 3.500/- and Rs. 5,000/- respectively.

In the above cost analysis depreciation of 12.5 percent on the value of animal has been assumed and the same works out to be Rs. 500/- for local animal and Rs. 1080/- for crossbred animal. As regards interest on the capital investment of animals, the prevalent rate of 12 percent per annum has been assumed.

Depreciation of cattle shed has been calculated on the value of the cattle sheds i.e. at the rate of 2 percent for permanent sheds and 5 percent for temporary sheds.

Interest on capital is charged on the fixed capital assets at the rate of 12 percent per annum. In case of animals giving milk, no interest is charged on the working capital because the farmer derives regular income from the sale of milk.

Miscellaneous cost of 10 percent was charged on the total recurring expenditure to cover the unforeseen expenses.

C. RETURNS.

The returns from the animals surveyed were in terms of quantity of milk, farm yard manures, calves and yak hairs. The following existing sale prices were adopted to work out the total cash returns.

In the dry high zone the yak milk is sold to the army @ Rs. 7/- per litre. In Lachung, the yak milk is sold at the rate of Rs. 8/- per litre. The yak milk yield per lactation has been assumed to be 665 litres. In the sub-tropical zone the milk of both local and crossbred cows is sold at the rate of Rs. 7.50 per litre. Regarding the sale of calf, the assumed value per calf was Rs 1000 for crossbred and Rs. 500/- for local calf. The following analysis highlights the results of the above cost analysis. Concerning the expenditure incurred and cash returns on livestock products.

Most of the farmers especially in the dry high and continental zones are well aware of the cost principles involved in livestock farming i.e. the relationship between cost of production and the receipt of revenue in terms of loss/profit to work out real income. It was also observed that the farmers of the region normally increase their income from livestock farming in two ways i.e. First by increasing production and second by reducing cost of production. The cost here by and large refers to the outlay of fund used in the production of livestock products e.g. milk, meat & eggs etc. In the field study it was initially proposed to cover milk only. While carrying out the field investigation, it was observed that the costs involved at the dairy farming at the initial stage are of two main categories i.e. fixed and recurring costs. Once the farm is established the farmers are more concerned about the income from the farm. Therefore, a modest attempt has been made here to analyse the various costs and cash returns in establishing one unit each of yak, local cattle and crossbred cattle during the production period of one lactation in the study area. The second aspect of the study is to analyse the economics of production of one litre of yak, local and crossbred cow milk. The results of the findings of the above study in case of yak rearing in the dry high zone and the continental zone have been presented in Table 6.14 and 6.15 respectively. The zonewise details of the cost analysis are presented below:

DRY HIGH ZONE:

The following analysis highlights the economics of establishment of one yak unit in terms of expenditures and returns under local condition in dry high zone taking Lhonak and Chho-Lhamo areas in to consideration. Table 6.14 presents the details of expenditure average costs involved and

the cash returns in establishing one unit of yak in the dry high zone of North Sikkim in one lactation period.

Table 6.14

Economics of Establishment of one unit of yak in the dry high zone of North Sikkim in one lactation period.

SI.No.	Details of expenditure	Average cost (in Rs.)
A. CAPITAL INVESTMENT.		
1.	Procurement of yak	5,000
2.	Transportation costs (including labour charges)	400
3.	Cost of Mobile shed for attendant	350
4.	Utensils	75
5.10	percent contingencies	582.50
Total		6,407.50
B. OPERATING COST.		
1.	Dry fodder or hay for 4 months @ of 3 kg. per day @ Rs. 3/- per kg.	1,080.00
2.	Cost of medicines and vaccines supplied free of cost by the Department - say	10.00
3.	Feeding of concentrates-260kg. @ Rs. 6.92	1,799.20
4.	Labour cost.	225.50
5.	Contingencies 10 percent.	311.47
Total		3,426.17

C. RETURNS:

1. Sale of milk - 665 @ Rs. 7/- per ltr.	4,655
2. Sale of calf -1/2 to 1 year old	1,000
3. Sale of yak hair - 0.750 kg.	37.50
<hr/>	
Total	5,692.50
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Net return (Rs. 5,692.50 - 3426.17) = Rs. 2,266.33	
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It will be seen from the Table 6.14 that the initial capital investment to establish one yak unit could be to the tune of Rs. 6,407.50. The operating cost worked out per yak per lactation based on the local management is calculated to be Rs. 3426.17. The return per yak by the sale of milk, calf and yak hair comes out to be Rs. 5,692.50. The milk so produced in the area is normally sold to the army who are stationed in the area and most of the unsold milk is converted into various products like yak, butter, hard and soft cheese and curd etc. The net return per yak works out to be Rs. 2,266.33 per lactation period.

