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RESTRICTED

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ASIAN DEVELOPMENT BANK

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# APPRAISAL REPORT

# OF THE

# PROPOSED

# SECOND LIVESTOCK DEVELOPMENT PROJECT

# IN

# NEPAL

October 1985

## CURRENCY EQUIVALENTS
(As of 31 August 1985)



| | | |
|---|---|---|
| Currency Unit | - | Nepalese Rupee (Rs) |
| Rs 1.00 | - | $0.058 |
| $ 1.00 | - | Rs17.20 |

(a) On 19 September 1981 the dual exchange rate introduced in March 1978 was abolished and the Nepalese Rupee was devalued and pegged to the US dollar at $1.00 = Rs 13.20. The Nepalese Rupee has been pegged to a trade-weighted basket of currencies since 1 June 1983.

(b) For the purpose of calculations in this Report, the rate of $1.00 = Rs 18.50 has been used. This was the rate generally prevailing during the appraisal of the Project.



## ABBREVIATIONS

| | | |
|---|---|---|
| ADBN | - | Agricultural Development Bank of Nepal |
| APROSC | - | Agricultural Projects Services Center |
| DDC | - | Dairy Development Corporation |
| DLDAH | - | Department of Livestock Development and Animal Health |
| DLDO | - | District Livestock Development Office |
| FAO | - | Food Agriculture Organization |
| GDP | - | Gross Domestic Product |
| HMGN | - | His Majesty's Government of Nepal |
| IFAD | - | International Fund for Agricultural Development |
| JT | - | Junior Technician |
| JTA | - | Junior Technical Assistant |
| LDC | - | Livestock Development Center |
| LDSC | - | Livestock Development Sub-Center |
| MOA | - | Ministry of Agriculture |
| UNDP | - | United National Development Programme |



## NOTES

(i) In this Report, "$" refers to US dollars and "Rs" to Nepalese Rupees.

(ii) The Fiscal Year (FY) of the Government begins on 16 July.

## PROJECT FOCUS, DESIGN AND RATIONALE

Livestock are an indispensable part of the agricultural production system in Nepal. They provide almost all the draft power for cultivation, their dung is extensively used as manure, and they provide most of the power for rural transportation. Livestock products are essential subsistence food items for the farming community as well as a source of cash income generation through trading.

In the traditional system of farming evolved over centuries, crop production, livestock and forestry have been closely integrated into the farming system, each supporting the other. Under this system, livestock performed the function of collecting, concentrating and breaking down large amounts of plant material to provide food for the family and also dung for composting and recycling. Since sufficient areas of pasture and forest were available, increasing numbers of cattle were kept to meet various needs. This situation has changed in recent years. Pressure from a rapidly increasing human population has led to deterioration in the forest areas, as trees have been cut for fuelwood, and more forests cleared for cultivation. As a result, the animal feeding base has been seriously depleted and productivity of livestock has fallen substantially. This in turn has led to still greater encroachment of forest areas thus causing a vicious spiral. Unfortunately, the contraction of the fodder base has not led to a decline in livestock numbers. In fact, farmers have tended to keep additional livestock in an attempt to compensate for a decline in productivity of individual animals. Further, unproductive animals are not removed because of religious constraints. There is clearly a need to convince individual farmers of the benefit of keeping fewer but more productive animals.

Poor animal health constitutes a major problem of the livestock sector in Nepal. This is not surprising considering the very large livestock numbers, the poor nutritional status of most stock and the limited animal health service. A cohesive program of livestock development is needed. While animal health programs, disease diagnosis and preventive as well as curative vaccines and veterinary drugs provide almost immediate benefits, productivity increases in animals can be sustained over the longer term only by improving feed supply and animal nutrition. In areas where feed resources are adequate and animal health services are available, breed improvements can also be more intensively applied. A systematic approach to livestock development by His Majesty's Government of Nepal (HMGN) which includes operational linkages between research, training, extension and credit, and provides for greater support for expanded private sector participation in production, processing and marketing activities is gradually emerging.

The Project is designed to support HMGN's sectoral objectives for livestock development. Its main focus will be on the improvement of disease control, livestock extension, and support services reaching down to the village level to improve the health and productivity of livestock in Nepal. The Project design takes into account the Government's sectoral strategies, and also lessons learned under the First Livestock Project (which was assisted by a Bank loan in 1979). This project was directed towards improving on-farm livestock production primarily through improved

animal health. The project also initiated a pilot program for intensive livestock development covering fodder production and marketing, animal health, extension and credit services to small farmers in five selected districts (including three in the Central Region). Implementation performance of this project is satisfactory. A major impact has been made in the project area in terms of increase in milk production/collection and income to the farmers. It is expected that the project will be completed by early 1986.

The proposed Project builds on the development impetus initiated under the First Livestock Project but with increased emphasis on intensive development particularly in respect of animal feed/fodder improvement in a larger area and institution-building of the Department of Livestock Development and Animal Health (DLDAH). The Project will have the following major components: (i) a national program to expand disease control and veterinary services at the field level; (ii) a program for improving animal nutrition, fodder and breeding services in the Central Region; (iii) an intensive livestock development program in 14 (out of 19) districts in the Central Region; and (iv) improvement of the central organization and management of field-level programs of the DLDAH.

Also in line with the Government's emphasis on encouraging the private sector to take a lead role in the development of the livestock sector, the Project will facilitate greater privatization of dairy sector activities and associated services, the establishment of an autonomous enterprise for vaccine production, introduction of charges for veterinary services, and the use of the private enterprises/outlets in the distribution of vaccines and drugs.

The total cost of the Project is estimated at $17.5 million and the proposed Bank loan of $14 million will finance about 80 per cent of the total cost. The United Nations Development Programme (UNDP) has agreed in principle to provide cofinancing in the amount of $1.6 million. As a result of the Project, the quality of livestock will improve which in turn will contribute to increases in food production. It is expected that at least 116,000 farmers will derive benefits from Project interventions. It is projected that incremental production will reach 136,000 mt of milk and 20,000 mt of meat, valued at about $30 million annually at full development. The average annual income of a participating farmer will increase by about 140 per cent to at least $530 equivalent. The EIRR for the Project is estimated at about 32 per cent.

Successful Project implementation will be dependent on the effective institutional performance of DLDAH. Slow dissemination of information and inputs to individual farmers through field extension services would substantially reduce benefits. The Project incorporates measures to minimize these risks. Extension methodologies and effective communication systems will be developed within DLDAH. Staff and farmer training is provided for in critical areas. And distribution of vaccines and drugs will use private companies/outlets supplemented by a large number of private animal health workers for a more effective delivery at the farm level.

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IMMUNE BELT
0 25 50
Kilometers
86°00'
28°00'
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MID WESTERN REGION
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LEGEND:
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(boundaries not necessarily authoritative)
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LDC
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LDSC
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DLDAH, Project Office, Central Regional Directorate Office
Tripureshwar Veterinary Complex
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Dairy Plants
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# I. INTRODUCTION

1. In June 1984, the Bank provided a Technical Assistance grant (T.A. 605-NEP) amounting to $250,000 for the preparation of the proposed Second Livestock Development Project. This was requested by His Majesty's Government of Nepal (HMGN) to sustain the development impetus initiated under the (first) Livestock Development Project 1/ (Loan No. 445-NEP(SF)) approved by the Bank in December 1979.

2. The feasibility study for the proposed Project was prepared by Consultants 2/ who started their field work in October 1984. The Consultants' Final Report was submitted to HMGN and the Bank in February 1985 and was reviewed by a Fact-Finding Mission sent by the Bank in March 1985. Subsequently, an Appraisal Mission composed of R.L.Espiritu (Senior Financial Analyst) Mission Chief, S. R. Na Phuket (Livestock Specialist), M. Gopal (Counsel), P. McCabe (Country Officer) and P. Soriano (Economist/ Consultant) visited Nepal from 1-20 May 1985. The Mission visited the Project area and held detailed discussions with Government officials concerned. This Report is based on the feasibility study and the Mission's findings in the field.

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1/ Hereafter referred to as the First Livestock Project.
2/ Finnagro Oy of Finland in association with the Agricultural Project Services Center (APROSC), a local consulting firm.

## II. BACKGROUND

### A. General

3. Nepal is a landlocked country with a population of about 16.2 million (1984) growing at a rate of 2.7 per cent per annum. About 56 per cent of the population live in the mountains and hills (these areas are referred in this report as Hills) and the rest in the Terai (lowlands). Only about 5 per cent reside in urban areas. The economy is heavily dependent on agriculture which accounts for 60 per cent of gross domestic product (GDP), about 90 per cent of total employment and 70 per cent of exports.

4. The total cultivated land in Nepal is estimated at 3.1 million ha of which 1.6 million ha are in the Terai and 1.5 million ha in the Hills. Cropping intensities vary from about 130 per cent to over 160 per cent depending on location and water availability. Crop yields are generally low, and increases in agricultural production, averaging about 1.0 per cent annually between 1973 and 1983, have been largely due to the expansion in area planted.

5. In the Hills, agricultural production is largely subsistence-oriented. Crops are grown on terraced slopes using every available piece of land. Animal husbandry is an important supportive activity in all parts of the country and in the high hills it represents the main economic activity for many households. The average size of land holdings is less than 0.4 ha. Agricultural productivity has fallen due to the extension of cultivation to marginal land and to a decline in soil fertility. As a result of increasing cultivation, grasslands and forests are being rapidly depleted as sources of fodder and fuel, and animal waste traditionally used as fertilizer is increasingly used as fuel. Many of the Hill districts are food deficit areas.

6. The situation in the Terai 1/ provides a marked contrast with that of the Hills. The average size of holdings is 1.7 ha and the Terai farmers have better access to supportive agricultural services. Better transportation infrastructure, more irrigation and a more favorable man-land ratio has traditionally enabled the Terai to produce a surplus. This surplus particularly of foodgrains meets some of the Hill deficits and provides the bulk of merchandise exports. However, yields are low and the continuous increase in human population has greatly reduced these surpluses. The livestock population in the Terai are generally much less compared with the Hills.

### B. The Livestock Sector 2/

#### 1. Role in the Economy

7. Livestock occupies a significant place in the economy. It contributes about 15 per cent of the total GDP in the form of milk, ghee, meat, manure and skins and 25 per cent of the agricultural GDP. Further, livestock are an indispensable part of the agricultural production system in Nepal. They provide almost all the draft power, and their dung is

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1/ Also sometimes spelled as Tarai.
2/ For a more detailed background information, see Appendix 1.

extensively used for composting, the principal -- and in many cases the only -- means of replenishing soil nutrients. The bullocks in the Terai and the mules, buffaloes, yak and chauries 1/ in the Hills also provide most of the power for rural transportation. In addition, livestock provide essential items for subsistence food for the farming community - milk and ghee from cows and buffaloes and meat from goats, sheep and buffaloes. Livestock products in the form of ghee, wool and live animals are also traded.

8. The export of livestock products in FY1983/84 amounted to Rs 414 million -- mainly in form of live animals (Rs 95.3 million) and hides and skins (Rs 268.6 million). Imports of livestock and livestock products are significant -- about Rs 381.2 million in value and consist mainly of live animals for slaughter, wool for carpets, milk products and eggs (see Appendix 2).

## 2. Structure and Current Status

### (a) Livestock Population and Productivity

9. Livestock statistics in Nepal are not very reliable but current estimates place the national livestock population at about 6.0 million cattle, 3.0 million buffaloes, 4.9 million goats, 0.8 million sheep, 0.5 million pigs and 8.0 million poultry. These figures indicate that Nepal has one of the highest livestock populations per unit of cultivated area in the developing world. The average farming family in the Hills maintains 3.7 cattle, 1.9 buffalo, 2 goats and 8 chickens and in the Terai, an average of 2.5 cattle, 0.85 buffalo, 2 goats and 2 chickens.

10. Cattle in Nepal are characteristically small and adult animals on average weigh about 150 kg in the Hills and 200-250 kg in the Terai. The male animals are normally used to provide draft power for cultivation. On the other hand, female cattle are mainly kept to breed replacement bullocks, although they also yield small quantities of milk -- about 160-180 liters per lactation. This is used mainly for home consumption. The calving interval is long -- more than two years -- and calf mortality is high, especially among female calves which are not as carefully managed since only males command a good price when raised and sold as draft animals. Slaughter of cattle in Nepal is not acceptable on religious grounds and is prohibited by law.

11. Over 60 per cent of the buffalo population in Nepal are adult females reflecting the fact that buffaloes are kept mainly for milk production and that male animals may be slaughtered for meat. The local buffalo is quite small, 250-300 kg liveweight, but hardy and suited to local conditions particularly in the Hills. These animals produce 350-450 liters of milk per lactation, much of which is used for home consumption and also ghee production. Along the Terai, Murrah buffalo from India and their crosses with local stock predominate. These animals are larger and produce 1,000-2,000 liters of milk per lactation. However, production as in cattle has been limited by poor nutrition and by a particularly long

1/ Chauries are produced by crossing the yak (a Tibetan ruminant found in the high hills of Nepal) and cattle.

calving interval -- often in excess of two years. In general, buffalo are considered as the "cash crop" of the livestock subsector. Farmers are willing to pay quite high prices for good milking buffaloes and these animals are given preference in the allocation of limited fodder resources.

12. In the high hills, animal husbandry is the major agricultural activity for many households. In these areas, farmers maintain herds of 15-30 yaks or chauries to provide most of their income and only secondarily grow areas of crop mainly for subsistence. The availability of fodder in the alpine regions is expected to become acute in the future because of the impending closure of the traditional grazing areas in Tibet.

13. Goats are considered important in Nepal because goat meat is consumed by all sections of the population. Apart from some large herds in the Western and Far Western Regions, 1/ most goats are kept in units of one to five animals by village households. The local goat is very prolific and hardy although quite small in size (about 20-25 kg liveweight at maturity) and slow-growing. Attempts to improve this local stock by crossing with the Indian Jamnapuri breed have been made with some positive results under the Bank-assisted First Livestock Project. Sheep are kept for wool and also mutton production.

14. The majority of poultry in Nepal are chicken kept in small numbers (less than 10 birds) by farming families in rural communities. Production of eggs and meat is low and mortality among young chicks is very high. Most poultry production is consumed within the household. Commercial poultry production was started in the Kathmandu Valley some 20 years ago but expansion has been constrained by the availability of feeds.

15. Most of the pigs in Nepal are of the small native type which scavenge in herds around villages. Meat from these animals is generally consumed only by a small number of people in the lower social classes. In recent years, improved breeds of pigs have been introduced to supply meat mainly for the tourist industry.

16. It is estimated that in 1983, livestock production included about 78,700 mt of meat (buffalo 53,400 mt, goat/sheep 17,500 mt, poultry 4,600 mt, and pig 3,200 mt), 731,000 mt of milk (buffalo 501,100 mt and cattle 229,900 mt), 3,200 mt of eggs and 211 mt (1984/85) of wool. Livestock productivity in Nepal is low. The existing livestock population could constitute a potentially massive asset. However, this asset is largely unrealizable and in many situations, it may now become an increasingly serious liability. Because of a prohibition on the slaughter of cattle and female buffalo, economic returns (excluding the value of draft power) from these animals are far below those expected in countries where such prohibitions do not exist. By way of comparison, Thailand has a similar-sized large ruminant population. The output from this herd is valued at more than three times (mainly from meat production) the output of Nepal's herd (mainly from milk production). The prohibition of the slaughter of cattle has another adverse effect as it tends to increase the livestock

1/ The country is administratively divided into five regions comprising the Eastern Region, the Central Region, the Mid-Western Region apart from the Western and Far Western Regions.

population. Calculations based on the total area of land that requires cultivation by draft animals and the average capability of a pair of working bullocks would seem to indicate that Nepal has a cattle herd 25 to 30 per cent above what should be necessary.

(b) Livestock Nutrition and Health

17. In the traditional system of farming evolved over centuries in the Hills, crop production, livestock and forestry have been closely integrated into the farming system, each supporting the other. Under this system, livestock were a means of collecting, concentrating and breaking down large amounts of plant material to provide food for the family and also dung for composting and recycling. Since sufficient areas of pasture and forest were available, increasing numbers of cattle were expected to supply greater quantities of compost to maintain various needs. Unfortunately, this situation has changed in recent years. Pressure from a rapidly increasing human population has resulted in the general deterioration in the forest areas, as trees have been cut for fuelwood, and more forests cleared to provide additional land for cultivation. With the dwindling of the forests, the harvesting intensity on the better types of fodder trees became very heavy and many trees succumbed or at least were unable to maintain their previous level of fodder production. As a result, the animal feeding base throughout the Hills has been seriously depleted and productivity of livestock has fallen substantially. This has led to a decreased availability of compost, reduced crop production, fewer crop residues for feeding the animals, further lowering of their productivity, and greater encroachment on the forest areas thus causing a vicious spiral which further accentuates the already critical situation. This has led to widespread soil erosion and also the replacement of the more nutritious species of pasture with species of lower productivity and palatability.

18. In the Terai, as more land has come under cultivation and pasture areas have deteriorated, livestock nutritional requirements are increasingly met from crop residues (particularly rice straw) and from the limited feed available along roadsides and on paddy lands. Neither of these resources is of high nutritional value. While poor nutrition is a major constraint on livestock production, little work has been done on investigating means of improving fodder production and very limited facilities and trained manpower are used for this purpose.

19. Estimates of feed requirements and availability for livestock on a national basis are not available due to inadequate data. However, for the Central Region, the Consultants calculated feed requirements at some 1.9 million mt against an availability of about 1.5 million mt (see Appendix 1) indicating a shortage of about 400,000 mt annually. The shortfall has been estimated at 35 per cent of requirement in the high hills, 18 per cent in the mid-hills and 27 per cent in the Terai.

20. Unfortunately, the contraction of the fodder base has not led to a decline in livestock numbers. In fact, it appears that farmers have actually tended to keep additional livestock in an attempt to compensate for a decline in productivity of individual animals. This situation results from the fact that farmers are competing for the use of fodder in public forests and grazing areas. In such circumstances, there is a need

to convince individual farmers of the benefit of reducing livestock numbers in order to ensure adequate fodder supply to a smaller number of animals. In most areas, the individual looks at his loss in livestock numbers only as his neighbors' gain in fodder supply, and not as a direct benefit to himself.

21. Poor animal health constitutes a major problem of the livestock sector in Nepal. This is not surprising considering the very large livestock numbers, the poor nutritional status of most stock and the limited animal health service. Poor nutrition is linked to high incidence of animal diseases and production losses due to mortality or debility from disease are substantial. Losses result directly from reduced production of meat, milk, eggs and wool and indirectly (and possibly more importantly) from loss of draft power at critical times during the cropping cycle. The direct losses alone are roughly estimated at Rs 2,500 million (about $130 million equivalent) annually. Important animal diseases are internal parasites, foot and mouth disease, rinderpest, haemorrhagic septicemia, new castle disease, ranikhet and fowl pox and rabies (see Appendix 1).

(c) Processing, Marketing and Trade

22. Marketing in Nepal is severely fragmented because of transportation difficulties, the absence of a market information system and a large number of subsistence farms. Established markets are located mainly in the surplus producing Terai and their integration with markets in the bordering areas of India is more pronounced than their linkages with each other or with the hill markets. Apart from a small segment of the dairy processing industry and leather and shoes factory, the marketing and processing of livestock and livestock products is handled by the private sector. Live animals and eggs are usually sold through village markets and then taken by traders to major consumption centers. Middlemen play the dominant role in all stages of marketing from the farmer to the retailer. Animals are usually slaughtered by butchers under unhygienic conditions on river banks or in many cases in the butcher's backyard.

23. Approximately 2 per cent of the estimated national milk production is collected and marketed by the state-owned Dairy Development Corporation (DDC). Small private milk processing plants have recently been established in Kathmandu selling liquid milk and various dairy products. The bulk of milk produced is consumed on the farm, sold in the locality in raw form or processed into ghee (clarified butter) or curd for household consumption (see Appendix 2).

24. Retail prices of milk, meat and eggs tend to vary depending on the area. Except for DDC-marketed milk, there are no price controls on the sale of livestock products and market prices are determined by supply and demand. Buffalo meat is the cheapest meat (about Rs 15/kg) with goat and chicken meat normally priced up to 140-180 per cent higher. Milk pricing is somewhat peculiar in that while DDC is the dominant retailer of liquid milk in the urban areas (particularly Kathmandu where it controls about 60 per cent of the total market), the recorded price of milk has tended to follow market forces. At present, the retail price of milk in Kathmandu and Hetauda is Rs 6.14/liter; in Biratnagar, Rs 6.56/liter; and in Pokhara, Rs 3.95/liter. In contrast, DDC's present price is Rs 6.00/liter

(effective September 1985). The price of fish is about Rs 30/kg, twice that of buffalo meat but slightly lower than goat and chicken meat.

25. There is quite an active trade in livestock and livestock products. Live animals (mainly cattle and buffalo) are exported in large numbers to India but at the same time live animals are also imported from India into Nepal. Other major items traded are hides and skins, wool, ghee and butter as well as eggs and feedstuffs.

## 3. Livestock Institutions and Support Services

26. Institutional support for the development of the livestock sector is provided by the Department of Livestock Development and Animal Health (DLDAH) which was established in 1979 within the Ministry of Agriculture (MOA). Prior to then, livestock matters had been the responsibility of the Animal Science Division within the Department of Agriculture (DOA). The Division had operated under a number of constraints including acute shortage of trained manpower and support facilities, limited capacity for research, fodder production and absence of a livestock extension service. Priority was given to crop production and livestock received only secondary consideration. Since 1979, efforts have been made to develop an effective livestock service delivery system and establish the necessary facilities. While some significant achievements have been made, several of the constraints have not yet been adequately overcome.

27. The Dairy Development Corporation (DDC) was established in 1969 as a Government corporation to develop and promote the dairy industry including the collection, pasteurization and distribution of milk and milk products. The Corporation operates four milk processing plants (in Kathmandu, Hetauda, Biratnagar and Pokhara) as well as a number of cheese plants in the more remote parts mainly in the Hills. DDC has made a significant contribution to dairy development. However, it is at present incurring financial losses mainly as a result of low utilization of its facilities and low prices of its milk and milk products. 1/

28. The Agricultural Development Bank of Nepal (ADBN) is the main source of institutional credit to the livestock sector and has an active and fast expanding program of lending to the sector. Because of the strong linkage between livestock, crop production and forestry, the DOA and the Agriculture Inputs Corporation (AIC) within MOA, the Department of Forests (DOF) within the Ministry of Forests and Soil Conservation also indirectly play a role in livestock development.

### (a) Research and Extension

29. Agricultural research is carried out mainly by the DOA and the DLDAH. However, experience in agricultural research is limited. The extensive variations in rainfall, temperature, soil types and irrigation

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1/ With the recent price increase (para 24), however, it is expected that DDC will be able to cover its operating cost and generate a small profit.

facilities, and the lack of adequate supply of inputs and trained extension personnel throughout Nepal have also been obstacles to the transfer of research findings from experimental farms to the farmers. In recognition of the importance of research, however, HMGN recently obtained funding from the USAID for its Agricultural Research and Production Project. 1/ This project has as its main objective the strengthening of the research and extension programs of DOA and DLDAH and the expansion of the seed production and distribution systems of the Agricultural Inputs Corporation (AIC) in the Hills. The production program component of the project will initially support the development of an effective methodology initially in four hill districts of the Western Region involving the integration of livestock, agro-forestry and crop extension at the farm level.

30. Prior to the separate establishment of the Government's DLDAH in 1979, livestock extension was provided by agriculture extension agents of DOA who also advised on crops and fisheries. After 1979, DLDAH started developing a separate livestock extension service. Field staff are now based in veterinary hospitals or dispensaries, on Government livestock farms or at Livestock Development Centers (LDCs). However, insufficient transport, lack of vaccines and drugs and related equipment plus inadequate incentives continue to prevent the delivery of effective extension programs geared to disease control and livestock and fodder development at the village level. Existing extension services are station-bound and have been confined to providing clinical treatments to individual sick and/or injured animals brought to the veterinary hospitals and dispensaries (which are usually located in towns). To reach the farmer in the rural (particularly remote) areas, a promising start has been made under the Bank-assisted First Livestock Project which had initiated the establishment of a number of Livestock Development Centers (LDCs) in selected districts (see para 41 below). The Project initiated a systematic program for improvement and upgrading of livestock field services and provided support for vaccine production and the establishment of a disease diagnostic program.

(b) Animal Health Care

31. The existing disease diagnostic facilities of DLDAH are rudimentary and knowledge of the major contributory diseases and their epidemiology is minimal. Before the First Livestock Project was initiated, the existing field facilities in Nepal consisted of 34 veterinary hospitals, 16 dispensaries and four quarantine checkposts. Although the central diagnostic laboratory at Tripureshwar (in Kathmandu) is being upgraded under the First Livestock Project, it has only recently been completed and is expected to be operational only in 1986. To be fully effective, this central laboratory will eventually need associated field laboratories at the district level and competent staff to collect diagnostic materials as well as identify the nature and causes of the diseases so that the most appropriate control measures could be adopted.

32. The Biological Products Division of DLDAH, also located at Tripureshwar, has been producing vaccine since 1964 primarily for distribution to veterinary hospitals and dispensaries throughout the

1/ This was approved by USAID in May 1985 in the amount of $10 million.

country. The vaccine facility has concentrated its efforts on producing Rinderpest and Haemorrhagic septicemia vaccines for cattle and buffaloes, Newcastle disease and Fowl pox vaccines for poultry and Rabies vaccine primarily for humans and dogs. Foot and mouth disease vaccines (for cattle/buffaloes) are imported. In recent years, the DLDAH initiated a program to extend livestock health services by tapping the services of private village workers who are not Government employees. These workers charge nominal fees for their services which include the application of simple animal treatments, vaccines and drugs. As a result of the upgrading of the present vaccine facility initiated under the First Livestock Project, production levels will be increased. All vaccine and veterinary drugs are at present given free of charge to farmers.

(c) Breed Improvement

33. The animal breeding program (both through artificial and natural means) is still poorly organized, although some improvements have been made in certain districts. Frozen and chilled semen for the artificial insemination of ruminants is supplied from the National Artificial Insemination (AI) Center at DLDAH's Livestock Farm at Khumultar (also in Kathmandu). At this Center, crossbred Jersey and pure Murrah bulls are kept for producing semen and imported frozen Jersey semen is held in stock. At present, fresh liquid semen is distributed via public transport to 40 LDCs in the Kathmandu Valley and frozen semen carried by air is used in other parts of the country. Assistance to farmers to improve their local cattle and goat stocks is also given by the distribution in villages of improved bulls and bucks bred from herds kept at DLDAH's livestock farms at Khumultar, Jiri and Khimti (the latter two located in the hills northeast of Kathmandu) and at three Fodder Resource Centers at Janakpur, Lalbandi and Nepalganj.

(d) Credit

34. Relatives, village moneylenders, landlords and traders have traditionally met the credit needs of the rural population in the past. During recent years, however, the share of institutional credit provided by the Agricultural Development Bank of Nepal (ADBN), the sajhas (multi-purpose cooperative societies) and the commercial banks has expanded rapidly. ADBN, which was established in 1968 provides credit to farmers directly, through the sajhas and through small farmers' groups. ADBN has been used as the executing agency for four Bank-financed agricultural credit projects, three of which have been successfully completed; the fourth loan is expected to be utilized by 1986. 1/ The IFAD-assisted Small Farmer Development Project was also implemented satisfactorily by ADBN and IFAD has recently approved a second project. The two IFAD projects and the fourth Bank-assisted agricultural credit project include substantial livestock components. The sajhas provide credit as well as agricultural inputs and marketing facilities to farmers. The commercial banks 2/

1/ The combined Bank loans for these four agricultural credit projects amounted to $26.4 million including the $15.0 million for the fourth one which was approved in December 1980.

2/ The Nepal Bank Limited and the Rastriya Banijya Bank are the two older commercial banks in Nepal. Two others (both joint ventures with foreign banks) were recently authorized to commence operations in the country.

entered into the agricultural credit business only recently when they were required by the Nepal Rastra Bank (the Central Bank) to invest at least 5 per cent of their deposit resources in agriculture and other priority sectors. These commercial banks are quite keen on expanding their lending to the livestock sector and have expressed their willingness to provide livestock-related credit in support of the proposed Project (see para 68).

(e) Regulations

35. Long term development in the livestock sector will require legislative and regulatory controls on livestock-related activities, livestock investments and health requirements. Laws affecting the livestock sector in Nepal are found in various enactments. The most important is Chapter VII of the National Code of Nepal, entitled "Quadrupeds". This Chapter largely regulates the treatment of livestock, including slaughter of "prohibited" animals (mainly cattle and all female animals with very limited exceptions) which is prohibited by this law. Slaughter of animals for commercial purposes is governed by various provisions of the Town Panchayat Act, the Village Panchayat Act and the Local Administration Act. These provisions cover such aspects as compulsory licensing of abattoirs and their inspection, the maintenance of slaughter facilities, prohibition of slaughter of diseased animals as well as prevention of cruelty to animals. However, enforcement of these provisions is relatively weak. At present, most commercial slaughter is carried out by butchers (there is now only one abattoir in the country) and licensing procedures are not well developed. Besides these two main bodies of laws, there are certain other laws governing livestock. Parts of the Infectious Diseases Control Act apply to livestock. As required by a covenant under the First Livestock Project, 1/ regulations have been issued under this Act regarding vaccination of livestock. The Government has declared its intention of adopting separate legislation governing livestock disease control. The Feed Materials Act and the Pasture Nationalization Act affect livestock nutrition. Under the Pasture Nationalization Act, village panchayats controlling grazing lands are entitled to levy taxes for the use of such lands and also bear responsibility for their improvement.

(f) Manpower Development and Training

36. There is an acute shortage of skilled manpower at most levels of livestock services. In the past, animal health was given priority over animal husbandry and feed/fodder promotion. Despite this, at present, there are only about 110 veterinary graduates which is extremely inadequate compared with the large livestock population. The situation in respect of other functional areas is worse.

37. The Tribhuvan University, through its Institute of Agriculture and Animal Science (IAAS) located at Rampur in Chitwan District, is the only institution in Nepal which turns out Bachelor of Science (B.S.) graduates in agriculture. While it provides for the pre- service training for middle level extension workers - called Junior Technicians (JTs) and Junior Technical Assistants (JTAs) - IAAS does not at present produce graduates either in animal science or veterinary medicine.

1/ Para 11, Schedule 6, Loan Agreement for Loan No. 445-NEP(SF).

38. For livestock related courses particularly in veterinary medicine, most students go to India for their primary degree and many travel overseas for further post-graduate training. Recently, however, IAAS received some assistance from the World Bank (WB) and USAID. 1/ This Project is aimed at upgrading the existing academic, research and extension programs of IAAS including the establishment of a B.S. degree course in Animal Science (to produce initially an annual output of 50 graduates); and to improve and expand the facilities/curriculum for the (pre-service) training of JTAs (to produce initially an annual output of about 550 JTAs including 100 exclusively for livestock). To supplement these, DLDAH conducts its own training programs for JTs and JTAs based at its Khumultar Farm but these are mainly geared for in-service/practical application at the village level. With the assistance provided under the First Livestock Project and the proposed Project, these programs will eventually have an effective capacity of 100 trainees annually.

4. Review of the First Livestock Project

39. A large number of donors have provided assistance for livestock development. However, most of this assistance has been through inclusion of a livestock component under integrated rural development projects or credit programs. As of December 1984, total external assistance received by the livestock sector amounted to a little less than $20 million including the $9.2 million (net) Bank loan for the First Livestock Project. Therefore, the amount of assistance has been small and the institutional development needs of the sector have not been adequately addressed. The First Livestock Project was designed to meet this shortcoming and to initiate a long term program for livestock development in Nepal.

40. In designing the project, it was recognized that the main constraints on livestock development in Nepal were: high incidence of diseases causing death and loss of production in animals; poor quality and insufficient quantity of livestock feed; low genetic potential for milk and meat production of the indigenous livestock; and lack of suitable marketing channels for livestock products in many areas of the country. The livestock development agencies lacked manpower, facilities and a plan of action and programs to deal with these constraints effectively. The project proposed to deal with these problems in a phased manner. By necessity, disease control had to be tackled on a national basis if real and lasting progress was to be made. Therefore, the project aimed at improving animal health in the country through improved disease diagnosis and monitoring and increased coverage of the livestock population with preventive vaccines and treatment and provided for: diagnostic facilities, veterinary centers, quarantine checkposts, vaccine production and improved communications and disease reporting.

41. On the other hand, from implementation considerations, comprehensive development packages aimed at production improvements could not be undertaken countrywide. Therefore, the project was designed to promote livestock development (mainly for milk production) through an

1/ Under the Agricultural Manpower Development Project for which a combined WB and USAID financing of $12.5 million was recently negotiated by the Government.

intensive program of livestock extension backed up by all the necessary technical production and marketing inputs in selected areas only. Accordingly, the intensive program for livestock development was limited to five districts, of which three (Sarlahi, Dhanusha and Mohattari) are in the Central Region and two (Banke and Bardia) in the Mid-Western Region. In these districts, provisions were made for: livestock resource centers and facilities; a program to improve fodder production and livestock nutrition and an extension organization filtering down to the farm level; improved livestock and artificial insemination services; credit; and the development of milk collection and marketing. It was envisaged that depending on actual experience, the intensive livestock development approach of the project could serve as a model for achieving future improvements in livestock productivity in other areas. Both the animal health and intensive livestock development components are being executed by the DLDAH; the provision of credit by the ADBN; and the development of milk collection and marketing facilities by the DDC.

42. Project implementation is progressing well, except for the diagnostic laboratory and vaccine production components which have been delayed largely due to technical reasons. Most of the other physical implementation targets envisaged during appraisal, however, have been achieved and a major impact has been made in the five districts which has stimulated a substantial increase in milk production/collection at the farm level. Based on present progress, the entire project including the vaccine facility can be completed by early 1986. Compliance with the Bank loan covenants under this project has on the whole been satisfactory (see Appendix 3 for further details).

43. Despite delays in the construction of the central animal health facilities, the project has made certain contributions to the animal disease control in the country. Intensive vaccination campaigns have been organized to control outbreaks of major contagious diseases and large numbers of animals have been treated against internal parasites. These activities have prevented losses in terms of animal deaths and, perhaps more important, have reduced shortages of animal draft power at crucial times of planting or harvesting. However, as the project facilities are nearing completion or are just about to commence operation, it is considered too early to measure the overall impact of the animal health services component in quantitative terms. However, it can be seen that farmers have become more receptive to the improved technology being introduced by DLDAH and have already demonstrated their willingness to pay for livestock services and certain vaccines and/or drugs. The animal health problem in Nepal is complex and large in magnitude and considerable efforts are still required to reach a satisfactory status.

