CHAPTER VI

SUMMARY AND CONCLUSION

India possesses the largest number of cattle in the world, but due to low productivity the per capita availability of milk is very low. Most of the Indian breeds have draught resisting qualities and can withstand diseases and parasites and possess potentialities for improvement. Cross-breeding with exotic breed was thought to be the best method of improving the productivity of cattle. The other important factors also to be considered in this respect are veterinary services, feed and management. The main drawback of crossbred cattle is that they are very much susceptible to diseases.

During the first two Five Year Plans, the animal husbandry development programme in India was operated through Key Village Schemes (KVS). From the Third Plan onwards, while KVS continued the emphasis shifted to Intensive Cattle Development Projects (ICDP) which was based on cross-breeding of indigenous cows with exotic breeds. This method of cross-breeding was considered to be the best for increasing milk production potential.

Under the Fourth Plan 'Operation Flood' project was taken up to improve the well-being of small and marginal farmers and agricultural labourers in addition to the milk production aspect. The project expected to vastly increase the average milk yield per cow and buffalo through ensured supply of balanced feed. Subsequent generation of cattle and buffaloes were to be improved through intensive cross-breeding programme implemented by artificial.
insemination. These steps were intended to improve the well-being of small and marginal farmers and agricultural labourers.

A further intensification of this programme was recommended in the Draft Fifth Plan. In terms of milk production the achievements of the above projects fell much below the expectation. The milk production in India increased from 17.15 million tonnes in 1951 to only 23.20 million tonnes in 1973-74. This means that after 23 years of planned development increase in milk production was only 6.05 million tonnes. Again with production level at 23.20 million tonnes per year, per capita availability of milk per day is 105 grams against the minimum nutritional requirement of 210 grams.

The reasons for this slow progress may be indicated as follows:

1. In accordance with the relative economic importance of different categories of animals a differential feeding rate pattern is prescribed. For example, since the young stock does not give immediate return, they are considerably underfed.

2. Irrespective of the differential feeding rates, the present feeding standards followed for various categories of animals are, generally, far below the recommended nutritional levels in India.

This state of affairs results in loss of body weight, decline in milk production and may seriously affect the normal reproductive behaviour of the animal. Much of the usefulness of crossbreeding work will be lost unless the cows are adequately fed.
Another important reason lies in the economics of crossbred cattle. The efficiency of crossbred cattle should not be judged in terms of milk production alone. To justify the introduction of crossbred cattle a social cost-benefit analysis is necessary.

Only two social cost-benefit analysis of crossbred cattle have been made so far in India. The first one was made in 1976 jointly by National Dairy Research Institute, Karnal and Indo-Swiss Project, Kerala on the Brown Swiss crossbreeding programme of the Indo-Swiss Project, Kerala. The second one was performed by Dr. S.N. Mishra in 1978 on Intensive Cattle Development Project (ICDP) and ICDP-1, Poona.

The above two works yielded opposite results. The former work recommended crossbred cattle as socially desirable while the latter work found the crossbred cattle to be socially undesirable.

In social cost-benefit analysis, the aim is to identify and measure the losses and gains in economic welfare of the society as a whole following from the project in question.

The idea of social cost-benefit analysis gradually evolved through the writings of different authors since the middle of the last century. The volume of Harvard University Water Programme gave a seasonably integrated theory of cost-benefit analysis in 1962, with costs and benefits related more clearly to welfare losses and gains.

Subsequently more works were done in this field and various ideas about the objective of cost-benefit analysis developed in course of time.
The aim of cost-benefit analysis is to maximize the present value of all the benefits less costs subject to certain constraints. The conditions for welfare maximization were not likely to be fulfilled throughout an economy and so the resource allocation could not be optimal and the marginal social rate of time preference and the risk adjusted marginal social rate of return from investment would not coincide. So far as cost-benefit analysis is concerned, non-fulfilment of the conditions of welfare maximum elsewhere in the economy makes the market values of the outputs and inputs biased measures of benefits and costs. These divergences are really the issues of national economic policy to be tackled by some other agencies. However, the Pareto principle is not considered to be an universally applicable investment criterion because in most cases this criterion is not satisfied. Social cost-benefit analysis provides requisite help for identifying such resource allocation combination within a sector that maximize its benefits.

According to Little and Mirrlees, mercantile costs and benefits, based on market prices, have to be suitably adjusted so that the difference between them represents the social loss or gain. They also advocate the adjustment of the mercantile rate of discount and use a shadow wage rate to assess the real social value.