CONTINENTAL ZONE.

In the continental zone the three different types of milk producing animals reared are yak, local siri cow, and cross-bred cows. The details of the cost of production of these animals are enumerated below.

1. Yaks - The economics of establishment of one unit of yak in this zone is almost same as that of the dry high zone except that

the cost of feed is slightly lower. The details of investment and returns are presented in Table 6.15.

Table 6.15

Economics of establishment of one yak unit in the continental zone of North Sikkim in one lactation.

A.	Capital Investment	Investment Cost in (Rs.)
1.	Procurement of yak	5,000
2.	Transportation cost (including labour charges)	400
3.	mobile shed for attendant.	350
4.	Utensils	75
5.	10 percent contingencies	582.50
TOTAL:		Rs. 6,407.50
B. OPERATING COST.		
1.	Dry fodder or hay for 3 months @ 3 kg per day @ Rs. 2 per kg.	540.00
2.	Cost of medicines and vaccine (fee) token amount	10.00
3.	Feeding of concentrates - 260 kg. @ Rs. 6.08 per kg.	1,580.00
4.	Labour cost.	225.50
5.	Contingencies 10%	235.55
TOTAL:		Rs. 2,591.05

C. RETURNS

1. Sale of milk 665 ltrs. @ Rs. 8.00 per ltr.	5,320.00
2. sale of calf (1/2 to 1 year old)	1,000.00
3. sale of yak hair 0.750 kg. @ Rs. 50/ per kg.	37.50
<hr/>	
TOTAL:	Rs. 6,357.50
Net return (6,357.50-2,591.05)	Rs. 3,766.45
<hr/>	

In the continental zone the capital cost involved in establishing one yak unit is estimated to be Rs. 6,407.50 with the recurring expenditure of Rs. 2,591.05 per lactation. The return per yak per lactation on the sale of milk, calf and yak hair is worked out to be Rs. 6,357.50. The net return per yak per lactation is however calculated to be Rs. 3,766.45 (Table 6.15).

SUB-TROPICAL ZONE.

From the economics of establishment of one cow unit of local "seri" cow and crossbred cow in the subtropical zone of North Sikkim in one lactation period, the following picture emerges. Table 6.16 illustrates the economics of establishment of one cow unit.

Table 6.16

Economic for establishment of One Cow Unit of Local Seri and Crossbred cow in the sub-tropical zone of North Sikkim in one lactation period.

A. Capital Investment:	Local Cows (Rs.)	Crossbred Cows (Rs.)
1. Construction of cattle shed		
3.5 sq.m. floor space	1400.00	1500.00
2. Purchase of animal	4000.00	9000.00
TOTAL CAPITAL COST:	5400.00	10500.00
B. Operating cost.		
1. Cost of feed.	1196.25	3960.00
2. Cost of dry fodder	1170.00	1215.00
3. Green fodder @ 20kg. per day. @ Rs. 0.50 per kg.	2550.00	2650.00
4. Imputed value of labour @ Rs. 6/- per day.	410.85	550.42
5. Contingencies 10% insurance etc.	532.71	837.54
TOTAL OPERATING COST:	5859.81	9212.96
C. RETURNS:		
1. Sale of milk	7312.50	16275.00
2. Sale of calf & Manure	555.00	1055.00
TOTAL RETURN:	7867.50	17330.00
NET RETURNS PER ANIMAL:	2007.69	8117.04