44. There is no doubt that the project has been successful in the introduction of elementary livestock extension services, accompanied by the development of milk collection and marketing, and to a lesser degree, meat marketing. This integrated approach is particularly visible in the Janakpur area. After only two years of extension efforts such as supply of improved stock, introduction of fodder crops in the traditional crop rotations, increased veterinary services, training and demonstrations, and a guaranteed outlet for the produce, a new awareness has developed among the small farmers. They now realize that besides draft power and manure

from their animals, they can receive important regular extra income through sales of milk.

45. The provision of credit for purchasing livestock has similarly encouraged many farmers to own improved buffalo types, purchased either directly or indirectly from India, in place of their lower yielding animals. This has had a great impact in the milkshed areas on improving the local breed. A survey carried out recently supports this. The survey showed that up to 40 per cent of the large ruminant population in the districts covered under the First Livestock Project are now of the improved type (as against about 25 per cent in other districts which are outside the Project area). The project has to a large extent also stimulated a system whereby farmers in milkshed areas sell their dry cows in order to purchase lactating buffaloes. It would seem, therefore, that at least in the districts covered under the First Livestock Project, this process of gradual education and exposure has begun to "take root" and the farmer at the village level now recognizes that keeping more improved buffaloes would provide him better income compared with keeping "the less productive" cattle. In the long run this is expected to lead to a reduction in the number of livestock.

46. On the institutional side, the special skills of livestock development, animal health and fodder production have been upgraded among technical staff through the staff training component of the project. The layer of qualified specialists on all levels is, however, still very thin. The project has also been successful in promoting the establishment of informal farmers' associations to take care of milk collection at village level. The positive initial experience with these farmers' associations should encourage them further to take up a variety of commercial supply activities in support of the members' livestock development. Such activities could include the operation of milk collection centers and eventually the milk chilling centers and the sale of veterinary medicines, fodder seeds, fertilizer, concentrate feeds, minerals, vitamins, milk utensils, etc.

47. Important lessons have also been learned from the implementation of the project, which have been taken into account in the proposed Project's design. Under the project, fodder seed production was confined to two Government Resource Centers, which have been able to supply only a small percentage of local farmers' needs. Thus the expansion of a cropping system which includes a fodder crop onto a large number of farms has been constrained by a lack of suitable seed. To overcome this problem and encourage the private sector to set up seed production farms, arrangements with selected farmers/contract seed growers along with DLDAH's technical support (in addition to the Government Resource Centers) have now been incorporated and would be pursued under the proposed Project. Other lessons pertain to the need to maintain a viable milk pricing policy determined by market forces to encourage producers to expand their production, the need to gradually implement a cost recovery policy in respect of vaccines and drugs and the need to provide adequate incentives to field staff. All these policy issues were discussed in detail and assurances obtained from Government with a view to ensuring a more effective implementation of the proposed Project (see paras 118-124).

## 5. Future Sector Development

### (a) Supply and Demand for Livestock and Livestock Products

48. The existing livestock population (cattle and buffaloes) are clearly in excess (in numbers) of what is required for draft power and the capacity of the feed resources available. However, their productivity is very low. It is, therefore, clear that livestock development programs must concentrate on increasing the productivity per animal unit while not increasing animal numbers. Productive animals must be protected from disease and carefully managed in order to extend their productive life and total output. Moreover, ways that have been found effective and workable (such as those tried out with some success under the First Livestock Project) to accelerate the reduction in the number of the "less productive" animals in the country must be intensified.

49. There are no reliable national consumption data for livestock and livestock products. However, best available estimates indicate that annual per capita consumption of milk increased from 39.0 liters in 1975 to about 50 liters in 1985; for meat (from buffalo, goat, pig, poultry and sheep combined) from 3.7 kgs to 6.0 kgs; and for eggs from 0.17 kgs to 0.22 kgs. During the last decade (1975-85), therefore, it would appear that a definite upward trend in national consumption has occurred; there are indications, however, that a major part of this may have been achieved by increasing the country's importations. In FY1980/81, recorded imports of Nepal of milk and milk products amounted to about 4,500 mt and of meat, 7,800 mt. In FY1983/84, both of these sharply increased to about 16,800 mt and 14,450 mt respectively 1/ (Appendix 2). Apart from the pressure from the increasing human population, the Consultants attribute these consumption and trade patterns to several factors, particularly the low prices of livestock products in Nepal (e.g. buffalo meat and milk) which encourage consumption by consumers, the severe transport difficulties which hamper distribution from the production area to the consumer area and the inadequacy of the Government's livestock support facilities which in fact discourage the producer at the farm level.

50. Total present consumption of milk for the entire country is roughly estimated at around 700,000 to 750,000 metric tons, of which approximately 98 per cent is locally produced. The balance is being met by milk powder and other importations. It should be noted, however, that because of the marketing difficulties in Nepal, particularly in the movement of perishable commodities such as milk, shortfalls in supply to the urban areas (particularly Kathmandu Valley) are much more severe than elsewhere in view of their larger concentrated population and their distance from producing areas. The Government estimates that the combined consumption of milk in the urban areas is about 40,000 mt yearly or about 6 per cent of national consumption. Of the 40,000 mt urban milk demand, Kathmandu accounts for about 70 per cent.

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1/ Actual imports and consumption may in fact be much higher than recorded figures in view of the long open border with India and the active trading (largely unchecked) of livestock and other products between the two countries.

51. The Mission prepared projections for demand for milk, meat and eggs based on average consumption levels attained for the period 1979-85 and an assumed population growth rate of 2.7 per cent per year. On this basis, a total domestic requirement of about 1.1 million mt of milk, 160,000 mt of meat and 6,200 mt of eggs by 1995 is projected. To meet this demand, local production of livestock products as of 1984 accordingly will have to be increased by at least an additional 300,000 mt of milk, 75,000 mt of meat and 2,800 mt of eggs by 1995. Even at these conservative levels, the annual intake of an average person in Nepal will be equivalent to less than 80 per cent of the combined minimum nutritional requirement for milk, meat and eggs. 1/

52. Foreign exchange earnings from the export of hair, hides and skins (for carpets and various leather products) have shown an encouraging upward trend during the last three years. In 1983/84, these amounted to Rs 268.6 million compared with Rs 45 million in 1980/81. Prospects for increasing export earnings from these products would appear to be bright but would depend on the ability of the livestock sector to supply adequate raw hides and skins as raw materials and the capability of the local industry to upgrade the quality of their products to enable them to compete in the world market.

(b) Future Development Plans and Policies

53. In spite of the fact that livestock is an indispensable part of the farming system in Nepal, the actual animal protein consumption of an average Nepalese continues to be among the lowest in South Asia. 2/ This is particularly significant since as a landlocked country, Nepal will necessarily have to rely on livestock for its animal protein requirements. Also, the production of milk as well as hides and wool have proven to be quite profitable while goat meat, chicken and eggs as well as buffalo meat are the result of quick-yielding and low-cost production systems or are by-products derived from draft animals. Milk in particular is part of the Nepalese diet and dairying, being an activity with a long tradition, can well be expanded to benefit a large number of rural farmers.

54. The local production of certain animal vaccines also is advantageous to Nepal largely owing to its low labor cost and the assurance of controlled quality and faster delivery, not to mention investments in equipment, buildings and staffing already made. While animal health programs, disease diagnosis and preventive as well as curative vaccines and veterinary drugs provide almost immediate benefits, productivity increases in animals can be sustained over the longer term only by improving feeds and animal nutrition.

1/ As recommended by FAO, the minimum annual nutritional requirement for an average Nepalese should be 64 liters for milk, 7.5 kgs for meat and 0.54 kgs for eggs.

2/ Nepal's animal protein consumption per capita per day (including fish) for 1978-80 is about 6.7 grams. The comparable figure for Afghanistan is 8.3 grams; for Pakistan, 14.1 grams; and for Burma 8 grams. Source: FAO Production Yearbook.

55. A systematic nutrition development program, however, requires the coordination of agricultural, livestock and forestry extension services in the implementation of animal husbandry techniques using improved technologies while adaptive research and field testings at the farm level are being systematically undertaken. In areas where feed resources are adequate and animal health services are available, breed improvements can also be more intensively applied.

56. To implement the strategies for development outlined above in a more organized manner, organizational and institutional aspects need to be given greater attention. A cohesive program for national livestock development which includes operational linkages in research, training, extension and dairy development, at present performed by several agencies, needs to be organized. As the main agency responsible for the country's livestock development program, DLDAH can take the initiative on these matters beginning with an effective field service delivery system to enable it to reach the farmer at the village level; this has actually started under the First Livestock Project in a very limited area but greater inputs are required in a bigger, compact area. There is a need to develop suitable and simple technology packages which can be readily adopted by farmers; this needs to be supported by an effective vaccine production and distribution system to ensure that effective animal health cover is maintained. Skilled and motivated manpower within DLDAH must be developed to enable it to plan and execute its development programs; adequate incentives, particularly to field staff assigned to the more remote areas, must be provided and its overall organizational system must be strengthened to handle not only planning but also the implementation and monitoring/-evaluation activities of an expanded program.

57. Finally, while the foregoing physical infrastructure, services/facilities and supporting manpower are all important to develop the livestock sector, greater private sector participation in processing and marketing activities is needed. The public sector (through DDC and DLDAH) has initially taken the lead role in the development of the livestock sector particularly in the more remote areas. In a similar vein, the Government now recognizes that the private sector needs to be given more encouragement to expand its present role and to provide much of the support services required. This approach, including the development of a viable market sustained by the gradual introduction of charges for veterinary services, vaccines and drugs and complemented by the transfer of part or all of the public sector facilities (e.g., vaccine production/distribution) to the private sector, would be a desirable direction in which to move over the next few years.

58. The Government's present policies for livestock development are consistent with the above approach. In the recently approved Seventh Five-Year Plan (FY1985-90), HMGN has given high priority to the development of the livestock sector. The main objectives for the livestock sector have been stated as follows: to increase the income of farming communities through livestock rearing; to increase the country's self-sufficiency in milk and milk products, and at the same time to increase the export of some high-value dairy products; to achieve self-sufficiency in meat and egg production; to increase the production of wool and other animal by-products; to improve fodder production and pasture management systems; and to provide extension and adequate animal health services.

59. To achieve these objectives, the Plan has specified the following strategies:

(i) milk collection centers in major producing areas will be opened near motorable roads and at other suitable positions; and adequate incentives will be offered to the private sector, and where feasible to farmers' organizations, to take up livestock and poultry rearing, dairy processing and marketing;

(ii) in the remote areas, particularly in the high hills, processing of livestock and livestock products will be encouraged;

(iii) improved support facilities and services for forage production and pasture management, animal health, breed upgrading and manpower training will be provided; and

(iv) credit will be expanded.

60. The Plan also advocates establishment of model livestock villages or "pockets", where raising of livestock would be promoted. Consequently, intensive extension services will be provided to these villages which specialize in various forms of livestock husbandry. Budget-wise, it is envisaged that resource allocations to the livestock subsector will double under the Seventh Plan as compared to Sixth Plan allocations and its share increase to about a fourth of the allocation for the agriculture sector as a whole.

C. The Project Area

61. The proposed components of the Project will have different geographical coverage. Recognizing that disease control needs to be dealt with on a national basis, the Project will provide essential inputs for strengthening disease control with a country wide coverage. Similarly, the Project will support institutional development and strengthening of DLDAH, including the establishment of three technical divisions and provide for significant training which will have a national impact. At the next level, the Project component(s) comprising animal nutrition, fodder development, breed improvement and improved veterinary field services will cover the whole of the Central Region excluding Rasuwa and Nuwakot Districts. 1/ Finally, the intensive livestock development program component of the Project will cover selected areas in 14 (out of 19) districts of the Central Region. The selected areas have locational advantages including scope for linkages with milk collection/chilling and livestock marketing facilities, development potential and other conditions suitable for intensive livestock production.

62. Accordingly, the Project will provide key inputs in support of a national disease control program. The main aspects of the Government's national animal health program are basic services provided through the hospitals in the 75 districts, mass vaccinations particularly against foot-and-mouth disease (FMD) and rinderpest, mass treatment against foot-rot (in sheep), and control of outbreaks of other contagious diseases

1/ These two districts are covered under another development scheme.

through limited vaccinations and of parasitic diseases through drenching treatments. Self-sufficiency in production of selected vaccines will be aimed at.

63. The selection of the Central Region for intensive livestock development is based on the following considerations: existing infrastructure, development opportunities including market outlets, tradition of livestock raising and farmer aptitude. Certain other areas in the country were excluded as they are covered under various ongoing development projects which include livestock programs/components.

64. The Central Region, which includes the Kathmandu Valley, has about a third of the country's human population. Among the five development regions in the country, it is considered relatively the most developed in terms of infrastructure, particularly motorable roads. The Project area in the Central Region (excluding Rasuwa and Nuwakot Districts) is about 1.85 million ha in area accounting for about 13 per cent of the country's land area. At present, only 42 per cent of the Terai and 18 per cent of the middle hills remain as forest and much of that is degraded through grazing, tree lopping and fuelwood collection. Most of the remaining land is cultivated for crop production, about 7 per cent with irrigation. In the high hills, however, human population and associated grazing pressures have been less intense and existing grassland and forest areas have remained botanically stable. A large number of ecological pockets exist and each demands a farming system suited to its particular conditions. Thus, strategies for crop and fodder resource development are likely to vary considerably from farm to farm, and this should be taken into account in packaging extension programs. Typical of the country, and the basis of the social structure in the rural areas is the small family farm -- which averages about 0.55 ha in the Hills and 1.6 ha in the Terai. The growing of foodgrains supplemented by livestock remains the primary occupation. While the human population is distributed almost evenly between the Hills and the Terai, there are more livestock in the latter than in the former (in contrast with the rest of the country where more livestock are generally carried in the Hills). This may be due in large part to the better infrastructure and marketing facilities available in the Central Region and proximity to the Kathmandu Valley, a major consumption area for livestock and livestock products. (See Appendix 1 for a detailed description of the Project area.)

# III. THE PROJECT

## A. Project Objectives

65. The main objective of the Project is to increase livestock production through improved livestock productivity in Nepal by supporting the Government's development effort in this sector. The Project will aim to:

(i) reduce livestock mortality and improve livestock health and productivity through an improved disease control program;

(ii) increase livestock feeding resources and raise the levels of livestock nutrition through improved livestock management methods;

(iii) improve human nutrition by increasing on-farm availability of high protein foods derived from livestock products;

(iv) increase smallholder farm income from the sale of livestock and livestock products through intensive livestock development; and

(v) reduce imports of livestock and livestock products by increasing the supply of locally produced meat and milk.

## B. Project Rationale and Scope

66. The Project builds on the development started under the First Livestock Project but places increased emphasis on intensive development particularly in respect of animal feed/fodder in a larger area and institution-building of the DLDAH. The main focus of the Government's role in the livestock sector development will be on effective delivery of support services at the farmer level and on support to the private sector to establish or expand its related activities. The organizational mechanism for delivery of services which the Project will support comprises the following:

(i) To coordinate and provide necessary management and technical support to the more critical components of the Project, three new divisions will be established within DLDAH: a Fodder and Nutrition Division, an Animal Breeding Improvement Division and a Livestock Production and Promotion Division;

(ii) District Livestock Development Offices (DLDOs) will be established in each district to serve as the focal point for livestock development in the area; where there are existing veterinary hospitals or other facilities, these will be upgraded to DLDOs and provided with necessary facilities and staffing;

(iii) To reach the farmer at the village level, a network of Livestock Development Centers (LDCs) in each district will be established. The LDCs will be staffed with up to four livestock technicians who will provide extension and support services. In addition, the LDCs will supervise and support Livestock Development

Subcenters (LDSCs) in the area. Over the long term, each district is expected to have an average of about nine LDCs -- one in each Ilaka. 1/ Because of implementation considerations, this will be undertaken in a phased manner;

(iv) A number of LDSCs will be established to provide extension advice to farmers on various aspects of animal husbandry and care. There will be about three to four LDSCs per LDC. Under the phased implementation, selected LDSCs will be upgraded to LDCs; and

(v) LDCs will be linked with milk collection/chilling and other livestock marketing facilities whenever possible.

67. In brief, the scope of the Project will comprise the following five main components:

(a) animal health improvement: consisting of a national program to expand veterinary services at the field level including the provision of vaccines and drugs and improved disease control measures;

(b) animal nutrition and fodder development: to provide and distribute improved planting materials and associated services in the Central Region;

(c) animal breed Improvement: to provide and distribute improved genetic materials/stock and associated services in the Central Region;

(d) intensive livestock development: to provide a package of extension and support services in animal breeding, feeding, management and health integrated with livestock/crop production and marketing in 14 (out of 19) districts in the Central Region; and

(e) institution-building: comprising the improvement of the central administration and management of field-level programs of the DLDAH, provision for manpower training, consultant services and fellowships.

68. To maximize the impact of the foregoing infrastructure and services inputs envisaged under the Project, credit will be provided to farmers for the purchase of livestock (mainly buffaloes and goats) to increase milk and meat production, and to meet the financing needs of producers' associations and/or private enterprises for the establishment or expansion of commercial breeding farms, small to medium-sized dairy processing and marketing facilities, veterinary drug stores-cum-feed shops

1/ Ilakas are used as the spatial hub for service delivery since Nepalese "districts" which have an average population of 200,000 and an average cultivated area of 42,000 ha are too large to serve as the lowest level of planning, management and control. On the other hand, the "village panchayat", with an average population of 3,700 and an average cultivated area of 800 ha, is too small for that purpose.

and simple slaughter slabs/sheds. Funds will be provided from various credit programs of ADBN, commercial banks and sajhas (see paras 34 and 123).

## C. Detailed Project Description

### 1. Animal Health Improvement

69. The long-term program initiated under the First Livestock Project for controlling livestock diseases throughout the country will be continued.

#### (a) Vaccine Production

70. The Biological Products Division at Tripureshwar assisted under the First Livestock Project will be supported until its facilities are developed to full production levels. Minor facilities and extra equipment (mainly laboratory, spare parts and materials) not provided under the First Livestock Project as well as incremental recurrent costs for five years will be provided. Provision for a service contract has also been made to maintain the vaccine production equipment in working order. The amount of vaccines expected to be produced under the Project is shown in Appendix 1 (Table 10).

#### (b) Livestock Disease Diagnostic Services

71. The on-going development of the Central Diagnostic Laboratory at Tripureshwar and the Foot-and-Mouth Disease Epidemiology Laboratory at Budhanilkantha (both in Kathmandu) will be continued under the Project. Extra staff, equipment, recurrent costs and maintenance service will be provided to these laboratories to enable them to monitor the disease situation in the country and provide a rapid and accurate response to disease outbreaks. To augment DLDAH's field disease diagnostic services, a small three-roomed regional diagnostic laboratory will be constructed, equipped and staffed at Janakpur.

#### (c) Disease Control Programs

72. A Rinderpest Immune Belt will be established along the Indo-Nepal border and the major trunk roads from India and Tibet into Nepal. For 5 km within the border and along the road, all cattle and buffaloes will be vaccinated. Tissue culture vaccine will be imported to supplement the local vaccines produced at Tripureshwar. The Rinderpest Vaccination program will be carried out by DLDOs, LDCs and LDSCs located within the immune belt areas. Bicycles and special allowances for field staff will be provided for the purpose. The 22 quarantine checkposts initiated under the First Livestock Project will be upgraded by providing staff quarters, water supply, fencing, animal handling facilities, bicycles, and, where possible, electricity to carry out vaccinations of livestock entering the country and monitor livestock movements as well as restrict entry of diseased animals. These facilities will act not only as checkpoints but will also monitor other contagious diseases and provide veterinary and general livestock extension services.

(d) Field Veterinary Services

73. Animal health services to farmers will be expanded through establishment of about 900 private village animal health workers in the Central Region to treat simple sickness and vaccination of village livestock and to continue the demonstration of parasite control programs initiated under the First Livestock Project. After special training at DLDOs or LDCs, the village animal health workers will be provided with basic veterinary equipment. They will purchase under a credit scheme all other required veterinary medicine and materials. Anthelmentics will be procured for distribution to DLDOs, LDCs and LDSCs and animal health workers. Foot-and-Mouth Disease vaccine will be imported for carrying out vaccinations among crossbred milking animals and among working animals surrounding the disease outbreaks.

2. Animal Nutrition and Fodder Improvement

74. A Fodder and Nutrition Division will be established as part of the reorganization of the DLDAH. It will be responsible for the overall management of the nutrition improvement scheme under the Project.

(a) Fodder Development

75. This component will aim mainly at providing supporting inputs such as planting materials, fertilizers and technical packages and supervision regarding on-farm fodder resources development for intensive livestock development. It also aims to increase soil fertility and production of fodder resources on communal land through broadcasting of legume seeds over the areas. Limited seeds and seedlings of improved fodder varieties as well as extension services and facilities for improved fodder harvesting and storage will be provided for demonstration purposes to farmers in the high hills of the Central Region. The two Fodder Resource Centers established at Janakpur and Lalbandi under the First Livestock Project will be further improved for production of seed and planting materials and existing facilities at the Khumultar Farm (in Kathmandu) and Jiri/Khimti Farms (in the hills, northeast of Kathmandu) will be upgraded and will undertake screening of suitable fodder species, feeding systems evaluation and demonstration as well as limited seed production. A central seed handling center will be established at Khumultar with subcenters at Janakpur, Lalbandi and Jiri/Khimti. A total of 60 small nurseries will be constructed for the propagation of fodder tree seedlings and grass cuttings in the Central Region. A forage seed and seedling production capacity will be established to meet Project needs primarily through smallholder seed and seedling production contracts utilizing manual labor. For initial establishment and screening, about three mt of Leucaena, Stylosanthes spp. and other legume and grass seeds will be imported. Funds for purchase of locally produced seeds and seedlings will be provided. To meet the expanded requirement for Rhizobial inoculants (to stimulate nitrogen fixation), the Soil Microbiology Laboratory (also at Khumultar) will be upgraded.

(b) Improvement of Prepared Feeds

76. The utilization of prepared feeds for dairy animals as well as pigs and poultry will be improved through the following measures. Adequate laboratory facilities will be provided and improved supplementary feed rations for dairy animals developed and field tested under local conditions. The existing laboratory at Khumultar Farm will be upgraded with a range of new equipment and materials in order to provide a comprehensive feed analysis service. Similarly, the existing laboratory at the DLDAH feedmill in Hetauda will be improved by repairing existing buildings and providing basic equipment and materials as well as transportation for field work. Limited support in the form of repairs to the old buildings, provision of fencing, and trucks for feed transportation will be provided to support the existing plant in preparing trial feeds and also for maintaining feed supplies to Government farms.

3. Animal Breed Improvement

77. This component will provide the necessary support for implementing artificial and natural breeding programs at the LDCs/LDSCs. An Animal Breeding Division will be established within DLDAH to supervise the overall breeding program.

(a) Artificial Breeding Services

78. Artificial Insemination (AI) services under the intensive livestock development component as well as existing AI services under other programs of DLDAH will be improved by increasing supplies and distribution of frozen semen to be supplemented by 60,000 doses of Jersey/Friesian and Murrah semen to be imported under the Project. The National Artificial Insemination Center (NAIC) at Khumultar Farm will be upgraded with the completion of the second floor of the AI laboratory and office building; the old sheds would be improved with adequate fencing to house 30 bulls; and staff quarters will be constructed. The Khumultar Farm's ruminant herd will be adjusted to carry about 30 AI bulls and 30 cows for AI training and production of colostrum-free buffalo calves. The AI bull herd will be established through the purchase of 15 Murrah buffalo bulls and five Haryana bulls and the local selection and purchase of 10 grade Jersey/Friesian bulls. Vehicles will be provided for distribution of the liquid nitrogen and frozen semen. Maintenance services for certain AI equipment will be provided through contract arrangements with selected firms in the private sector.

(b) Natural Breeding Services

79. The sire distribution program in the Central Region will be implemented in areas which cannot be reached by the AI field services and in the case of goats, in the area specifically selected for the goat improvement program. About 300 Murrah buffalo and grade Jersey/Friesian male calves will be locally selected and procured for growing under contract and about 1,000 male goats, to be purchased from the Bheri Zone (situated in the Far Western Region) and other areas outside the Central Region will be distributed under the program. Extra specialist staff will be recruited and transportation provided to implement the program and prepare the necessary extension materials and training to support it.

4. Intensive Livestock Development

80. The Project will expand the extension and support services package of the First Livestock Project both in intensity of activities and area coverage. The package will include breeding improvement through provision of artificial insemination and natural breeding services, nutrition improvement through improved feeding practices and on-farm fodder production and management, and animal health improvement through improved sanitation, regular vaccination and veterinary treatment. The area for intensive development will be expanded to cover 14 districts in the Central Region. 1/

81. Additional staff, equipment and vehicles will be provided for upgrading 14 district veterinary hospitals into District Livestock Development Offices (DLDOs), the upgrading or establishment of 41 Livestock Development Centers (LDCs) and 232 Livestock Development Sub-Centers (LDSCs), from which a package of livestock extension and support services will be provided. 2/ Where feasible, semen, planting materials, fertilizers, vaccines, drugs and other materials will also be provided to these centers. While most extension activities and facilities will be similar in all LDCs and LDSCs, the services provided in respect of the milk production and milk collection improvement program will vary within the Project area in accordance with the requirements of each area.

(a) Dhanusha, Mohattari and Sarlahi Districts

82. In the three districts included for intensive livestock development under the First Livestock Project, the District Veterinary Hospitals will be upgraded to DLDOs (one in each district); of the 73 service centers, established under the First Livestock Project, 15 selected centers will be upgraded to LDCs exercising supervisory functions over the remaining 58 centers. These 58 centers will be known as LDSCs. All DLDOs and LDCs will be equipped with mobile artificial insemination (AI) facilities. Ten LDCs will be associated with new milk collection centers to be operated by farmers' associations/cooperatives; while ten will be associated with existing milk collection centers and one with an existing milk chilling center. These farmers' cooperatives were organized under the joint supervision of DLDAH and DDC and their initial operations have generally been successful.

(b) Chitwan, Makwanpur, Bara, Parsa, Rautahat and Sindhuli Districts

83. Six existing District Veterinary Hospitals (one in each district) will be upgraded to DLDOs. In addition to the existing 24 service centers (established by DLDAH from its own resources), 56 new centers will be established. Of these 80 centers, 21 will be developed as LDCs and the remainder will serve as LDSCs. All 21 LDCs will be equipped with mobile

1/ Dhanusha, Mohattari, Sarlahi, Chitwan, Makwanpur, Bara, Parsa, Rautahat, Sindhuli, Kathmandu, Lalitpur, Bhaktaphur, Kavhre and Dhading.

2/ For a tentative list of these LDCs/LDSCs and the typical set of equipment/facilities they will carry, see Appendix 4.

AI facilities and be associated with the 15 existing milk chilling or collection centers of DDC; six will be with newly established collection centers of farmers associations/cooperatives.

(c) Kathmandu, Lalitpur, Bhaktaphur, Kavhre and Dhading Districts

84. In these Hill Districts, the five District Veterinary Hospitals will be upgraded to DLDOs and a total of 120 service centers (LDCs and LDSCs combined) established or upgraded. Five LDCs will be newly established at or adjacent to the five existing milk chilling centers (operated by DDC). A total of 115 LDSCs will be assisted, of which 57 are to be upgraded from existing service centers: 76 LDSCs will be situated at existing milk collection centers, nine LDSCs with new milk collection centers and the remaining 30 LDSCs in the more remote areas. The five LDCs and five DLDOs will be equipped with mobile AI equipment to provide services around the 31 nearby LDSCs which are accessible by road. They will also serve as the back-up station for another 55 LDSCs (associated with milk collection centers but not accessible by road) which will be provided with stationary artificial insemination equipment.

5. Institution Building

85. The Project will provide for the development of the DLDAH's livestock extension and service capabilities through the reorganization of the Department, strengthening of manpower and increasing in general in-service training, establishing monitoring and evaluation systems and providing fellowship training and consultancies. The headquarters building of the Department will also be completed.

(a) Central Regional Directorate Office

86. The Central Regional Directorate Office will be provided with adequate office space by adding one floor to the DLDAH Headquarters building at Harihar Bhawan (Kathmandu). This will also accommodate a conference room and a library for the DLDAH. Additional manpower, facilities and vehicles will be provided to the directorate office to carry out the additional supervision functions of field activities under the Project.

(b) Extension Methodology Development and Technology Packaging

87. To manage the development of appropriate extension packages, a Livestock Production and Promotion Division within DLDAH will be established. Specialist staff and facilities will be provided to: (i) identify appropriate extension methodologies to be used for effective delivery at the village level; (ii) design the extension technology packages; and (iii) produce appropriate extension and communications materials.

(c) Training

88. Special training for DLDAH staff and selected farmers supported by facilities (including a technical library) will be established at Khumultar Farm which will provide both theoretical and practical training in animal breeding, artificial insemination, pasture and fodder crop establishment and management, animal treatment and disease control, extension methodology and other relevant courses. Study tours will be provided to examine improved fodder production and successfully operating livestock production systems similar to Nepal's conditions, especially those in the Project area. Approximately 500 DLDAH staff will be trained during the Project implementation period. Funds for conducting farmers' training at DLDOs, LDCs, LDSCs and in villages will be provided. During the Project implementation period, about 20,000 farmers will be trained in animal husbandry and forage production.

(d) Monitoring and Evaluation

89. The Planning and Evaluation Division of DLDAH will have overall responsibility for monitoring and evaluating Project implementation and performance, and will coordinate the monitoring activities of other Project implementation units. The Division will be provided with adequate and suitably qualified staff and the necessary facilities (including a micro-computer), and will be strengthened and assisted through the provision of staff training and consultancy assistance under the Project.

(e) Consultants and Fellowships

90. A total of 71 man-months of consultant services (consisting of 35 man-months foreign and 36 man-months local) will be provided to assist DLDAH during Project implementation. The foreign specialists will assist in establishing systems and methodologies in pasture and fodder development, extension methodologies and communications, animal breeding, milk marketing and various aspects of livestock disease diagnosis and vaccine production. Local management consultants (in association with selected foreign experts) will be employed to assist in designing and establishing a Project monitoring and evaluation system, designing and installing suitable accounting and auditing systems for participating milk producers associations/cooperatives, conducting institutional studies in respect of the dairy sector and the vaccine production facility and reviewing the regulatory/legal framework affecting the livestock sector (see paras 110 and 118-120).

91. In view of the critical need for manpower training, a total of 1,137 man-months of overseas and local fellowships will be provided. This consists of 57 man-months of short overseas training in specialized fields (ranging from one man-month to a maximum six man-months per trainee); and 1,080 man-months of: (i) local academic training leading to a Bachelor's Degree in Animal Science (for ten trainees at 48 man-months per trainee); and (ii) overseas academic training leading to a Bachelor's Degree in Veterinary Science (for ten trainees at 60 man-months per trainee).

92. A summary of the consultants and fellowships envisaged is shown in Tables 1 and 2 below:

Table 1: Consultant Services
(manmonths)

| A. Foreign Consultants | Manmonths |
|---|---|
| 1. Pasture/Fodder/Nutrition Expert | 12 |
| 2. Extension/Training/Communication | 3 |
| 3. Foot-and-Mouth Disease Lab Management | 3 |
| 4. Bacteriologist | 3 |
| 5. Virologist | 3 |
| 6. Milk Processing/Marketing | 4 |
| 7. Artificial Breeding | 6 |
| 8. Maintenance Engineer | 1 |
| Sub-Total | 35 |
| B. Local Consultants | |
| Firm of Management/Financial Consultants (in association with foreign experts) | 36 |
| Total | 71 |

Table 2: Fellowships
(manmonths)

| A. Special Training (no. x mm) | Local | Foreign | Total |
|---|---|---|---|
| 1. Pasture/Fodder (6 x 1) | - | 6 | 6 |
| 2. Artificial Breeding (6 x 1) | - | 6 | 6 |
| 3. Disease Investigation (1 x 2) | - | 2 | 2 |
| 4. FMD Diagnosis/Typing (1 x 3) | - | 3 | 3 |
| 5. Bacterial Vaccines (1 x 3) | - | 3 | 3 |
| 6. Tissue Culture Vaccines (1x3) | - | 3 | 3 |
| 7. Extension Methodology (2 x 1) | - | 2 | 2 |
| 8. Animal Nutrition/Fodder Utilization (1 x 6) | - | 6 | 6 |
| 9. Virology (1 x 3) | - | 3 | 3 |
| 10. Parasitology (1 x 3) | - | 3 | 3 |
| 11. Pathology (1 x 3) | - | 3 | 3 |
| 12. Bacteriology (1 x 3) | - | 3 | 3 |
| 13. Planning/Monitoring (2 x 3) | - | 6 | 6 |
| 14. Computer Science (2 x 3) | - | 6 | 6 |
| 15. Accounting/Procurement (2 x 1) | - | 2 | 2 |
| Sub-Total | - | 57 | 57 |
| B. Academic Training (no. x mm) | | | |
| 1. Bachelor's Degree: Veterinary Science (10 x 60) | - | 600 | 600 |
| 2. Bachelor's Degree: Animal Science (10 x 48) | 480 | - | 480 |
| Sub-Total | 480 | 600 | 1,080 |
| Total | 480 | 657 | 1,137 |

D. Cost Estimate

93. The total Project cost including physical and price contingencies, duties and taxes and service charges on the Bank loan during the five-year implementation period is estimated at $17.5 million equivalent. The foreign exchange cost is $8.5 million (about 49 per cent of the total cost) while the local currency cost is $9.0 million equivalent (about 51 per cent). Investment costs represent 75 per cent and incremental recurrent costs, about 25 per cent of the total base cost (see Table 3 for the cost summary on the next page; for details, see Appendix 6).

E. Financing Arrangements

94. Of the total cost of $17.5 million, it is proposed that the Bank provide from its Special Funds resources a loan of $14.0 million to finance part of the foreign exchange cost of the Project ($7.2 million) and part of the local currency cost ($6.8 million). Bank financing of local currency expenditures may be applied to costs in respect of civil works, equipment and materials and incremental recurrent costs. Bank financing will amount to 80 per cent of the total Project cost. In addition, the United Nations Development Program (UNDP) has agreed in principle to co-finance, on a grant basis, the fellowships and consultant components amounting to $1.6 million. The Government's contribution will be for part of the civil works and recurrent costs and duties and taxes (see Table 4 for a financing summary and Appendix 7 for details).