Little and Mirrless recommended the cost-benefit analysis specially for developing countries, where due to various economic factors the price mechanism do not reflect social costs and benefits.
Thus instead of predicted actual prices 'shadow' prices or 'accounting' prices are to be used so as to reflect the real costs and benefits of the society. They agree that the 'accounting' prices are unreal but they argue that the predicted actual prices also are the prices of future and thus carry with them an element of speculation.

According to Little and Mirrlees the main limitation of cost-benefit analysis is that, it pre-supposes all the costs and benefits to be quantifiable which may not be so in reality. Quantification of such costs and benefits are ultimately influenced by individual bias. The second limitation, according to them, arises out of the pre-supposition of existence of a mechanism for determination of accounting prices. Unless these conditions are fulfilled, they feel, use of accounting price based cost-benefit analysis as a universal tool for project evaluation in developing countries will be difficult.

According to Dasgupta, Sen and Marglin, social cost-benefit analysis is not a technique, but an approach. Projects are judged by their precise impact on the economy. This impact is evaluated using parameters which reflect national goals, social objectives and global facts. Thus social cost-benefit analysis provides a method whereby the total effects of a project are judged in the light of the overall objectives of the national planning.

Dasgupta et al., feel that for the purpose of public sector project evaluation in developing countries social cost-benefit analysis based on shadow prices is to be performed, because market
prices do not take into account the effects of income distribution, externalities and consumers' surplus. The shadow prices depend to a large extent on Government policies. Shadow prices of inputs and outputs of the project can be determined by the project evaluator at his own level. The other shadow prices, namely, social rate of discount, shadow price of foreign exchange and shadow wage rate for unskilled labour, are national parameters. The effectiveness of social cost-benefit analysis depends much upon how national parameters are derived and used.

Dasgupta et al., accept the objective of 'aggregate-consumption' as the basis of computation in social cost-benefit analysis. A unit of average present consumption today is taken as the unit of account. The consumption stream of the future is evaluated in terms of the equivalent amount of present consumption.

The basic problem involved in calculating the aggregate-consumption benefits of a project is to measure the consumers' 'willingness to pay' for the 'net output' of the project. These net output of the project are direct benefits. In addition, there may be other indirect benefits that are not reflected by immediate willingness to pay. These indirect benefits are the ancillary good or service produced in connection with the project.

The above problem is also prevalent in the calculation of aggregate-consumption costs. The appropriate cost concept is that of the maximum alternative benefits forgone, technically known as 'Opportunity Cost'. These alternative benefits forgone are the
direct costs. In addition, there may be indirect costs due to the external effects that result in a net loss to society.

Practically it is impossible to quantify many of the externalities. Instead of ignoring them, we should recognize it as one of the most serious drawbacks of social cost-benefit analysis.

In order to calculate the national economic profitability we are to compute social benefits and social costs on the basis of national parameters. National Planning plays a crucial role in the estimation of some of these national parameters.

These national parameters are required to be evaluated at the national level and in general they are independent of all the decisions taken at the project level.

There are two categories of national parameters, (1) Weights and (II) Shadow prices.

Weights are those national parameters which reflect the marginal importance of various objectives and are derived directly from value judgements. In this category we have (a) Weights on income distribution, (b) Weights on merit wants, (c) Social rate of discount, which reflects the relative weight on aggregate consumption at different times, and (d) other objectives that the Government may consider sufficiently important to be included in the national economic profitability calculation.

'Shadow prices' reflect better the real costs to society and the real benefits than the actual prices. These shadow prices are treated as functions of unknown weights. In this category we have
(a) shadow price of investment, (b) shadow price/labour and (c) shadow price of foreign exchange.

The weights may vary over time so that these national parameters are proportional to time horizon. With changes in the relative importance of the objectives the profitability of the project from the national viewpoint may change. Also the objectives of a project will vary from country to country and within each country from one situation to another. Correspondingly every national parameter will not be important to every project.

Evaluation of the net aggregate-consumption benefits is carried out best through successive steps of approximation. In the first step the benefits and costs are assessed on the basis of the market prices. Here the assumption is that the market prices adequately reflect social opportunity costs.

The second approximation involves the adjustment of the market prices wherever these do not reflect the social opportunity cost.