In the sub-tropical zone of North Sikkim, almost all the farmers rear cattle i.e. both the "Seri" or local cows and the crossbred cows. The economics of establishing one cow unit of local "Seri" and crossbred cow in this zone in one lactation period has been shown in Table 6.16. From the Table 6.16 it is quite clear that the capital investment in case of local cow is Rs. 5,400/- which is substantially less than that of the crossbred cows for which the capital investment in terms of rupees appears to be almost double i.e. Rs 10,500/-. Similarly, the operating cost of Rs. 5,859.81 in case of local cow is reasonably lower than that of crossbred cows which is Rs. 9,212.96 per lactation. However, total cash return in case of crossbred cow of Rs. 17,330.00 is much higher than that of the local cow which stands at Rs. 7,867.50 only. From the above, it could be inferred that rearing of crossbred cows in the area can always be profitable in terms of cash return in view of the fact that the net return per cross bred cow is substantially higher than that of the local indigenous cows. The cash returns being Rs. 20,000/- and Rs. 8,000/- for the former and the later respectively. On the other hand, the amount of capital investment and other operating costs for both types of animal vary substantially. In regard to local cows, the expenditure incurred on various heads is lower than the exotic varieties. As the return for crossbred animals is always higher, one can say that rearing exotic crossbred animals in the region can not only be economically viable but it can also raise the farm income of the households to a new high. Wide introduction of cross bred cows in the area can help in commercial production of milk and milk products.

6.5.4. Economics of Milk Production.

An attempt has been made in this Chapter to analyse the economics of cost of milk production for yak at different

climatic zones and for two different breeds of cattle i.e. local "Seri" breed and crossbred Jersey breed in north sikkim. The method of analysis of the different parameters of the cost of production is based on the techniques adopted by Joshi (1982) in case of yaks in Nepal and by Sastry et al (1979), Pandey (1980) Sastry and Pal (1982), George and Nair (1990) and Thomas and Sastry (1991) in case of cattle and buffaloes. The category wise cost of milk production and returns per yak in dry high zone and continental zone has been presented in Table 6.17. It will be seen from Table 6.17 that the feed and fodder alone account for a substantial portion of the total expenditure incurred, the percentages being as much as 60.51 percent for dry high zone and 54.03 percent for the continental zone. The second highest amount of expenditure is found to be incurred on the cost of replacement and depreciation followed by the payment of interest on capital investment on animal. If the second and third cost components are combined together then the total expenditure on interest on investment on animal and replacement/depreciation cost of animal comes out to be Rs. 1225 i.e. 25.74 percent for dry high zone and Rs. 1125 i.e. 31.22 percent in the continental zone.

Table 6.17

Category-wise cost of milk production and returns per yak during an intercalving period in North sikkim.

Sl. No.	Particulars of costs and returns.	Yak farming in Dry High Zone Rs.	Percentage to total expenditure	Yak farming in Continental zone Rs.	Percentage to total expenditure
A. EXPENDITURE.					
1.	Present value of animal	5000	-	5000	-

2. Interest on investment on animal	600	12.61	600	15.29
3. Replacement/depreciation cost of animal.	625	13.13	625	15.39
4. Interest and depreciation on fixed assets (yak tent)	120	2.52	120	3.06
5. Imputed value of labour at the rate of Rs. 7/- per man/days	225.50	4.74	225.50	5.75
6. Feed and fodder costs	2879.20	60.51	2120.00	54.03
7. Miscellaneous other costs	308.92	6.49	233.00	5.94
8. Total Expenditure	4758.62	100	3923.50	100
9. Total Expenditure excluding value of labour	4533.12	-	3698.00	
B. RETURNS.				
10. Average milk yield (litres)	665.00	-	665.00	
11. Returns from sale of milk	4655.00	-	5320.00	
12. Value of calf and manure	1000.00	-	1000.00	
13. Sale of yak hair	37.50	-	37.50	
14. Gross returns(10+11+12)	5692.50	-	6357.50	
15. Net returns:				
a. Excluding value of labour labour in total cost.	1159.38	-	2659.50	
b. Including value of labour in total cost.	933.88	-	2424.10	
16. Net cost (7-(11+12))	3721.12	-	2886.00	
17. Net cost per litre of milk	5.60	-	4.34	
18. Net return per litre of milk.	1.40	-	3.66	

As far as gross returns from yaks are concerned the various items include sale of milk, sale of calf and manure and sale of yak hair etc. The total return per yak per lactation comes out to be Rs. 5692.50 in the dry high zone and 6357.50 in the continental zone. The net returns per yak excluding the value of labour in total cost are Rs. 1159.38 and Rs. 2659.50 in the dry high and continental zones. However, if the value of labour in total cost is included the returns per yak are Rs. 933.88 in the dry high zone and Rs. 2434.10 in the continental zone. The cost of production per litre of milk is worked out to be Rs. 5.60 in the dry high zone and Rs. 4.34 in the continental zone. Similarly the net return per litre of milk is Rs. 1.40 in the dry high zone and Rs. 3.66 in the continental zone. The reasons for high cost of production of yak milk in dry high zone as compared to that of the continental zone may be attributed to high transport cost of feed and fodder. The farmers are also not given any transport subsidy by the State government.

