CHAPTER I

ANIMAL HUSBANDRY IN INDIAN ECONOMY

1. History of Dairying

Livestock has an important role in the progress of nations. Countries with a high developed agriculture invariably have livestock as a major farm enterprise.

The history of the beginning of dairying is hidden in obscurity. Archaeologists excavated pictorial reports on dairying dating back to 9000 B.C. As early as 6000 B.C., Sanskrit writings in India told of milk and its value as food. The Greeks are credited with the statement of as early as 2000 B.C. that "neither milk nor cheese failed in Libya the year round." Hippocrates, the noted Greek physician, wrote of milk in 500 B.C. Aristotle stated that "Casein, fat and water are all the known substances in milk."

As more authentic records become available to historians, frequent references are found to cattle and their products, Gibbon wrote, "The Tartars (376 A.D.) took cattle with them on their campaigns for milk and meat supplies. Each caravan of Tartars had 20 to 30 oxen and planned to pasture them as they roved from one section of the country to the other." Gibbon also stated that the number of cattle owned by a ruler was indicative of his power and influence. Cattle were classed with slaves as the best criterion of the wealth and political power of a ruler.
During Caesar's invasion of Europe in the first century B.C., cattle were found in many places, particularly in what is now Switzerland, France and Netherlands. Romans and the invasions of Caesar must get the credit for early dissemination of knowledge concerning milk and its products.

In 800 A.D., the use of cheese was well known in the region that is now Germany. Monks of the monasteries devoted much time to the development of cheese-making art.

In the middle of the thirteenth century, Marco Polo in his account of travel over parts of Asia, reported that, he found cattle and their products being used by the people of these regions.

Dairying during the Dark Ages was in most primitive stage. As land tenure assumed greater importance under stable Governments, dairying was encouraged. Wild animals became scarcer after the invention of gunpowder in the fourteenth century. That further necessitated the domestication of livestock, because, it became necessary to raise animals for food.

Under the feudal system in the Middle Ages, the vassals and serfs had to do the menial work of providing feed and care for cattle during the nongrazing season of the year. This was an important step in the domestication of cattle. Without feed supply and necessary care, the animals could not be maintained through the nongrazing season and without these facilities livestock keeping would have been nearly impossible.
2. Some Aspects of Animal Husbandry

Cattle breeds in India:

India possesses the largest number of cattle of any country in the world. According to 1972 Census there are 179 million cattle in India excluding 58 million buffaloes and their progeny. Owing to different geographical conditions the livestock population in different regions in India are of different types. There are 26 breeds of cattle and 6 breeds of buffaloes, in addition to a large number of non-descripts which are small in size and of very low productivity. The latter do not belong to any particular breed and represent the admixture of a number of types which are yet to be purified and fixed by judicious breeding and careful programming.

Indian cattle perform better in the dry areas than the heavy rainfall areas of the coastal or hilly regions of the country. Thus, cattle of good breed are found in Punjab, Haryana, Delhi, Rajasthan, Saurashtra, Uttar Pradesh and parts of Bombay, Tamilnadu, Karnataka and Andhra Pradesh.

Most of the Indian breeds are wellknown for their drought resisting qualities and for withstanding diseases and parasites. They possess potentialities for improvement and respond favourably to better feeding and management.

A detailed examination of the rainfall map of India will show that it is invariably in the higher elevations of the country and in humid areas like those of Assam, Bengal, Bihar, Orissa and Kerala that cattle are small and non-descript.
What is a breed

A group of animals related by descent and similar in most characters like general appearance, features, size, configuration etc. are said to be a breed. There may be considerable differences between individuals, still they have, as a group, many common points which distinguish them from other groups. Such a common characteristic group is termed as breed. The purity of the breed is maintained by confining the mating of the animals to within the breed.

What is cross-breeding

Cross-breeding is mating between the different breeds. Mating may be a natural one or may be made by artificial means. The objective of such artificial breeding is to increase the productivity of cattle. The offspring usually derives 50% of characteristic from the father's side and the rest 50% from the mother's side. Thus the cross-breeding with a bull of superior productivity level with a non-descript can vastly increase the productivity level for the next generation.

What is artificial insemination (A.I.)

Artificial insemination is the deposition of male reproductive cells in the female reproductive tract by mechanical means. The semen is also collected from the male by artificial means. The semen is inseminated into the female by placing a portion of it either in a collected or a diluted form into the convex or uterus by mechanical means at the proper time and under most hygienic conditions.