The final approximation is done on the assumption that the social value of the funds devoted to investment is greater than that of the same funds devoted to consumption.

To evaluate the net effect of the project on the rate of investment, it is necessary to identify the following:

(1) All the benefit and cost flows that make up the second approximation.
(2) Accompanying cash transfers, according to the groups that gains and loses.

(3) To estimate the respective marginal savings propensities of each group.

For this purpose three broad groups of gainers and loosers, namely, (a) Semi-skilled and unskilled workers, (b) Government and (c) Private sector, are taken into account.

Values of the net consumption benefits flowing to these groups are evaluated. These values are then corrected to get the 'Social value' according to proportions in which each is divided between consumption and investment.

Finally, we get the value of net aggregate-consumption benefits to the country as a whole in any given year as the sum of the social values of net benefits flowing to each distinct group.

The second national objective that is to be considered in the evaluation of the project is the objective of redistributing benefits in favour of a particular region or group. This is necessary because the items of benefit and cost taken into consideration may promote one objective while adversely affecting the realization of the other.

In order to accommodate the objective of redistribution of benefits in favour of a particular group or region in social cost-benefit analysis one adjustment is necessary for the total value of net aggregate-consumption benefits redistributed to the particular group or region in any year. A part of the net aggregate-
consumption benefits will be respent within the region irrespective of whether the direct benefits measured in terms of the total value of net aggregate-consumption of a particular group or region, are consumed or invested. The reinvestment will result in a new round of benefits to the region if they lead to net transfer of wage and profits from elsewhere in the country or activate otherwise idle resources in the particular region. If \( \gamma \) represents the proportion of marginal benefits to the region which, when respent, results in additional benefits to the region, the adjustment will come as a multiplier denoted by \( \frac{1}{1-\gamma} \).

In principle, all the national parameters introduced in connection with the project appraisal are functions of time. The appropriate values may therefore change according to the year in which the benefits and costs are being measured. All the time-flows are then converted into their equivalent present values by discounting back to the year 0 at the suitable rate of discount. The present values of each flow item can then be used to compute the project's total contribution to the different objectives.

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

A critical review of the report reveals that the list of benefits taken in the project appraisal was not exhaustive. It did not include the sale value of scrap cattle and sale value of sterile heifers.

An analysis of the cost components shows that some of the cost items taken in the project appraisal were redundant. For some cost items included, arbitrary values were taken. Some other cost items relevant in this context were not included.

The interests on fixed capital and working capital were taken into account in the cost-benefit analysis of this project. Now Indo-Swiss Project, Kerala is a public project and for a public sector project the interests are really transfer payments rather than payments for the use of a resource within the economy. Thus these interests should not have been included in the cost component.

Depreciation on capital investment was included in the cost calculation. But the cost of the asset was incurred at the time of acquiring the asset and was also shown as a cost. Thus addition of depreciation in the cost component amounted to double counting.

The concept of opportunity cost was introduced only for family labour and capital. The project evaluators did not consider the opportunity cost of hired labour. Employment of workers in the new project involves the transfer of income from the owners
of capital to labour, the transfer being equal to wage. Since the owners of capital have much higher savings rate than unskilled labour and since there is a premium on savings, this transfer represents a cost to the society. This entire cost can only be calculated with the help of opportunity cost concept.

The social rate of discount (i) was arbitrarily assumed to be 10%. But there is no consensus about the rate of social rate of discount among the Economists. Calculation of this rate involves a number of factors. Each of these factors has its own range of variation. Thus it is not possible to get a single value for the social rate of discount. In India this range has been found to be 8% to 10%.

The opportunity cost of capital (q) was also arbitrarily assumed to be 10%. John Bayer has estimated the marginal productivity (opportunity cost) of capital for India to be 12% to 15%. Our judgement suggests that the most likely value for the opportunity cost of capital is 15%.

Again, if the social rate of discount and the opportunity cost of capital are taken to be equal (10% in this case) the shadow price of investment will be equal to 1. This implies that the society is indifferent in its choice between investment and consumption. This can never be a situation in a developing country.

Next we find that 15% of the heifers do not enter into production. Thus the cost of rearing these sterile calves from birth
till these are identified as sterile heifers and disposed off, is a social cost. Such a huge cost was not included in the cost component.