The category wise cost of milk production and returns per local Seri cow and crossbred cow in north sikkim is presented in Table 6.18. This table also indicates that the feed and fodder are the major items of expenditure which accounts for Rs. 4916.25 per local cow i.e. 69.02 percent of the total expenditure and Rs. 7825.00 per crossbred cow i.e. 66.08 per cent the total expenditure on recurring cost. Though the rearing cost of the local cow is cheaper by Rs. 4719.23 as compared to the crossbred cows never the less production per crossbred cow is higher by Rs. 9462.50. The net returns per local cow could be Rs. 744.89 (if the cost of labour is included in the total cost) and Rs. 1155.74 (if the cost of the labour is excluded from the total cost). In case of crossbred cow, the return per cow is calculated to be Rs. 6038.58, (if the value of the labour is excluded from the total cost) and Rs. 5488.16 (if

the value of the labour is included in the total cost). Consequently, the cost of production of one litre of milk is worked out to be Rs. 6.74 or nearly Rs. 7/- in case of local cows and Rs. 4.74 or Rs. 5.00 per litre for crossbred cow. The net return per litre of milk is found to be only Rs. 0.76 for local cow and Rs. 2.53 for the crossbred cows. It can thus be concluded that even though the rearing cost of local cows are lower than that of crossbred cows but the returns from the former are not very promising. Despite high rearing cost, the return per crossbred cow is much higher. Similarly, the cost of production of one litre of milk seems to be very high in case of local cow than that of the crossbred cows. But the return per litre of milk is much lower in case of local cow than that of the crossbred cows. From similar studies carried out in Kerala, it was reported that during the lactating period, the cost per litre of milk from crossbred and local cows was Rs. 2.41 and Rs. 3.16/- respectively and with the inclusion of dry period alongwith the lactating period the cost of production of milk thus reported was Rs. 5.24 for local cow and Rs. 3.70 for crossbred cows.⁴⁰

Table 6.18

Category-wise cost of milk production and returns per local Siri and Crossbred cow during an intercalving period in North sikkim.

SI. Particulars of expenditure No. and returns.	Local "Seri" cow in (Rs.)	Percentage to total cost	Crossbred cow in (Rs.)	percentage to total cost
A. Present value of animal	4000.00	-	9000.00	-
1. Interest on investment on animal	480.00	6.74	1080.00	9.12
2. Replacement/depreciation cost of animal.	500.00	7.02	1125.00	9.50
3. Interest and depreciation on fixed assets (yak tent)	168.00	2.36	180.00	1.52
4. Imputed value of labour at the rate of Rs. 7/- per man/days	410.85	5.77	550.42	4.65

40. George, P.S. and Nair, K.N. Livestock Economy of Kerala, Trivandaum. Center for Development Studies. 1990, p. 105-115.

5. Feed and fodder costs	4916.25	69.02	7825.00	66.08
6. Miscellaneous other costs	647.51	9.09	1081.42	9.13
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7. TOTAL COSTS	7122.61	100.00	11841.84	100.00
<hr/>				
8. Total costs excluding value of labour	6711.76	-	11291.42	-
<hr/>				
9. Average milk yield (litres)	975.00	-	2170.00	-
10. Returns from sale of milk	7312.50	-	16275.00	-
11. Value of calf and manure	555.00	-	1055.00	-
12. Gross returns (10+11)	7867.50	-	17330.00	-
13. Net returns:				
a. Excluding value of labour labour in total cost.	1155.74	-	6038.58	-
b. Including value of labour in total cost.	744.89	-	5488.16	-
14. Net cost (7-11)	6567.61	-	10786.84	-
15. Net cost per litre of milk	6.74	-	4.97	-
16. Net return per litre of milk.	0.76	-	2.53	-
<hr/>				

It is important to note that the cost of production of milk depends on a number of factors such as breed of the animal, type of housing and localtion, season and herd size, and stage of lactation etc. Moreover, the sample animals should be sufficient in number and repeated observations over a period of time should be the main criteria. In the current study, as a matter of fact, it was not possible to cover the animals in different stages of lactation and the households were visited only once. Hence, in view of these difficulties the data on cost of production of milk yield should be considered as only indica-

tor of an overall pattern. A more systematic study has to be planned therefore, over a longer period of time. This kind of study, if under taken in future, will help us arrive at a clear picture concerning relative cost benefit out of livestock farming in the area. As regards the market sale price of milk, the same is found to be the highest in North Sikkim with cost per litre ranging between Rs. 7.50 to Rs. 8 per litre. For a comparative analysis the rate of sale price of milk in other states and in the rest of Sikkim is given in Table 6.19.