The first scientific research in artificial insemination of
domestic animals was performed on dogs in 1780 by the Italian scientist Lozanno Spallanzani. This experiment proved that the fertilizing power resides in the spermatozoa (male reproductive cell). In the latter part of the nineteenth century the technique of artificial insemination developed under research station conditions. This technique was first put into commercial use in USSR and later in the Western world. Dr. Sampath Kumarori* employed this method for the first time in India at the Palace Dairy Farm, Mysore in August 1939. Indian Veterinary Research Institute, Izatnagar, started experimental work under the direction of Dr. P. Bhattacharya in 1942. Centres were started by the Government of India, under his direction, at Calcutta, Hissar, Madras, Bangalore and Nagpur in 1945. At present artificial insemination is practised throughout the country. The technique employed have now reached such a state of development that they can be used with a fair degree of success in all domestic species.

Advantages of artificial insemination(A.I.) over natural breeding

1. The chief advantage of artificial insemination is that it increases the usefulness of superior sire to an extra-ordinary degree. It makes available sires of inheritance for milk and butter fat production to all dairymen within a limited area. Previously only a few could get the advantage of good bulls.

2. The services of superior sires are greatly extended. By natural services a bull can impregnate 50 to 60 cows per year. But
New York Artificial Breeders Co-operative have sired 10,000 in one year by one bull. By natural service it would have taken about 200 years for a bull to accomplish this.

3. The breeders do not need to maintain a herd sire and thus can avoid the botherations of the management of a bull. It helps to regulate the breeding programme and the space between successive calvings without unnecessarily prolonging the dry period.

4. The dairyman does not have the problem of searching and purchasing a new herd every two years to avoid inbreeding.

5. By quickly transporting the semen by air to different countries the facilities of artificial insemination can be utilised on a wider scale.

6. If artificial insemination is conducted under complete sanitary conditions by specially trained persons, the danger of spread of genetical diseases are lessened.

7. Overcomes the difficulty of size and weight.

8. Increases the rate of conception.

9. Helps in better record keeping.

10. Old, heavy and injured sires can be used with advantages.

**Limitations of artificial insemination (A.I.)**

1. Requires well trained personnel and special equipments.

2. Requires more time than the natural services.

3. Requires the knowledge of structure and function of reproduction on the part of the operator.
4. Market for the bulls is reduced while that for superior germ plasm is increased.

5. Selection of the sire should be very rigid in all respects.

**Problems under Indian conditions**

1. The sentimental views of the people do not appreciate castration of scrub bulls which are very essential.

2. Lack of proper idea about artificial insemination. Some say that it produces weaker calves etc.

3. It hampers the prospects of the breeders in the disposal of their bull calves.

4. Unfavourable climatic conditions for preservation and transportation of semen.

Milk production could be increased either (1) by introducing exotic breed or (II) by improving the local stock through systematic cross-breeding programme.

Neither it will be possible for the foreign genetic strains to adopt to the prevailing environmental conditions readily nor the vast number of local breed cows could be eliminated because of their low productivity. Through natural selection over centuries the Indian cow has developed many positive characters which makes it the most suitable and best adopted animal for the prevailing environmental conditions. Systematic introduction of exotic inheritance into local stock would be the best method of increasing milk production potential.
However it should be noted that programmes of animal breeding alone is not sufficient for improvement of the standard of dairy farming. The other important factors are veterinary services, foodstuff supplies and management.

One of the main drawbacks of the cross-breed cattle is that they are very much susceptible to diseases. It will thus be necessary to give increased attention towards providing adequate animal health cover.

An improved animal can express its full genetic production potential only under adequate and balanced feeding and management conditions. N.C. Wright (1952) showed that proper feeding and management of animals alone can increase the milk production in the country upto 35%. There are specific nutritional requirements of dairy cattle for growth maintenance, milk production and pregnancy which have to be met through a balanced feeding programme at least cost.

There are two aspects of animal feeding: (I) The science of nutrition; (II) The art of feeding animals.

Livestock feeds are generally classified according to the amount of specific nutrient they furnish in the ration. They are divided into two general classes—Roughages and Concentrates. Roughages are bulky feeds containing relatively large amount of less digestible material. In this the crude fibre content is more than 18%.
Concentrates are feeds which contain relatively smaller amount of fibre and have a comparatively high digestibility and as a result have a higher nutritive value per unit weight than roughages.