Table 4: Financing Arrangement
($ million)

| | Foreign | Local | Total | % |
|---|---|---|---|---|
| Bank | 7.2 | 6.8 | 14.0 | 80.0 |
| UNDP | 1.3 | 0.3 | 1.6 | 9.1 |
| HMGN | - | 1.9 | 1.9 | 10.9 |
| Total | 8.5 | 9.0 | 17.5 | 100.0 |

95. The Borrower of the proposed Bank loan will be the Kingdom of Nepal and the Executing Agency for the Project will be DLDAH. The Borrower will make available the proceeds of the Bank loan to the Executing Agency to implement the Project through budgetary appropriations. The Borrower has assured the Bank that it will make available in a timely manner all other funds required in addition to those provided under the Bank loan and UNDP grant, to ensure the effective implementation of the Project; and it will make funds available for the operating costs of the Project facilities during implementation and after its completion. 1/ The annual recurrent

1/ Loan Agreement: Schedule 6, para 14.

Table 3: Summary of Cost Estimate
($ million)

| | | Foreign Cost | Local Cost | Total Cost |
|---|---|---|---|---|
| I. | BASE COST a/ | 5.75 | 5.61 | 11.36 |
| | A. Animal Health Improvement | 1.85 | 0.43 | 2.27 |
| | 1. Vaccine Production | 0.42 | 0.07 | 0.49 |
| | 2. Diagnostic Services | 0.12 | 0.04 | 0.16 |
| | 3. Disease Control Program | 0.41 | 0.28 | 0.69 |
| | 4. Field Veterinary Services | 0.90 | 0.04 | 0.94 |
| | B. Animal Nutrition/Fodder Dev | 0.66 | 1.15 | 1.81 |
| | 1. Planting Material Production | 0.28 | 0.38 | 0.66 |
| | 2. Pasture/Forage Development | 0.16 | 0.61 | 0.76 |
| | 3. Khumultar Nutrition Laboratory | 0.06 | 0.03 | 0.10 |
| | 4. Hetauda Feed Laboratory Mill | 0.16 | 0.13 | 0.29 |
| | C. Breeding Improvement | 0.87 | 0.34 | 1.21 |
| | D. Intensive Livestock Development | 1.20 | 2.78 | 3.98 |
| | E. Institution-Building | 1.17 | 0.91 | 2.08 |
| | 1. Consultants | 0.49 | 0.17 | 0.66 |
| | 2. Fellowships | 0.47 | 0.06 | 0.53 |
| | 3. Training/Monitoring, etc. | 0.21 | 0.67 | 0.88 |
| II. | CONTINGENCIES | 2.46 | 3.42 | 5.88 |
| | 1. Physical Contingency b/ | 0.57 | 0.56 | 1.14 |
| | 2. Price Escalation c/ | 1.89 | 2.85 | 4.74 |
| | Sub-Total I and II | 8.18 | 9.03 | 17.21 |
| III. | SERVICE AND OTHER CHARGES DURING CONSTRUCTION | 0.29 | 0.00 | 0.29 |
| IV. | TA COST TRANSFERRED TO LOAN | 0.02 | 0.00 | 0.02 |
| | TOTAL PROJECT COST | 8.47 | 9.03 | 17.50 |
| | (PERCENTAGE) | (48.40) | (51.60) | (100.00) |

a/ At May 1985 prices.
b/ Estimated at 10 per cent of base cost.
c/ Based on annual escalation of 12.0 per cent from 1986-90 for local costs; and 7.5 per cent in 1986 and 8.0 per cent thereafter for foreign exchange costs.

costs of the Project are estimated at about $0.57 million equivalent. The Mission considers that the Project's recurrent costs after completion will be within the Government's capacity to finance.

F. Environmental and Energy Aspects

96. The Project is expected to significantly contribute to reducing the present high rate of environmental degradation, particularly in the Hills where there is severe soil erosion. Soil erosion control will be an important aspect of the Project's fodder improvement program. Livestock exclusion areas will be established in the Project area where denudation from overgrazing has become most severe in order to encourage vegetative cover to re-establish. Fodder trees and pasture legumes and grasses will be grown in ways which will stabilize the soil. Denudation, flash flooding in the wet monsoon season and loss of soil fertility should all be reduced. Firewood supplies will be substantially increased as more fodder trees are grown, thereby reducing pressure on the already denuded forests and allowing more manure to be used as fertilizer. As a result of the improved productivity of animals, increased manure will be produced both to enhance the fertility of the soil and to serve as fuel for cooking and/or heating. The required fuel for vehicles and motorcycles under the Project will be insignificant when compared to the increased household firewood and manure to be generated by the Project.

# IV. IMPLEMENTATION ARRANGEMENTS

## A. Project Organization and Coordination

### 1. The Executing Agency

97. DLDAH is responsible for all animal production and health services in Nepal including extension and (in-service) training. When its functions were carried out as a division of the Department of Agriculture (DOA) within the Ministry of Agriculture (MOA), DOA was operating four regional directorates relating to livestock extension and field animal health services as well as the central veterinary hospital, central diagnostic laboratory, the biological products section and various livestock farms. All these have now been transferred to form the core of the present DLDAH. Over the years and soon after the First Livestock Project was approved, DLDAH had undergone various organizational changes accompanied by a gradual growth in its staffing.

98. The DLDAH is headed by a Director-General who is assisted by two Deputy Directors-General - one responsible for animal health and the other for animal production. With its headquarters in Kathmandu, DLDAH's functions are divided into eight divisions, six of which are under the supervision of the two Deputy Directors-General, as follows:

(a) Under the Deputy Director-General for Animal Health: the Diagnostic Services Division, the Biological Products Division, and the Veterinary Services Division; and

(b) Under the Deputy Director-General for Animal Production: the Animal Breeding Division, the Fodder and Nutrition Division, and the Livestock Production and Promotion Division.

In the course of discussions during the appraisal of the proposed Project, the Government/DLDAH agreed to establish the Fodder and Nutrition Division (in recognition of its importance in the promotion of a successful animal nutrition/forage development program) and the Livestock Production and Promotion Division (to develop and manage appropriate technology packages for application at the farm level) as well as strengthen DLDAH's Regional and District offices in a manner consistent with the thrust to develop its field delivery system. The other technical divisions concerned with animal health in particular namely, the Biological Products Division which is charged with the production of vaccines and the Veterinary Services Division, are similarly being supported further under the Project (see Appendix 5 for DLDAH's organization chart).

99. In addition to his general supervision responsibilities, the Director-General also exercises direct supervision over the Planning and Evaluation Division and the Livestock Training Center (both of which are also being assisted under the Project) as well as the five Regional Directors (each in charge of one of the five regions in the country). The Regional Directorates in turn supervise the District Livestock Development Offices (DLDO) (representing each of the 75 districts in the country) which in turn supervise the Livestock Development Centers (LDCs) and the Livestock Development Sub-Centers (LDSCs) at the village level.

The LDCs and LDSCs are the field offices of DLDAH which maintain day-to-day contact with the farmers. At the present time, there are some 300 LDCs in the country, of which 150 are in the Central Region; the plans of the DLDAH envisage an increase in the number of LDCs/LDSCs to a total of about 500 within the next few years. Under the agreed organizational arrangements, therefore, the DLDOs supported by the network of LDCs/LDSCs are the critical links in the DLDAH structure which permeate down to the village level. Each DLDO will be manned by up to about 15 staff headed either by a veterinarian or an animal husbandry graduate. The DLDOs are responsible for all matters relating to animal husbandry, preventive veterinary care, the basic coordination of livestock activity at the farm level as well as a variety of statistical and routine reporting tasks. On the other hand, each LDC will be manned by up to four staff headed by a Junior Technician (JT) while each LDSC will be manned by up to two staff (headed by either a JT or a JTA). The JTs/JTAs maintain the contact with and carry out the field services of the DLDAH to the farmers.

100. DLDAH at present has a total staff of 3660 of whom about 90 per cent are spread out in its various field offices. Approximately 60 per cent of its total staff are considered technical, viz., veterinarians, animal husbandry experts, extension workers, etc. and the balance as administrative and support staff. It is envisaged that DLDAH's personnel will be gradually increased consistent with the increasing responsibilities now planned for it in the next few years. By and large, the key professional posts of the DLDAH are manned by generally competent staff most of whom gained their university degrees in India; a number of them have completed post graduate studies and undergone special training overseas. Certain critical posts requiring strengthening, however, have been identified and this situation will be remedied under the Project through increased manpower training and/or consultant inputs. Middle level staff undergo training locally (thru IAAS) but in-service training, particularly for the JTs and JTAs, is being carried out satisfactorily by DLDAH under its ongoing training programs.

### 2. Project Coordination Committee

101. The Ministry of Agriculture (MOA) will bear overall responsibility for the effective implementation of the Project including all decisions affecting policy. A Project Coordination Committee (PCC) will be established within three months of loan effectiveness. 1/ It will be responsible for overall coordination, for reviewing the progress of the Project periodically and overseeing Project benefit monitoring and evaluation (PBME) activities. The PCC will meet as often as necessary, but at least once every three months. It will consist of the Director-General, DLDAH, as Chairman and will include as members representatives of ADBN, DDC, MOA, the Finance Ministry, Department of Cooperatives and the Department of Forestry. The Project Coordinator will function as Member-Secretary to the PCC. This Committee may create sub-committees or include such additional members as may be considered appropriate.

1/ Loan Agreement: Schedule 6, para 4.

### 3. Project Management Office

102. A Project Management Office (PMO) will be established within three months of loan effectiveness to coordinate the day-to-day implementation of the Project. The PMO will be headed by a Project Coordinator who will be a senior official of DLDAH acceptable to the Bank, with sufficient authority and rank to enable him to perform his functions as quickly and as independently as possible. The Project Coordinator will be assisted by an adequate number of suitably qualified staff including accounting, engineering, clerical and administrative personnel. 1/

103. Specifically, the PMO will be responsible for: (i) coordination of the day-to-day implementation of the Project; (ii) formulation of annual plans of operation/budgets for approval of MOA/PCC in close collaboration with concerned agencies, particularly the Nepal Rastra Bank, ADBN and DDC; (iii) procurement of equipment and materials; (iv) coordination of land acquisition and construction of physical facilities; (vi) administration of consulting services and fellowships; (vii) coordination of fielding of Project personnel; and (viii) monitoring of Project implementation including preparation of periodic reports. The PMO will be assisted by expatriate and local consultants provided under the Project.

### 4. Field Level Execution

104. DLDAH through its Regional Directorate for the Central Region (and other Regional Directorates as required) will be responsible for the operation of the completed physical facilities as well as for required planning and implementation of the various programs covered under the proposed Project. At the field level, DLDOs upgraded from District Veterinary Hospitals in each district in the Project area will be responsible for the implementation of the Project including coordination with the field offices of DDC and other credit institutions (including ADBN and commercial banks). 2/ The Government will ensure that adequate credit will be provided by such institutions to eligible sub-borrowers e.g. smallholder farmers for the purchase of buffaloes and goats; and private entrepreneurs for the establishment of commercial breeding farms, small to medium size private dairy processing plants, veterinary drugstores-cum-feedshops and slaughter-slabs and other marketing facilities. 3/

### 5. Manpower Requirement

105. A total of 633 extra staff will be required for establishing the PMO and supporting the general strengthening of the DLDAH's various technical divisions over the Project period. Of the 633 positions, 50 will

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1/ Loan Agreement: Schedule 6, para 2 and 3.
2/ Loan Agreement: Schedule 6, para 5(a) and (b).
3/ Loan Agreement: Schedule 6, para 6(a) and (b).

be university-trained professional posts (either in animal husbandry or veterinary medicine) which could be filled by staff transfers (from DOA or other offices), or by agricultural or animal husbandry graduates of the Tribhuvan University's Institute of Agriculture and Animal Science (IAAS). The rest of the additional staff (or about 90 per cent of requirement) will be the livestock extension workers (JTs and JTAs) and support staff (drivers, peons, etc) who can all be readily recruited. Many of these staff are existing staff of the PMO under the First Livestock Project whose appointments are considered temporary and usually co-terminus with the life of the project (see Appendix 8 for a breakdown).

## B. Procurement

106. All equipment, materials and supplies will be procured in accordance with the Bank's Guidelines for Procurement and the eligibility requirements under Special Funds loans. 1/

### 1. Civil Works

107. Contracts for civil works will be awarded to local contractors using local competitive bidding procedures acceptable to the Bank. The use of local contractors is justified in view of the large number of small contracts involved and their scattered locations which make them unsuitable for international bidding. However, foreign firms at present operating in Nepal or with representatives in Nepal will be eligible to submit bids for such works.

### 2. Equipment, Materials and Livestock

108. Bicycles, miscellaneous minor equipment, farm materials, seeds, semen and livestock required for the Project may be procured locally in accordance with procedures acceptable to the Bank. Semen and seedlings would be procured taking into account their suitability and quality.

109. Procurement of goods and services for the operation for Project facilities will be financed in accordance with Government's normal procedures and will be funded by the Bank on a percentage basis.

### 3. Consultant Services

110. The Project provides for a total of 71 man-months (mm) of consultant services (35 mm foreign and 36 mm local) to provide the necessary technical support to DLDAH and to undertake institutional studies in respect of the dairy sector in general and DDC in particular. 2/

111. All the foreign consultants will be recruited on an individual basis while the local consultants will be from a consulting firm (to be engaged in association with selected foreign experts). The cost of these consultants will be financed on a grant basis by the UNDP and the Bank will act as Executing Agency for the purposes of selection and recruitment.

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1/ Loan Agreement: Schedule 4, para 2. For a procurement summary, see Appendix 9.

2/ See Appendix 10 for the detailed terms of reference.

Consultants will be engaged by the Bank in consultation with the Project Executing Agency (DLDAH) and in accordance with the provisions of the Bank's Guidelines on the Use of Consultants. 1/

4. Fellowships

112. Overseas fellowships for selected DLDAH staff totalling 657 mm will be provided plus 480 mm local fellowships/training (see para 92). DLDAH, with the assistance of the consultants provided under the Project, will submit to the Bank for concurrence within 12 months of loan effectiveness appropriate fellowship programs and a detailed list of criteria for the selection of candidates to be trained. The individual candidates will be determined by agreement between the Executing Agency and the Bank. The Government will establish an appropriate system to require recipients of fellowships/training to return to Nepal to serve DLDAH in positions relevant to their training. 2/

C. Implementation Schedule

113. Project implementation is expected to take five years from the date of loan effectiveness. In view of the nature of the components of the Project and to ensure the optimum use of the loan during implementation, the details of the various components to be provided under the Project (including their phasing, exact number and exact location) will be determined by agreement between the Executing Agency and the Bank. In the course of such determination, the requirements of farmer beneficiaries, conditions prevailing in the Project area and the advice of consultants to be provided under the Project will be duly taken into account (see Appendix 11).

D. Operation and Maintenance

114. Operation and maintenance of all plant and equipment of the vaccine production facility and the central diagnostic laboratory at Tripureshwar and the national artificial insemination center at Khumultar will be carried out by DLDAH 3/ with the assistance of suitable private contractors, if necessary. Provision has been made under the Project for a maintenance service contract including the training of DLDAH staff. Liquid nitrogen, improved semen, planting materials and seeds will be distributed along with the medicines and vaccines to the LDCs and the LDSCs through DLDOs. Selected farmer members of milk producers associations/cooperatives participating under the Project will be given training through the field offices of DLDAH. Livestock extension workers of DLDAH will provide most of the field support to these farmers to assist them in strengthening the production, collection and sale of their milk which will eventually contribute to the strengthening of their association. Over time and where feasible, it is anticipated that the milk producers associations/cooperatives will take over the milk collection centers assisted under the Project and eventually some of the milk chilling centers of DDC.

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1/ Loan Agreement: Schedule 5, para 2.
2/ Loan Agreement: Schedule 6, para 10(a) and (b).
3/ Loan Agreement: Schedule 6, para 14(b).

E. Accounts and Audit

115. DLDAH will maintain separate financial records and accounts for the Project. The Government will ensure that all accounts maintained for the Project are audited annually by the Auditor-General of the Borrower. Certified copies of such audited accounts will be submitted to the Bank within nine months of the end of the financial year to which they relate. In addition, such statements will be submitted to the Bank in an unaudited form, in English, within six months of the end of the financial year to which they relate. 1/

F. Monitoring and Reports

1. Monitoring

116. The Planning and Evaluation Division of DLDAH, assisted by the local firm of management consultants, will have overall responsibility for monitoring and evaluating Project implementation and performance. Working closely with the Project Management Office (PMO), the Division will coordinate its own Project monitoring activities and those of the PMO and other relevant DLDAH Divisions/Offices to ensure that they comprise an integrated and effective Project management information system. These monitoring activities should also provide a significant input to the information requirements for the Planning and Evaluation Division's evaluations of Project performance and impact on intended beneficiaries, to be accomplished midway through Project implementation (about the third year) and shortly after (within 12 months) Project completion. A benchmark survey will also be accomplished by the Division during the early stages of Project implementation for the purposes of verifying the receipt, use and impact of goods and services by beneficiaries under the First Livestock Project, initiating/recommending remedial action necessary to ensure that benefits envisaged under that Project are achieved, and establishing benchmark comparators for use in the two subsequent performance/impact evaluations of the proposed Project. Detailed proposals for Project monitoring and evaluation activities will be prepared in consultation with the Bank. 2/

2. Reports

117. The Government will submit to the Bank quarterly reports on the Project and on the operation and management of the Project facilities. The reports will indicate, among other things, progress made and problems encountered during the quarter under review, steps taken or proposed to be taken to remedy these problems, and the proposed program of activities and expected progress during the following quarter. Promptly after physical completion of the Project, but in any event not later than three months thereafter or such later date as may be agreed for this purpose between the Government and the Bank, the Government will prepare and furnish to the Bank a report on the execution and initial operation of the Project, including its cost, the performance by the Government of its obligations

1/ Loan Agreement: Section 4.06(a) and (b).
2/ Loan Agreement: Schedule 6, para 13.

under the Loan Agreement and the accomplishment of the purposes of the loan. 1/

## G. Special Implementation Arrangements and Assurances

### 1. Pricing Policy for Milk

118. Under the First Livestock Project, the DDC had committed itself to setting milk prices at levels which would provide sufficient incentives to farmers; and to a pricing policy for the sale of milk to consumers at levels sufficient at least to generate revenues to cover all operating and administrative expenses including an adequate provision for maintenance and to provide a reasonable rate of return on total assets each year. The prices being paid by DDC to producers are at present considered adequate. However, its retail price for its milk products is considered low and DDC until recently has been incurring losses in its operations. During the last five years (FY1980/81-FY1984/85), the DDC raised its retail price twice (the first increase was in FY1980/81 and the second in September 1984) although not to a level commensurate with making a profit. In recognition of this situation and as a result of discussions during appraisal, Government has again allowed DDC to raise its prices in September 1985. The further increase was confirmed by the Government during negotiations on the proposed loan (for details, see Appendix 2, page 67). Based on these adjustments, it is expected that DDC will be able to fully cover its operating cost while generating some profit and providing an increase in prices paid to producers/suppliers. Further, the Government has confirmed that it is considering as a long term objective the eventual privatization of the entire dairy sector (including DDC) and is committed meanwhile to encouraging the private sector dairy industry. In this connection, it was agreed that an indepth study will be required to firm up the long run institutional direction of the dairy sector, to identify the causes of DDC's high operating cost and to improve DDC's organization and financial structure with a view to formulating practical short term and long term measures to enable DDC to operate on a self-sustaining basis by the end of the Seventh Five Year Plan (i.e. 1990). The study will be supported under the Project. Except as the Borrower and the Bank shall otherwise agree, the study is expected to be completed by December 1986 2/ (see para 90).

119. In addition, the Government agreed to establish an effective price review mechanism involving the Government/DDC and the Bank to ensure that prices set by DDC reflect market levels for milk; and are adequate to provide incentives for producers. 3/

### 2. Vaccine Production and Distribution

120. The vaccine production facility is expected to be operational by early 1986. In this connection, Government has given an assurance that it will establish at an appropriate time an autonomous entity to operate and manage the facility on commercial lines with private sector participation to the extent possible. However, to determine the appropriate organization

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1/ Loan Agreement: Section 4.07.
2/ Loan Agreement: Schedule 6, para 16(a).
3/ Loan Agreement: Schedule 6, para 16(b).

and financial structure of the entity as well as a realistic time schedule for its formation, it was agreed that DLDAH with the assistance of consultants will carry out a study with the following work plan: (i) the study will commence within 18 months of the effective date of the loan; (ii) within three months after the commencement of the study, an interim report will be submitted to the Government and the Bank which will form the basis for tripartite discussions between the Government, the Bank and the Consultants; (iii) on the basis of these discussions, appropriate plans for further action including the type of the entity, its detailed structure and implementation program will be agreed upon between the Government and the Bank. 1/ For the detailed terms of reference for the study, see Appendix 10.

121. Meanwhile, DLDAH, with the assistance of the consultants provided under the Project, will be responsible for the operation of the vaccine production facility as well as the supply of veterinary medicines and drugs. In this connection, the following policy measures were agreed to between Government and the Bank:

> Cost Recovery of Vaccines/Drugs - Consistent with its commitment under the First Livestock Project, the Government agreed to implement measures to progressively recover costs of drugs and certain vaccines from the end-users over a five-year period. 2/ In this regard, it was agreed that the cost of such drugs/vaccines (defined as full cost on CIF Kathmandu basis, production and/or mixing cost, transport charges, handling losses plus a reasonable mark up) will be charged on the following scale: 20 per cent of the cost in Year 1 (involving a 80 per cent subsidy), 40 per cent of the cost in Year 2 (involving an 60 per cent subsidy), 60 per cent of the cost in Year 3 (involving a 40 per cent subsidy), 80 per cent of the cost in Year 4 (involving a 20 per cent subsidy), and 100 per cent of the cost in Year 5 (involving no subsidy).
>
> The Distribution of Vaccines and Drugs - It was agreed that DLDAH would use local private pharmaceutical enterprises and cooperatives in the distribution of vaccines and drugs to the end-users. Further, private animal health workers who currently charge a nominal fee for their services would also be utilized in this distribution scheme. 3/ DLDAH has so far trained about 2,000 of these private lay workers (mainly for vaccination and treatment of animals) and it is intended that each of the 4,500 panchayats in the country will eventually have at least one trained animal health worker to supplement the efforts of the field staff of DLDAH.

3. Pasture and Fodder/Feed Production

122. This program plays a critical role in the successful implementation of the Project, and the participation of the private sector has been particularly taken into account. While the initial seed and

1/ Loan Agreement, Schedule 6, para 15.
2/ Loan Agreement, Schedule 6, para 12.
3/ Loan Agreement, Schedule 6, para 7.

seedling supply will come from the Fodder Resource Centers established under the First Livestock Project, the Government has agreed to enter into contract arrangements with private farmers in the Project area to produce fodder seeds and distribute these to other farmers and thus expand the coverage and impact of the Project. Fodder tree seedlings to be produced by the contract farmers will initially be introduced under the Project at selected LDCs and LDSCs in the Project area. Planting materials will initially be distributed free of charge to farmers through mini-kit packages to promote the production of seeds. As the program gets underway and acceptance among farmers is established, the concept of cost recovery on a gradual basis will be introduced to recoup part or all the costs of such seeds and seedlings. 1/

4. Coordination with Concerned Agencies

123. The Government is committed to causing all concerned agencies to cooperate with and assist DLDAH in the implementation of the Project. In particular, the Government will cause DDC to ensure that its activities in the Project area are coordinated with the milk collection centers, the DLDOs and LDCs/LDSCs being established or upgraded under the Project; the ADBN and other credit institutions (particularly the commercial banks) will provide for adequate livestock related credit to be made available in the Project area; and the DOA and the DOF will ensure that their activities and programs are coordinated with the forage development components included under the Project. 2/

5. Provision for Adequate Manpower

124. In recognition of the importance of providing adequate manpower required by the Project, the Government agreed to ensure that all necessary technical and administrative staff would be made available on a timely basis and in accordance with a detailed staffing schedule to be agreed upon between the Government and the Bank. 3/

6. Imprest Account

125. In order to ensure the timely availability of local funds, a portion of the proceeds of the loan will be channelled into an imprest account/fund to be established by DLDAH under the Project with the Treasury Division of the Office of the Comptroller-General. 4/ Except as the Bank shall otherwise agree, the account will be composed of about 90 per cent Bank funds and about 10 per cent Government funds, representing approximately the respective levels of financing for eligible items covered by the account. The actual amount to be deposited will be established annually, based on anticipated expenditures for equipment, materials, civil works, recurrent costs, fellowships and local consultants as well as the annual rate of the account's turnover.

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1/ Loan Agreement, Schedule 6, para 8.
2/ Loan Agreement, Schedule 6, para 6.
3/ Loan Agreement: Schedule 6, para 9.
4/ Loan Agreement: Schedule 6, para 11.

# V. FINANCIAL AND ECONOMIC EVALUATION

## A. General

126. The Project will improve rural incomes by increasing on-farm production as well as sales of milk and meat and also increase on-farm consumption of these livestock products thereby improving human nutrition. Increased livestock productivity will result from improved animal health, nutrition and breeding as a result of the Project's support for improved disease control, forage/pasture development, extension and breeding services. Successful implementation of the fodder development program under the Project will not only improve livestock productivity but substantially contribute to reducing ecological degradation in the Hills and to remedying the associated problem of falling agricultural production.

## B. Benefits and Beneficiaries

### 1. Benefits to the National Economy

127. The direct quantifiable Project benefits are increases in milk and meat production as a result of increased livestock productivity. At full development, 1/ it is projected that incremental increases of livestock products will reach some 136,000 mt of milk and 20,000 mt of meat with a gross value of at least $30 million annually (at early 1985 farmgate prices). In addition, an extra 20 million vaccine doses are expected to be produced annually at Tripureshwar as a result of the Project. Foreign exchange savings from reduced importation of livestock and livestock products as well as vaccines are estimated at about $20 million equivalent yearly.

128. No difficulty is anticipated in the marketing of the various outputs resulting from the Project. The Project produce will supply less than 15 per cent of the projected demand for milk and meat by 1995. The vaccine production and the medicines/drugs to be imported under the Project can be absorbed in the country given the country's needs.

### 2. Farm and Other Benefits

129. About 116,000 smallholder farmers whose present yearly family income is estimated at about Rs 4,000 ($220 equivalent) or less will be the main beneficiaries. It is projected that their incomes will increase to about $530 equivalent yearly or by about 140 per cent. The Project will also lead to: the creation of 10 million man-days of employment (many of them women); the development of about 8,000 ha of homestead area for improved pasture and forage for buffalo/cattle feed; 20,000 ha of communal grazing areas and 17,000 kms of leguminous fodder trees on terraced bunds; and the training of at least 500 livestock extension workers and 20,000 farmers. Other non-quantifiable benefits will include: (i) overall strengthening of the administrative framework for livestock and veterinary services in terms of adequately trained staff, technicians and farmers; and (ii) transfer of technology to operate an autonomous vaccine production facility preparatory to its eventual commercial operation.

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1/ Anticipated at Year 10.

## C. Financial and Economic Evaluation

### 1. Financial Evaluation

#### (a) Financial Internal Rate of Return (FIRR)

130. The vaccine production facility will be initially operated by DLDAH and subsequently transferred to an autonomous entity to operate it on commercial lines with private sector participation to the extent possible. The attractiveness to the private sector in participating in this will depend on many factors including product sales price, output and the organizational and financial arrangements eventually selected. Therefore, various options and arrangements including transfer of the entire facility and subcontracting or leasing for a fee part or all of the facility to the new entity will be examined under a detailed study to be undertaken by consultants under the Project (see para 120). To assess the financial implications, a preliminary FIRR was calculated on the operation of the vaccine production facility based on the following assumptions: the investment costs will include the "salvage value" of assets acquired under the First Livestock Project plus all incremental costs (including recurrent) to be incurred under the proposed Project; the selling price of vaccines would initially be equivalent to only 20 per cent of the cost of the imported vaccines and progressively increased to match the full imported price only by Year 5; and the facility will reach its full production capability by Year 10. Based on these assumptions, the FIRR works out at about 10 per cent.

#### (b) FIRR Sensitivity Tests

131. The sensitivity of the FIRR was tested for changes in the following cost and revenue parameters: (i) price or production; (ii) the costs of raw materials and inputs; and (iii) investment costs. The FIRR was found most sensitive to changes in the revenue stream and change in selling price of output would affect the FIRR more than any other factor tested. Similarly, if the full import parity price for the vaccine output is applied from Year 1, the FIRR increases to 16 per cent. 1/ Of lesser effect would be increase in the operating costs. Table 5 below summarizes the FIRR sensitivity tests:

Table 5. FIRR Sensitivity Tests

| | | FIRR (%) |
|---|---|---|
| (i) | Base Case | 10.0 |
| (ii) | Benefits Reduced by 10 per cent | 7.0 |
| (iii) | Operating Costs Increased by 10 per cent | 8.0 |
| (iv) | Investment Costs Reduced by 10 per cent | 11.0 |
| (v) | Import Parity Price Applied from Year 1 | 16.0 |

1/ This FIRR of 16 per cent also corresponds to the EIRR on the vaccine facility based on the value of outputs being considered as the benefits. If benefits are estimated based on the value of animals saved as a result of the application of the vaccines and the full investment costs under the First Livestock Project are included, the EIRR will still be at least 20 per cent.

132. The proposed study will further examine different combinations of these variables, capital structure and the timing for the establishment of the entity which will make the operation commercially viable and sufficiently attractive for private entrepreneurs.

2. Economic Evaluation

(a) Economic Rate of Return (EIRR)

133. The EIRR was calculated by including Project as well as all related investment costs under the First Livestock Project but excluding all duties and taxes. The key assumption used is that a progressively increasing proportion of livestock in the Project area will benefit from the Project - beginning from 2 per cent in Year 1 up to a conservative 30 per cent by Year 20 for cattle/buffalo and goats and up to 80 per cent for poultry. Adjustments were made on the Project's benefits to adjust the financial prices of Project output (mainly milk and meat) by using a Standard Conversion Factor of 0.90 to correct distortions between border price and internal prices. On this basis, the EIRR of the Project has been estimated at about 32 per cent, which is satisfactory (see Appendix 12 for detailed assumptions and calculations).

(b) EIRR Sensitivity Tests

134. Variations in relevant costs and revenue parameters have been made through a series of sensitivity tests to determine their impact on the EIRR. The key variable found to adversely affect the EIRR was likewise the benefit stream which is dependent on the assumed rate of adoption by farmers of improved forage/fodder utilization, clinical treatments and extension support given by DLDAH staff. If the investment costs under the First Livestock Project are excluded and the overall benefits proportionately reduced, the EIRR remains essentially unchanged. Table 6 below summarizes the EIRR sensitivity tests.

Table 6: EIRR Sensitivity Tests

| | | EIRR (%) |
|---|---|---|
| (i) | Base Case | 32.7 |
| (ii) | Benefits Reduced by 10 per cent | 27.8 |
| (iii) | Two-Year Delay in Project Start-Up | 22.3 |
| (iv) | Benefits Reduced by 50 per cent | 12.9 |
| (v) | First Livestock Project's Investment Cost excluded but benefits reduced to 55 per cent 1/ | 35.1 |

1/ Based on the proportion of investment costs due to difficulty in distinguishing benefits between the two projects which are essentially two phases of a single program. If the full benefits are considered and the cost of the First Livestock Project is considered as sunk, the EIRR of the Project would be over 50 per cent.

D. Project Risks

135. Successful Project implementation will be dependent on effective institutional performance. Slow dissemination of information and inputs to individual farmers through field extension services, particularly in relation to on-farm fodder development would substantially reduce the Project benefits ultimately derived from increased milk and meat production. Also, inappropriate or inadequate use of laboratory facilities provided under both the First and Second Projects for disease diagnosis and vaccine production would reduce or in some instances negate the considerable benefits to be derived from effective delivery of field animal health services.

136. The Project incorporates measures to minimize these risks. Considerable investment is provided for development of extension methodologies and improvement of communication systems within DLDAH, and for providing overseas fellowships to livestock extension staff to see first hand appropriate fodder development programs under conditions similar to Nepal. Particularly, as there are no veterinary training facilities in Nepal, major Project investment will also be directed towards the further development of in-country specialist skills in livestock disease diagnosis and vaccine production. As the distribution of vaccines and drugs will be carried out by private companies and/or outlets on a commission basis supplemented by a large number of private animal health workers, it is anticipated that the dissemination of such vaccines and drugs to the villages will be more effective.

## VI. CONCLUSIONS AND RECOMMENDATIONS

137. Increasing livestock numbers and diminishing resource base have created a vicious cycle of falling agricultural productivity in large parts of the country. In the Hills this is associated with increasing ecological degradation. Environmental degradation is considered a major economic problem facing the country. The Government has recognized this and has assigned highest priority to development programs in foodgrain and livestock production which will contribute to the improvement of the environment. The Project has been designed to support the Government's objectives for livestock development and to make livestock a more productive element of the rural farming system.

138. The Project will sustain the development impetus initiated under the Bank-assisted First Livestock Project. Under that project, a start was made in upgrading field services throughout the country, initially in disease control; simultaneously, intensive livestock development was started on a pilot basis in limited areas. After four years of implementation of this project, it is already apparent that intensive development through provision of a package of support services particularly in fodder development, combined with comprehensive animal health services and credit, has resulted in a considerable increase in livestock production. The volume of milk marketed has increased dramatically, more farmers are growing fodder crops and a significantly greater percentage of livestock owners are raising improved milking buffaloes. The proposed Project will continue the intensive development approach initiated in three Terai districts in the Central Region, and will extend it into 11 additional Terai and Hill Districts (all in the Central Region). It will support the investments made under the First Livestock Project in vaccine production and disease diagnostic facilities until they are fully operational, and continue the upgrading of animal health field services in the Central Region. The Project will further pursue fodder improvement by making greater use of fodder crops in Terai cropping systems, and by setting up fodder production and management systems appropriate to the ecologically fragile hill areas in the Central Region. It is expected that increased extension emphasis on fodder development with greater community cooperation will result in improved animal production, and by reducing soil erosion and improving soil fertility make a significant contribution towards arresting the severe ecological degradation.

139. The total Project cost is estimated at $17.5 million. The Government has requested a loan of $14 million from the Bank's Special Funds resources to finance part of the foreign exchange cost of the Project and part of the local currency cost. In addition, the UNDP has agreed in principle to co-finance on a grant basis the fellowships and consultant components amounting to $1.6 million. The Borrower would be the Kingdom of Nepal and the Executing Agency, the DLDAH.