Table 6.19
Procurement price of hilly milk unions

Name of the Milk Union	Contents	Average Price (4%fat+8.5%SNF)
1. Sikkim Milk union	Fat 65, SNF 40	Rs. 6.18
2. Simla (Himachal Pradesh)	Fat 47, SNF 35	Rs. 5.00
3. Srinagar (J. & K.)	Fat 55, SNF 36	Rs. 5.44
4. Kohima (Nagaland)	Fat 60, SNF 40	Rs. 5.97
5. Himul (West Bengal)	Fat 46, SNF 36	Rs. 4.90

It will be seen from table 6.19 that as far as the procurement price of milk for different milk unions particularly in the hills are concerned, the procurement price for the Sikkim milk Union has been quoted as the highest i.e. Rs. 6.18 per litre. The high procurement price for the milk produced in Sikkim needs further research and investigation as far as the cost components are concerned.

Presently, it seems that the dairy development programme is not well organized in north Sikkim. However, the Central Government has sanctioned an integrated Dairy Development

project for north Sikkim which is being implemented by the State Government. Once the milk processing and chilling plants are established then the milk marketing would be laid on firm footing and the procurement cost might go down.

6.5.5. LIVESTOCK FARMING VERSUS AGRICULTURAL FARMING IN LACHUNG VALLEY : A COMPARATIVE ANALYSIS.

In Lachung valley, the farmers largely depend on mixed farming i.e. livestock raising and agricultural farming. With a view to highlighting the significance of mixed farming in this region it has been appropriately decided to undertake a special study on the productivity of agricultural farming vis-a vis livestock raising. In this study, as many as 142 households were covered by adopting random sampling method in the following five villages.

Villages and number of households covered in the survey

SI. No.	Name of village	No. of household covered
1.	Bichu	45
2.	Singring	13
3.	Thomchi	10
4.	Fokha	21
5.	Sharchok	53
TOTAL:		142

The farmers were personally interviewed and the production of agricultural crops and land holdings etc. were recorded.

It was observed that the land holding or the farm size of the farmers in the area vary between below 1 acre to 5 acres and above. As flat and arable land in the area is inadequate, large farmers generally own about 5 acres of land or more. Keeping the scarcity of arable land in view, the operating land holdings of the farmers have been arbitrarily classified into as many as six categories namely marginal, small, low medium, medium, high medium and large. The informations were collected as per the survey proforma developed for Lachung Valley. The prices taken into consideration for determining the cost of various livestock and agricultural products were as per the existing market rates.

Analysis:

The number of farmers involved in livestock and agricultural farming in the Lachung valley has been presented in Table 6.20. It will be seen from Table 6.20 that only 5 households or 3.52 percent out of 142 depend exclusively on livestock farming whereas 68 households or 47.89 percent of the total depend mostly on agricultural farming for economic sustenance. However, as many as 57 households accounting for 40 percent of the total depend both on agricultural as well as livestock farming. Only 12 households i.e. 8.45 percent are agricultural workers. They, therefore, neither rear livestock nor do they take up agricultural farming.

Table 6.20

DISTRIBUTION OF FARMERS IN VARIOUS FARM SIZES IN LIVESTOCK &
AGRICULTURAL FARMING (LACHUNG VALLEY)

Holding size.	No. of farmers depending exclusively on livestock farming.	No. of farmers depending on exclusively on Agricultural farming	No. of farmers depending on exclusively livestock & Agriculture farming	No. of farmers
Below 1 acre	2	10	1	5
1-2 acres	3	34	17	6
2-3 acres	nil	14	18	1
3-4 acres	nil	9	12	nil
4-5 acres	nil	1	5	nil
Above 5 acres	nil	nil	4	nil
TOTAL:	5	68	57	12
Percentage :	3.52	47.89	40.14	8.45