The number of substances used as feeding stuff to different species of livestock may exceed 2000 items. An outline of classification of the conventional feeds into broad categories are indicated below.

3. Review of Livestock Development and Livestock Policy in India

Objectives and outlays

The objectives of livestock development found in India's plan documents are reducible into two parts: (1) Increasing milk production (ii) Supply of milk under hygienic conditions to the growing urban population. Following table shows the development outlays in the successive plans.
<table>
<thead>
<tr>
<th>Item</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>Annual Plans</th>
<th>IV</th>
<th>V</th>
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<td>Animal Husbandry</td>
<td>8.00</td>
<td>21.00</td>
<td>54.00</td>
<td>-</td>
<td>94.10</td>
<td></td>
</tr>
<tr>
<td>Dairying &amp; Milk supply</td>
<td>7.81</td>
<td>17.44</td>
<td>36.00</td>
<td>59.70</td>
<td>139.00</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15.81</td>
<td>38.44</td>
<td>90.00</td>
<td>59.70</td>
<td>233.10</td>
<td>522.40</td>
</tr>
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The item animal husbandry broadly covers all those development programmes which serve the first objective. While the total outlay more than doubled from plan to plan, the growth of outlay on dairying and milk supply has been faster since the Third plan. Detailed break-up of the outlays is not available. But it is fairly certain that the lion's share of the outlay on animal husbandry is accounted for by veterinary facilities and breed improvement.

Similarly, most of the outlay on dairying and milk supply has gone into setting up milk processing plants, and chilling and marketing facilities for milk.

During the first two plans the animal husbandry development programme in India was operated through an integrated project....
called Key Village Schemes (KVS). This project provided for the establishment of bull rearing farms in selected breeding tracts, supply of pedigree bulls to areas marked for development, castration of scrub bulls, facilities for artificial insemination, veterinary services and fodder demonstration plots on cultivators' holdings. From the Third Plan onward, particularly since 1965, while Key Village Schemes continued, the emphasis shifted to Intensive Cattle Development Projects (ICDP). The chief differences between the Key Village Schemes and the Intensive Cattle Development Projects are that the latter has larger population coverage. Intensive Cattle Development Project is based on cross-breeding of the indigenous cows with exotic breeds, and tends to be located in milkshed areas of urban dairy plants. All other components continue to be common. It is thus distinguished from Key Village Scheme by its cross-breeding component and the fact of link-up with dairying and urban milk supply programmes. The relative shift from Key Village Schemes to Intensive Cattle Development Projects is due to the shift in official policy from one of developing a dual purpose (milk and draft) cattle breed by selective breeding to a milk breed by cross-breeding with exotic cattle. This shift occurred towards the closing years of the Third Plan.

Under the Fourth Plan, in 1970-71 'Operation Flood' project was taken up for improving the well-being of the small and marginal farmers and agricultural labourers in addition to the milk production
aspect. It was decided that at least one third of the producers to be helped by this project may be drawn from the group of small farmers and at least another one third from among marginal farmers and/or agricultural labourers.

The major lines of action proposed are: (i) increase in milk yield per animal through increase in the capacity of dairy processing facilities, (ii) shifting of cattle-sheds from cities to rural areas, (iii) development of transportation and storage network of milk, (iv) development of milk procuring system and (v) improvement in standards of dairy farming by programmes of animal breeding, veterinary services, feedstuff supplies and management.

The expected benefits on successful completion of the project was assumed to be: (i) availability of wholesome milk at stable and reasonable prices, (ii) removal of dairy cattle from cities, (iii) establishment of a broad basis for development of national dairy industry and (iv) improvement of productivity of dairy farming in rural areas bringing major increase in income with special emphasis on improvement of income of small and marginal farmers and agricultural labourers.

The 'Operation Flood' project was expected to vastly increase the average milk yield per cow and buffalo through ensured supply of balanced feed by owners, improvement of subsequent generation of cattle and buffaloes through intensive cross-breeding programme implemented by artificial insemination.
Achievements

Assessed in terms of the number of schemes and their components as the plan documents generally does the achievements look quite impressive. However, proper assessment of achievements, should be done in terms of the contributions the schemes and projects actually made to the increase in milk production.