140. In addition to the standard provisions and requirements contained in loan documents of the Bank, specific agreements were obtained from the Government and Executing Agencies concerned in respect of the following:

(i) Approval of the UNDP funds for the fellowship and consultant components of the Project as a condition of loan effectiveness (Loan Agreement, Section 6.01).

(ii) Preparation of a comprehensive study by December 1986 to firm up the long-run institutional direction of the dairy sector with a view towards privatization and the establishment of an effective mechanism for the review of the milk price (Loan Agreement, Schedule 6, paras 16(a) and (b).

(iii) An autonomous entity will be established to operate and manage the vaccine production facility on commercial lines; a study will commence within 18 months of loan effectiveness to determine the type of entity, its organizational and financial structure and a detailed implementation schedule to be agreed upon by the Government and Bank (Loan Agreement, Schedule 6, para 15).

(iv) The Government will implement measures to progressively recover costs of drugs and certain vaccines from the end-users over five years (Loan Agreement, Schedule 6, para 12).

(v) Distribution of vaccines and drugs provided under the Project will be undertaken by cooperatives, local private pharmaceutical enterprises and/or private animal health workers (Loan Agreement, Schedule 6, para 7).

(vi) To ensure timely availability of funds, an imprest account/fund will be established with the Office of the Comptroller-General and will be operated and maintained in accordance with terms and conditions agreed between the Borrower and the Bank (Loan Agreement, Schedule 6, para 11).

(vii) The Government shall cause all concerned agencies to cooperate and assist DLDAH as required in the implementation of the Project, in particular DDC, ADBN and other credit institutions, DOA and DOF (Loan Agreement, Schedule 6, para 6).

# LIST OF APPENDIXES

# BACKGROUND INFORMATION ON THE LIVESTOCK SECTOR IN NEPAL

## A. An Overview

1. Performance of the livestock sector during the Sixth Five-Year Plan (FY1980-85) period has been mixed. On the institutional side, the most important developments were: (i) the establishment in 1979 of the Department of Livestock Development and Animal Health (DLDAH) within the Ministry of Agriculture (MOA) to be responsible for overall livestock development in the country; (ii) establishment of five regional directorates; and (iii) establishment of 41 new veterinary hospitals so that all the 75 districts in the country now are covered with this facility. However, the following constraints hampered the sector, viz: (i) lack of sufficient marketing facilities and deficiencies in the pricing of livestock products (particularly in respect of DDC-supplied milk); (ii) difficulties experienced in delivering development inputs and services to remote areas; (iii)shortages in supplies and physical facilities such as buildings, roads, equipment, breeding material, vaccines, veterinary drugs and instruments; (iv) lack of proper technologies adapted to the unique local conditions; (v) insufficient extension organization and shortage of trained manpower; and (vi) inadequate coordination between financial, marketing and technical organizations.

## B. Feed Resources

2. Statistics on the livestock population (cattle, buffaloes, goats, sheep, pigs and poultry) for the entire country and in the Project area can be seen in Tables 1 and 2. The problem of inadequate feed resources in relation to the country's relatively large livestock population has been recognized by the Government for some time. During the last 20 years or so, there have been several projects (funded through bilateral and multilateral agencies) that have tried to resolve the twin problems of livestock and agricultural production in Nepal. Each has made its studies and recommendations on these problems but the overall impact has so far been marginal. There are various reasons for this but the most important appears to be the failure to establish an effective national institution that has the experience and facilities to develop the technology needed.

3. Any attempt to evaluate feed resources in Nepal, either from a quantitative or qualitative point of view, has to be made on a very provisional basis. Little survey work has been carried out (and probably could not be justified under present conditions), but estimates have been made of the output of different types of feed. Data compiled by Agricultural Projects Service Centre (APROSC) indicate that projected average feed supply in Nepal is only 840 kg TDN per animal unit 1/ while requirement is 920 kg TDN per animal unit which represents a deficiency of 562,550 mt TDN for the whole country (Table 3). In the Project area as well as in the Central Region as a whole, however, APROSC's data show a surplus of feed supply mainly due to the surpluses in the Terai. On the other hand, when the Consultants recalculated the feed resources in

1/ Total Digestible Nutrient (TDN), a measure of energy allowances.

the Central Region using various sources of information (including APROSC's), the result has been a deficiency in feed supply in all ecological zones including the Terai (see Table 4). The shortfalls in feed supplies in the Terai, Mid-hills and High-hills were estimated at 27 per cent, 18 per cent and 35 per cent respectively.

4. Besides the present high stocking density of ruminants per arable land area, there are a number of factors contributing to the feed shortages. First is the environment. Although the climate of Nepal is generally conducive to the production of vegetation, the soils present a serious problem, particularly in the Hills. Erosion is bound to occur naturally, but when the surface of unterraced land is broken, the effect can be disastrous. Second is the limited scope for the country to import resources, either feedstuffs or fertilizers and parenthetically, the need to examine why increased amounts of feed ingredients are being exported (see Table 5); needless to say, if such feed ingredients are not exported, they would alleviate the livestock feed situation domestically. 1/ Third is the tradition of crop production in Nepalese farming. This is a factor enforced on the community by the need to produce its own staple food supply. At the same time, it represents a valuable source of skill which can be exploited to produce more fodder. Approximately 30 per cent of the total land area in the main Project area (viz, Central Region) is cultivated as against only 20 per cent for the entire country (Table 6). Fourth is the involvement of very small-scale farmers who, in the vast majority of cases, are operating on a subsistence scale. For these people, even the simplest technical innovation may represent a risk which many of them would not be prepared to take.

5. The fodder development program, under the First Livestock Project, showed that it is possible to grow in the Terai a number of fodder species of higher feeding value that can be used in conjunction with traditional feeding regimes. In those parts of the Project area that are irrigated, berseem (Trifolium alandrium), when sown just before or directly after paddy harvest, has been very successful. Yields of up to 45 tons per ha of grown material in five cuts or 25-30 tons per ha in three cuts plus 300 kg seed per ha have been obtained. Being a legume, this species has obvious soil-fertility improvement qualities for subsequent crops besides being a high protein forage. In the non-irrigated parts of the Terai, oats is a crop that is proving very useful for winter forage production. Yields of 25-30 tons per ha of green material have been harvested through two cuts. Hybrid Napier grass has also been distributed widely. This fodder would, however, benefit from having a legume companion and trials are in progress to examine the value of annual medics (Medicago spp) and some vetches (Vicia spp). Another possibility for this zone is lupins (Lupinus angustifolius), a crop which could be used to produce seeds for supplementary feeding.

6. The fodder tree program, based largely on Leucaena (Leucaena leucocephala) has been, however, disappointing. This has been due to insufficient attention being paid to the transplanting techniques and rhizobial innoculation of Leucaena as well as the choice of well-drained soils for its establishment. In the Terai, a serious problem exists with animals that are allowed to graze more or less at will. Since many of

1/ In FY1983/84, the value of these animal feedstuff exports amounted to about Rs 55 million.

these animals belong to small landless farmers, it is difficult to prescribe that all animals shall be stall-fed, although this would be desirable. An alternative is to use Stylosanthes spp broadcast along roadsides and on waste ground. This has been very successful in Thailand and some studies on this have been made in the Janakpur area. Further studies with both S. humilis and S. hamata should be undertaken. Another interesting use of Stylosanthes spp has been as an understorey forage in forest plantings. Apart from providing good weed and fire control in the young plantations, this fodder has provided excellent yields of hay.

7. In the Hills, there have been numerous small-scale introductions of grasses and legumes such as Trifolium spp. A strain of white clover has become naturalized, and is spreading slowly. Perennial ryegrass has shown itself to be productive in some orchards, while kikuyu has demonstrated a capacity for soil erosion control, and is used effectively in roadside stabilization even in areas above 2000 m. More recently oats and vetch have been promoted and are proving popular in milkshed areas. There has been a great deal of emphasis placed on native fodder trees, with variable results in survival after distribution of seedlings. Somewhat less attention has been given to Leucaena, although it has been highly productive up to 1400 m on southernly slopes, and has survived at 2000 m. The capacity of Leucaena to control erosion while providing large quantities of fuelwood and forage has been well demonstrated at several sites.

## C. Animal Health

8. After nutritional deficiency, the major causes of productive loss in livestock are infectious diseases and parasitism. Animal diseases of major importance in Nepal include: (i) in cattle and buffaloes - haemorrhagic septicemia, foot and mouth diseases, and helminth and protozoan parasites; (ii) in sheep and goats - clostridial diseases and parasites; and (iii) in poultry - Newcastle disease and fowl pox. The total disease complex is little understood although most of the major animal diseases affecting livestock and poultry have been diagnosed; their incidence is generally underestimated and little is known of their epizootiology. The estimated production losses from various diseases is shown in Table 7.

### 1. Types of Livestock Diseases

9. Prior to 1963, rinderpest was enzootic in Nepal. In 1964, HMGM started a National Rinderpest Control Program. During 1964-69, all adult cattle and buffalo animals or nearly 70 per cent of the total large ruminants were vaccinated and an immune belt was created along the whole length and width of the Terai. In total, about 3.0 million animals were vaccinated. For nearly two years afterwards, mass vaccination and follow-up vaccinations were carried out in the Terai. Then the program was discontinued. In 1973, some five years after the end of mass vaccination, a fresh outbreak of rinderpest was noticed. The quick spread of the disease to a large area of the Terai, with high mortality, made it necessary to re-start the mass vaccination. The second campaign was carried out in 1974-78. But this campaign was stopped after 1978. After this second mass vaccination, new outbreaks of rinderpest were not reported

until the autumn of 1984. In September 1984, the disease occurred in the vicinity of Kathmandu among buffaloes imported from India. Experts consider that an immunity level of 80 per cent among animals is needed to limit an outbreak from spreading. Since the current immune status of animals is far below this recommended level, the DLDAH has decided to resume the mass vaccination program with assistance under the Project.

10. There are three types of Foot-and-Mouth Disease strains encountered in Nepal, namely A, O and Asia I. The disease is enzootic in Nepal and causes huge economic losses in livestock production. Local breeds are resistant but upgraded animals appear to be very susceptible. The highest losses are encountered in upgraded lactating cows and buffaloes and in draft animals, which are incapable of work if they contract the disease.

11. Sporadic outbreaks of Haemorrhagic Septicemia disease occur in all seasons, although some increase in the number of cases is usually seen near the start of the rainy season. Mortality rates are high in affected animals. Buffaloes are more severely affected than cattle.

12. The production losses from Newcastle Disease (Ranikhet) is very high because it has virtually prevented any reasonable development of village chickens. The average village has an outbreak of the disease once in every five years (20 per cent morbidity) when it frequently kills the entire poultry population (40-95 per cent mortality). In the case of fowl pox, even though the level of mortality is low, the total losses of birds from this disease are significant nationally. The major impact of this disease is on imported birds, where intrinsic immunity is not as high as in the local chickens. Vaccination carried out through vaccine production and distribution has to some extent controlled the disease. However, due to insufficiency of vaccine and its distribution, the vaccination could only reach a small proportion of the poultry population.

13. Internal parasites are another important cause of loss of production and of mortality in animals in Nepal. Production losses resulting from internal parasite infestation are difficult to quantify. In cattle and buffaloes, effects usually show up as reduced liveweight gain and sale weight, increased degeneration and calving intervals, reduced land preparation capability, delayed working age, reduced milk production and increased mortality, particularly in calves. Internal parasites exaggerate the production losses of poor nutrition. In sheep and goats, mortality rates from internal parasites are higher than in cattle and buffaloes and offtake weights are significantly reduced.

2. Disease Control Measures

14. The control and treatment for these diseases and parasites have been carried out by the District Veterinary Hospitals and Livestock Development Centers developed under the First Livestock Project and other integrated rural development projects. In addition, a large number of village animal health workers have been trained to carry out vaccination and simple disease and parasite treatments. Large vaccination campaigns have been organized to control major contagious diseases and large numbers of animals have been treated against various diseases and internal

parasites. However, the more sophisticated disease diagnostic services can be carried out only after the Central Diagnostic Laboratory being established under the First Livestock Project is completed and becomes operational.

15. Provision of adequate vaccines and veterinary drugs is considered the key for effective disease prevention/control. In this regard, the First Livestock Project initiated the establishment of a new vaccine production facility which is expected to be operational from 1986. At present, DLDAH's vaccination programs have been carried out by using vaccines produced by its existing facilities at Tripureshwar (initially built in 1964) supplemented with imported vaccines. Annual production (for FY1979/8 thru FY1983/84) and importation (FY1982/83 thru FY1984/85) of various vaccines is presented in Tables 8 and 9; while Consultants' estimate of vaccine demand in the country and production capability by type of vaccine is shown in Table 10. The facility's vaccine production capability is more than adequate to meet the country's needs particularly for Rinderpest and HS (cattle and buffaloes) and NCD and fowl pox (for poultry). FMD (for ruminants) which is cheaper to import will not be produced. Production of rabies vaccines will be supplemented by imports (see Appendix 3 for further details). To combat internal parasites, a pocket drenching program was started by the First Livestock Projet concentrating on the control of liver fluke and other internal worms thru the application of drugs (anthelmentics).

## D. HMGN's Livestock Development Plans

### 1. Development Targets

16. The Government's prospective Seventh Five-Year Plan (FY1985/90) quantifies the development and production targets of milk and meat, which for the project area are projected to increase from 170,290 mt to 239,900 mt for milk and from 31,730 mt to 39,640 mt for meat. Total national milk production is projected to increase from the base-year production of 704,975 mt to 861,298 mt or about 22 per cent over the plan period. This increase is expected to result mainly from the rise in production per animal, both in respect of cattle and buffalo.

17. In development work, the districts are divided into high-level, mid-level and primary-level on the basis of existing productivity levels, availability of extension services and access to roads and markets. To encourage milk production, milk collection and marketing will be expanded to establish a national milk grid which covers the Biratnagar, Hetauda, Pokhara, Butwal, Kathmandu and Banke areas. It is expected that, through milk grid development, milk collection will reach 59,130 mt in the last plan year. The Hetauda and Kathmandu grids would be in the area of the proposed Project where the DDC proposes to establish altogether 210 collection centers and 22 chilling centers.

18. The establishment of cottage milk industries will also be promoted in remote areas which are outside the milk grid. These industries will process the collected milk into cream, butter, cheese and/or ghee and the products will be sold in the nearest urban market. In the Project area, such industries are planned to be established in the Districts of Dolakha, Sindhupalchok, Sindhuli, Kavre, Lalitpur, Ramechhap and Dhading;

at least two small to medium size dairy processing plants in each district with a daily collection of 500 to 1,000 liters of milk will be established.

2. Animal Health Services

19. The main aspects of the Government's national animal health program are basic services provided through the hospitals in the 75 districts, mass vaccinations particularly against foot-and-mouth disease (FMD) and rinderpest, mass treatment against foot-rot (in sheep), and control of outbreaks of other contagious diseases through limited vaccinations and of parasitic diseases through drenching treatments. Self-sufficiency in production of selected vaccines will be aimed at. The following programs will be promoted: (i) in the high-level production program districts, veterinary hospitals will be upgraded with better treatment facilities; (ii) an immune belt against rinderpest will be established along the Nepal-India border; (iii) veterinary checkposts will be activated to control livestock movements in the border areas and prevent the spread of diseases by animals and animal products originating from abroad; (iv) FMD mass vaccinations will be concentrated in areas with a high population of improved animals; and (v) disease control laboratories will be activated and the production of rabies and other vaccines will be increased.

3. Other Extension Services

20. The Seventh Plan also emphasizes the improvement of animal productivity (milk and meat) by development of breeding services through artificial insemination (AI) and natural breeding. The artificial insemination program will be concentrated in districts and areas accessible by motorable roads. It is planned that 165,000 first inseminations will be carried out annually by the end of the plan period (the present level is about 10,000). Both cattle and buffalo are included in the AI programs. Natural breeding services will be improved in remote areas where AI cannot be provided. Improved cattle and buffalo bulls will be distributed in those areas.

E. Project Area

1. Physical Features

21. As with most aspects of life in Nepal, livestock production in the Central Region is greatly influenced by the natural features of the area. The total area of the Central Region is some 2.66 million ha (including the Rasuwa and Nuwakot Districts), 1/ of which the Terai occupies approximately 37 per cent, the mid-hills 35 per cent, and the high-hills and mountains (i.e. above 3,000 m) some 27 per cent.

22. The climate of the Region varies with altitude. In the southern plains, it is tropical and subtropical. The mid-hills are classed as having a warm temperate climate, while the high-hills are considered to be temperate and, at high levels, alpine. Rainfall throughout the Region

1/ These districts are covered under another development scheme.

occurs mainly in the monsoon season from June through to September/October but light, erratic rainfalls may occur at other times. At altitudes above 3,000 m, appreciable falls of snow can occur in January and February. The average annual rainfall over recent years in Janakpur (Terai) was about 1,300 mm, in Kathmandu (mid-hills) some 1,300 mm, and in Sindhupalchok District (high-hills) 3,600 mm.

23. The natural vegetation of the Region has been greatly modified or removed by man. The only exceptions are in some parts of the high-hills and mountains. The Terai was originally forest but has been heavily cleared for crop production. Only 210,000 ha or 23 per cent of the zone (together with 93,000 ha of the Royal Chitawan National Park) remain as forest and much of that is degraded through grazing, tree lopping and fuelwood collection. Of the remaining cultivable land, virtually all is in use for crop production. In the mid-hills, very little vegetation remains in its natural state. A great deal has been cleared and the land terraced for cultivation. According to the "Land Use Plan Project" prepared by APROSC in early 1985, some 37 per cent of the mid-hills zone of the Region is under crop production, 18 per cent is forest, and 17 per cent open grazing land. Little qualitative information exists about the forest and grazing areas but observation suggests that both resources have been severely degraded through over-utilization. The high-hills and mountains have been less affected from the vegetation point of view. This is due in part to their inaccessibility and to a lower density of human and animal population.

24. Supplies of water for livestock and crop production are very variable but only in one part of the Terai, north of Janakpur, was it reported as being a limiting factor for livestock production. Otherwise, numerous springs and small streams exist and there are several sizeable rivers. The latter are being managed for the generation of hydro-electric power and irrigation.

## 2. Social Features

25. The human population of the Central Region is about 4.5 million (1982) or about 30 per cent of the country's total population. Of the total, nearly 90 per cent live outside urban areas. While the population of the Region is dispersed roughly half in the Terai and half in the Hills (mostly mid-hills), it is not static. Two migration flows exist: one from all parts to Kathmandu and another from the mid-hills to the Terai.

26. Throughout the Central Region, as in most parts of Nepal, the basis of the social structure in rural areas is the small family farm on which crop production and livestock are very closely associated. The presence of livestock on a farm is no doubt a traditional aspect of family life but it has become obligatory in view of the dependence on animal power for cultivations, use of manure to try and maintain soil fertility, and provision of milk to supply animal protein in the diet. While the opportunity to change to a simple market economy, supplying the urban market of Kathmandu and other cities, exists along the few highways, it is still very rare to find a farm specializing in crop or livestock production.

27. Although farm sizes are small and family sizes relatively large (approximately 5.2 in both the Terai and the Hills), the labor supply for crop and livestock production is not excessive. In fact, pressure on family labor is heavy particularly at sowing and harvest periods. In the Janakpur area of the Terai, much of the paddy harvest depends on migrant labor from India. Similarly, problems exist in the Hills when part of the male population migrates to India during the winter to work or trade. There is little information about land tenure in any part of Nepal, and a cadastral survey is badly needed. The Consultants' survey showed that in the Central Region some farmers rent land. On the other hand, it is known that some "landless" livestock owners exist.

28. In rural areas, despite frequent mixtures of ethnic groups, there appears to be a fairly strong community spirit. Farm families often cooperate in tasks of crop cultivation and harvest. The group approach is also used in the political function of the country. Each of the Districts that go to make up the Region is divided into Panchayats comprising a group of villages or wards. These Panchayats have elected committees that have the power to enforce control over local activities, including the use of forests and grazing areas.

3. Infrastructure Base

29. The Central Region is probably the most favored part of the country with regard to development of infrastructure. Nevertheless, conditions are generally rudimentary and they represent a serious inhibiting factor to development. Paved roads radiate from Kathmandu. To the northeast, it will soon be possible to travel to Jiri on such a road. Westwards, there is a major highway to Pokhara and this is linked, through Hetauda, to a very good road that traverses the Terai zone (at least in the Central Region). All roads in the Hills are narrow, tortuous and liable to serious damage in the monsoon period. Other roads, where they exist, are generally dirt or gravel.

30. Despite a lack of roads, transport of goods takes place over numerous tracks by means of porters. Although this system involves great effort and is slow, it provides employment for a significant part of the population of the Hills. By contrast, air transport is well organized and it is possible to travel to several air strips located in the high-hills. There is a regular daily service between Kathmandu and Janakpur.

31. Radio communication is frequently used by Government offices to maintain contact with isolated outposts and this is supported by telephone links between larger towns. Under the First Livestock Project, a number of these communication facilities were provided to DLDOs in various parts of the country.

32. The supporting statistics may be seen in the following tables.

Tables -

Table 1. Livestock Population, Nepal
('000)

| Type | 1980 a/ | 1981 | 1982 | 1983 | 1984 | 1985 b/ |
|---|---|---|---|---|---|---|
| Cattle | 5,906 | 5,942 | 5,977 | 6,013 | 6,048 | 6,084 |
| Buffalo | 2,705 | 2,762 | 2,819 | 2,875 | 2,932 | 2,989 |
| Sheep | 561 | 614 | 668 | 721 | 775 | 828 |
| Goat | 3,656 | 3,917 | 4,179 | 4,442 | 4,704 | 4,967 |
| Pig | 358 | 382 | 407 | 431 | 456 | 480 |
| Chicken | 20,000 | - | - | - | - | 7,967 |

a/ Base population used for Sixth Five Year Plan.
b/ Base population used for Seventh Five Year Plan.

Table 2. Projected Ruminant Population in the Intensive Project Area and Central Region [a/]
(1985)

| Ecological Zones and Districts | CATTLE | | | Total | BUFFALO | | | | Total | GOAT | | | | Total | SHEEP | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Adult | | Young | | Adult | | Young | | | Adult | | Young | | | Adult | | Young | | |
| | L | Total | Animal | | M | F | M | F | | M | F | M | F | | M | F | M | F | |
| TERAI | | | | | | | | | | | | | | | | | | | |
| Dhanuska | 7,748 | 86,340 | 24,352 | 110,692 | 2,528 | 18,011 | 6,406 | 6,403 | 33,348 | 1,359 | 41,979 | 3,781 | 16,137 | 63,256 | - | 182 | - | - | 182 |
| Mohattari | 8,028 | 80,282 | 20,070 | 100,352 | 1,350 | 20,588 | 6,119 | 6,109 | 34,166 | 12,285 | 51,198 | 7,488 | 22,167 | 93,138 | - | - | - | - | - |
| Sarlahi | 5,332 | 67,538 | 21,328 | 88,866 | 2,793 | 15,500 | 6,135 | 6,126 | 30,554 | 6,041 | 35,536 | 10,934 | 19,659 | 72,170 | 29 | 15 | 6 | - | 50 |
| Rautahat | 4,413 | 73,546 | 18,386 | 91,932 | 1,743 | 20,168 | 7,131 | 7,120 | 36,162 | 8,081 | 52,356 | 8,828 | 19,648 | 88,913 | 109 | 203 | 67 | 34 | 413 |
| Bara | 5,123 | 51,870 | 12,167 | 64,037 | 1,136 | 11,075 | 3,862 | 6,341 | 22,414 | 4,539 | 29,402 | 4,959 | 11,036 | 49,936 | 28 | 53 | 17 | 9 | 107 |
| Parsa | 6,036 | 48,891 | 11,468 | 60,359 | 790 | 11,701 | 4,293 | 4,291 | 21,075 | 10,758 | 21,275 | 5,452 | 14,646 | 52,131 | 142 | 303 | 31 | 130 | 606 |
| Chitwan | 11,546 | 74,087 | 22,130 | 96,217 | 3,380 | 33,197 | 10,696 | 8,408 | 55,681 | 4,454 | 26,465 | 5,932 | 11,612 | 48,463 | 1,118 | 1,635 | 1,326 | 806 | 4,885 |
| Sindhuli a/ | 9,309 | 85,852 | 17,584 | 103,436 | 647 | 19,941 | 2,388 | 8,442 | 31,418 | 10,554 | 55,252 | 8,049 | 14,689 | 88,544 | - | - | - | - | - |
| Makawanpur a/ | 10,163 | 96,551 | 30,490 | 127,041 | 1,325 | 16,995 | 5,362 | 4,261 | 27,943 | 9,664 | 57,417 | 12,903 | 25,175 | 105,159 | 13 | 48 | 10 | 15 | 86 |
| Subtotal | 67,698 | 664,957 | 177,975 | 842,932 | 15,692 | 167,176 | 52,392 | 57,501 | 292,761 | 67,735 | 370,880 | 68,326 | 154,769 | 661,710 | 1,439 | 2,439 | 1,457 | 994 | 6,329 |
| MID-HILLS | | | | | | | | | | | | | | | | | | | |
| Kathmandu | 6,490 | 25,598 | 10,455 | 36,053 | 194 | 9,556 | 3,409 | 3,406 | 16,565 | 6,539 | 24,792 | 4,929 | 10,020 | 46,280 | 1,866 | 4,646 | 1,000 | 882 | 8,394 |
| Bhaktapur | 3,225 | 10,804 | 5,321 | 16,125 | 118 | 4,554 | 1,512 | 1,510 | 7,694 | 2,086 | 10,842 | 1,105 | 3,814 | 17,847 | 869 | 4,381 | 1,627 | 1,615 | 8,492 |
| Lalitpur | 3,612 | 22,705 | 4,386 | 27,091 | 364 | 8,786 | 4,031 | 2,796 | 15,977 | 2,831 | 23,615 | 1,736 | 4,207 | 32,389 | 2,460 | 3,846 | 966 | 1,183 | 8,455 |
| Kavre | 10,912 | 77,373 | 21,823 | 99,196 | 585 | 29,843 | 9,139 | 11,745 | 51,312 | 18,684 | 76,986 | 19,886 | 38,478 | 154,034 | 568 | 1,534 | 228 | 238 | 2,568 |
| Dhading b/ | 1,052 | 10,919 | 2,236 | 13,155 | 1,916 | 51,705 | 12,130 | 10,588 | 76,339 | 13,196 | 78,398 | 17,618 | 34,374 | 143,586 | 253 | 968 | 193 | 296 | 1,710 |
| Subtotal | 25,291 | 147,399 | 44,221 | 191,620 | 3,177 | 104,444 | 30,221 | 30,045 | 167,887 | 43,336 | 214,633 | 45,274 | 90,893 | 394,136 | 6,016 | 15,375 | 4,014 | 4,214 | 29,619 |
| PROJECT AREA | 92,989 | 812,356 | 222,196 | 1,034,552 | 18,869 | 271,620 | 82,613 | 87,546 | 460,648 | 111,071 | 585,513 | 113,600 | 245,662 | 1,055,846 | 7,455 | 17,814 | 5,471 | 5,208 | 35,948 |
| CENTRAL DEV. REGION | 123,248 | 1,082,174 | 297,598 | 1,379,772 | 26,337 | 378,994 | 114,983 | 122,049 | 642,363 | 142,200 | 751,626 | 146,262 | 314,193 | 1,354,281 | 23,479 | 56,258 | 17,240 | 16,446 | 113,423 |

a/ Parts of the districts are in the mid-hill zone.
b/ Part of the district is in high hill zone.

Note: L = lactating cow, M = Male, F = Female.

Source: Nepal Perspective Plan, APROSC, 1985 (unpublished data)

Table 3. Estimated Feed Requirement and Supply for Project Area (Districtwise) and Nepal As a Whole - Projection for 1985

(TDN in mt)

| Ecological Zone and Districts | Total Feed Requirement (TDN) | Total Feed Supply (TDN) | Balance (TDN) | Feed Requirement per L.U. (TDN) | Feed Supply per L.U. (TDN) |
|---|---|---|---|---|---|
| TERAI | | | | | |
| Dhanusha | 86,340 | 110,478 | 24,138 | | |
| Mohattari | 83,670 | 107,061 | 23,391 | | |
| Sarlahi | 71,880 | 91,975 | 20,095 | | |
| Rautahat | 79,465 | 101,681 | 22,216 | | |
| Bara | 52,535 | 67,223 | 14,688 | | |
| Parsa | 50,365 | 64,445 | 14,080 | 0.93 | 1.19 |
| Chitwan | 94,020 | 120,305 | 26,285 | | |
| Sindhuli | 82,650 | 105,757 | 23,107 | | |
| Makawanpur | 90,645 | 115,987 | 25,342 | | |
| Subtotal | 691,570 | 884,912 | +193,342 | 0.93 | 1.19 |
| MID-HILLS | | | | | |
| Kathmandu | 33,210 | 27,074 | - 6,136 | | |
| Bhaktapur | 15,215 | 12,403 | - 2,812 | | |
| Lalitpur | 28,410 | 23,161 | - 5,249 | | |
| Kavre | 97,075 | 79,137 | - 17,938 | | |
| Dhading | 71,270 | 58,100 | - 13,170 | 0.92 | 0.75 |
| Subtotal | 245,180 | 199,875 | - 45,305 | 0.92 | 0.75 |
| PROJECT AREA | 936,750 | 1,084,787 | + 148,037 | 0.93 | 1.03 |
| CENTRAL DEVELOPMENT REGION | 1,269,830 | 1,428,569 | + 158,739 | 0.92 | 0.91 |
| NEPAL | 6,137,065 | 5,574,515 | - 562,550 | 0.92 | 0.84 |

Note:
(1) Total feed requirement (TDN) is based on APROSC' Land Use Plan Study (1985). As far as the total feed supply is concerned, the Consultant has estimated the feed supply with the help of interpolation because of lack of data.
(2) Total feed requirement for animals is estimated based on the existing production level (milk, meat) of animals.
(3) TDN = Total Digestible Nutrient; LV = Livestock Units.
Source: Compiled and computed based on Nepal Land Use Plan Study, APROSC 1985.

Table 4. Calculation of Feed Requirements and Supply

1. Animal Population in the Central Region, 1983/84

| Animal | Terai | Mid-Hills | High-Hills | Total |
|---|---|---|---|---|
| Adult cattle | 510,071 | 370,135 | 203,284 | 1,083,490 |
| Young cattle | 139,396 | 91,389 | 57,347 | 288,132 |
| Adult buffalo (male) | 12,737 | 5,832 | 4,079 | 22,648 |
| Adult buffalo (female) | 125,430 | 152,559 | 70,235 | 348,224 |
| Young buffalo (male) | 43,407 | 42,333 | 15,996 | 101,736 |
| Young buffalo (female) | 44,415 | 48,073 | 24,199 | 116,687 |
| Sheep | 2,771 | 33,894 | 25,197 | 61,862 |
| Goats | 486,949 | 480,249 | 275,763 | 1,242,961 |

Source: APROSC - Projection of livestock population, TDN requirements and supply.

2. TDN Requirements (mt) of Livestock in the Central Region, 1983/84

| Animal | Terai | Mid-Hills | High-Hills | Total |
|---|---|---|---|---|
| Adult cattle | 453,963 | 329,420 | 180,923 | 964,306 |
| Young cattle | 56,734 | 37,195 | 23,340 | 117,269 |
| Adult buffalo (male) | 12,559 | 5,750 | 4,022 | 22,331 |
| Adult buffalo (female) | 135,841 | 165,221 | 76,065 | 377,127 |
| Young buffalo (male) | 33,423 | 32,596 | 12,317 | 78,336 |
| Young buffalo (female) | 34,200 | 37,016 | 18,633 | 89,849 |
| Sheep | 712 | 8,711 | 6,476 | 15,899 |
| Goats | 125,146 | 123,424 | 70,871 | 319,441 |
| TOTAL | 852,578 | 739,333 | 392,647 | 1,984,558 |

Standards Used in Calculating TDN Requirements:

| | | |
|---|---|---|
| Adult cattle | - | bullock weighing 275 kg and need for draft for 180 days. |
| | - | cow weighing 225 kg and producing 165 liters of milk per year with BF content and 6 per cent. |
| | - | mean TDN requirement is 890 kg per head per year. |
| Young cattle | - | animals weighing 60 kg with TDN requirement of 407 kg per head per year. |
| Adult male buffalo | - | animals weighing 350 kg with TDN requirement of 986 kg per head per year. |
| Adult female buffalo | - | animals weighing 300 kg and producing 460 liters of milk per year with BF content of 7 per cent. |
| | - | TDN requirement of 1,083 kg per head per year. |
| Young buffalo (male and female) | - | animals weighing 125 kg with TDN requirement of 770 kg per head per year. |
| Sheep and Goats | - | mean TDN requirement of 257 kg per head per year. |

Source: APROSC - Projection of livestock population, TDN requirements and supply.

3. Fodder Resources of the Central Region (mt TDN), 1983/84)

| Animal | Terai | Mid-Hills | High-Hills | Total | % |
|---|---|---|---|---|---|
| Crop by-products | | | | | |
| -- irrigated areas | 76,551 | - | - 76,551 | 5.14 | |
| -- non-irrigated areas | 418,564 | 424,405 | 62,503 | 905,472 | 60.78 |
| Forest | 103,639 | 126,474 | 27,622 | 257,735 | 17.31 |
| Fodder trees (homestead) | - | 9,723 | - | 9,723 | 0.65 |
| Grazing | 7,150 | 37,954 | 159,935 | 205,039 | 13.76 |
| Supplementary feeding | 17,488 | 10,803 | 6,841 | 35,132 | 2.36 |
| TOTAL | 623,392 | 609,359 | 256,901 | 1,489,652 | 100.00 |

Standards Used in Calculating Fodder Resources:

Areas of land under cultivation, forest and grazing (APROSC Land Use Plan Project).