It will be seen from table 6.20 that out of 130 households practising either livestock farming or agriculture farming or both as mixed farming. Majority of them i.e. 68 out of 130 depend on agriculture farming for their sustenance followed by 57 depending on a mixed type of farming constituting of both livestock and agriculture. The rest 5 households however, have livestock farming as their main occupation. As the sizes of the farms in terms of acreage have been arbitrarily classified, it

will be interesting to throw light on the distribution of farm households in various size classes. A glance at table 6.20 reveals that out of 5 households depending on only livestock for their livelihood two have farms with less than one acre of land and the rest three accounting for 60 percent of the total have farm, sizes varying between 1 to 2 acres. The above farm households could be termed as marginal and small farmers respectively.

Switching over to the households practising agricultural farming only, it is observed that marginal and small farmers alone constitute of more than 64 percent of the total. The rest of the farm households could be termed as medium farm households whose farmsize varies between as much as 2 to 3 acres to 4 to 5 acres of land. As far as these farm households are concerned, maximum fall in the category of small or marginal farming followed by an appreciable share of farmers who could be termed as medium farmers.

As far as the farm households depending on both agriculture and livestock for their economic sustenance are concerned, it could well be observed that more than 31 percent of them are either marginal or small farmers in term of area devoted to such farming. It is interesting to note that a substantial share of the farmers belong to the medium category (i.e. 61.89 percent). As low as 7.02 percent of the farm households could be termed as large farmers possessing more than 5 acre of land.

From the above analysis it could be inferred that in Lachung Vally the above three categories of farmers possess different farm sizes. The households practising mixed farming appear to be economically better off as more than 60 percent of the households are medium farmers. However, a very few

devote relatively more land for agriculture and livestock farming and could be termed as large farmers. Here agricultural farming appears to be more prominent than that of the livestock. It could be substantiated from the above fact that out of 130 households surveyed at random more than 52 percent depend on agriculture for sustenance.

DISTRIBUTION OF INCOME GENERATED FROM LIVESTOCK AND AGRICULTURE FARMING ACCORDING TO FARM SIZE:

Keeping the distribution of farmers according to farm sizes in view, it will be worth while to discuss the pattern of distribution of income generated from livestock and agricultural farming according to various arbitrary farm sizes. For the purpose, the average income per household derived from livestock farming and agriculture farming have been worked out taking into account the various arbitrary sizes of holding. The average income from livestock and agricultural farming separately per household per annum has been presented in Table 6.21. It will be seen from table 6.21 that the farmers depending exclusively on livestock farming with holding below one acre earn Rs. 12,835/- per annum.

Table 6.21**INCOME FROM LIVESTOCK & AGRICULTURE FARMING (Lachung valley)**

Holding size	Average Income from livestock farming per household per year (in Rs.)	Average Income from Agricultural farming per household per year (in Rs.)	Average Income from Agriculture-cum livestock farming per household per year (in Rs.)
Below 1 acre	12,835	6,130.00	10,200.00
1-2 acres	18,440	6,912.88	20,345.88
2-3 acres	nil	5,799.00	19,151.94
3-4 acres	nil	5,776.00	18,534.00
4-5 acres	nil	9,600.00	21,816.00
Above 5 acres	nil	nil	17,422.50

and the farmers with the holding size between 1 to 2 acres earn Rs. 18,440 per annum. It could further be observed that the income shows an increasing trend as the farmsize increases. It has been confirmed during field investigation that the farmers normally use government grazing lands round the year. Such high income may be attributed to low level of spending on grass and fodder due to free grazing.

As regards the income generated from agriculture farming it was found that the average income per household does not necessarily depend on the size of holding except that farmers with 4-5 acres of land have an average income of Rs. 9,600/- per annum which is more than the income received by the farmers having less than 1 acre of cultivated land. Switching

over to the average income generated from mixed farming i.e. agricultural cum livestock farming, it is observed that income from such farming ranges between Rs. 10,200/- per annum to as high as Rs. 21,816/- per annum. The farmer with land holding generally less than one acre earns as much as Rs. 10,200/- from mixed farming as compared to Rs. 6,130/- per annum from agricultural farming alone. It could thus be seen from table 6.21 that holding size generally above one acre of land gives relatively better return in terms of cash as far as mixed farming is concerned. From the above table it can also be seen that income from livestock farming is more than double as compared to that of income derived from agricultural farming alone. As a matter of fact the income derived from the mixed farming looks much more promising than that of agricultural farming alone. In the plains as per the study conducted by the Indian Council of Agricultural Research over the period 1962-63 to 1967-68 concerning a comparative analysis on the economics of dairy farming versus mixed arable farming in Nasipur Patiala (Punjab) net returns per hectare of land in rupees are Rs. 1480/- Rs. 1348/- and Rs. 1107/- per annum for dairying, mixed and arable farming respectively.⁴¹

From the above analysis it could be inferred that mixed farming in Lachung Valley has a better prospect in terms of cash return than that of agriculture alone through the area stands quite favourable for raising a number of agricultural crops.