The milk production in the country has increased from 17.15 million tonnes in 1951 to only 23.20 million tonnes in 1973-74. This means that with 23 years of planned development increase in milk production is only 6.05 million tonnes.

D.Sundersan (1976) has shown that if proper feeding, management and veterinary facilities are provided a crossbred cow will yield 1500 litres of milk per lactation on the average. This means that this 23.20 million tonnes of milk per year could be produced with just 15 million crossbred cows.

With production level at 23.20 million tonnes per year, per capita availability of milk is only 105 gms. per day while the minimum nutritional requirement is 210 gms. More alarming fact is that due to acute disparity in income distribution this gap is widening for majority of people with income levels below the national average. On the basis of projected population growth rate of about 2%, contemplated income growth rate of 5.5% per annum and an income elasticity coefficient of 1.6 for milk- the demand for milk in 1978-79 was estimated to be about 38 million tonnes. If the recommended nutritional allowance of 210 gms. per capita per day
was to be made available to the projected mid-year population of 632.66 million in 1978-79, the production requirement of milk would be about 48.5 million tonnes in that year.

Let us now inquire about the reasons for slow progress in milk production. Fifth Five Year Plan intended to develop dairying as an important economic occupation for small and marginal farmers and landless labourers. The planners assumed that proper breeding, veterinary, feeding and management programme will be followed by these small and marginal farmers and landless labourers. However this assumption does not conform to the field condition.

In accordance with the relative economic importance of different categories of animals a differential feeding rate pattern is prescribed.

Irrespective of the differential feeding rates generally there is substandard nutrition of animals in India. The average deficiency in respect of digestible nutrients (calories) is estimated to be 30% while for digestible crude proteins this deficiency is as high as 70%. The overall deficit when spreaded over different types of animals, works out to about 30% for animals in milk, 50% for dry animals, 60% for adult males and 80% to 90% for the young. Substandard feeding forces the animal to produce below its potential. It also hampers the reproductive characteristics of the population as manifested in high mortality rate, late age for first calving, a long intercalving period, short breedable span, poor work capacity
and short working life, besides general susceptibility to
diseases and death.

The substandard current level of feeding is sustained on
dry roughage and concentrate-feeds obtained as agricultural
byproducts, grazing on accessible pasture land and green fodder
produced from about 4% of the total cropped area that is annually
allocated to it. Estimates suggest that if feeding were raised
to the required nutritional level, the need of additional area
under fodder would be stupendous. The area under green fodder
alone would have to be doubled, and for concentrates oil cake
alone would require about 60 million more acres of land to be put
under oil seeds. This is not feasible in the agricultural situa-
tion of to-day. Thus some alternative measures have to be found
out for increasing milk production in India.

4. Review of Literature of Cost-Benefit Analysis of
Crossbred Cattle in India.

Dairying with crossbred cattle is generally recommended for
supplementing income of the small and marginal farmers and agri-
cultural labourers. They suffer badly from underemployment and
low incomes under the existing condition. Such recommendations
should take into account the additional economic risk involved
in this enterprise. So it is necessary to make cost-benefit
analysis of dairying with crossbred cattle.
Milk production will be an economic proposition only under two conditions:

1) supply of nutrients required for milk production at as cheap rate as possible, and 2) higher milk productivity of the dairy cow so that the proportion of feed cost to total cost of milk production could be kept low.

The economy of crossbred cows should not be judged by their milk production only. In crossbreeding, a low producing indigenous cattle surviving on a low plane of nutrition mainly on crop residue is replaced by a high producing animal, requiring high level of nutrition, to be met by quality fodders and supplemental concentrates. Thus the analysis of dairy production will be incomplete unless a social cost-benefit analysis is performed.

In India, systematic financial cost-benefit analysis of dairy keeping started only in the early seventies. Dr. N. Somasekhara, in his paper, 'The Bangalore Dairy- A Techno-economic Study', published in 1974, claimed that "perhaps for the first time" he estimated the different cost components systematically and used projected population for his analysis. However, almost all the results were expressed in percentage.

P.N. Kuwar (1975) remarked that most of the cost studies on the economics of milk production were conducted in a rather unscientific manner. So no valid inference could be drawn on the basis of those studies. They relate to one or two specific
years instead of covering the entire life cycle of the milch animal.