Yields of crops in areas under cultivation (Report of Integrated Cereals Project, 1984).

| | | | |
|---|---|---|---|
| -- Terai (irrigated) | rice and wheat | total grain yield/yr | 5.67 mt |
| -- Terai (non-irrigated) | rice | | 2.82 mt |
| -- Mid-Hills | rice and maize | | 5.18 mt |
| -- High-Hills | barley | | 1.00 mt (estimate) |

Yields of crop by-products (APROSC Project of Livestock Population, TDN Requirements and Supply)

| | | | |
|---|---|---|---|
| -- Rice straw | fodder: | grain 1.62 x TDN content 27.6% x estimate utilization 90% | = 1.28 mt TDN |
| -- Wheat straw | fodder: | grain 2.17 x TDN content 35.7% x estimate utilization 30% | = 0.58 mt TDN |
| -- Maize stalk | fodder: | grain 2.21 x TDN content 35.2% x estimate utilization 50% | = 2.05 mt TDN |
| -- Barley straw | fodder: | grain 1.81 x TDN content 38.4% x estimate utilization 75% | = 0.52 mt TDN |

-- Bran and other by-products included in 'Supplementary feeding' below

Yields from resources other than by-products (APROSC Project of Livestock Population, TDN Requirements and Supply)

| | |
|---|---|
| -- Forest | 0.34 mt TDN/ha in the Terai and Mid-Hills |
| | 0.20 mt TDN/ha in the High-Hills |
| -- Fodder trees (homestead) | 0.054 mt/farm |
| -- Grazing | 0.24 mt TDN/ha in the Terai and Mid-Hills |
| | 1.54 mt TDN/ha in the High-Hills |
| -- Supplementary feeding | 0.09 mt/farm (in form of purchased concentrates, bran, kitchen waste, etc.) |

4. Deficiency of Feed Supplies in the Central Region, 1983/84

| | Terai | Mid-Hills | High-Hills |
|---|---|---|---|
| $100 - \frac{\text{Supply}}{\text{Requirements}} \times \frac{100}{1}$ | 27% | 18% | 35% |
| TDN (mt) | 229,186 | 129,974 | 135,746 |
| TDN (mt/farm) | 0.79 | 0.72 | 1.19 |

Table 5. Export and Import of Animal Feedstuffs

(Value in NRs million)

| Feedstuff | Country | Import 1980/81 Qty (mt) | Import 1980/81 Value | EXPORT 1980/81 Qty (mt) | EXPORT 1980/81 Value | EXPORT 1981/82 Value | EXPORT 1982/83 Value | EXPORT 1983/84 Value |
|---|---|---|---|---|---|---|---|---|
| 1. Brans, sharps and other residues | | | | | | | | |
| - Cereals | India | 162 | 0.15 | 5,860 | 9.2 | 9.1 | 7.9 | 14.7 |
| - Leguminous vegetables | | 15 | 0.02 | 978 | 1.0 | 4.9 | 4.7 | 7.2 |
| Subtotal | | 177 | 0.2 | 6,838 | 10.2 | 14.0 | 12.6 | 21.9 |
| 2. Oilcakes | | | | | | | | |
| - Linseed | India | 19 | 0.02 | 2,143 | 3.9 | 5.8 | 4.5 | 8.5 |
| - Mustard seeds | | 118 | 0.20 | 8,265 | 9.0 | 15.8 | 22.9 | 21.0 |
| - Others | | 150 | 1.00 | 5,327 | 5.4 | 3.4 | 5.5 | 3.8 |
| Subtotal | | 287 | 1.2 | 15,735 | 18.3 | 25.0 | 32.9 | 33.3 |
| 3. Sweetened Forage | India | 26 | 2.0 | - | - | 4.3 | 1.5 | - |

Note: No import figures are available except for FY1980/81.

Source: Department of Customs.

Table 6. Estimated Land Classification and Utilization Pattern of the Project Area (District wise) and Nepal
(Area in ha)

| Ecological Zone and Districts | Cultivated Land | Forest Land | Grazing Land | Road and Settlement Area | Snow Cover Area | Others | Total |
|---|---|---|---|---|---|---|---|
| TERAI | | | | | | | |
| Dhanusha | 65,912 | 26,619 | 3,640 | 2,988 | - | 18,841 | 118,000 |
| Mohattari | 80,152 | 8,706 | 3,076 | 1,853 | - | 6,413 | 100,200 |
| Sarlahi | 43,515 | 34,832 | 4,253 | 2,750 | - | 40,550 | 125,900 |
| Rautahat | 87,440 | 13,162 | 3,457 | 2,305 | - | 6,236 | 112,600 |
| Bara | 41,022 | 57,246 | 4,317 | 2,210 | - | 14,205 | 119,000 |
| Parsa | 46,334 | 39,106 | 4,154 | 1,977 | - | 43,729 | 135,300 |
| Chitwan | 47,192 | 125,150 | 6,895 | 1,849 | - | 40,714 | 221,800 |
| Sindhuli | 11,716 | 152,011 | 47,578 | 1,243 | - | 36,552 | 249,100 |
| Makawanpur | 36,787 | 147,986 | 46,336 | 1,702 | - | 9,789 | 242,600 |
| Subtotal | 460,070 | 604,818 | 123,706 | 18,877 | - | 217,029 | 1,424,500 |
| MID-HILLS | | | | | | | |
| Kathmandu | 23,703 | 10,049 | 1,580 | 3,040 | - | 1,128 | 39,500 |
| Bhaktapur | 8,612 | 740 | 833 | 952 | - | 763 | 11,900 |
| Lalitpur | 14,437 | 8,925 | 5,624 | 1,434 | - | 8,080 | 38,500 |
| Kavre | 60,235 | 16,752 | 26,664 | 2,094 | - | 33,855 | 139,600 |
| Dhading | 49,898 | 38,339 | 36,786 | 1,752 | 6,221 | 59,604 | 192,600 |
| Subtotal | 156,885 | 74,805 | 71,487 | 9,272 | 6,221 | 103,430 | 422,100 |
| PROJECT AREA | 616,955 (33.4%) | 679,623 (36.8%) | 195,193 (10.6%) | 28,149 (1.5%) | 6,221 (0.3) | 320,459 (17.4%) | 1,846,600 (100%) |
| CENTRAL DEVELOPMENT REGION | 719,409 (26.9%) | 870,219 (32.6%) | 335,076 (12.6%) | 33,433 (1.3%) | 166,510 (6.2%) | 544,353 (20.4%) | 2,741,000 (100%) |
| NEPAL ('000 ha) | 2,959 (20.1%) | 5,390 (36.6%) | 1,978 (13.4%) | 103 (0.7%) | 2,247 (15.3%) | 2,041 (13.9%) | 14,718 (100.0%) |

Source: Nepal Land Use Plan, APROSC 1985, Unpublished Data.

Table 7. Estimated Annual Production Loss from Major Livestock and Poultry Diseases and Parasites and Expected Value Saved Under the Project

| | Division Group | No. Affected WOP (mn) | Milk Prod. Loss ('000 mt) [h/] | Egg Prod. Loss (mn) [i/] | Off-take Loss ('000 mt) [j/] | 1986 Value of Loss (NRs mn) [k/] | 1986 Number Treated (mn) [l/] | 1986 Value Saved Production (NRs mn) | 1990 Number Treated (mn) [l/] | 1990 Value Saved Prodn. (NRs mn) [b/] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Internal Parasites [a/] | 5.3 [f/] | 291 | - | 40 | 1644 | 0.06 [m/n/] | 18.6 | 0.06 | 18.6 |
| 2. | FMD [b/] | 2.7 [f/] | 24 | - | 3.3 | 136 | .0045 [m/o/] | 0.25 | 0.03 | 1.64 |
| 3. | Rinderpest [c/] | 9.0 [f/] | 63 | - | 13.6 | 447 | 0.8 | 447 | 1.2 | 447 |
| 4. | HS [d/] 1.8 [f/] | 7.7 | - | 1.8 | 56 | .64 | 4 | 1.2 | 7.5 | |
| 5. | NCD [e/] | 5.6 [g/] | - | 58 | 10.0 | 178 | 1.2 [m/] | 26.7 | 3.2 | 63.2 |

a/ Internal Parasites -
(i) at least 40 per cent of large and small ruminant population is affected.
(ii) production loss from infection in the herd is displayed by:
-- an estimated 50 per cent reduction in surplus milk production; and
-- an estimated 50 per cent reduction in offtake due to reduced growth rates, reduced calving percentages, higher mortalities and increased generation intervals.

b/ Foot and Mouth Disease (FMD) -
(i) the disease is enzootic countrywide. An estimated 30 per cent of the large ruminant population are affected annually.
(ii) production loss from infection in a herd is displayed by:
-- an estimated 10 per cent reduction in surplus milk production directly as a result of consequent infertility; and
-- an estimated 10 per cent reduction in offtake due to calf mortalities, infertility, abortion and unthriftiness resulting from the disease outbreak.

c/ Rinderpest -
(i) the disease is not present in Nepal.
(ii) without establishment of a regular vaccination program, the disease would become endemic countrywide resulting in:
-- 8 per cent annual milk production loss; and
-- 12 per cent annual reduction in offtake.

d/ Haemorrhagic Septicaemia (HS) -
(i) the disease occurs countrywide, although outbreaks in a particular village herd would probably occur no more than once every five years (i.e., 20 per cent of the population).
(ii) production losses resulting from high mortalities particularly in buffaloes are estimated to result in:
-- 5 per cent fall in annual milk production; and
-- 8 per cent fall in annual offtake.

e/ Newcastle Disease (NCD), Ranikhet and Fowl Pox
(i) NCD and Fowl Pox occur countrywide, and together affect an estimated 70 per cent of the poultry population.
(ii) productive loss from the disease is estimated to be:
-- 50 per cent reduction in offtake mainly due to mortality;
-- 35 per cent reduction in surplus egg production due mainly to high replacement needs of household flocks to compensate for high mortalities, and high mortalities in laying hens. Also cessation of laying is common during disease outbreaks.

f/ Large ruminants only recorded.
g/ Chickens only recorded.
h/ 1985 milk production of 727,200 mt annually.
i/ 1985 egg production of 160 million annually.
j/ 1985 meat production of 139,449 mt annually.
k/ Prices applied:
-- milk - NRs 4.5/kg
-- meat - NRs 12/kg
-- eggs - NRs 1 each

l/ 20% wastage allowance.
m/ 2 doses per treatment.
n/ Only affected animals treated.
o/ Vaccinations mostly made around outbreak.

Table 8. Annual Production of Vaccines
(FY1979/80 thru FY1983/84)

| Vaccines/Year | Unit | FY1979/80 | FY1980/81 | FY1981/82 | FY1982/83 | FY1983/84 |
|---|---|---|---|---|---|---|
| 1. Haemorrhagic septicemia | doses | 231,560 | 422,938 | 404,800 | 499,000 | 706,400 |
| 2. Rinderpest (GIV) | doses | 679,100 | 260,575 | 200,000 | 118,400 | 98,000 |
| 3. Rabies - 5% | ml | 87,000 | 246,934 | 207,310 | 281,700 | 378,950 |
| - 20% | ml | 24,445 | 31,047 | 38,643 | 27,600 | 28,000 |
| 4. Newcastle Disease | | | | | | |
| - F - Strain | doses | 855,200 | 976,400 | 1,201,400 | 1,200,000 | 1,415,000 |
| - M - Strain | doses | 912,000 | 1,255,500 | 1,322,000 | 2,000,000 | 2,004,000 |
| 5. Fowl Pox | doses | 546,600 | 585,250 | 601,000 | 600,000 | 822,000 |
| 6. Black quarter | doses | - | - | - | - | - |

Source: Biological Product Division and Rabies Control Unit, Tripureshwar, DLDAH.

Table 9. Annual Importation of Vaccine
(FY1982/83 thru FY1984/85)

| | FY1982/83 | | FY1983/84 | | FY1984/85 (Est.) | |
|---|---|---|---|---|---|---|
| | Quantity (doses) | Amount (NRs) | Quantity (doses) | Amount (NRs) | Quantity (doses) | Amount (NRs) |
| Haemorrhagic Septicemia | 50,000 | n.a. | 60,000 | 147,900 | 200,000 | 435,450 |
| Black Quarter | - | n.a. | 20,000 | 49,300 | 8,000 | 10,450 |
| Foot and Mouth Disease | 10,000 | n.a. | 27,000 | 266,568 | 50,000 | 264,000 |

Source: DLDAH.

Table 3. Estimated Feed Requirement and Supply for Project Area (Districtwise) and Nepal As a Whole - Projection for 1985

(TDN in mt)

| Ecological Zone and Districts | Total Feed Requirement (TDN) | Total Feed Supply (TDN) | Balance (TDN) | Feed Requirement per L.U. (TDN) | Feed Supply per L.U. (TDN) |
|---|---|---|---|---|---|
| TERAI | | | | | |
| Dhanusha | 86,340 | 110,478 | 24,138 | | |
| Mohattari | 83,670 | 107,061 | 23,391 | | |
| Sarlahi | 71,880 | 91,975 | 20,095 | | |
| Rautahat | 79,465 | 101,681 | 22,216 | | |
| Bara | 52,535 | 67,223 | 14,688 | | |
| Parsa | 50,365 | 64,445 | 14,080 | 0.93 | 1.19 |
| Chitwan | 94,020 | 120,305 | 26,285 | | |
| Sindhuli | 82,650 | 105,757 | 23,107 | | |
| Makawanpur | 90,645 | 115,987 | 25,342 | | |
| Subtotal | 691,570 | 884,912 | +193,342 | 0.93 | 1.19 |
| MID-HILLS | | | | | |
| Kathmandu | 33,210 | 27,074 | - 6,136 | | |
| Bhaktapur | 15,215 | 12,403 | - 2,812 | | |
| Lalitpur | 28,410 | 23,161 | - 5,249 | | |
| Kavre | 97,075 | 79,137 | - 17,938 | | |
| Dhading | 71,270 | 58,100 | - 13,170 | 0.92 | 0.75 |
| Subtotal | 245,180 | 199,875 | - 45,305 | 0.92 | 0.75 |
| PROJECT AREA | 936,750 | 1,084,787 | + 148,037 | 0.93 | 1.03 |
| CENTRAL DEVELOPMENT REGION | 1,269,830 | 1,428,569 | + 158,739 | 0.92 | 0.91 |
| NEPAL | 6,137,065 | 5,574,515 | - 562,550 | 0.92 | 0.84 |

Note:
(1) Total feed requirement (TDN) is based on APROSC' Land Use Plan Study (1985). As far as the total feed supply is concerned, the Consultant has estimated the feed supply with the help of interpolation because of lack of data.
(2) Total feed requirement for animals is estimated based on the existing production level (milk, meat) of animals.
(3) TDN = Total Digestrive Nutrient,; LV = Livestock Units.

Source: Compiled and computed based on Nepal Land Use Plan Study, APROSC 1985.

# CONSUMPTION AND MARKETING SITUATION OF MILK AND MEAT PRODUCTS IN NEPAL

## A. An Overview

1. The availability of milk and meat products in Nepal can only be estimated on the basis of assumptions as there are no reliable census, surveys or data available on the actual number of milking animals, milk production and usage, internal and external trade in milk and meat products, and consumption patterns within different income groups for the population.

2. Based on the Bank prepared Nepal Agricultural Sector Strategy Study (NASSS) published in 1982 and FAO data, the nutritional situation of an average person in Nepal is not satisfactory. In 1985, it is estimated that the actual consumption per capita per year for milk is about 50 liters, 6 kgs for meat and 0.22 kgs for eggs. Approximately 70 per cent of the meat consumption is from buffalo, about 20 per cent from goat and 10 per cent from pigs, poultry and sheep. In terms of protein equivalent, the combined consumption of milk, meat and eggs translates to about 2.9 kgs per capita per year which is about 70 per cent of the minimum recommended nutritional requirement by FAO for an average Nepalese. 1/ For a comparison with other countries in South Asia, please see Table 1. 2/ NASSS estimates that to supply the minimum food and nutritional needs in Nepal, cereal production should at least double and production of livestock products in terms of milk, meat and eggs should triple from present levels by the Year 2000.

## B. The Dairy Sector

### 1. Existing Situation

#### (a) Its Structure

3. The Dairy Development Corporation (DDC) dominates the organized dairy industry at present. 3/ While it markets only 2 per cent of the estimated national milk production, it supplies approximately 60-70 per cent of the milk consumption in Kathmandu Valley. For the three other urban areas, namely Hetauda, Pokhara and Biratnagar, it is estimated that DDC provides up to 25 per cent of the milk demand. The private sector in recent years has shown increasing interest in investing in the dairy processing business. In Kathmandu, there are at present three medium sized privately-operated dairy processing plants producing liquid milk, ice

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1/ FAO's prescribed minimum nutritional protein consumption in Nepal: 2.24 kgs milk; 1.64 kgs meat; and 0.08 kgs eggs or a total of 3.96 kgs per capita per year.

2/ Table 1 indicates that Nepal's animal protein consumption per capita per day (including fish) for 1978-80 is about 6.7 grams. In contrast, the comparable figure for Afghanistan is 8.3 grams; for Pakistan, 14.1 grams; and for Burma, 8 grams. Source: FAO Production Yearbook.

3/ For a description of the highlights on DDC's operations, see Table 2.

(Reference in Text: page 3, para 8; page 6, para 23; page 14, para 49; page 37, para 118)

cream, yoghurt and cheese. In rural areas, the collection, reprocessing and manufacture of ghee is also organized by the private sector. In addition, a number of producers' cooperatives have been organized particularly in the Project area under the First Livestock Project and initial results of operations have been encouraging.

4. The collection of milk is generally difficult in Nepal because of bad road conditions and the generally rugged terrain. Thus, only a limited number of households can benefit from the regular and organized outlets provided by the DDC and the private dairy processing plants. The bulk of the milk produced in the country is consumed on the farm, sold in the locality in raw form or processed into ghee or other milk products for household consumption. For milk haulage, porters, carts and bicycles are commonly used at the village level thus providing a source of income for hundreds of people usually hired either by the DDC or by farmer groups. The milk so collected from the villages is then delivered/collected at the various milk collection centers and/or chilling centers established by DDC or milk producers' associations/cooperatives. From these chilling centers/ collection centers, the raw milk is then transported by trucks/bulk tankers to the four processing plants of DDC. By the end of 1984, DDC estimates that approximately 22,000 farmers (many of whom are organized as cooperatives) were more or less regularly supplying milk through its existing 226 collection centers and 17 collection/chilling centers. To encourage the formation of these milk producers associations/cooperatives, DDC pays a handling fee of 9.7 per cent based on the total gross value of milk supplied by such groups. The purpose is to compensate these cooperatives for the cost of milk collection, recording, testing and administration of individual payments to the members/farmers. Apart from ensuring its supply of raw milk, this system considerably reduces DDC's costs of staff and management.

5. The four milk processing plants of DDC have a total rated pasteurization capacity of 72,000 liters per day in one shift (6 hours) operation but the effective utilization has been averaging only about 80 per cent (see Table 3). At present, the plant in Kathmandu has an average daily output of 42,000 liters as compared with its rated capacity of 30,000. This indicates a utilization of about 140 per cent. All the other three plants in Pokhara, Hetauda and Biratnagar, however, operate with a much lower capacity utilization (between 30 and 50 per cent) partly in view of the inadequacy of the local raw milk supply and due to increasing competition from private vendors. During the last five years, the combined output of pasteurized milk of the four DDC processing plants increased from 10.6 million liters in 1979/80 to 21.6 million liters in 1983/84. The main plant in Kathmandu produced 72 per cent of the total, which shows the dominant position of that market area.

6. DDC is heavily dependent on the use of imported milk solids (viz, powder) in the processing of its liquid milk output. The share of locally produced and collected milk in the total production of pasteurized milk was as low as 36 per cent in 1981/82 although increasing somewhat to 43 per cent in 1983/84 mainly because of the increased milk output from the three districts in Janakpur as a result of the First Livestock Project (Table 4). The bulk of the imported milk powder of DDC has been donated by the World

Food Programme (WFP) supplemented by commercial imports since October 1981. The WFP has been assisting Nepal's dairy industry since 1974 through four different programs. The last one (which was signed in September 1982) involved the donation of 1,900 tons of skimmed milk powder (SMP) and 151 tons of butter oil (BO) with an estimated value of $2.7 million. Proceeds from the sale by DDC of WFP donated milk commodities are deposited in a special bank account and used by DDC to support its dairy development programs under a WFP-approved plan of utilization.

7. The distribution of the milk output of DDC is carried out by its own milk shops and retail booths. The booths operate for a few hours during morning and evening hours selling about 85 per cent of the daily total while the shops sell throughout the day on a cash payment basis. About 85 per cent of the milk is sold in one-half liter (returnable) glass bottles, the rest being packed into half-liter plastic sachets. The aim is to gradually increase the share of sachets (which are manufactured in Nepal from imported granules); the bottles are currently imported from India. As DDC milk is not rationed, part of the supply is marketed by private resellers or processors who make exorbitant profits.

(b) Pricing Policy

8. By virtue of its Charter, DDC's Board of Directors has the authority to review and implement revised milk prices. However, in practice, this is subject to clearance by the Ministry of Agriculture and ultimately the Cabinet. The Government's milk price policy, up to mid-1984, appeared to have been geared more to providing low and favored prices to urban consumers, especially in Kathmandu, rather than at providing incentives to farmers to increase production in line with market demand. During the last six years, DDC's retail price of milk was increased thrice - the most recent one being in September 1985. 1/ The price paid by DDC to producers for their raw milk supply was similarly increased although timing was not always synchronized. This can be seen below:

1/ During negotiations, HMGN confirmed that DDC's retail price was again increased by about 33.3 per cent over present prices equivalent to about Rs 1.50 per liter effective 17 September 1985. This would bring DDC's new retail price to Rs 6.00 per liter, which would enable DDC to cover its operating cost, provide an increase in prices paid to producers and generate a reasonable profit. Also, effective 17 September 1985, the new prices to be paid to producer/suppliers will be Rs 4.50 per liter, an increase of 20 per cent.

DDC's Producer/Retail Prices
(FY1979/80-1984/85)

| | Producer Price (5% fat) | Retail Price (3% fat) |
|---|---|---|
| | (Rs per liter) | |
| 1979/80 (Base) | 2.25 | 2.80 |
| 1980/81 | 2.75 (+22.3%) | 3.50 (+25%) |
| 1981/82 | 2.75 | 3.50 |
| 1982/83 | 3.75 (+36.4%) | 3.50 |
| 1983/84 | 3.75 | 3.50 |
| 1984/85 | 3.75 | 4.50 a/(+28.6%) |
| 1985/86 | 4.50 (+20.0%) | 6.00 (+33.3%) |

a/ Effected in September 1984.

The price paid to producers/suppliers is generally based on the fat content of the milk and the distance from the source of supply. In the Kathmandu area, the new price is about Rs 0.85 per fat unit plus transport or porter's fee which ranges from Rs 5-12 per 40-liter can. To discourage adulteration with water, the DDC recently introduced a bonus payment to suppliers on the basis of a solid-not-fats (SNF) content with a fixed minimum standard of 8 per cent. Thus, if an aggregate sample from the milk contains over 8 per cent SNF, an additional payment is made using an agreed formula. An average milk producer/supplier, therefore, receives nearly Rs5 and up per liter delivered at the Kathmandu plant. For the three other processing plants, DDC pays between about Rs 0.65 per fat unit per liter to Rs 0.90 per fat unit per liter. No SNF formula is applied. The formula for payment now at present being used is considered rather complicated and generally difficult for the producers to understand. DDC with the assistance of WFP/FAO are currently taking steps to modify this formula and to come up with a more effective price review mechanism.

10. The failure in the past to adjust the retail price of DDC for its pasteurized milk particularly in Kathmandu resulted in distortions in the urban milk markets and a serious deterioration in the financial position of the DDC. For the highlights on DDC's operations and background, see Table 2. At Rs 6.00 per liter (3 per cent fat), DDC's new retail price now approximates similar liquid milk products being marketed by private vendors and processors (reported at about Rs 6-8 per liter). Market forces generally determine the prices of the products marketed by the private sector, but it is possible that these prevailing "free market" prices may be artificially high at this time in view of the shortage of milk particularly in the urban areas. DDC's prices generally have a strong impact on the supply of raw milk coming from producers and on the consumption of consumers.

11. Consultants indicate that while there is in general a shortage of fresh milk particularly during the dry season, the population living in rural areas with herds of cattle and buffaloes have excess milk. These people usually have about 1 liter per day per family, either from their own animals or purchased from neighbors at prices ranging between Rs 4-6 per

liter. For these people, availability of fresh milk may be more assured compared to those living in the urban areas particularly Kathmandu. In many mountain areas not accessible to commercial supply, however, milk may also be difficult to obtain.

2. Prospects

12. The total consumption of milk for the entire country is currently estimated at around 700,000 to 750,000 mt, of which approximately 98 per cent is locally produced. The balance of about 2 per cent is met by milk powder and other importations. Based on the present human population, the actual per capita consumption works out at about 50 liters per year. In the Project area (mainly Central Region), the existing demand for milk is about 180,000 mt or about 25 per cent of national demand.

13. Ghee, cheese and other dairy products are to some extent made available by traditional traders in remote areas. The Government's intention is to gradually introduce new products mainly in the form of milk powder to cater for the needs of the undersupplied sectors of the population. However, because of the present inadequacy of raw milk supply, the Consultants considered that the establishment of a milk powder plant would not be feasible, at least during the next few years. At the request of the Government, however, it was agreed that by about the middle of the Project implementation period the raw milk supply situation should be reviewed. A study of the viability of establishing an economic-sized milk powder plant would be made at a later date.

14. Due to the lack of reliable data, it is difficult to estimate the future demand for milk and milk products in the different regions of Nepal including the Project area. However, an attempt was made by the Mission to project the demand and supply situation on two bases: first, on the basis of the average per capita consumption achieved during the last five years combined with a human population growth of 2.7 per cent per annum through 1995. Second, on the basis of the minimum nutritional requirement recommended by FAO. These projections should only be considered as indicative of broad orders of magnitude. On the first basis, it is estimated that demand in Nepal of milk and milk products will increase from around 750,000 mt in 1985 to at least 1.1 million mt by 1995. Under such circumstances, the supply of milk and milk products would have to increase by at least an additional 300,000 mt. On the basis of FAO's prescribed nutritional intakes, the estimated demand for milk and milk products would be much higher - at about 1.4 million mt by 1995. If there is an increase in real per capita income, it is likely that this demand will further increase.

15. The demand and supply pattern in the Project area would be similar. Assuming that the human population in the Project area increases at about the same rate as the national average, the demand for milk should increase from about 180,000 mt at present to about 400,000 mt by 1995. This indicates that the present supply of milk and milk products will need to be increased by at least 200,000 mt over the next ten years.

C. Other Livestock Products

16. There are no organized marketing channels for meat and other livestock products (like eggs). Middlemen play a dominant role in all stages of marketing from the farmer to the retailer. As a rule, middlemen generally only specialize in one type of animal. This goes so far that a man trading in female buffaloes seldom associates himself with a trader of male buffaloes. Middlemen collect buffaloes from the Terai and adjoining districts of India. The animals are then brought to Kathmandu by truck and also by trekking in herds of 20-50 animals. Often, these animals are sold to butchers by other middlemen. No scales are used to determine the price of buffaloes or any other animals. Slaughtering is done by butchers who themselves retail the meat or sell it to meat retailers. In Hetauda, there is a fully equipped slaughterhouse with meat processing facilities. Mainly because of its very large capacity, this plant has not been economical to operate and has been idle for seven years. Occasionally some chickens are slaughtered.

17. The estimate of national meat production in 1984/85 (i.e. from buffalo, goat, pig and poultry and sheep) varies considerably from about 98,000 mt, (equivalent to about 6 kgs per capita per year) as reconstructed by the Mission from available data to about 139,000 mt as indicated by the Government in its Seventh Plan (equivalent to about 8.56 kgs per capita per year). The Government's estimate in Mission's view may be on the high side taking into account past trends during the last five years. Using the same methodology as that for milk, the production/demand for meat using Mission's reconstructed data was projected. It is estimated that by 1995, total meat demand in the country would reach at least 164,000 mt from the present 98,000 mt. This indicates an annual per capita consumption of about 7.6 kg in ten years time, which approximates FAO's prescribed minimum nutritional requirement for meat. In the Kathmandu Valley, the Consultants estimated that the demand for meat would increase from about 9,800 mt at present (about 10 per cent of national production) to about 21,200 mt by 1995 (about 13 per cent of expected national demand). Regardless of the projections and methodology used, it would seem that local production will need to be substantially increased to meet projected consumption for meat in the next decade.

18. The supporting statistics may be seen in the following tables:

Tables
1. Animal Protein Consumption Per Capita Per Day, South Asia
2. Highlights on Dairy Development Corporation Operations
3. DDC: Capacity and Capacity Utilization of the Milk Plants in 1983/84
4. DDC: Output of Pasteurized Milk 1979-84 Manufactured from Fresh Milk and Imported Milk Powder and Butter Oil
5.0. Estimated Livestock Population and Per Capita Consumption of Animal Products, 1975-1995 in Nepal
5.1. Estimated Supply and Demand of Milk, Meat and Eggs
5.2. Estimated Technical Parameters for Livestock and Poultry
6. Export and Import of Meat, Milk and Eggs
7. Exports of Livestock and Livestock Products
8. Imports of Livestock and Livestock Products
9. Selected Average Retail Prices in Principal Towns for Livestock Products and Fish

Table 1. Animal Protein Consumption per Capita per Day South Asia (in Grams)

| | Animal Protein (excluding fish) [a] | | | | Animal Protein (including fish) [b] | | | |
|---|---|---|---|---|---|---|---|---|
| | 1966-68 | 1969-71 | 1974-76 | 1977-79 | 1966-68 | 1969-71 | 1975-77 | 1978-80 |
| Bangladesh | 2.8 | 2.8 | 2.5 | 2.9 | 6.8 | 6.5 | 5.7 | 5.3 |
| Afghanistan | n.a. | n.a. | n.a. | n.a. | 10.2 | 9.1 | 8.3 | 8.3 |
| Burma | 3.6 | 3.8 | 3.5 | 3.7 | 7.7 | 8.0 | 7.9 | 8.0 |
| India | 4.1 | 4.0 | 3.8 | 3.8 | 4.9 | 4.8 | 4.8 | 4.7 |
| Nepal | 6.8 | 6.9 | 6.8 | 6.7 | 6.9 | 7.0 | 6.9 | 6.7 |
| Pakistan | 13.6 | 13.6 | 13.4 | 13.5 | 14.2 | 14.0 | 13.8 | 14.1 |
| Sri Lanka | 3.8 | 3.5 | 3.2 | 3.3 | 9.5 | 8.2 | 6.9 | 6.7 |
| Average | 5.8 | 5.8 | 5.5 | 5.7 | 8.6 | 8.2 | 7.8 | 7.7 |

a/ 1980 FAO Production Yearbook.
b/ 1982 FAO Production Yearbook.

Table 2. Highlights on Dairy Development Corporation Operations

1. The Dairy Development Corporation (DDC) which was established in 1969 is managed by a Board of Directors appointed by HMGN. The General Manager of DDC acts as the Executive Chairman of the Board while the other members are from Government institutions, namely: The Director-General of DLDAH, Ministry of Agriculture representative, Controller-General's representative, Undersecretary of National Planning Commission, Undersecretary of Ministry of Finance, and the Chief of the Food Research Laboratory.

2. The principal objectives of DDC are to develop, organize and promote the dairy industry including the improvement of the production, collection, pasteurization, sales and distribution of milk and milk products. DDC also has the responsibility for enhancing the economic condition of milk producers and protecting the health of consumers.

3. In the more remote areas, particularly in the hill areas, DDC also operates a number of small-scale cheese and butter factories. DDC employs a relatively large staff numbering 980 of which close to 50 per cent are stationed at the Kathmandu dairy plant (400 personnel).

4. During the last five years, DDC's gross income increased from NRs 47.1 million in 1979/80 to NRs 104.2 million in 1983/84 or an average annual growth rate of 24 per cent. On the other hand, its expenditures during the same period increased from NRs 50.2 milliion to NRs 115.4 million, a yearly growth rate of 26 per cent. In 1983/84, DDC's actual operating cost (including raw milk and depreciation) was calculated at about Rs 4.33 per liter compared with an average income of Rs 3.80 per liter, indicating a net loss of Rs 0.52 per liter. Excluding the cost of raw milk, DDC's operating cost works out at Rs 1.33 per liter. A summary of DDC's income/expenditure is presented below:

DDC Income/Expenditure Comparison
(1979/80-1983/84), NRs Million

| Year 1/ | Gross Income | Total Expenditures | Surplus/ Deficit |
|---|---|---|---|
| 1979/80 | 47.8 | 50.1 | - 2.3 |
| 1980/81 | 52.9 | 56.4 | - 3.4 |
| 1981/82 | 70.3 | 73.6 | - 3.3 |
| 1982/83 | 101.6 | 108.0 | - 6.3 |
| 1983/84 | 104.2 | 115.3 | -11.1 |

5. The financial position of DDC for the past five years shows that total assets increased from NRs 65.8 million to NRs 149.6 million or an increase by 127 per cent. On the other hand, its liabilities have grown by 157 per cent from NRs 37.7 million to NRs 97.0 million. Its equity capital amounting to NRs 52.6 million as of 31 July 1984 has been seriously eroded by the continuous losses. However, with the price increase to Rs 6.00/liter from September 1985 (see Appendix 2, para 8), it is anticipated that DDC will be able to cover its operating cost and generate some profit for the FY 1985/86 even after paying an increased price to milk producers/suppliers.

1/ Audited except for FY1983/84.

Table 3. DDC: Capacity and Capacity Utilization of the Milk Plants in 1983/84 (One Shift Operation), Average per Day in Liters

| Milk Plant | Rated Capacity | Total Output | Capacity (Utilization %) |
|---|---|---|---|
| Kathmandu, (6 x 5,000/h) | 30,000 | 42,000 | 140 |
| Biratnagar | 12,000 | 3,900 | 33 |
| Hetauda | 18,000 | 8,500 | 47 |
| Pokhara | 12,000 | 3,500 | 29 |
| DDC | 72,000 | 57,900 | 80 |

Source: Technical Division, DDC.

Table 4. DDC: Output of Pasteurized Milk 1979-84 Manufactured from Fresh Milk and Imported Skim Milk Powder (SMP), Whole Milk Powder (WMP) and Butter Oil (BO) ('000 liters/kg)

| Year | Local Milk | Recombined Milk | Total Production Toned Milk | Share of Local Milk % | SMP Used | WHP Used | BO Used |
|---|---|---|---|---|---|---|---|
| 1979/80 | 5,041 | 5,513 | 10,554 | 48 | 608 | 185 | 19 |
| 1980/81 | 6,194 | 6,386 | 12,580 | 49 | 716 | 70 | 55 |
| 1981/82 | 5,891 | 10,605 | 16,496 | 36 | 930 | 100 | 166 |
| 1982/83 | 7,733 | 12,016 | 19,749 | 39 | 1,091 | - | 210 |
| 1983/84 | 9,329 | 12,322 | 21,651 | 43 | 1,134 | - | 177 |
| Total | 34,188 | 46,842 | 81,030 | (42) | 4,479 | 355 | 627 |

Note: SMP, WHP and BO including supplies from the WFP over the last four years:

- SMP - 3,149 tons
- BO - 317 tons

Commercial inputs since October 1981:

- SMP - 706 tons
- WHP - 100 tons
- BO - 383 tons

Discrepancies in added figures due to non-availability of data on alternative usage.