6.5.6. Distributional pattern of expenditure and income of the farmers of Dry High Zone.

Unlike the other two climatic zones, the farmers of Dry High Zone depend largely on livestock farming for their economic sustenance. As indicated earlier, farmers in this zone

41. Chaula, N.K. and Khanna, R.S. Social Revolution through Dairying. In (Dairying as an instrument of change. Proceedings of 19th International Dairy Congress. New Delhi; 1974. p. 136-139.

rear yaks, sheep and goats in large number for their livelihood. Due to their centuries of physical isolation in the mountain fastnesses the high landers in the region have built up their own traditional ways of livestock rearing. With a view to studying the economic life of these people, a household survey has been conducted to know the dynamics of their economy that primarily centers around various kinds of livestock. In this zone, the farmers of Lhonak and Chho-Lhamo have been interviewed with the help of structured questionnaires. From the data and information so gathered, the distributional pattern of expenditure and income according to farm size has been analysed with the help of statistical tables.

Analysis:

The type and number of livestock reared by each household play an important role in the generation of family income. The expenditure on various heads in rearing the animals also varies depending on their types and numbers. Table 6.22 illustrates the number of animals reared by each household and the average family size in each region such as chho-Lhamo and Lhonak.

Table 6.22**LIVESTOCK HOLDING AND FAMILY SIZE IN DRY HIGH ZONE OF NORTH SIKKIM.**

	Chho-Lhamo	Lhonak
No. of yaks per household	50.00	39.0
No. of sheep per household.	146.00	39.0
No. of goat per household.	17.00	9.0
Average family size.	5.53	4.5

It will be seen from table 6.22 that the number of yaks, sheep and goats per household is substantially higher in Chho-Lhamo region than that of Lhonak. The average family size is also more in case of Chho-Lhamo i.e. 5.53 than Lhonak region where the same is 4.50.

From the sale price of livestock products such as wool and the milk products etc. and the prevailing market price of the said products, the following picture emerges. Table 6.23 presents the livestock, livestock products and their sale price for the above two regions. As per data collected from field survey, the production and subsequent sale of livestock from Chho-Lhamo as many as 33 yaks, 91 sheep and 23 goats per annum have been sold in the market. The total output of milk products per annum similarly amounts 212 kg. butter and 304 kg. of dry yak cheese. The wool production is however estimated at 1642.5 kg. per annum.

Table 6.23

Levestock, Livestock products and the sale prices for Lhonak and Chho-Lhamo regions of North Sikkim.

Livestock/livestock products	Chho-Lhamo		Lhonak	
	No.	Rate(Rs.)	No.	Rate(Rs.)
(A) 1. yaks	33	5000	74	5000
2. Sheep	91	1500	93	1500
3. Goat	23	1000	20	1000
Milk products.				
B. 1. Yak butter in kg.	212	120	420	120
2. Yak dry cheese in kg.	304	80	590	55
C. Wool production in kg.	1642.5	80	438.75	80

Similarly it will be seen from table 6,23 that as many as 74 yaks, 93 sheep and 20 goats are annually produced and subsequently sold from Lhonak region. As far as out put of milk products is concerned as much as 420kg. of butter and 590 kg. of hard dry cheese are produced annually from the region. The wool production is only 438.75 kg. The existing cost of livestock, butter, wool etc. are similar in both the regions.