Lastly, the social value of investment was not calculated so the shadow price of investment ($p^{inv*}$) and marginal propensity to save for Indian farmers ($Sp$) were not brought into analysis. In our exercise we found $p^{inv*}$ to be 3.00 and 1.91 for social rates of discount, $i = 0.08$ and 0.10 respectively. We have estimated $Sp$ as 0.21.

However, on the basis of the cost components of the report, the rearing of a Brown Swiss Crossbred (BSC) cow from birth up to old age has been found to incur net loss in the plains and yield net gain in the highlands.

The reason for this difference in profitability lies in the difference in the feed cost in the two regions. Due to the availability of green leaves and grasses which constitute major feed component with opportunity cost almost equal to zero in the highlands the feed cost becomes very low. This facility is however not available in the plains.

Considering the situation in highlands to be of very special type, on the basis of the data of initial BSC cattle as cohort and the information available in the project report an independent cost-benefit analysis of BSC cows in the plains of Kerala was taken up. It was treated as a private investment project from the point of view of the farmers.
Using all the relevant national parameters, the social value of the net aggregate-consumption benefit of this project was found to be negative in the plains. This implies that the project should not have been recommended in the plains of Kerala.

The approach of social cost-benefit analysis of crossbred cattle from farmers' point of view is equivalent to that of a private investment project. The data were collected with this objective in view. At the first step of our analysis we estimated the national parameters involved.

The social rate of discount (SRD), which is the marginal rate of substitution between consumptions at consecutive points of time, or the rate at which the weight on consumption falls over time, is essentially a normative value. It expresses society's preference for consumption in different time periods.

We have used the formula

\[ \text{SRD} = \left( \frac{1+g}{e} \right) - 1 + \text{PTP} \]

for estimating the social rate of discount. Here 'g' is the growth rate of per capita consumption, 'e' is the elasticity of diminishing marginal utility of consumption, and 'PTP' is the pure time preference rate.

The perspective plan in India projects a growth rate of 3% during the seventies and 4% after 1980-81. These values of 'g' were used. The elasticity of diminishing marginal utility (e) is
a normative value. On the basis of the National Sample Survey data, Deepak Lal estimated \( e' \) for India. He found the estimate of \( e' \) to be -2.30. Since \( e' \) is a normative value, it is likely to be somewhat arbitrary. We preferred a slightly lower value of \( e' \) and took it as -2.5 in our exercise. Based on these most likely estimates of \( g' \) and \( e' \), the range of SRD becomes 7.6 to 10.3 percent, or if rounded, 8 to 10 percent. However, given the manner in which \( g' \) and \( e' \) have been estimated, the degree of precision may be questioned.

Due to the divergence between the opportunity cost of capital and the social rate of discount another national parameter, the shadow price of investment (savings), \( p^{inv*} \), comes up. This value is estimated as \( p^{inv*} = \frac{(1-s)q}{r-sq} \)

where \( r \) is the social rate of discount, \( q \) is the marginal productivity of capital and \( s \) is the rate of reinvestment.

John Beyer has estimated the value of \( q \) for India to be between 12% to 15%. The Planning Commission has projected a marginal savings rate of 0.28 for the Fourth Plan and 0.33 for the subsequent period through 1980-81. Restricting the calculation of \( p^{inv*} \) to those values of the variable we consider to be most likely, \( q = 0.15, \ i = 0.08 \) and 0.10 and \( s = 0.30 \), we have the range of \( p^{inv*} \) as 1.91 to 3.00. Here, \( p^{inv*} = 1.91 \) for \( i = 0.10 \) and \( p^{inv*} = 3.00 \) for \( i = 0.08 \).

The shadow wage rate for unskilled labour represents society's loss of marginal product in alternative employment. As far as
family labour is concerned, the opportunity cost for dairy enterprise is more or less zero. This item was not included in the cost component. The shadow wage rate for hired labour including direct and indirect effects (SWR) has been estimated by the formula

$$SWR = m + s_{cap}'(P_{inv}' - 1)w$$

where 'm' is the marginal product in the present employment, 's_{cap}' is the rate of savings for the owner of capital, 'w' is the market wage rate.

The range of values of 'P_{inv}' was estimated earlier and 'w' is known. The rate of savings from profit 's_{cap}' can be approximately estimated as the ratio of the profit retained by Public Limited Companies to total profit. Reserve Bank of India Bulletin, February 1972 shows that in the last six years this ratio has ranged from 0.34 to 0.46. We assume this value to be 0.40 for our analysis.