Table 5.0. Estimated Livestock Population/Production and Per Capita Consumption of Animal Products, 1975-1995 in Nepal

| | 1975 | 1979 | 1980 | 1983 | 1985 | 1986 | 1987 | 1988 | 1990 | 1995 |
|---|---|---|---|---|---|---|---|---|---|---|
| Human Population (in million) | 12.84 | 14.26 | 14.64 | 15.84 | 16.40 | 16.84 | 17.30 | 17.77 | 18.74 | 21.41 |
| I. Estimated and Projected a/ Livestock Population (in million) | | | | | | | | | | |
| - Cattle | 5.73 | 5.87 | 5.91 | 6.01 | 6.08 | 6.08 | 6.08 | 6.08 | 6.08 | 6.08 |
| - Buffalo | 2.48 | 2.65 | 2.71 | 2.88 | 2.99 | 3.03 | 3.07 | 3.10 | 3.18 | 3.39 |
| - Goat | 2.61 | 3.40 | 3.66 | 4.44 | 4.97 | 5.08 | 5.19 | 5.30 | 5.65 | 6.15 |
| - Sheep | 0.35 | 0.51 | 0.56 | 0.72 | 0.83 | 0.84 | 0.85 | 0.86 | 0.89 | 0.94 |
| - Pig | 0.26 | 0.33 | 0.36 | 0.43 | 0.48 | 0.49 | 0.50 | 0.52 | 0.55 | 0.61 |
| - Poultry | 7.17 | 8.21 | 8.49 | 9.36 | 9.99 | 10.32 | 10.66 | 11.01 | 11.75 | 13.83 |
| II. Estimated Production of Livestock Products and Per Capita Consumption | | | | | | | | | | |
| A. Meat ('000 mt) b/ | | | | | | | | | | |
| - Buffalo | 33.6 | 43.2 | 47.2 | 53.4 | 69.1 | 70.5 | 72.8 | 76.5 | 89.0 | 114.8 |
| - Goat | 7.3 | 10.5 | 11.3 | 15.1 | 17.8 | 18.3 | 18.7 | 20.9 | 21.8 | 28.9 |
| - Sheep | 1.0 | 1.6 | 1.7 | 2.4 | 3.0 | 3.0 | 3.0 | 3.1 | 3.5 | 4.4 |
| - Pig | 1.4 | 2.0 | 2.5 | 3.2 | 3.7 | 3.8 | 3.9 | 4.4 | 4.8 | 5.9 |
| - Poultry | 3.4 | 3.9 | 4.2 | 4.6 | 5.1 | 5.4 | 5.6 | 7.4 | 8.5 | 10.3 |
| Total Meat Production ('000 mt) | 46.7 | 61.2 | 66.9 | 78.7 | 98.7 | 101.0 | 104.0 | 112.3 | 127.6 | 164.3 |
| Per Capita Consumption (kg) | 3.7 | 4.3 | 4.6 | 5.0 | 6.0 | 6.0 | 6.0 | 6.3 | 6.8 | 7.6 |
| B. Milk ('000 mt) c/ | | | | | | | | | | |
| - Buffalo milk | 312.48 | 380.3 | 429.3 | 501.1 | 567.5 | 575.1 | 601.0 | 615.2 | 667.8 | 813.6 |
| - Cow milk | 187.94 | 216.6 | 219.4 | 229.9 | 266.0 | 266.0 | 266.0 | 266.0 | 266.0 | 266.0 |
| Total Milk Production ('000 mt) | 500.42 | 596.9 | 648.7 | 731.0 | 833.5 | 841.1 | 867.0 | 881.2 | 933.8 | 1,079.6 |
| Per Capita Consumption (litre) | 39.0 | 41.9 | 44.3 | 46.1 | 50.8 | 50.0 | 50.0 | 50.0 | 50.0 | 50.0 |
| C. Egg Production ('000 mt) | 2.2 | 2.5 | 2.9 | 3.2 | 3.7 | 3.9 | 4.0 | 4.1 | 4.8 | 6.2 |
| Per Capita Consumption (kg) | 0.17 | 0.17 | 0.20 | 0.20 | 0.22 | 0.23 | 0.23 | 0.23 | 0.25 | 0.29 |

a/ Livestock population for 1975-1983 is taken from the Bank's Nepal Agriculture Sector Strategy Study (NASSS), APROSC and other sources. For 1985-1995, the livestock population growth rates are taken from Land Use Plan, APROSC 1985, Unpublished Data as follows: Buffalo, 1.26 per cent; Goat, 2.15 per cent; Sheep, 1.26 per cent; Pig, 2.41 per cent; and Poultry, 3.32 per cent.

b/ Meat production is estimated based on the technical parameters developed (or estimated) with the help of different national and international published documents (see Table 5.2). Total estimated meat production of imported live animals (which are being imported for meat purpose) has also been incorporated in the total meat production; but this does not include the processed or canned meat being imported.

c/ The total milk production does not include the milk and milk products derived from milk powder and others, which are imported. But the milk extracted from the imported live animals is taken into account.

Table 5.1. Estimated Supply and Demand of Milk, Meat and Eggs, 1984-1995

| | Milk | Meat | Eggs |
|---|---|---|---|
| 1984 [a] | | | |
| Nutritional Demand [b] ('000 mt) | 1030.07 | 128.42 | 8.70 |
| Supply ('000 mt) | 782.25 | 88.70 | 3.41 |
| Gap ('000 mt) | 247.82 | 31.72 | 5.29 |
| Actual Per Capita Consumption (kg/yr) | 48.53 | 5.50 | 0.21 |
| Recommended Nutritional Requirement (kg/yr) | 63.90 | 7.50 | 0.54 |
| 1985 [a] | | | |
| Nutritional Demand [b] ('000 mt) | 1047.96 | 122.51 | 8.86 |
| Realistic Demand [c] ('000 mt) | 833.50 | 98.70 | 3.75 |
| Gap ('000 mt) | 214.46 | 23.81 | 5.11 |
| Additional Requirement [d] ('000 mt) | 51.25 | 10.00 | 0.34 |
| Estimated Per Capita Consumption (kg/yr) | 50.82 | 6.02 | 0.23 |
| 1990 | | | |
| Nutritional Demand [b] ('000 mt) | 1197.49 | 139.99 | 10.12 |
| Realistic Demand [c] ('000 mt) | 933.80 | 127.60 | 4.84 |
| Gap ('000 mt) | 263.69 | 12.39 | 5.28 |
| Additional Requirement [e] ('000 mt) | 151.55 | 38.90 | 1.43 |
| Projected Per Capita Consumption (kg/yr) | 50.00 | 6.81 | 0.26 |
| 1995 | | | |
| Nutritional Demand [b] ('000 mt) | 1368.10 | 159.93 | 11.56 |
| Realistic Demand [c] ('000 mt) | 1079.60 | 164.30 | 6.23 |
| Gap ('000 mt) | 288.50 | 4.37 | 5.33 |
| Additional Requirement [f] ('000 mt) | 297.35 | 75.60 | 2.82 |
| Projected Per Capita Consumption (kg/yr) | 50.00 | 7.60 | 0.29 |

a/ Represents estimated actual.
b/ Based on FAO's recommended nutritional requirement for an average Nepali.
c/ Realistic demand is based on projected annual per capita consumption.
d/ Difference between projected realistic demand for 1985 and supply level in 1984.
e/ Difference between projected realistic demand for 1990 and supply level in 1984.
f/ Difference between projected realistic demand for 1995 and supply level in 1984.

Table 5.2. Estimated Technical Parameters for Livestock and Poultry, 1975-1995 in Nepal

| | 1975 | 1979 | 1980 | 1983 | 1985 | 1986 | 1987 | 1988 | 1990 | 1995 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Calving/Kidding/Farrowing/Hatching Rate (%) | | | | | | | | | | |
| - Cattle | 16.4 | 16.4 | 16.5 | 17.0 | 17.5 | 17.5 | 18.0 | 18.0 | 19.0 | 21.0 |
| - Buffalo | 28.2 | 28.7 | 28.8 | 29.0 | 29.2 | 29.2 | 29.2 | 29.4 | 30.0 | 32.0 |
| - Goat/Sheep | 41.0 | 41.5 | 41.5 | 41.5 | 42.5 | 42.6 | 42.6 | 42.9 | 43.3 | 45.0 |
| - Pig | 43.4 | 43.4 | 43.4 | 43.5 | 44.0 | 440.0 | 44.2 | 44.5 | 45.0 | 46.0 |
| - Poultry | 84.0 | 84.0 | 84.0 | 84.0 | 84.0 | 85.0 | 85.0 | 85.0 | 85.0 | 85.0 |
| 2. Mortality Rate (%) | | | | | | | | | | |
| - Cattle | 13 | 13 | 12 | 12 | 11 | 11 | 11 | 11 | 10 | 10 |
| - Buffalo | 12 | 12 | 11 | 11 | 10.5 | 10 | 10 | 10 | 9 | 9 |
| - Goat/Sheep | 18 | 17 | 17 | 16 | 15 | 15 | 15 | 15 | 15 | 14 |
| - Pig | 18 | 17 | 17 | 17 | 16 | 16 | 16 | 15 | 15 | 14 |
| - Poultry | 33 | 33 | 32 | 32 | 31 | 31 | 31 | 30 | 28 | 27 |
| 3. Offtake Rate (%) | | | | | | | | | | |
| - Cattle | 3.1 | 3.1 | 4.2 | 4.7 | 6.2 | 6.2 | 6.7 | 6.7 | 8.7 | 10.7 |
| - Buffalo | 16 | 18 | 19 | 19 | 20 | 20 | 20 | 20 | 21.5 | 23.5 |
| - Goat/Sheep | 22 | 24 | 24 | 26 | 27 | 27 | 27 | 27 | 27 | 29 |
| - Pig | 23 | 24 | 27 | 28 | 28 | 28 | 28 | 29 | 29 | 30 |
| - Poultry | 48 | 48 | 49 | 49 | 50 | 51 | 51 | 52 | 54 | 55 |
| 4. Carcass Weight (kg) | | | | | | | | | | |
| - Buffalo | 75 | 80 | 80 | 85 | 100 | 100 | 102 | 106 | 110 | 120 |
| - Goat/Sheep | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 12 | 12 | 13 |
| - Pig | 20 | 21 | 22 | 22 | 23 | 23 | 23 | 24 | 25 | 26 |
| - Poultry | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 1.8 | 1 | 1 |
| 5. Milk Yield (Litre) | | | | | | | | | | |
| - Buffalo | 450 | 500 | 550 | 600 | 650 | 650 | 675 | 675 | 700 | 750 |
| - Cow | 200 | 225 | 225 | 225 | 250 | 250 | 275 | 275 | 300 | 350 |
| 6. Egg Production/Bird (No.) a/ | 40 | 40 | 45 | 45 | 50 | 50 | 50 | 50 | 55 | 60 |

a/ One egg equals approximately 30 grams.

Table 6. Exports and Imports of Meat, Milk and Eggs a/
(FY1980/81 thru FY1983/84)

| | Unit | 1980/81 | 1981/82 | 1982/83 | 1983/84 |
|---|---|---|---|---|---|
| A. EXPORTS | | | | | |
| 1. Meat | | | | | |
| - Buffalo | mt | 1,254 | 1,524 | 2,232 | 1,914 |
| - Goat | mt | 571 | 699 | 4,467 | 420 |
| - Sheep | mt | 61 | 171 | - | - |
| - Pig | mt | 276 | - | 361 | 311 |
| - Poultry | mt | - | - | - | - |
| Subtotal | mt | 2,162 | 2,394 | 7,060 | 2,645 |
| 2. Milk/Milk Products | mt | 7,806 | 5,956 | 8,025 | 10,094 |
| 3. Eggs | No. in million | 0.1 | - | - | - |
| B. IMPORTS | | | | | |
| 1. Meat | | | | | |
| - Buffalo | mt | 6,202 | 6,817 | 3,158 | 12,210 |
| - Goat | mt | 637 | 900 | 767 | 1,269 |
| - Sheep | mt | 231 | 283 | 297 | 413 |
| - Pig | mt | 520 | 665 | 635 | 566 |
| - Poultry | mt | 240 | - | - | - |
| Subtotal | mt | 7,830 | 8,665 | 4,857 | 14,458 |
| 2. Milk/Milk Products | mt | 4,488 | 11,596 | 20,331 | 16,807 |
| 3. Eggs | No. in million | 11.8 | - | 10.2 | 14.3 |
| C. BALANCE | | | | | |
| 1. Meat | mt | -5,668 | -6,271 | +2,230 | -11,813 |
| 2. Milk/Milk Products | mt | +3,318 | -11,040 | -12,306 | -6,713 |
| 3. Eggs | No. in million | -11.7 | - | -10.2 | -14.3 |

Notes:

a/ Figures recorded by the Department of Customs indicate only the number of animals exported and imported. Hence, for the estimation of meat exports, the following were assumed: 90 kg carcass wt. for buffalo, 11 kg for goat and sheep, 23 kg for pigs and 1.0 kg for poultry bird. In the case of imports, all assumptions remain the same except for buffalo wherein a carcass weight of 75 kg was used.

b/ For milk and milk products, Department of Customs' data indicate only their value but not the quantity. The volume of milk was estimated based on a based on a computed cost of NRs3.32 per liter of milk for import and NRs3.19 for export.

Source: Department of Customs.

Table 7. Exports of Livestock and Livestock Products
FY1980/81 thru FY1983/84

(Value in NRs millions)

| Item | Unit | FY1980/81 | | FY1981/82 | | FY1982/83 | | FY1983/84 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Qty | Value | Qty | Value | Qty | Value | Qty | Value |
| 1. Live Animals | | | | | | | | | |
| - Buffalo a/ | No. | 20.9 | 12.7 | 25.4 | 11.9 | 37.2 | 14.4 | 31.9 | 24.0 |
| - Cattle a/ | in | 46.5 | 28.3 | 38.8 | 26.1 | 39.7 | 30.2 | 190.2 | 62.8 |
| - Goats | ('000) | 51.9 | 5.6 | 63.5 | 4.9 | 406.1 | 8.7 | 38.2 | 6.2 |
| - Sheep | | 5.5 | 0.6 | 15.5 | 1.3 | - | - | - | - |
| - Pig | | 12.0 | 0.7 | - | - | 15.7 | 3.2 | 13.5 | 2.3 |
| - Horses and Hinnies | | 1.0 | 0.8 | - | - | - | - | - | - |
| Subtotal | ('000) | | 48.7 | | 44.2 | | 56.5 | | 95.3 |
| Poultry Fowl | ('000) | - | - | - | - | - | - | - | - |
| 2. Milk and Milk Products | | | | | | | | | |
| - Butter (canned) | mt | - | - | - | - | 74.8 | 2.1 | 108.0 | 2.7 |
| - Pasteurized Ghee | mt | - | - | 442.0 | 13.2 | 187.0 | 5.5 | 230.0 | 7.4 |
| - Other Ghee | mt | - | - | 185.0 | 5.8 | 712.4 | 18.0 | 850.2 | 22.1 |
| - Other Dairy Products | mt | n.a | 24.9 | - | - | - | - | - | - |
| Subtotal | | | 24.9 | | 19.0 | | 25.6 | | 32.2 |
| 3. Eggs (Poultry) | No. in millions | n.a | 0.1 | - | - | - | - | - | - |
| 4. Fish (fresh & dead), chilled | mt | 65.6 | 0.2 | - | - | 323.7 | 2.5 | 175.6 | 7.5 |
| 5. Leather/skin (bovine, equine, sheep, goat, lamb) | pcs ('000) | 2004.2 | 81.7 | 1136.9 | 52.8 | 2331.0 | 83.8 | 88.5 | 5.6 |
| 6. Wool and Others | | | | | | | | | |
| - Wool | mt | 19.9 | 0.7 | 58.6 | 2.2 | - | - | - | - |
| - Bristles | mt | n.a. | 1.5 | - | - | - | - | n.a. | 4.8 |
| - Yak tails | (No. '000) | - | - | 256.6 | 1.2 | - | - | - | - |
| Subtotal | | | 2.2 | | 3.4 | | - | | 4.8 |
| 7. Fabrics woven, carpets (wool and animal hairs) | meters | n.a. | 45.0 | n.a. | 75.4 | n.a. | 136.1 | n.a. | 268.6 |
| 8. Meat | | | | | | | | | |
| - Cows and buffaloes boneless meat | mt | - | - | n.a. | 2.9 | - | - | - | - |
| - Meat of other animals | mt | n.a. | 1.1 | - | - | - | - | - | - |
| - Animal products (N.E.S.) | mt | - | - | - | - | - | - | - | - |
| Subtotal | | | 1.1 | | 2.9 | - | - | - | - |
| GRAND TOTAL (NEPAL) | | | 203.9 | | 197.7 | | 304.5 | | 414.0 |

a/ Includes adult male and female and calves.

Source: Department of Customs, Ministry of Finance, compiled data.

Table 8. Imports of Livestock and Livestock Products
FY1980/81 thru FY1983/84

(Value in NRs millions)

| Item | Unit | FY1980/81 | | FY1981/82 | | FY1982/83 | | FY1983/84 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Qty | Value | Qty | Value | Qty | Value | Qty | Value |
| 1. Live Animals | | | | | | | | | |
| - Buffalo a/ | No. | 82.7 | 3.2 | 90.9 | 61.3 | 42.1 | 86.4 | 162.8 | 145.9 |
| - Cattle a/ | in | 48.6 | 35.4 | 36.4 | 32.8 | 17.5 | 36.0 | 46.1 | 47.1 |
| - Goats | ('000) | 57.9 | 12.4 | 81.8 | 12.2 | 69.7 | 21.8 | 115.4 | 22.4 |
| - Sheep | | 21.0 | 4.1 | 25.7 | 5.3 | 27.0 | 6.3 | 37.5 | 15.1 |
| - Pig | | 22.6 | 3.4 | 28.9 | 4.9 | 27.6 | 13.1 | 442.6 | 10.2 |
| - Horses and Hinnies | | 3.9 | 1.6 | 1.5 | 1.3 | - | - | - | - |
| Subtotal | ('000) | | 60.1 | | 117.8 | | 163.6 | | 240.7 |
| Poultry Fowl | ('000) | 240.4 | 1.1 | - | - | - | - | - | - |
| 2. Milk and Milk Products | | | | | | | | | |
| - Milk & Cream (fresh & processed | mt | n.a. | 9.4 | n.a. | 7.0 | - | - | n.a. | 1.2 |
| - Milk Powder (5% & 1.5% fat) | mt | - | - | n.a. | 31.5 | n.a. | 54.7 | n.a. | 49.0 |
| - Butter (Canned) | mt | 181.0 | 2.1 | - | - | 17.5 | 2.4 | - | - |
| - Ghee (fresh & processed) | mt | 184.3 | 3.4 | - | - | 72.2 | 10.4 | 183.7 | 5.6 |
| Subtotal | | | 14.9 | | 38.5 | | 67.5 | | 55.8 |
| 3. Eggs (Poultry) | No. in millions | 11.8 | 5.8 | - | - | 10.2 | 5.4 | 14.3 | 8.1 |
| 4. Fish (fresh & dead), chilled | mt | 817.7 | 3.6 | - | - | 433.7 | 7.2 | 372.5 | 6.0 |
| 5. Wool and Others | | | | | | | | | |
| - Coarse wool & hairs | mt | 475.6 | 15.0 | 422.8 | 2.0 | 637.0 | 17.5 | 1542.2 | 65.9 |
| - Yarn (wool & hairs) | mt | n.a. | 17.3 | - | 10.5 | n.a. | 8.5 | n.a | 2.0 |
| Subtotal | | | 32.3 | | 12.5 | | 26.0 | | 67.9 |
| 6. Fabrics 85% by weight of wool & hair | meters | n.a. | 8.0 | - | - | - | - | 105.6 | 2.7 |
| Leather/skin (bovine, sheep, goat) | pcs ('000) | 85.4 | 13.1 | 43.6 | 2.0 | - | - | - | - |
| 7. Processed meat of all kinds of animals and birds | mt | 465.0 | 1.1 | - | - | - | - | - | - |
| 8. Animal fat | mt | 22.0 | 2.3 | - | - | - | - | - | - |
| GRAND TOTAL (NEPAL) | | | 142.3 | | 170.8 | | 269.7 | | 381.2 |

a/ Includes adult male and female and calves.

Source: Department of Customs, Ministry of Finance, compiled data.

Table 9. Selected Average Retail Prices in Principal Towns for Livestock Products and Fish
(FY1980/81 thru FY1984/85)

| Products | Unit/ Price | FY1980/81 | | | | FY1981/82 | | | | FY1982/83 | | | | FY1983/84 | | | | FY1984/85 (Estimates) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Kath-mandu | Hetauda | Birat-nagar | Pokhara | Kath-mandu | Hetauda | Birat-nagar | Pokhara | Kath-mandu | Hetauda | Birat-nagar | Pokhara | Kath-mandu | Hetauda | Birat-nagar | Pokhara | Kath-mandu | Hetauda | Birat-nagar | Pok-hara |
| Meat | | | | | | | | | | | | | | | | | | | | | |
| - Buffalo | Rs/kg | 12.50 | 7.71 | N.A. | 14.00 | 12.50 | 8.08 | N.A. | 14.00 | 12.90 | 9.75 | N.A. | 15.00 | 15.00 | 10.00 | N.A. | 16.00 | 15.00 | 10.00 | N.A. | 17.25 |
| - Goat | Rs/kg | 29.15 | 21.08 | 18.00 | 22.50 | 30.00 | 22.00 | 19.50 | 24.83 | 30.04 | 23.66 | 21.75 | 29.50 | 33.00 | 28.33 | 25.58 | 32.81 | 36.65 | 30.00 | 27.37 | 49.12 |
| - Chicken | Rs/kg | 27.16 | 23.00 | 17.98 | 25.00 | 31.25 | 25.35 | 19.28 | 27.27 | 36.83 | 27.75 | 22.00 | 34.04 | 40.00 | 26.90 | 24.52 | 40.67 | 43.88 | 30.00 | 28.27 | 45.00 |
| Fish | Rs/kg | 20.30 | 18.00 | 19.08 | 18.25 | 25.00 | 20.00 | 21.16 | 20.00 | 27.25 | 23.35 | 25.64 | 20.00 | 30.30 | 33.00 | 26.87 | 20.00 | 30.00 | 24.00 | 27.13 | 21.94 |
| Egg | Rs/pc | 0.90 | 0.88 | 0.98 | 0.99 | 0.91 | 1.03 | 1.05 | 1.00 | 0.94 | 1.05 | 1.20 | 1.05 | 1.10 | 1.08 | 1.25 | 1.10 | 1.18 | 1.19 | 1.25 | 1.24 |
| Fresh Milk | Rs/liter | 3.51 | 3.51 | 3.06 | 3.21 | 5.26 | 3.60 | 4.23 | 3.07 | 5.26 | 6.67 | 4.63 | 3.44 | 5.33 | 6.14 | 5.00 | 3.86 | 6.14 | 6.14 | 6.56 | 3.95 |
| Pasteurized Milk | Rs/liter | 3.18 | 2.80 | 2.80 | N.A. | 3.50 | 3.30 | 3.00 | N.A. | 3.50 | 3.70 | 3.70 | N.A. | 3.58 | 4.04 | 4.00 | N.A. | 4.50 | 4.50 | 4.50 | N.A. |
| Ghee | Rs/kg | 35.52 | 34.05 | 32.71 | 36.42 | 41.83 | 42.63 | 44.15 | 44.42 | 46.10 | 41.82 | 42.00 | 44.27 | 50.28 | 43.84 | 45.75 | 46.96 | 65.11 | 57.23 | 55.38 | 57.35 |

Source: Nepal Rastra Bank, Pricing Division - 1985.

# FIRST LIVESTOCK PROJECT
# A STATUS REPORT AND REVIEW OF COMPLIANCE WITH LOAN COVENANTS

## A. Introduction

### 1. Major Components

1. The (first) Livestock Development Project was approved by the Bank for an ADF loan of $9.2 million (net) in December 1979 (under Loan No. 445-NEP(SF)). The loan became effective in October 1980. The major components of this project comprise the following:

(a) Provision of Animal Health Facilities throughout Nepal comprising the establishment or upgrading of: (i) diagnostic facilities; (ii) veterinary centers; (iii) quarantine checkposts; (iv) vaccine production facility; and (v) communications and disease reporting.

(b) Development of Livestock Production in Janakpur and Nepalganj areas comprising:

(i) Livestock Support Facilities: (a) project resource centers; (b) fodder production and investigation facilities; (c) livestock extension and training; and (d) livestock/artificial insemination services.

(ii) Provision of Credit for Livestock Purchase

(iii) Milk Collection and Marketing

(c) Fellowships and Consulting Services

(i) Training Fellowships: in dairy technology, vaccine production, foot-and-mouth disease control, veterinary services, livestock extension, nutrition and forage and animal husbandry (total: 345 mm); and

(ii) Consulting Services in vaccine production, virology, bacteriology, quality control, FMD, veterinary services, livestock extension and fodder production (total: 110 mm).

### 2. Executing Agencies/Financing Plan

2. The animal health and livestock development components are being executed by the DLDAH (total cost: $7.36 million equivalent); the provision of credit for the purchase of buffaloes and goats by the ADBN (total cost: $1.85 million equivalent); and the development of milk collection and marketing facilities by the DDC (total cost: $1.97 million equivalent). 1/

1/ Represents base costs only; physical and price contingencies would add 40 per cent more to the base costs.

(Reference in Text: page 11, para 42)

3. The financing plan for the total estimated cost of the project amounting to $15.7 million (including contingencies), is shown in Table 1 below.

Table 1: Financing Plan

| Source | Foreign | Local ($ million) | Total Cost | % |
|---|---|---|---|---|
| Bank a/ | 9.20 | - | 9.20 | 59.0 |
| EEC b/ | 0.68 | 2.40 | 3.08 | 20.0 |
| UNDP c/ | 0.70 | - | 0.70 | 5.0 |
| ADAB d/ | 0.89 | - | 0.89 | 6.0 |
| HMGN | - | 1.83 | 1.83 | 12.0 |
| Total | 11.47 | 4.23 | 15.70 | 100.0 |

a/ Originally approved in the amount of $12.28 million but later reduced to $9.2 million due to availability of EEC funding on a grant basis.
b/ Funding of the EEC is for civil works.
c/ Funding of the UNDP and the Australian Development Assistance Bureau (ADAB) is for consultants and fellowships.

4. As of end-September 1985, nearly 70 per cent of the Bank's loan has been committed while the entire EEC contribution has been disbursed. A substantial portion of the UNDP and ADAB contribution has also been disbursed. On the whole, it is anticipated that the entire Project can be completed by early 1986 and all disbursements made before the end of December 1986 (the closing date of the loan).

### 3. Technical Assistance (TA)

5. The First Livestock Project also included two technical assistance packages: (i) provision of services of a Technical Advisor for 18 months in the amount of $150,000; and (ii) provision for Project preparation for a possible Second Project for 25.5 manmonths in the amount of $190,000. The Technical Advisor's main terms of reference included assisting the Project Coordinator in establishing the procedures for the efficient coordination/implementation of the Project as well as training staff of the Project Office (PO) in all aspects of Project administration. This technical assistance was implemented with some positive impact on the PO. Regarding the PPTA (item ii), it was originally envisaged that EEC would finance this. However, due to funding constraints, this did not materialize and the Bank eventually took up this PPTA in June 1984.

## B. Present Status

### 1. Overall

6. Generally, it can be concluded that the Project has been successful in fulfilling its objectives. The Project has now completed the fourth year of its five-year implementation period and many of the physical targets have already been achieved.

7. There have been, however, some serious delays in the tendering and contracting of local civil works. The result has been that many of the facilities which, according to the original plan of operations, should have been in routine operation for more than a year have not yet been completed. This refers particularly to the more complex civil works such as the central facilities for vaccine production, the Central Diagnostic (CDL) and the Foot-and-Mouth Disease Laboratory (FMDL). This slow performance is not specific to the Project but rather reflects the local contracting situation.

8. Despite delays in the construction of the central animal health facilities, the Project has contributed significantly to the overall animal disease control situation in the country. Large vaccination campaigns have been organized to control outbreaks of major contagious diseases. This activity has prevented losses in terms of animal deaths but, perhaps more important, has reduced losses of animal draft power at crucial times of planting or harvesting. Large numbers of animals have also been treated against internal parasites.

9. The project has been successful in the introduction of elementary livestock extension services accompanied by the development of milk collection and marketing and to a lesser degree, meat marketing. This integrated approach is particularly visible in the Janakpur Project area. After only two years of extension efforts such as supply of improved stock, introduction of fodder crops in the traditional crop rotations, increased veterinary services, training and demonstrations, and a guaranteed outlet for the produce, a new awareness has developed among the small farmers. They now realize that besides draft power and manure from their animals, they can receive important regular extra income through sales of milk.

## 2. Animal Health Facilities Provided

10. Before the First Livestock Project was initiated, the field facilities in Nepal consisted of 34 veterinary hospitals, 16 dispensaries and 4 checkposts. These facilities were to be upgraded to District Livestock Centers (DLCs) 1/ and an additional 11 centers were to be established. All of these are being upgraded under the First Livestock project and most are now operational. Each center includes buildings, veterinary clinics/offices, staff accommodation, veterinary equipment, medicines and transport.

11. The First Livestock Project also supplied 46 sets of veterinary equipment, 45 microscopes, 58 refrigerators, 64 post-mortem tables, 189 castrators, 50 obstetrical sets, 64 instrument cabinets, 11 jeeps, 18 pick-ups, 46 motorcycles, 3 trucks, 2 minibuses and 61 HF radio sets to centers. However, there is still a shortage of transport in many centers, and it is proposed to remedy this under the proposed (Second) Project. Veterinarians were supposed to run the centers but due to the lack of manpower, some posts are still vacant. This causes difficulties in the normal operation of the centers. It was originally planned that

1/ Now called District Livestock Development Offices (DLDOs) under the proposed Project.

vaccination teams would be established to cover all areas of the country. One team would be associated with each DLC and to remedy in part the manpower shortage, the time spent for vaccinating would be extended from five to nine months per year. These teams would also treat animals against internal parasites, particularly liver fluke. Drugs have been purchased and allocated to the different centers.

12. As a part of an overall effort to reduce the spread of animal diseases, to monitor livestock movements and to restrict the entry of diseased animals, 20 new quarantine checkposts were to have been established and two old checkposts upgraded at key points of entry close to the India-Nepal frontier. However, only 10 so far have been completed (largely due to a shortage of EEC funding for civil works). Facilities to be provided include office/store buildings, staff housing and veterinary and cattle handling equipment.

13. A major constraint to disease control programs in Nepal has been the lack of effective communications. Under the First Livestock Project, a network of high-frequency radio transceivers has been established to link all DLCs. The network is already partially working and will be completed before the end of December 1985.

3. Vaccine Production Facility

14. Under the First Livestock Project, the objectives for establishing the vaccine production facility were: (i) to increase substantially vaccine output; (ii) to introduce tissue culture production techniques; and (iii) to improve quality control and potency testing.

15. To meet these objectives, the existing buildings housing the Biological Products Unit of DLDAH were to be renovated and the following items procured: vaccine production and packaging equipment, service and maintenance facilities, initial supplies of vials and bottles, refrigerated vans for the distribution of vaccines and general transport. The investment costs amount to about $1.2 million equivalent. Substantial technical support was also planned for the initial stages of the operation to set up production systems and ensure proper operation and maintenance. A provision for 54 manmonths of consultant services was made in the field of production engineering, virology, bacteriology and quality control. Apart from that, nine DLDAH officers were due to receive training for a total of 51 manmonths in various aspects of vaccine production and quality control.

16. The Consultants evaluated this component in some detail and concluded as follows: (i) that the original plan target for animal vaccine production was rather ambitious but due to the flexible nature of vaccine production, quantities can be adjusted to suit the country's needs; (ii) that tissue culture production techniques (being new and complex) should be applied first for diagnostic purposes on a small scale, then gradually increased depending on experience; and (iii) that quality control techniques at present are very limited and should be upgraded with substantial manpower training to bring these to international standards.

17. Consultants recommended, and Mission and Government agreed, that DLDAH would continue production of five vaccines (rinderpest, HS, black quarter, Newcastle Disease and fowl pox) according to the revised schedules but would reconsider production of FMD vaccines 1/ (which would be cheaper to import due to recent technological advances). Further, the Consultants recommended that the FMD laboratory intended now for simply typing the FMD strains should be converted to a center for epidemiology of infectious diseases by applying sufficient security standards specified in the original design.

4. Livestock Production

18. To promote livestock development mainly for milk production, an intensive program of livestock production was initiated in five districts - in Sarlahi, Dhanusha and Mohattari districts in Janakpur area and in Banke and Bardia districts in Nepalganj area. Two Fodder Resource Centers (FRCs) have been established - one each in the Janakpur and Nepalganj area to conduct trials in the introduction of pasture and fodder species for livestock feeds and to serve as training centers for farmers and JTs/JTAs.

19. These FRCs were supported by five District Resource Centers (now called DLDOs in the proposed Project) and Livestock Development Centers (71 in Janakpur and 18 in Nepalganj) which coordinated and implemented livestock development activities at the district and panchayat levels respectively. The JTs and JTAs were provided with bicycles and motorcycles and the professional staff with vehicles to improve their mobility for extension work. Up to early 1985, a total of about 5,000 farmers and extension workers have benefitted from the training programs conducted under the Project.

19. On the credit side, the repayment of loans given by ADBN to farmer beneficiaries for purchase of buffaloes and goats in the project area has been generally satisfactory, mainly due to the collection mechanism of deducting the loan payments from milk sales of these farmers at milk collection centers operated by either DDC or milk producers' associations/cooperatives. A major impact in terms of increased milk production in the project area was made when milk collection in just three districts of Janakpur reached nearly 2.4 million liters in FY1983/84 from 1.1 million liters in FY1982/83.