Based on Table 6.23 the annual income from sale of various categories of livestock, milk products and wool has been worked out. In order to find out the annual income, expenditure on various counts of the households under review has been cal-

culated from the survey data. the details of both these parameters such as expenditure and income are presented in Table 6.24. It will be seen from the said table that of the total expenditure the expenditure incurred on the purchase of livestock alone accounts for 37.64 percent for Chho-Lhamo and 24.23 percent for Lhonak region. The maximum expenditure incurred is on food which accounts for 49.22 percent and 40.81 percent of the total expenditure for Chho-Lhamo and Lhonak region respectively. Consequently, the average expenditure per house hold in Chho-Lhamo comes out to be Rs. 25330 which is much less than that of Lhoank region i.e. as much as Rs. 43,286.30. Such high in curring of expenditure on animal feed and purchase of the animals etc. in the Lhonak region could mainly.

Table 6.24

STATEMENT OF EXPENDITURE AND REVENUE IN RESPECT OF LIVESTOCK FARMING IN CHHO-LHAMO AND LHONAK AREAS OF DRY HIGH NORTH SIKKIM.

A. Heads of expenditure	Chho-Lhamo (Amt. in Rs.)	Percentage to total Expen- diture	Lhonak (Amt. in Rs.)	Percentage to total Expen- diture
1. Purchase of livestock	142995.00	(37.64)	157294.50	(24.23)
2. Expenditure on food.	187005.00	(49.22)	265005.00	40.81
3. Other expenses	49950.00	13.14	226995.00	34.96
Total expenditure:	379950.00	100.00	649294.50	100.00
Average expenditure per house hold	25330.00		43,286.30	

B. TOTAL REVENUE

1. Sale of yak	1,65,000.00	33.13	3,70,000.00	57.15
2. Sale of sheep	1,36,500.00	27.41	1,39,500.00	21.55
3. Sale of goat	23,000.00	4.12	20,000.00	3.09
4. Sale of wool	1,31,400.00	26.38	25,100.00	5.42
5. Sale of butter	25,440.00	5.11	50,400.00	7.78
6. Sale of oheese	16,720.00	3.35	32,450.00	5.01
<hr/>				
Total REVENUE Received:	4,98,060.00	100.00	6,47,450.00	100.00
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Average REVENUE per household.	33,204.00		43,163.33	
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Net income : (+)	1,18,110.00		(-) 1844.50	
Net income per family. (+)	7,874.00		(-) 122.97	
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be attributed to the high transport cost of the various items of food and feed ingredients which have to be transported either on foot or by yak back from Thangu onwards as the area is not connected with moterable roads. Moreover, the area as has been discussed earlier has difficult terrain conditions and remains often and usually cut off from the mainland either due to landslide caused by heavy down pour in the lower region or owing to heavy snowfall in the higher region. On the other hand, Chho-Lhamo region is connected by roads and transportation of goods therefore is relatively cheaper. The overall picture of the net return or income per family indicates that the return per family in the Chho-Lhamo region works out to be Rs. 7,874 per annum. The returns per household of the Lhonak region is however, on the negative side i.e. minus Rs. 122.97. Such a negative trends in returns in livestock farming

could largely be attributed to high transportation cost of the essential farm requirements and numerous other socio-economic and physical factors. It is high time that the state government should introduce some sort of transport subsidy for the Lhonak farmers to economically sustain in such harsh environmental conditions.

6.5.7. Conclusion.

In conclusion one can say that livestock rearing being the traditional occupation of the people in North Sikkim has a promising future in view of its enormous potentiality in the region. From the economic analysis of livestock farming it is quite interesting to note that high yielding cross breed animals are increasingly cost effective and the return is substantially higher than the local indigenous varieties. A comparative analysis of livestock versus crop farming in the region also indicates that the former is more productive than the later in terms of cash returns. What needs to be emphasized here is that the entire North district in Sikkim needs special attention for the development of livestock sector. The following suggestions in this regard will there fore go a long way in promoting this sector as economically the most vibrant that can generate employment and brost the economy of the region for a better future.

1. The infrastructural development be undertaken on which footing to make this enterprise commercially viable.
2. As the products are perishable quicker scientific disposal of the same be given priority.

3. For better income, a strategy should be chalked out for a wider marketing system.
4. Awareness among the farmers has to be created for adopting modern innovations.
5. For improving the investment capacity of the farmers, institutional network should be developed to extend loan facilities through banks and cooperatives to the farmers at lower rate of interest.
6. Adequate financing facilities should also be developed to motivate the farmers to go in for modern technology.
7. Over and above educational facilities in the region should be given priority as education is the only instrument to bring about a perceptible change in the outlook of the farmers. Therefore educated farmers are always found to be more receptive to new technology than the uneducated ones.