P.L. Sankhayan and A.S. Joshi (1975), in connection with their study in rural Punjab, suggested that instead of relying only on cross-bred cattle, it would perhaps be a worthwhile proposition to improve the existing feeding standards of indigenous cows simultaneously for the rapid development of dairy enterprise in rural areas.

A.R. Rajapurohit (1975) remarked that any dairy development programme which is not associated with the development of fodder resources is bound to give negative results.

The first attempt for social cost-benefit analysis in the field of dairying was made by P.S. George and U.K. Srinivasan in 1975. They made a social cost-benefit analysis of loans given by the State Bank of India in Baroda district. The study area covered the farmers belonging to milk societies affiliated to the Baroda Dairy. They considered buffaloes as only milch animals. In this study they introduced the concept of opportunity cost of capital and assumed this value to be 10%. Increase in income of small farmers was given 20% higher social value than money income level, and income accrued to the large farmers was assumed to have 10% less social value than the money value of income. They found the internal rate of return to be 44%. However, the values of the parameters used was somewhat arbitrary and the other concepts of social cost-benefit analysis like shadow wage rate and shadow
price of investment were not taken into account. Moreover, their conclusion was related to milch buffaloes only.

Perhaps for the first time in India in the dairy projects with crossbred cattle National Dairy Research Institute, Karnal and Indo-Swiss Project, Kerala, jointly working on the Cattle Breeding Programme of Indo-Swiss Project, Kerala (1976) attempted to make a social cost-benefit analysis on the basis of the concept of opportunity cost for capital and family labour and social rate of discount. They found that dairying with crossbred cattle is socially beneficial. However, they admitted that their social cost-benefit analysis has some limitations.

Raj Vir Singh, R.K. Patel and S.S. Ahlawat (1977) remarked that dairying is a capital intensive enterprise and the requirement of capital increases manifold with the introduction of improved technology. With existing meagre resources of the small farmers it is not possible to adopt the improved dairy technology.

Dr. S.N. Mishra of the Institute of Economic Growth, Delhi, in his study on Intensive Cattle Development Project (ICDP) and ICDP-I (ICDP linked with the marketing component), Poona, made the first more comprehensive social cost-benefit analysis of this problem in 1978. He calculated the discounted benefit-cost ratios at discount rates ranging from 0.0 to 11.25 per cent for ICDP and ICDP-I. A scrutiny of these values reveal that the social benefit -cost ratios of the ICDP and ICDP-I are negative
for all the discount rates. Although, linking of the chilling and marketing facilities for milk to ICDP, improve the social benefit-cost ratios but even that do not make it economically viable. ICDP and ICDP-I would appear to be economically viable if milk is taken as the only benefit and the cost of maintenance of the breedable cows together with the public cost is taken as the cost item. One can easily see that the above conclusion is not acceptable because neither the benefit nor the cost components are exhaustive. With the above result, Prof. S.N. Mishra, in an ex-post review of Maharashtra Government's decision in setting up ICDP and ICDP-I, made the following remark:

"The Maharashtra Government's decision, to adopt the project for execution in 1967 stands out in marked contradiction to the decision to which our analysis has led --- the decision of the Government, instead of being based on a sound ex-ante evaluation of the project was guided by optimistic assumptions and partial indicators such as remarkably high milk yield of the cross-breed in contrast to the indigenous cow. Indeed, the latter fitted very well with the objective of increasing milk production. As a matter of fact, guided by such partial indicators many State Governments in India have undertaken extensive programmes similar to the ICDP, Poona ......

In conclusion, it thus appears that the Government in its partial view of the project may have been right in making the decision it did make. But then the right decision under a partial
view may turn out to be a costly decision under a total view as proved in this case by our results."

It is thus noted that the last two cost-benefit analyses gave contradictory results regarding the admissibility of dairying with crossbred cattle. The objective of this work is to clear up this confusion.

It may be noted that National Dairy Research Institute and Indo-Swiss Project, Kerala, admitted that their social cost-benefit analysis on the cattle breeding programme of Indo-Swiss Project, Kerala, has some limitations. A critical study of this work is presented in Chapter IV.

Lastly, the ideas emerging from the above discussion has been supported by a social cost-benefit analysis on the basis of the data collected from the districts of Birbhum, Hooghly and Nadia in West Bengal.