C. Compliance with Loan Covenants

20. Except for the delay in submission of the project audited accounts/financial statements by DDC and ADBN, the adjustment by DDC of its milk prices and the delay in the establishment of the revolving fund for the drugs component of the Project, the compliance by the Executing Agencies with the Bank's loan covenants has been satisfactory. A summary can be seen in Table 2 below:

1/ Actually not envisaged to be produced under the First Livestock Project but included in Government's Seventh Five Year Plan.

Table 2: Compliance with Loan Covenants

| COVENANT | DESCRIPTION | REMARKS |
|---|---|---|
| Art. IV, Section 4.06 (a and b) | The Borrower to: (i) maintain or cause to be maintained separate accounts for the Project; and (ii) have such accounts related financial statements audited annually, not later than 12 months after the end of each related fiscal year. | Partial compliance; DLDAH Project Accounts audited for FY1983/84 and prior years; for DDC/ADBN, Financial Statements for FY1983/84 under preparation. |
| Schedule 6, Para 1 | Project Coordinating Committee (PCC) - PCC shall be set up for ensuring coordination among Executing Agencies in the implementation of the Project; to be chaired by the Director-General of DLDAH and shall include senior level representatives of each of the other Project Executing Agencies. | Complied with. |
| Schedule 6, Para 2 | Project Office (PO) to be established to undertake overall supervision and coordination. | Complied with. |
| Schedule 6, Para 3 | PO to be headed by a full-time Project Coordinator and assisted by a full-time Veterinary Coordinator and a suitably experienced full-time Project Manager each for the Nepalganj and Janakpur areas. | Complied with. |
| Schedule 6, Para 4 | The Technical Adviser to be recruited under the TA Agreement shall be attached to the PO and shall be responsible for advising and assisting the Project Coordinator. | Complied with. |
| Schedule 6, Para 5 | The PO shall also be staffed with full-time technical personnel including a qualified Livestock Coordinator, Project Economist, Accountant and supporting administrative staff. | Complied with. |
| Schedule 6, Para 6 | ADBN and DDC shall each appoint a Project Officer assisted by necessary supporting staff. | Complied with. |
| Schedule 6, Para 11 | Control of Livestock Disease - The Borrower to introduce necessary procedures, rules and regulations under the Infectious Diseases Control Act, or introduce other legislation to permit compulsory vaccination and quarantine. | Being complied with. |
| Schedule 6, Para 12 | The Borrower to draw up and implement and an effective scheme for livestock disease reporting and monitoring within a period of 12 months after the effective date of the loan. | Delayed but complied with. |
| Schedule 6, Para 13 | Anthelmintic drugs to be procured for the treatment of smallholders' livestock for internal parasites; initially such treatment to be provided free of charge but progressively farmers shall be required to pay for the costs incurred in providing such treatment. The monies received thereby shall be paid by DLDAH into a Revolving Fund Account and shall be utilized solely for the future purchase of the enthelmintic drugs required for such treatment. | Partially complied with. Cost recovery to be implemented on a phased basis over five years; revolving fund under current circumstances not practicable. HMGN assured that adequate funds to purchase will be provided. |
| Schedule 6, Para 14 | The production techniques to be employed in the Vaccine Production Unit under the Project as well as the quality control procedures to be agreed with the Bank. | Not yet applicable pending completion/operation of Vaccine Production Unit. |
| Schedule 6, Para 15 | The quarantine checkposts to be established under the Project shall be sited alongside the country's borders and the major roads or tracks leading into the country. | Complied with. |
| Schedule 6, Para 16 | The selection of the site, the specifications and design for the FMD laboratory and the security precautions to be adopted shall be subject to the prior approval of the Bank. | Complied with. |

| | | |
|---|---|---|
| Schedule 6, Para 17 | Veterinary Centers shall introduce a scheme whereby veterinary clinics would regularly conduct training in outlying areas for the benefit of farmers in such areas. | Partial compliance. Only those districts with adequate staffing carry this out. |
| Schedule 6, Para 18 | Consultation with the Bank in deciding upon the criteria for selecting persons for staff training and the courses and institutes to which such persons shall be sent for such training. | Complied with. |
| Schedule 6, Para 19 | Prior to selecting sites for establishing the Milk Collection Centers under the Project, DDC to conduct a survey to ensure that there are sufficient milking buffaloes in the areas around such sites, and that such sites are strategically located so as to permit maximum efficiency in collecting milk for such centers. | Complied with. |
| Schedule 6, Para 20(a) | DDC shall at all times accept and purchase all milk produced in the Janakpur area; to ensure that the processing capacity of the Hetauda Dairy is sufficient to cope with the output of the Janakpur area. | Complied with. |
| Schedule 6, Para 20(b) | The procedures to be adopted by DDC for collecting and quality testing milk and making payments therefore shall be in accordance with the arrangements agreed with the Bank. | Complied with. |
| Schedule 6, Para 20(c) | The prices paid by DDC for the milk purchased from the Janakpur area shall be set at levels which would provide sufficient incentives to the farmers to increase productivity; to review its pricing policy for the sale of milk to consumers and to set prices at levels to generate revenues to cover all operating and administrative expenses including adequate provision for maintenance, and to provide a reasonable rate of return on its total assets each year. | Delayed but complied with. |
| Schedule 6, Para 21(a) | The Borrower to bear all the foreign exchange risks associated with the relending of the proceeds of the loan to DDC and ADBN. | Complied with. |
| Schedule 6, Para 21(b) | Loan proceeds relent to ADBN at an interest rate of 8 per cent per annum repayable over a period of 25 years including a grace period of 5 years. | Complied with. |
| Schedule 6, Para 21(c) | Loan proceeds relent to DDC at an interest rate of 2 per cent per annum repayable over a period of 20 years including a grace period of 5 years. | Complied with. |
| Schedule 6, Para 22 | ADBN to utilize the funds made available to it solely for making subloans to farmers in the Project Districts for the purchase of buffaloes and goats. | Complied with. |
| Schedule 6, Para 23 | (a) ADBN subloans to farmers to carry an interest rate of 11 per cent per annum repayable over a period of 7 years without a grace period. | Complied with. |
| | (b) ADBN to submit to the Bank quarterly statement of all subloans. | Complied with. |

## TENTATIVE LIST OF LIVESTOCK DEVELOPMENT CENTERS/ SUBCENTERS TO BE ESTABLISHED OR UPGRADED

I. Livestock Development Centers (LDCs)

A. Hills (Kavre, Kathmandu and Dhading Districts) a/

(i) LDCs (5) to be established at or near existing milk chilling centers:

1. Banepa, Kavre
2. Panauti, Kavre
3. Sankhu, Kathmandu
4. Chaurandi, Dhading
5. Panchkhal, Kavre

B. Terai (Dhanusha, Sarlahi, Mohattari, Rautahat, Bara, Chitwan, Sindhuli, Makawanpur Districts)

(i) LDCs (15) to be upgraded: b/

1. Sakhuwa (Mahendra Nagar), Dhanusha
2. Dhalkebar, Dhanusha
3. Nagarain, Dhanusha
4. Khaguri, Dhanusha
5. Jhatiyani, Dhanusha
6. Lalbandi, Sarlahi
7. Salempur, Sarlahi
8. Chandra Nagar, Sarlahi
9. Bhagawatipur, Sarlahi
10. Harkathawa, Sarlahi
11. Pipara, Mohattari
12. Balwa, Mohattari
13. Causala, Mohattari
14. Ram Gopalpur, Mohattari
15. Bardibas, Mohattari

(ii) LDCs (11) to be upgraded:

(Those with existing milk collection centers (5))

1. Chandranigahapur, Rautahat
2. Nijgadh, Bara
3. Saradanagar, Chitwan
4. Bhimphedi, Makawanpur
5. Santapur, Rautahat

(Those with new milk collection centers (6)) c/

1. Bhandara, Chitwan
2. Patihani, Chitwan
3. Pokhariya, Parsa
4. Hatiya, Makawanpur
5. Dakapa (or Kapulakot), Sindhuli
6. Padma Pokhari, Makawanpur

(iii) LDCs to be newly established at or near existing milk chilling centers (10):

1. Judibela, Rautahat
2. Sindureghari, Rautahat
3. Sundarpur, Rautahat
4. Bodhban, Bara
5. Gitanagar, Chitwan
6. Lanku, Chitwan
7. Chisapani, Makawanpur
8. Solithum, Makawanpur
9. Samani, Makawanpur
10. Nagsoti, Makawanpur

II. Livestock Development Subcenters (LDSCs)

A. Hills (Bhaktapur, Kavre, Kathmandu, Dhading, Lalitpur Districts)

(i) Existing LDSCs to be upgraded - already located in existing collection centers (18)
(ii) New LDSCs to be established with existing milk collection centers (58)
(iii) Existing LDSCs to be upgraded to support new collection centers (9)
(iv) Existing LDSCs to be upgraded (30)

B. Terai (Dhanusha, Mohattari, Sarlahi, Chitwan, Sindhuli, Makawanpur, Bara, Parsa, Rautahat Districts)

(i) Existing LDSCs to be upgraded (71)
(ii) New LDSCs to be established (46)

a/ Three districts (Bhaktapur, Lalitpur and Kavre) in the hill area are included in Project area but only livestock development subcenters will be established in these districts.
b/ Established under the First Livestock Project.
c/ To be established by DDC using their own resources.

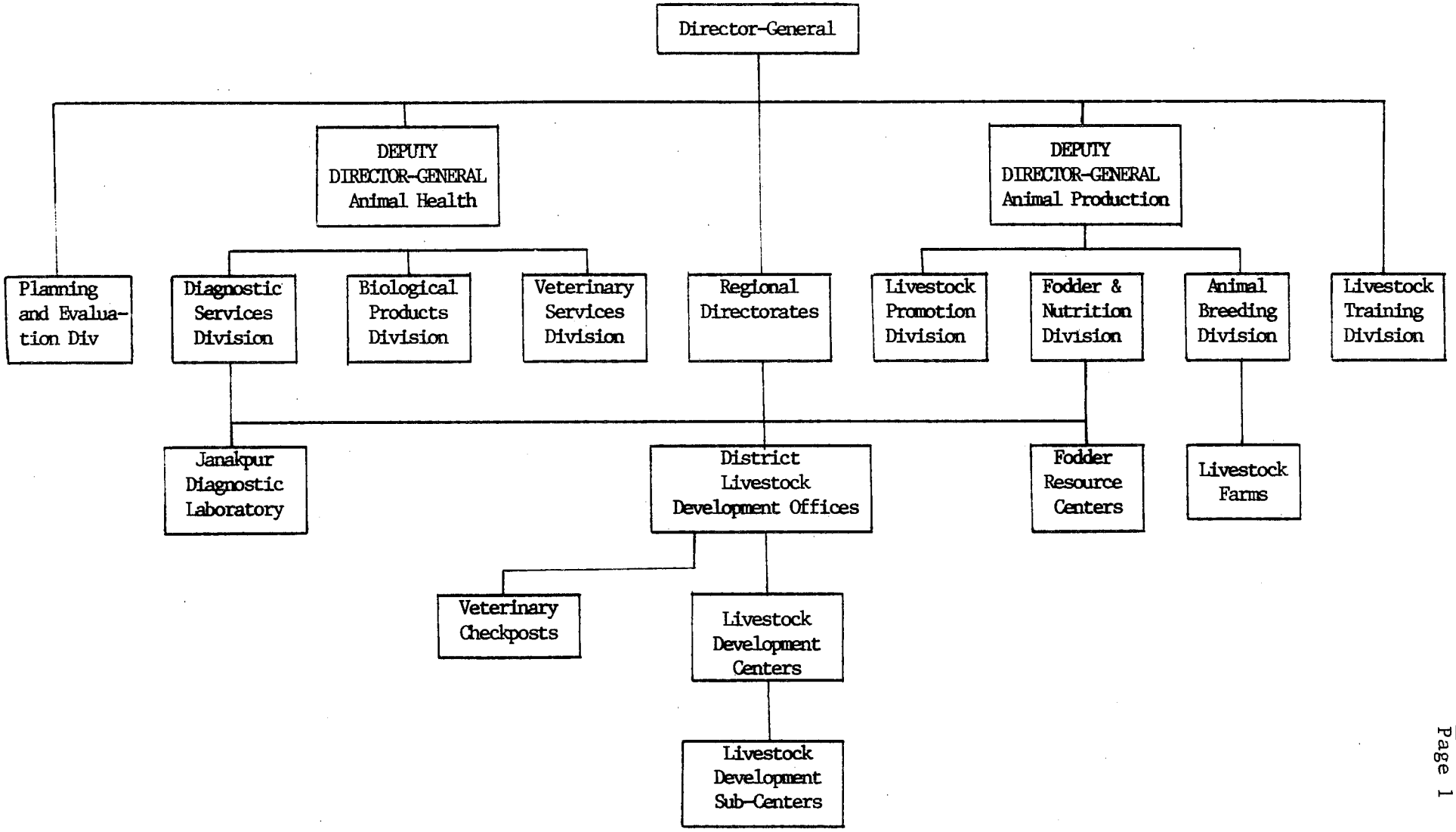
(Reference in Text: page 24, para 81)

## STANDARD EQUIPMENT FOR A TYPICAL LIVESTOCK DEVELOPMENT CENTER/SUBCENTER

| | Item | | Quantity | Cost (US$) a/ |
|---|---|---|---|---|
| 1. | Veterinary/Husbandry Equipment | | | 330.00 |
| | Thermometer | | 5 | |
| | Scalpel Handle | | 2 | |
| | Scalpel Blade | | 10 | |
| | Scissors | | 2 | |
| | Forceps | | 2 | |
| | Suture Needle | | 10 | |
| | Needle Holder | | 1 | |
| | Nylon Gut | | | |
| | Syringe (record) | 10 ml | 5 | |
| | | 5 ml | 10 | |
| | | 2 ml | 10 | |
| | Needle | | 20 | |
| | Drenching Gun | big | 1 | |
| | | small | 1 | |
| | Thermoflask | | 2 | |
| | Bull Holder | | 1 | |
| | Instrument Cabinet | | 1 | |
| | Castrator | big | 1 | |
| | | small | 1 | |
| | Rubber Gloves | | 10 | |
| | Rucksak | | 2 | |
| | Plastic Apron | | 2 | |
| | Rubber Boots | | 2 | |
| | Ear Notches | | 1 | |
| 2. | Milk Collection Equipment | | | 5,400.00 |
| | Milk cans, capacity 40 liters | | 10 | 600.00 |
| | Measuring and quality control equipment for reception and laboratory, chemicals, and utensils | | | 2,000.00 |
| | Can washing equipment (troughs) | | | 100.00 |
| | Water supply equipment and installation | | | 2,700.00 |
| 3. | Mobile AI Outfits for Terai LDCs and DLDOs | | | 1,300.00 |
| | AI kit bag with supplementary items such as breeding guns, tweezers, scissors, vacuum, flask, thermometer, etc. | | 2 | 200.00 |
| | 1 to 2 liters field tank, with canister | | 1 | 300.00 |
| | 5 to 10 liters semen tank with canister | | 1 | 400.00 |
| | 20 to 30 liters liquid N2 tank | | 1 | 400.00 |
| 4. | AI Mobile/Back-up Outfit for Midhill LDCs and DLDO (Bhaktapur) | | | 2,300.00 |
| | AI kit bag with AI equipment | | 2 | |
| | 1 to 2 liters field tank, with canister | | 3 | |
| | 5 to 10 liters semen tank, with canister | | 1 | |
| | 20 to 30 liters liquid N2 tank | | 2 | |
| 5. | AI Outfits for Midhills LDSCs | | | 500.00 |
| | AI kit bag with equipment | | 1 | |
| | 5 to 10 liters semen tank, with canister | | 1 | |

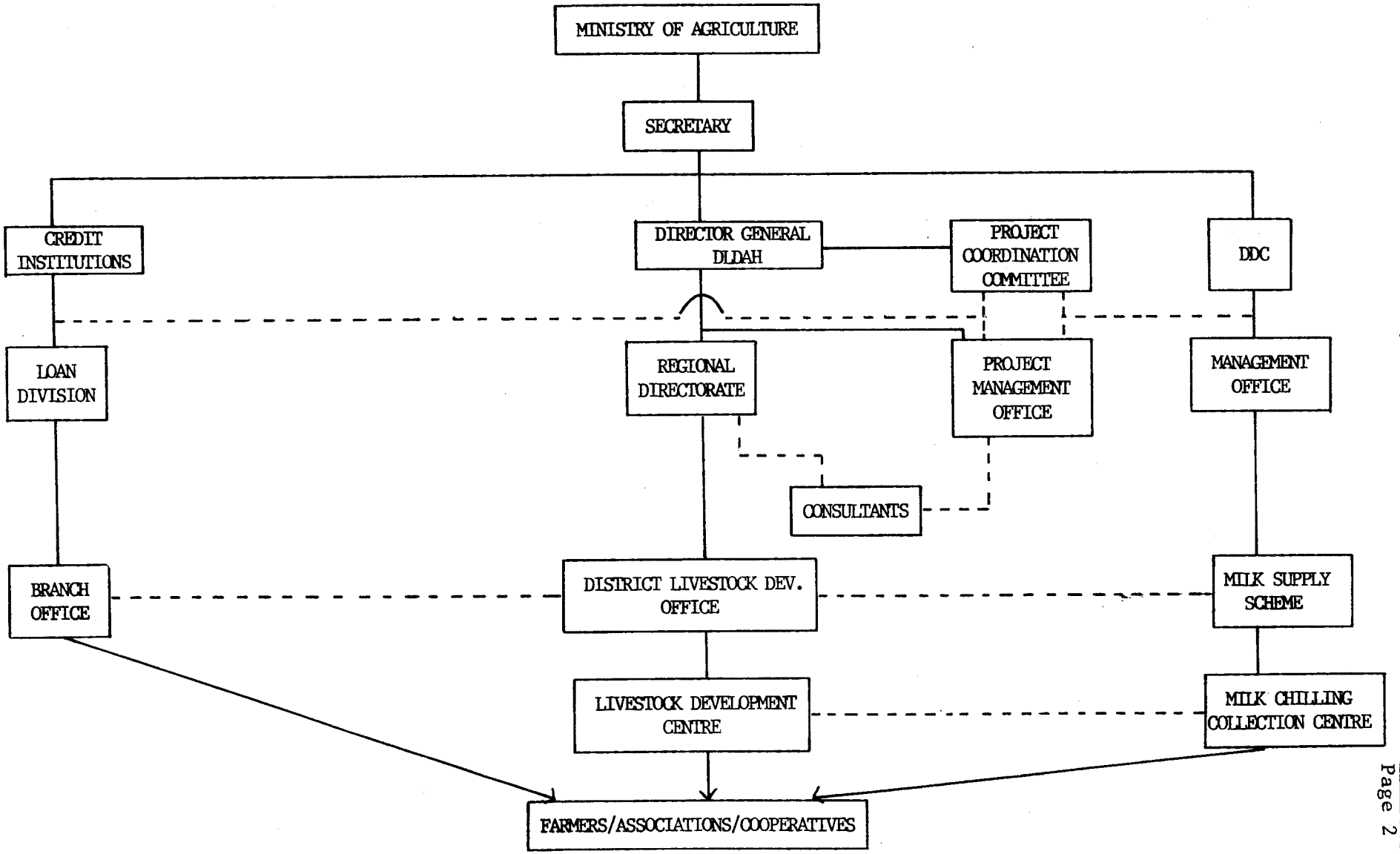
a/ Represents base costs only.

## DEPARTMENT OF LIVESTOCK DEVELOPMENT AND ANIMAL HEALTH




(Reference in text: page 31, para 98)

PROJECT COORDINATION CHART



DETAILED COST ESTIMATE
($'000)

| | | Foreign | Local a/ | Total |
|---|---|---|---|---|
| I. | ANIMAL HEALTH | 1,846.3 | 426.5 | 2,272.8 |
| | 1. Vaccine Production | 419.0 | 69.6 | 488.6 |
| | (a) Civil works | 4.7 | 12.6 | 17.3 |
| | (b) Equipment | 34.3 | 4.3 | 38.6 |
| | (c) Animals | 0.0 | 6.2 | 6.2 |
| | (d) Materials and supplies | 380.0 | 23.8 | 403.8 |
| | (e) Recurrent costs | 0.0 | 22.7 | 22.7 |
| | 2. Diagnostic Services | 116.3 | 43.5 | 159.8 |
| | (a) Civil works | 19.1 | 28.8 | 47.9 |
| | (b) Equipment | 29.5 | 0.3 | 29.8 |
| | (c) Vehicles | 1.0 | 0.5 | 1.5 |
| | (d) Materials and supplies | 53.2 | 3.3 | 56.5 |
| | (e) Recurrent costs | 13.5 | 10.6 | 24.1 |
| | 3. Disease Control | 410.5 | 277.9 | 688.4 |
| | (a) Civil works | 145.5 | 219.7 | 365.2 |
| | (b) Vehicles | 0.0 | 5.5 | 5.5 |
| | (c) Materials | 265.0 | 2.7 | 267.7 |
| | (d) Recurrent costs | 0.0 | 50.0 | 50.0 |
| | 4. Field Veterinary Services | 900.5 | 35.5 | 936.0 |
| | (a) Equipment | 85.5 | 0.9 | 86.4 |
| | (b) Materials | 815.0 | 8.1 | 823.1 |
| | (c) Recurrent costs | 0.0 | 26.5 | 26.5 |
| II. | ANIMAL NUTRITION/FODDER DEVELOPMENT | 664.3 | 1,152.8 | 1,817.1 |
| | 1. Planting Materials Production | 282.1 | 380.1 | 662.2 |
| | (a) Civil works | 61.2 | 99.6 | 160.8 |
| | (b) Equipment/Machinery | 91.5 | 1.4 | 92.9 |
| | (c) Vehicles | 10.0 | 6.8 | 16.8 |
| | (d) Materials | 54.0 | 40.5 | 94.5 |
| | (e) Recurrent costs | 65.4 | 231.8 | 297.2 |

a/ Includes duties and taxes in each component.

(Reference in Text: page 28, para 93)

| | Foreign | Local | Total |
|---|---|---|---|
| 2. Pasture/Forage Development | 155.0 | 609.1 | 764.1 |
| (a) Civil works | 69.7 | 105.3 | 175.0 |
| (b) Equipment | 67.1 | 12.0 | 79.1 |
| (c) Materials | 10.0 | 460.1 | 470.1 |
| (d) Recurrent costs | 8.2 | 31.7 | 39.9 |
| 3. Khumultar Nutrition Laboratory | 63.6 | 33.4 | 97.0 |
| (a) Civil works | 3.6 | 5.4 | 9.0 |
| (b) Equipment | 37.0 | 0.4 | 37.4 |
| (c) Materials/Supplies | 23.0 | 0.2 | 23.2 |
| (d) Recurrent costs | 0.0 | 27.4 | 27.4 |
| 4. Hetauda Feed Laboratory and Mill | 163.6 | 130.1 | 293.7 |
| (a) Civil works | 73.8 | 111.4 | 185.2 |
| (b) Equipment | 33.4 | 0.3 | 33.7 |
| (c) Vehicles | 23.0 | 15.4 | 38.4 |
| (d) Materials and supplies | 13.1 | 2.8 | 15.9 |
| (e) Recurrent costs | 20.3 | 0.2 | 20.5 |
| III. ANIMAL BREEDING IMPROVEMENT | 865.4 | 345.8 | 1,211.2 |
| (a) Civil works | 87.8 | 107.5 | 195.3 |
| (b) Equipment and machinery | 67.0 | 0.7 | 67.7 |
| (c) Vehicles | 12.0 | 8.2 | 20.2 |
| (d) Livestock | 20.0 | 30.2 | 50.2 |
| (e) Materials | 662.5 | 6.6 | 669.1 |
| (f) Recurrent costs | 16.1 | 192.6 | 208.7 |
| IV. INTENSIVE LIVESTOCK DEVELOPMENT | 1,198.7 | 2,783.5 | 3,982.2 |
| 1. Civil works | 777.0 | 1,269.6 | 2,046.6 |
| 2. Equipment | 314.7 | 13.0 | 327.7 |
| 3. Vehicles | 49.0 | 42.4 | 91.4 |
| 4. Recurrent costs | 58.0 | 1,458.5 | 1,516.5 |
| V. INSTITUTION BUILDING | 1,175.0 | 902.8 | 2,077.8 |
| 1. Administration and Monitoring | 49.4 | 263.4 | 312.8 |
| (a) Civil works | 26.9 | 40.6 | 67.5 |
| (b) Equipment | 22.5 | 0.2 | 22.7 |
| (c) Recurrent costs | 0.0 | 222.6 | 222.6 |

| | Foreign | Local | Total |
|---|---|---|---|
| 2. Training | 40.6 | 241.3 | 281.9 |
| (a) Civil works | 5.6 | 8.5 | 14.1 |
| (b) Equipment | 35.0 | 0.3 | 35.3 |
| (c) Recurrent costs | 0.0 | 232.5 | 232.5 |
| 3. Livestock Production/Promotion Division | 22.0 | 65.1 | 87.1 |
| (a) Equipment | 10.0 | 0.1 | 10.1 |
| (b) Materials | 12.0 | 3.1 | 15.1 |
| (c) Recurrent costs | 0.0 | 61.9 | 61.9 |
| 4. Fellowships | 471.0 | 60.0 | 531.0 |
| 5. Consultancy | 492.0 | 172.0 | 664.0 |
| 6. Maintenance Service Contract | 100.0 | 101.0 | 201.0 |
| TOTAL BASE COST | 5,749.7 | 5,611.3 | 11,361.0 |
| CONTINGENCIES | 2,464.8 | 3,418.3 | 5,883.1 |
| 1. Physical Contingency | 575.0 | 561.1 | 1,136.1 |
| 2. Price Escalation | 1,889.8 | 2,857.2 | 4,747.0 |
| SERVICE AND OTHER CHARGES DURING CONSTRUCTION | 239.9 | 0.0 | 239.9 |
| TA COST TRANSFERED TO LOAN | 16.0 | - | 16.0 |
| TOTAL PROJECT COST | 8,470.4 | 9,029.6 | 17,500.0 a/ |
| (PERCENTAGE) | 48.4 | 51.6 | 100.0 |

a/ Figures may not add due to rounding.

## DETAILED FINANCING ARRANGEMENT
($'000)

| | | BANK | | UNDP | | HMGN | Total |
|---|---|---|---|---|---|---|---|
| | | Foreign | Local | Foreign | Local | Local | Cost |
| I. | BASE COST | 4,786.7 | 4.291.6 | 963.0 | 232.0 | 1,087.7 | 11,361.0 |
| A. | Animal Health | 1,846.3 | 349.5 | | | 77.0 | 2,272.8 |
| | 1. Vaccine Production | 419.0 | 52.2 | | | 17.4 | 488.6 |
| | 2. Diagnostic Services | 116.3 | 36.9 | | | 6.6 | 159.8 |
| | 3. Field Vet. Services | 900.5 | 14.6 | | | 20.9 | 936.0 |
| | 4. Disease Control | 410.5 | 245.8 | | | 32.1 | 688.4 |
| B. | Animal Nutrition/Fodder Dev | 664.3 | 942.3 | | | 210.5 | 1,817.1 |
| C. | Livestock Breeding Improvement | 865.4 | 258.7 | | | 87.0 | 1,211.1 |
| D. | Intensive Livestock Dev | 1,198.7 | 2,083.5 | | | 700.0 | 3,982.2 |
| E. | Institution Building | 212.0 | 657.7 | 963.0 | 232.0 | 13.1 | 2,077.8 |
| | 1. Adm. & Monitoring | 49.4 | 251.9 | | | 11.5 | 312.8 |
| | 2. Training | 40.60 | 240.9 | | | 0.4 | 281.9 |
| | 3. Livestock Production/ Promotion Division | 22.0 | 64.9 | | | 0.2 | 87.1 |
| | 4. Fellowships | 0.0 | 0.0 | 471.0 | 60.0 | 0.0 | 531.0 |
| | 5. Consultancy | 0.0 | 0.0 | 492.0 | 172.0 | 0.0 | 664.0 |
| | 6. Service Contract | 100.0 | 100.0 | | | 1.0 | 201.0 |
| II. | CONTINGENCIES | 2,127.6 | 2,538.2 | 337.2 | 88.3 | 791.8 | 5,883.1 |
| | 1. Physical Contingency | 478.7 | 429.1 | 96.3 | 23.2 | 108.8 | 1,136.1 |
| | 2. Price Escalation | 1,648.9 | 2,109.1 | 240.9 | 65.1 | 683.0 | 4,747.0 |
| III. | SERVICE AND OTHER CHARGES DURING CONSTRUCTION | 289.9 | 0.0 | 0.0 | 0.0 | 0.0 | 289.9 |
| IV. | TA COST TRANSFERRED TO LOAN | 16.0 | 0.0 | 0.0 | 0.0 | 0.0 | 16.0 |
| TOTAL FUNDING SOURCES | | 7,220.2 | 6,829.8 | 1,300.2 | 320.3 | 1,879.5 | 17,500.0 a/ |

a/ Figures may not add due to rounding.

(Reference in Text: page 28, para 94)

INDICATIVE MANPOWER REQUIREMENT OF PROJECT

| | | Existing (Sanctioned) | Incremental 1 | 2 | 3 | 4 | 5 | Total Incremental | Total |
|---|---|---|---|---|---|---|---|---|---|
| I. ANIMAL HEALTH | | | | | | | | | |
| A. Biological Products Division | | | | | | | | | |
| 1. Main Lab | | | | | | | | | |
| Division Chief | G1 | 1 | - | - | - | - | - | - | 1 |
| Virologist | G2 | 1 | - | - | - | - | - | - | 1 |
| Bacteriologist | G2 | 1 | - | - | - | - | - | - | 1 |
| Assistant Virologist | G3 | 3 | - | - | - | - | - | - | 3 |
| Assistant Bacteriologist | G3 | 3 | - | - | - | - | - | - | 3 |
| Technical Assistant | NG1 | 20 | - | - | - | - | - | - | 20 |
| Electrician & Overseer | NG1 | 1 | 1 | - | - | - | - | 1 | 2 |
| Accountant | NG1 | - | 1 | - | - | - | - | 1 | 1 |
| Assistant Accountant | NG2 | 1 | - | - | - | - | - | - | 1 |
| Administrative Assistant | NG2 | - | 1 | - | - | - | - | 1 | 1 |
| JTA | NG2 | 7 | - | - | - | - | - | - | 7 |
| Assistant Overseer | NG2 | 2 | - | - | - | - | - | - | 2 |
| Assistant Electrician | NG2 | 2 | - | - | - | - | - | - | 2 |
| Typist | NG3 | - | 1 | - | - | - | - | 1 | 1 |
| Animal Attendant | NG3 | - | 4 | - | - | - | - | 4 | 4 |
| Stockman | NG3 | 14 | - | - | - | - | - | - | 14 |
| Peon, Watchman | Classless | 22 | - | - | - | - | - | - | 22 |
| | | 78 | 8 | - | - | - | - | 8 | 86 |
| B. Diagnostic Services Division | | | | | | | | | |
| 1. Main Lab | | | | | | | | | |
| Division Chief | G1 | 1 | - | - | - | - | - | - | 1 |
| Laboratory Chief | G2 | 2 | - | - | - | - | - | - | 2 |
| Virologist | G2 | 1 | - | - | - | - | - | - | 1 |
| Pathologist | G2 | 1 | - | - | - | - | - | - | 1 |
| Bacteriologist | G2 | 1 | - | - | - | - | - | - | 1 |
| Parasitologist | G2 | - | - | 1 | - | - | - | 1 | 1 |
| Assistant Bacteriologist | G3 | 2 | - | - | - | - | - | - | 2 |
| Assistant Pathologist | G3 | 2 | - | - | - | - | - | - | 2 |
| Assistant Virologist | G3 | 1 | - | - | - | - | - | - | 1 |
| Veterinary Officer | G3 | 5 | - | - | - | - | - | - | 5 |
| Technician | NG1 | 6 | - | - | - | - | - | - | 6 |
| Librarian | NG1 | - | 1 | - | - | - | - | 1 | 1 |
| Laboratory and Tech. Assistant | NG2 | 13 | - | - | - | - | - | - | 13 |
| Administrative Assistant | NG2 | 2 | - | - | - | - | - | - | 2 |
| Assistant Accountant | NG2 | 1 | - | 1 | - | - | - | 1 | 2 |
| Stockman | NG3 | 58 | - | - | - | - | - | - | 58 |
| | | 96 | 1 | 2 | - | - | - | 3 | 99 |
| 2. FMD Lab | | | | | | | | | |
| Senior Epidemiologist | G1 | - | 1 | - | - | - | - | 1 | 1 |
| Epidemiologist | G2 | 1 | - | - | - | - | - | - | 1 |
| Assistant Virologist | G3 | 1 | - | - | - | - | - | - | 1 |
| Assistant Serologist | G3 | 1 | - | - | - | - | - | - | 1 |
| Laboratory Manager | G3 | 1 | - | - | - | - | - | - | 1 |
| Laboratory Technician | NG1 | 5 | - | - | - | - | - | - | 5 |
| Laboratory Assistant | NG2 | 7 | - | - | - | - | - | - | 7 |
| Assistant Workshop Engineer | NG2 | - | 1 | - | - | - | - | 1 | 1 |
| Clerk | NG2 | 1 | - | - | - | - | - | - | 1 |
| Typist | NG2 | - | 1 | - | - | - | - | 1 | 1 |
| Assistant Accountant | NG2 | 1 | - | - | - | - | - | - | 1 |
| Stockman | NG3 | 10 | - | - | - | - | - | - | 10 |
| Cleaners | Classless | - | 2 | - | - | - | - | 2 | 2 |
| Peon | Classless | 2 | - | - | - | - | - | - | 2 |
| Watchman | Classless | - | 2 | - | - | - | - | 2 | 2 |
| | | 30 | 7 | - | - | - | - | 7 | 37 |
| 3. Veterinary Service Division | | | | | | | | | |
| Division Chief | G1 | 1 | - | - | - | - | - | - | 1 |
| Veterinary Officer | G2 | 2 | - | - | - | - | - | - | 2 |
| Assistant Veterinary Officer | G3 | 6 | - | - | - | - | - | - | 6 |
| JTA | NG2 | - | 6 | - | - | - | - | 6 | 6 |
| Clerk | NG2 | - | 1 | - | - | - | - | 1 | 1 |
| Peon/Cleaner | Classless | - | 2 | - | - | - | - | 2 | 2 |
| | | 9 | 9 | - | - | - | - | 9 | 18 |
| | | 213 | 25 | 2 | - | - | - | 27 | 240 |

Note: G - Gazetted.
NG - Non-Gazetted.