For estimating the value of 'm', it is observed that the agricultural wage which is an overestimate of marginal productivity of labour may be taken as the suitable first approximation to the direct opportunity cost. Since 'w' is the agricultural wage rate in our analysis it could be taken as equal to the marginal productivity of labour in the agricultural sector (m). The agricultural wage rates were taken from the Economic Review 1976-77 of the Government of West Bengal.
In developing countries $p_{inv}^*$ could be reasonably taken as greater than 1. So long as $m = w$ and the value of $p_{inv}^*$ is greater than 1, the shadow wage rate will be greater than the nominal wage rate.

In the present project no foreign exchange is involved, so calculation of the shadow price of foreign exchange, the other national parameter, is not necessary in this work.

On the basis of the sample drawn from Birbhum, Hooghly and Nadia districts in West Bengal in 1977-78 a detailed empirical exercise was made.

According to Little and Mirrlees the evaluation of a private sector investment project, like a public sector project, should be based on the shadow prices of inputs and outputs. But the sources of investment funds, and the uses to which the profits are put, require some adjustment. We perform the analysis on this line.

Here, the benefits included milk and dung produced, scrap value of the cattle, and sale value of the unproductive heifers. The costs included feed, shadow price of hired labour, medical expenses, interests on fixed and working capitals, depreciation on cattle-shed and miscellaneous items and cost incurred due to artificial insemination.

Since the purchase price of cattle was taken into account at the initial stage of the project its depreciation need not be taken in the maintenance cost. Interest on working capital for milking
Cow was ignored because this investment yielded immediate return.

Depreciation on cattle-shed was taken as a cost component because this cost was not taken into account in the initial year.

For a private investment project the interests are not transfer payments so these have been included in cost.

The costs and benefits for each year due to the project were calculated on the basis of the projected population. The project span was assumed to be nine years because on an average a crossbred cow have seven lactations covering a period of nine years.

The net present value is the aggregate of the discounted net benefits over nine years. To find the social value of the net aggregate-consumption benefit another national parameter, the marginal propensity to save in case of Indian farmers, is needed. No information is available about this parameter. B.K. Chowdhury and R. Pattnaik of Agro-Economic Research Centre, Santiniketan, conducted a study on 'Income, Savings and Investment in a progressive agricultural area'. The marginal propensity to save in case of Indian farmers was calculated on the basis of their data and it was assumed to hold for farmers all over India. This value was calculated to be 0.21.

On the basis of the probable values of all these relevant national parameters, the social value of the net aggregate-consumption benefit is found to be negative. This implies that for the given set of prices and the parameters the private sector investment on crossbred cattle is not socially desirable in the plains of West Bengal.
In India most of the imported breeds are from Europe and U.S.A., where the average temperature is quite low. This temperature difference poses a major problem for the adoptability of the crossbred cattle to the tropical environment in the plains of India. Thus the mortality rate for crossbred cattle can be readily seen to be higher in the plains than in highlands.

Again, the crossbred male cattle are less hardy than the local breed. Thus replacing local breed cattle by crossbred cattle in the plains will result in a loss in the availability of draught power. This further supports our conclusion that the crossbred cattle are not socially desirable in the plains of West Bengal.

For various categories of crossbred cattle, the share of feed in the total cost is around 80%. The share of the other cost components is very small.

By trial and error method we found that, other cost components remaining unchanged, the net present value of aggregate-consumption benefit would be positive if the feed cost was reduced by at least 24%.

The analysis of rearing and maintenance cost structure of crossbred cattle adopted by the highlanders of Kerala, namely, Settler Farmers and Tea Labourers, showed that such a reduction in feed cost is quite feasible in the highranges. The reason for this feasibility can readily be attributed to the fact that the highlanders mainly rely on green leaves and grasses instead of concentrates. These green leaves and grasses have almost zero
opportunity cost and they neutralize the requirement of concentrates to a great extent.

Also, in the highranges, the temperature is more suitable for adoption of crossbred cattle and the draught power requirement is relatively less.

The environment of the highlands of Kerala could be taken as typical of any other highland in any part of India. Hence we can logically conclude that the required more than 24% reduction in feed cost would be feasible in the highlands rather than the plains.

In addition to the above points, the better adoptibility of the crossbred cattle and relatively less requirement of draught power would justify the suitability of crossbred cattle in the highranges. So, in our judgment the Government should encourage rearing and maintaining of crossbred cattle in the highranges instead of in the plains.