(Reference in Text: pages 33-34, para 105)

## II. PASTURE/NUTRITION IMPROVEMENT

### A. Fodder and Nutrition Division

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Division Chief | G1 | - | - | 1 | - | - | - | 1 | 1 |
| Livestock Officer (Pasture) | G2 | 1 | - | - | - | - | - | - | 1 |
| Livestock Officer (Nutrition) | G2 | - | - | - | 1 | - | - | 1 | 1 |
| Assistant Livestock Officer | G3 | 3 | - | - | - | - | - | - | 3 |
| Nutritionist | G3 | - | 1 | - | - | - | - | 1 | 1 |
| JT | NG1 | 4 | - | - | - | - | - | - | 4 |
| Laboratory Technician | NG1 | - | 1 | 2 | 1 | - | - | 4 | 4 |
| JTA | NG2 | 10 | - | - | - | - | - | - | 10 |
| Administrative Assistant | NG2 | - | 1 | - | - | - | - | 1 | 1 |
| Typist | NG3 | - | 1 | - | - | - | - | 1 | 1 |
| Driver | NG3 | - | 1 | 1 | - | - | - | 2 | 2 |
| Laboratory Boy | Classless | - | 3 | - | - | - | - | 3 | 3 |
| Peon | Classless | - | 2 | - | - | - | - | 2 | 2 |
| | | 18 | 10 | 4 | 2 | - | - | 16 | 34 |

### B. Jiri/Khimti Farm & Coordinating Team

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Assistant Livestock Officer | G3 | - | 1 | - | - | - | - | 1 | 1 |
| JT | NG1 | - | 1 | 1 | 1 | - | - | 3 | 3 |
| | | - | 2 | 1 | 1 | - | - | 4 | 4 |

### C. Janakpur Farm & Coordination Team

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Livestock Officer | G2 | 1 | - | - | - | - | - | - | 1 |
| Assistant Livestock Officer | G3 | 2 | - | - | - | - | - | - | 2 |
| JT | NG1 | 1 | 1 | 1 | - | - | - | 2 | 3 |
| Accountant | NG1 | - | 1 | - | - | - | - | 1 | 1 |
| JTA | NG2 | - | 2 | 1 | - | - | - | 3 | 3 |
| Administrative Assistant | NG2 | - | 1 | - | - | - | - | 1 | 1 |
| Storekeeper/Typist | NG2 | - | 1 | - | - | - | - | 1 | 1 |
| Peon | Classless | - | 14 | 14 | - | - | - | 28 | 28 |
| Tractor Driver | Classless | 1 | 1 | - | - | - | - | 1 | 2 |
| | | 5 | 21 | 16 | - | - | - | 37 | 42 |

### D. Lalbandi Farm & Coordination Team

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Livestock Officer | G2 | - | - | 1 | - | - | - | 1 | 1 |
| Assistant Livestock Officer | G3 | 1 | - | - | - | - | - | - | 1 |
| JT | NG1 | 1 | 1 | 1 | - | - | - | 2 | 3 |
| Accountant | NG1 | - | 1 | - | - | - | - | 1 | 1 |
| JTA | NG2 | - | 2 | 2 | - | - | - | 4 | 4 |
| Typist | NG2 | - | 1 | - | - | - | - | 1 | 1 |
| Peons | Classless | - | 17 | 13 | - | - | - | 30 | 30 |
| Tractor Driver | Classless | - | 1 | 1 | - | - | - | 2 | 2 |
| | | 2 | 23 | 18 | - | - | - | 41 | 43 |

### E. Hetauda Feed Mill & Laboratory

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Plant Manager | G2 | 1 | - | - | - | - | - | - | 1 |
| Assistant Manager & Laboratory Controller | G3 | - | 1 | - | - | - | - | 1 | 1 |
| Marketing Personnel | NG1 | 1 | - | - | - | - | - | - | 1 |
| Laboratory Technician | NG1 | - | 1 | - | - | - | - | 1 | 1 |
| Machine Operator | NG1 | - | 1 | - | - | - | - | 1 | 1 |
| JT | NG1 | - | 1 | 2 | 2 | - | - | 5 | 5 |
| Accountant | NG1 | 1 | - | - | - | - | - | - | 1 |
| Administrative Assistant | NG1 | 2 | - | - | - | - | - | - | 2 |
| Boiler Mechanic | NG2 | 1 | - | - | - | - | - | - | 1 |
| JTA | NG2 | - | 1 | 2 | 2 | - | - | 5 | 5 |
| Driver/Mechanic | NG2 | 3 | - | - | - | - | - | - | 3 |
| Assistant Accountant | NG2 | 1 | 1 | - | - | - | - | 1 | 2 |
| Storekeeper | NG2 | 2 | - | - | - | - | - | - | 2 |
| Clerk | NG3 | 1 | 1 | - | - | - | - | 1 | 2 |
| Typist | NG3 | 1 | 1 | - | - | - | - | 1 | 2 |
| Driver | NG3 | 4 | - | - | - | - | - | - | 4 |
| Machine Helper | NG4 | 8 | - | - | - | - | - | - | 8 |
| Assistant Driver | Classless | 2 | - | - | - | - | - | - | 2 |
| Peon | Classless | 15 | - | - | - | - | - | - | 15 |
| | | 43 | 8 | 4 | 4 | - | - | 16 | 59 |
| | | 68 | 64 | 43 | 7 | - | - | 114 | 182 |

III. LIVESTOCK BREEDING IMPROVEMENT

A. Animal Breeding Division (including NAIC):

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Division Chief | G1 | - | 1 | - | - | - | - | 1 | 1 |
| Livestock Officer Breeding Programs | G2 | 1 | - | - | - | - | - | - | 1 |
| A.I. Programs (In-charge) | G2 | - | - | - | - | 1 | - | 1 | 1 |
| A.I. Field Services Manager | G3 | - | 1 | - | - | - | - | 1 | 1 |
| Laboratory Manager (NAIC) | G3 | 1 | - | - | - | - | - | - | 1 |
| Manager Liquid N Plant (NAIC) | G3 | 1 | - | - | - | - | - | - | 1 |
| Breeding Officer | | | | | | | | | |
| -- Buffalo and Cattle | G3 | - | 1 | - | - | - | - | 1 | 1 |
| -- Sheep and Goats | G3 | - | 1 | - | - | - | - | 1 | 1 |
| Liquid N2 Plant Mechanics | NG1 | 1 | 1 | - | - | - | - | 1 | 2 |
| JT | NG1 | 4 | 1 | - | - | - | - | 1 | 5 |
| JTA | NG2 | 7 | - | - | - | - | - | - | 7 |
| Administrative Assistant | NG2 | 1 | 1 | - | - | - | - | 1 | 2 |
| Typist | NG2 | 1 | 1 | - | - | - | - | 1 | 2 |
| Storekeeper | NG3 | - | 1 | - | - | - | - | 1 | 1 |
| Driver | NG3 | 1 | 1 | - | - | - | - | 1 | 2 |
| | | 18 | 10 | - | - | 1 | - | 11 | 29 |

IV. INTENSIVE LIVESTOCK DEVELOPMENT

A. Regional Directorate

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Regional Director | G1 | 1 | - | - | - | - | - | - | 1 |
| Senior Livestock Officer | G2 | 1 | - | - | - | - | - | - | 1 |
| Senior Veterinary Officer | G2 | - | 1 | - | - | - | - | 1 | 1 |
| Livestock Officers | G3 | 1 | - | - | - | - | - | - | 1 |
| Livestock Officers (fodder) | G3 | - | - | 1 | - | - | - | 1 | 1 |
| JT | NG1 | 4 | - | - | - | - | - | - | 4 |
| Accountant | NG1 | 2 | - | - | - | - | - | - | 2 |
| Administrative Assistant | NG1 | 1 | - | - | - | - | - | - | 1 |
| Administrative Assistant/Storekeeper | NG2 | 3 | - | - | - | - | - | - | 3 |
| Typist | NG2 | - | 1 | 1 | - | - | - | 2 | 2 |
| Driver | NG3 | 1 | 1 | - | - | - | - | 1 | 2 |
| Peon | Classless | - | 2 | - | - | - | - | 2 | 2 |
| | | 14 | 5 | 2 | - | - | - | 7 | 21 |

B. DLDO

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| District Livestock Dev. Officer | G2 | 3 | 4 | - | - | - | - | 4 | 7 |
| Livestock Development Officer | G3 | - | 14 | - | - | - | - | 14 | 14 |
| Veterinary Officer | G3 | 14 | - | - | - | - | - | - | 14 |
| JT | NG1 | 14 | 10 | 10 | 8 | - | - | 28 | 42 |
| Accountant | NG1 | 14 | - | - | - | - | - | - | 14 |
| Administrative Assistant | NG1 | 14 | - | - | - | - | - | - | 14 |
| JTA | NG2 | 42 | - | - | - | - | - | - | 42 |
| Assistant Accountant | NG2 | 14 | - | - | - | - | - | - | 14 |
| Administrative Assistant | NG2 | 14 | - | - | - | - | - | - | 14 |
| Driver | NG3 | 6 | 4 | 4 | - | - | - | 8 | 14 |
| Peon | Classless | 42 | 14 | - | - | - | - | 14 | 56 |
| | | 177 | 46 | 14 | 8 | - | - | 68 | 245 |

C. LDC (41)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| JT | NG1 | - | 10 | 13 | 13 | 5 | - | 41 | 41 |
| JTA | NG2 | 26 | 26 | 15 | 15 | - | - | 56 | 82 |
| Messenger | Classless | 26 | 15 | - | - | - | - | 15 | 41 |
| | | 52 | 51 | 28 | 28 | 5 | - | 112 | 164 |

D. LDSC (232)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| JTA | NG2 | 128 | 30 | 30 | 30 | 14 | - | 104 | 232 |
| Messenger | Classless | 128 | 40 | 34 | 30 | - | - | 104 | 232 |
| | | 256 | 70 | 64 | 60 | 14 | - | 208 | 464 |
| TOTAL | | 517 | 182 | 108 | 96 | 20 | - | 406 | 923 |

V. INSTITUTION BUILDING

A. Project Management Office

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Project Coordinator | G1 | 1 | - | - | - | - | - | 1 |
| Veterinary Coordinator | G2 | 1 | - | - | - | - | - | 1 |
| Livestock Coordinator | G2 | 1 | - | - | - | - | - | 1 |
| Office Superintendent | G2 | 1 | 1 | - | - | - | 1 | 2 |
| Chief Accountant | G2 | - | 1 | - | - | - | 1 | 1 |
| Personnel Officer | G3 | 1 | 1 | - | - | - | 1 | 2 |
| Senior Accountant | G3 | 1 | 1 | - | - | - | 1 | 2 |
| Supply Officer | G3 | 1 | 1 | - | - | - | 1 | 2 |
| Civil Engineer | G3 | 1 | 1 | - | - | - | 1 | 2 |
| Overseer | NG1 | 5 | 5 | - | - | - | 5 | 10 |
| Procurement Incharge | NG1 | 1 | 1 | - | - | - | 1 | 2 |
| Admininistrative Assistant | NG1 | 2 | 2 | - | - | - | 2 | 4 |
| Accountant | NG1 | 3 | 5 | - | - | - | 5 | 8 |
| Technical Assistant | NG1 | 2 | 2 | - | - | - | 2 | 4 |
| Storekeeper | NG1 | - | 1 | - | - | - | 1 | 1 |
| Administrative Assistant | NG2 | 2 | 2 | - | - | - | 2 | 4 |
| Procurement Assistant | NG2 | 1 | 1 | - | - | - | 1 | 2 |
| Assistant Accountant | NG2 | 2 | 2 | - | - | - | 2 | 4 |
| Typist | NG2 | 1 | 1 | - | - | - | 1 | 2 |
| Storekeeper | NG2 | 1 | 1 | - | - | - | 1 | 2 |
| Typist | Classless | 2 | 2 | - | - | - | 2 | 4 |
| Driver | Classless | 8 | 8 | - | - | - | 8 | 16 |
| Peons and Helpers | Peon Class | 10 | 10 | - | - | - | 10 | 20 |
| | | 48 a/ | 49 | - | - | - | 49 | 97 |

B. Planning and Evaluation Division

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Chief | G1 | - | 1 | - | - | - | 1 | 1 |
| Planning Officer | G2 | 2 | - | - | - | - | - | 2 |
| Economist/Statistician | G2 | - | 1 | 1 | - | - | 2 | 2 |
| Assistant Planning Officer | G3 | 2 | - | - | - | - | - | 2 |
| Assistant Economist/Statistician | G3 | - | 1 | 1 | - | - | 2 | 2 |
| Technical Assistant | NG1 | 4 | - | - | - | - | - | 4 |
| Typist | NG3 | - | 1 | 1 | - | - | 2 | 2 |
| | | 8 | 4 | 3 | - | - | 7 | 15 |

C. Libraries

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Librarian | G3 | - | 1 | - | - | - | 1 | 1 |
| Library Assistant | NG1 | - | 1 | - | - | - | 1 | 1 |
| Typist | NG2 | - | 1 | - | - | - | 1 | 1 |
| Clerk | NG3 | - | 1 | - | - | - | 1 | 1 |
| | | - | 4 | - | - | - | 4 | 4 |

D. Livestock Training Center

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Chief | G1 | 1 | - | - | - | - | - | 1 |
| Assistant Chief | G2 | - | - | 1 | - | - | 1 | 1 |
| Training Officer | G3 | 3 | 1 | 1 | 1 | - | 3 | 6 |
| Assistant Training Officer | NG1 | 4 | - | - | - | - | - | 4 |
| Storekeeper | NG1 | - | 1 | - | - | - | 1 | 1 |
| Administrative Assistant | NG1 | 1 | - | - | - | - | - | 1 |
| Accountant | NG1 | 1 | - | - | - | - | - | 1 |
| JTA | NG2 | 2 | - | - | - | - | - | 2 |
| Typist | NG2 | - | 3 | - | - | - | 3 | 3 |
| | | 12 | 5 | 2 | 1 | - | 8 | 20 |

E. Livestock Promotion Division

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Division Chief | G2 | - | 1 | - | - | - | 1 | 1 |
| Extension Specialists | G3 | - | 1 | - | - | - | 1 | 1 |
| JT | NG1 | - | 2 | 1 | - | - | 3 | 3 |
| Administrative Assistant | NG1 | - | 1 | - | - | - | 1 | 1 |
| JTA | NG2 | - | 3 | - | - | - | 3 | 3 |
| Clerk | NG2 | - | 1 | - | - | - | 1 | 1 |
| Typist | NG2 | - | 1 | 1 | - | - | 2 | 2 |
| Driver | NG3 | - | 1 | - | - | - | 1 | 1 |
| Storekeeper | NG2 | - | 1 | - | - | - | 1 | 1 |
| Peon | Classless | - | 4 | - | - | - | 4 | 4 |
| | | - | 16 | 2 | - | - | 18 | 18 |
| | | 68 | 78 | 7 | 1 | - | 86 | 154 |
| GRAND TOTAL | | 866 a/ | 349 | 160 | 104 | 20 | 633 | 1499 |

a/ Represents existing (sanctioned) posts in the Project area (mainly Central Region).

PROCUREMENT SUMMARY
($'000)

| | Items | ICB | IS | LCB | Others |
|---|---|---|---|---|---|
| 1. | Civil Works | | - | 3,271.20 | - |
| 2. | Equipment | | 782.30 | 9.50 | 61.30 |
| | Office Equipment/Furniture (audiovisual, computer, text, etc.) | | 63.10 | 9.50 | 16.20 |
| | Laboratory equipment | | 80.00 | - | 10.40 |
| | AI Equipment | | 193.00 | - | - |
| | Farm Equipment | | 89.10 | - | 30.00 |
| | Vet. and Vaccine Equipment | | 222.10 | - | 4.70 |
| | Milk Collection Equipment | | 135.00 | - | - |
| 3. | Vehicles (Jeep, truck, motorcycle, bicycles) | | 98.30 | 22.90 | - |
| 4. | Livestock | | - | - | 50.00 |
| 5. | Materials | 1,530.00 | 298.60 | 964.0 | 29.90 |
| | Frozen Semen | | 200.00 | 400.00 a/ | - |
| | Vet. drugs and chemicals | 1,130.00 | | - | 6.00 |
| | Vaccine products/supplies (bottles, vials, chemicals, etc.) | 400.00 | | - | 6.20 |
| | Laboratory materials (animals) | | 98.60 | - | 2.70 |
| | Office materials | | - | - | 15.00 |
| | Farm materials (seed, seedlings, etc) | | - | 564.00 b/ | - |
| 6. | Consultants | | 490.00 c/ | 174.00 c/ | - |
| 7. | Fellowships | | 471.00 | 60.00 | - |
| 8. | Maintenance Service Contract | | 201.00 | - | - |
| 9. | Recurrent Costs | | - | - | 2,748.50 d/ |
| 10. | Duties and Taxes | | - | - | 99.50 |
| TOTAL PROJECT BASE COST | | 1,530.00 | 2,341.20 | 4,501.60 | 2,989.00 |

a/ Mainly Murrah buffalo semen.
b/ Mainly for seed purchase from contracted farmers.
c/ Following Bank's Guidelines on the Use of Consultants.
d/ Mostly salaries, training expenses for farmers/staff and other recurrent costs.

Note: ICB = International Competitive Bidding
IS = International Shopping
LCB = Local Competitive Bidding

(Reference in Text: page 34, para 106)

# DRAFT TERMS OF REFERENCE FOR CONSULTANT SERVICES

## A. Foreign Consultants

### 1. Pasture and Fodder Development and Animal Nutrition Expert(s) (12 man-months)

An expert(s) with particular experience in pasture and fodder development, soil erosion control and animal nutrition will be employed for short-term assignments regularly for about three years of the Project period. He will commence work within six months after loan effectiveness. He will report to the Project Coordinator. The Expert(s) will assist DLDAH staff in establishing the field programs and intraining staff in the key aspects of the programs particularly in respect of:

(i) seed production, handling and distribution with emphasis on the organizational aspects of contract production, cleaning, storage, inoculation and pelleting and distribution programs;

(ii) the use of forages in soil erosion control;

(iii) rhizobium laboratory management and the handling of inoculants for large scale field programs;

(iv) species introduction and screening with particular emphasis on species for soil erosion control, for cut-and-carry management, for oversowing into heavily grazed communal lands, and for various purposes at high altitudes;

(v) management planning for large pasture/forage development programs over a diverse environmental range;

(vi) preservation and utilization of fodder and farm by-products and improvement of ruminant nutrition; and

(vi) the establishment of linkage with research and development organizations in other countries for the purpose of information exchange, and for supplying small quantities of seed for local evaluation.

### 2. FMD Laboratory Management Expert(s) (3 man-months)

Technicians/scientists at present employed in internationally recognized Foot-and-Mouth disease diagnostic laboratories will be employed to work in close collaboration with counterpart technicians and scientists in DLDAH's Foot-and-Mouth disease epidemiology laboratory at Budhanilkantha. These technicians/scientists will commence work six months after loan effectiveness. They will report to the Project Coordinator. During short-term visits by Nepalese laboratory staff to the international laboratory and return visits by the international laboratory staff, the systems for the Nepalese laboratory operation will be established and made operational. The systems, inter-alia, will include:

(Reference in Text: page 34, para 110; pages 37 & 38, para 120)

(i) overall laboratory management, including personnel management, procurement, finance, communications, operations and maintenance;

(ii) hygiene, isolation and quarantine with respect to the laboratory operation;

(iii) raising and handling of laboratory animals;

(iv) measurement and recording of the field disease situation;

(v) collection, transmittal and processing of laboratory specimens;

(vi) monitoring and evaluation of acquired information; and

(vii) preparation of the various protocols of the laboratory's operation.

3. Bacteriologist (3 man-months)

A specialist in bacterial vaccine production from a reputable international vaccine manufacturer will be engaged for a series of short-term visits to work in close collaboration with the staff of the Bacterial Vaccines Section of the Biological Products Division. As the bacterial vaccine laboratory is expected to have been commissioned prior to Project commencement, the Bacteriologist's functions will primarily be for trouble-shooting and staff training. The specific timing of his engagement will thus be flexible, although it is likely that most of his visits will take place in the early Project years. He will report to the Project Coordinator. His functions will, inter-alia, be to assist in:

(i) providing technical inputs into solving production problems;

(ii) designing, setting up and training staff in appropriate production systems; and

(iii) preparing specifications of production materials.

4. Virologist (3 man-months)

This consultant will be an experienced virologist who will provide short-term consultancies during the establishment of tissue culture techniques for the Bacterial Products Division, for the central diagnostic laboratory and for the Foot-and-Mouth disease epidemiological laboratory. He will report to the Project Coordinator. He will commence work within 12 months of loan effectiveness. The consultant will, inter-alia, assist in:

(i) designing, setting up and training staff in appropriate laboratory systems for carrying out tissue culture techniques;

(ii) the preparation of general specifications of laboratory modifications required to undertake tissue culture techniques; and

(iii) preparing specifications of production materials.

5. Milk Processing/Marketing Expert (4 man-months)

This consultant should have broad practical experience in organizing milk procurement, collection networks and transportation; in the manufacture of butter, cheese and liquid milk products including reconstituted and recombined milk; in the maintenance of dairy equipment; in staff development and supervision, the conduct of in-service training programs and in organizing producers' cooperatives and training. He will commence work within 20 months of loan effectiveness.

This consultant will, inter-alia, assist the Project Coordinator in the following:

(i) procurement of equipment, vehicles and materials for milk collection, storage, transportation to be provided under the Project, as well as in planning, contracting and supervising related construction and installation works;

(ii) developing the criteria for selection of the locations for collection and chilling centers and implementing them; transport development;

(iii) establishing procedures for improving milk handling, collection and transport to enable production and marketing of improved quality milk as well as training personnel and demonstrating the implementation of the procedures;

(iv) development of methodology and preparing an inventory of the collection and chilling centers of DDC with regard to the condition and operation of the equipment and vehicles, existing stock and storage control of spare parts, as well as the number, competence and working practices of maintenance personnel; and

(v) preparing plans and specifications for the procurement of essential spare parts, initiate acquisition and organize maintenance workshops and spare parts stores as well as a system for the timely replenishment of vital spare parts and materials.

6. Artificial Breeding Specialist (6 man-months)

This consultant should be a veterinarian or an animal scientist with extensive experience in the organization and management of artificial breeding programs. He will commence work within 12 months of loan effectiveness. He will report to the Project Coordinator. He will assist, inter-alia, the staff of the Animal Breeding Division of DLDAH in the following:

(i) the preparation of annual work plans, budget proposals, personnel establishment and monitoring of the artificial breeding program;

(ii) the supervision and implementation of the artificial breeding program, with particular reference to its technical and economic efficiency;

(iii) the development of cattle and buffalo semen collection and freezing techniques, and quality control;

(iv) the development of management systems for the bulls stationed at the National Artificial Insemination Center (NAIC);

(v) the development of procedures for procurement of new and replacement bulls as well as frozen semen;

(vi) liquid nitrogen production;

(vii) establishment of recording and analytical systems for the AI program;

(viii) preparation of the artificial breeding field services program and its implementation;

(ix) organizing semen and liquid nitrogen delivery to the field including storage and proper handling; and

(x) the in-service training of field and laboratory staff.

7. Extension and Training/Communications Specialist (3 man-months)

This consultant should have considerable experience in agricultural and preferably livestock extension in developing countries as an educator in farmer and extension staff training and in the preparation and delivery of radio and television extension programs. Asian experience will be essential. He will report to the Project Coordinator. He will commence work within 14 months of loan effectiveness. He will assist, inter-alia, with:

(i) establishing an extension methodology and design section within the newly created Livestock Production and Promotion Division of DLDAH;

(ii) preparing the curricula for the field staff of the Central Regional Office, the DLDOs, LDCs and LDSCs in animal nutrition and fodder development, animal breeding, animal nutrition, animal health and disease control;

(iii) identifying suitable appropriate extension programs, designing and preparing suitable methodologies for their delivery;

(iv) preparation of audio-visual material including the preparation of flip-charts, and in designing demonstration systems;

(v) identification of materials suitable for radio or video tape dissemination; and

(vi) preparation of guidelines of usage of the various methods of communications for dissemination of extension material.

8. Maintenance Engineer (1 man-month)

This consultant should be experienced in the installation and maintenance of modern vaccine production and other veterinary equipment, AI equipment including liquid nitrogen plant and should have a good knowledge of various equipment suppliers in the industry. His function will include the preparation of an appropriate maintenance contract for the vaccine production facility, the central diagnostic laboratory and the liquid nitrogen plant of the National Artificial Insemination Center. He will prepare the contract(s) in sufficient detail to ensure that all equipment is kept in working order and functional throughout the Project period, and that financial incentives are provided for the contractor to concurrently train local private firms in providing all the necessary maintenance services. The contract(s) will include spare parts, sufficient allowance being provided to ensure that an adequate supply of spare parts is kept in-country. The engineer will put as much detail as possible in the contract in terms of plant and equipment description the requirements for installation of spare parts, maintenance systems and procedures in case of breakdowns to be adopted to ensure that prospective contractors can make a meaningful guarantee to keep the plant and equipment fully functional. He will report to the Project Coordinator and should commence work within three months of loan effectiveness.

B. Local Firm of Management/Financial Consultants (36 man-months)

This firm will be engaged within six months of loan effectiveness. Unless otherwise indicated, this firm will be responsible to the Project Coordinator. Among other things, its terms of reference will include but not be limited to the following:

1. Monitoring/Evaluation (8 manmonths):

(a) Assist DLDAH/PMO in setting up their respective monitoring units, including the design of their coordinated work plans and instruments (e.g. internal report forms);

(b) Assist DLDAH in planning and carrying out the gathering and analysis of benchmark information with the aim of verifying the receipt, use and impact of goods and services delivered under the First Livestock Project on farmer/ beneficiaries, initiating/recommending remedial actions necessary to ensure that benefits envisaged under that Project are achieved, and establishing benchmark comparators for subsequent use in evaluating the impact on beneficiaries of the proposed Project; a survey of selected beneficiaries and informants in all or part of the Project area will be initiated to this end if available data are insufficient; and

(c) Assist DLDAH in planning and carrying out a mid-term and post-completion survey of the Project, on such dates as may be agreed between DLDAH/PMO and the Bank, with the aim of assessing Project performance and its impact on intended beneficiaries.

2. Accounting/Auditing (8 manmonths): Assist DLDAH and DDC in establishing or strengthening participating milk producers' cooperatives in terms of overall management, staffing and operations; designing and installing effective accounting and auditing systems; and reviewing/adjusting as required the systems installed.

3. Manpower Development (3 manmonths): Prepare and assist in the implementation as required of a suitable program for manpower training and development for DLDAh staff (including aspects of recruitment, promotion and career planning) to promote specialization of staff as well as increase their motivation;

4. Institutional Study/Vaccine (6 manmonths including 2 mm foreign): In association with foreign consultants experienced in the pharmaceutical business:

   (a) Assist DLDAH/PMO in undertaking a physical inventory of all vaccine-related assets of DLDAH;

   (b) Recommend an appropriate valuation of such assets including the identification of assets that are considered unproductive and should be scrapped and/or sold;

   (c) Taking into account items (a) and (b) above, prepare ten year financial projections (profit and loss including comparative cost analysis, cash flow and balance sheets) together with sensitivity analyses assuming the vaccine production facility will be operated: (i) as part of DLDAH; (ii) as a statutory board/corporation; or (iii) as a private/public limited company under the Companies Act.

   (d) recommend the appropriate type of organization (including detailed personnel requirements) to operate and manage the vaccine facility, and the terms and conditions (including relending rate and/or leasing arrangements if appropriate) under which the Government should transfer the assets and related liabilities to the proposed organization; and

   (e) assist as required DLDAH in preparing necessary documentation to implement its recommendations, e.g., charter, policy statements to guide its operations, proforma operating budgets, etc.

5. Institutional Study/Dairy Sector (7 manmonths including 3 mm foreign): In association with foreign consultants experienced in dairy management/cooperative structures, assist the Government/ DDC to:

   (a) undertake a comprehensive review of the dairy sector as a whole (in the national and regional context) and DDC in particular with a view to determining the institutional direction of the sector including the practical possibilities of a partial or full privatization of DDC;

(b) review DDC's past and prospective financial performance, identify specific causes of its high operating costs and recommend practical short term and long term measures to improve its efficiency (including its reorganization and capital restructuring) and enable it to meet its commitments/loan covenant with the World Food Programme and the Bank under the First Livestock Project and this Project;

(c) examine the continued viability of DDC as a Government-controlled corporation and formulate practical proposals as to how DDC could effectively be vested with pricing and management autonomy to enable it to operate fully on a self-sustaining basis as soon as possible and no later than the end of the Seventh Five Year Plan (i.e. 1990);

(d) evaluate the financial, institutional and regulatory base required for ensuring an adequate and regular supply of milk solely through independent private sector dairy industries in the event the Government decides that a centralized Dairy Corporation need not continue to function in the country.

6. Livestock Regulatory Review (4 manmonths including 1 mm foreign): In association with a foreign legal expert for a brief period, a local consultant (preferably a lawyer with experience in the fields of livestock laws and legal drafting) will be recruited within 24 months of the loan effectivity. His terms of reference will include the following:

(a) Consolidation of existing regulations and preparation of a Livestock Laws Manual: to collect all legislation, rules and regulations relating to livestock at present in force in Nepal (hereinafter called Livestock Laws); collate and up-date all such Livestock Laws by incorporating all amendments/repeals at appropriate places in the principal provisions; arrange such Livestock Laws under suitable subheadings related to the areas of administration of the livestock sector; present an annotated commentary and analysis of relevant case-law under each provision of such Livestock Laws; and prepare, on the basis of the above, in a form appropriate for publication, a manuscript for a Livestock Laws Manual, suitable for easy reference and use by officials of the DLDAH in their day-to-day work as well as in planning future activities;

(b) Review of enforcement mechanisms for Livestock Laws: to review existing procedures for the enforcement of Livestock Laws at the national, regional and local levels and identify deficiencies/weaknesses; and recommend measures required to improve enforcement of such Laws including, if necessary, appropriate linkages with other existing civil and criminal law enforcement mechanisms; and

(c) Identification of areas for legislative initiatives: in relation to the review of Livestock Laws conducted under (a) above, identify major gaps in such Laws and propose broad outlines of legislation urgently required to optimise investments in the livestock sector (with particular reference to livestock conservation and protection, improvement, import and export, marketing, slaughter, breeding, disease control, dairy/poultry and nutrition).

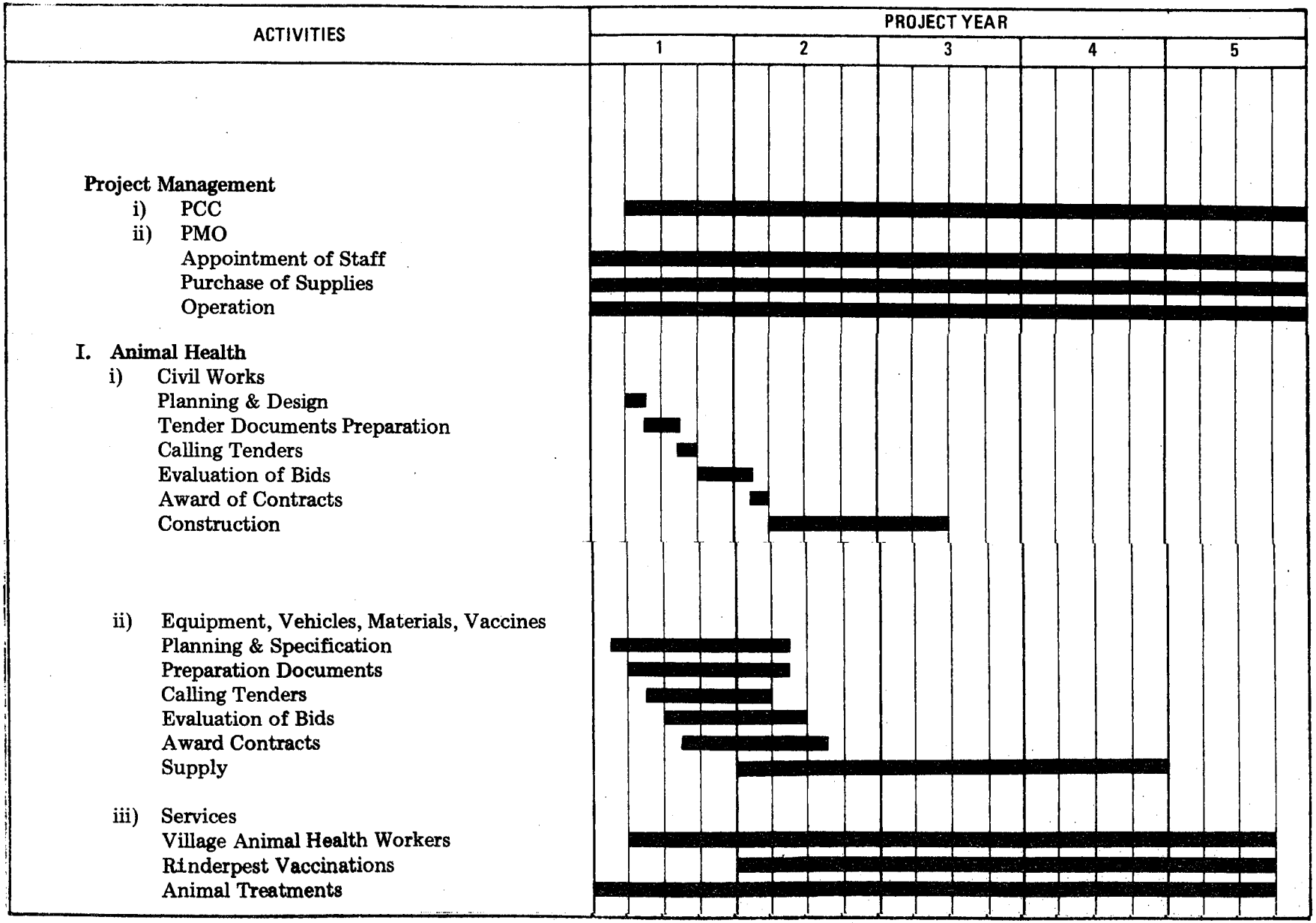
7. Work Plan: The work plan with regards to the institutional study on the dairy sector/vaccine will be as follows:

(a) the study will commence within six months of the effective date of the loan with regards to item 5 (viz, dairy institutional issues) and within 18 months with regards to item 4 (viz, vaccine facility);

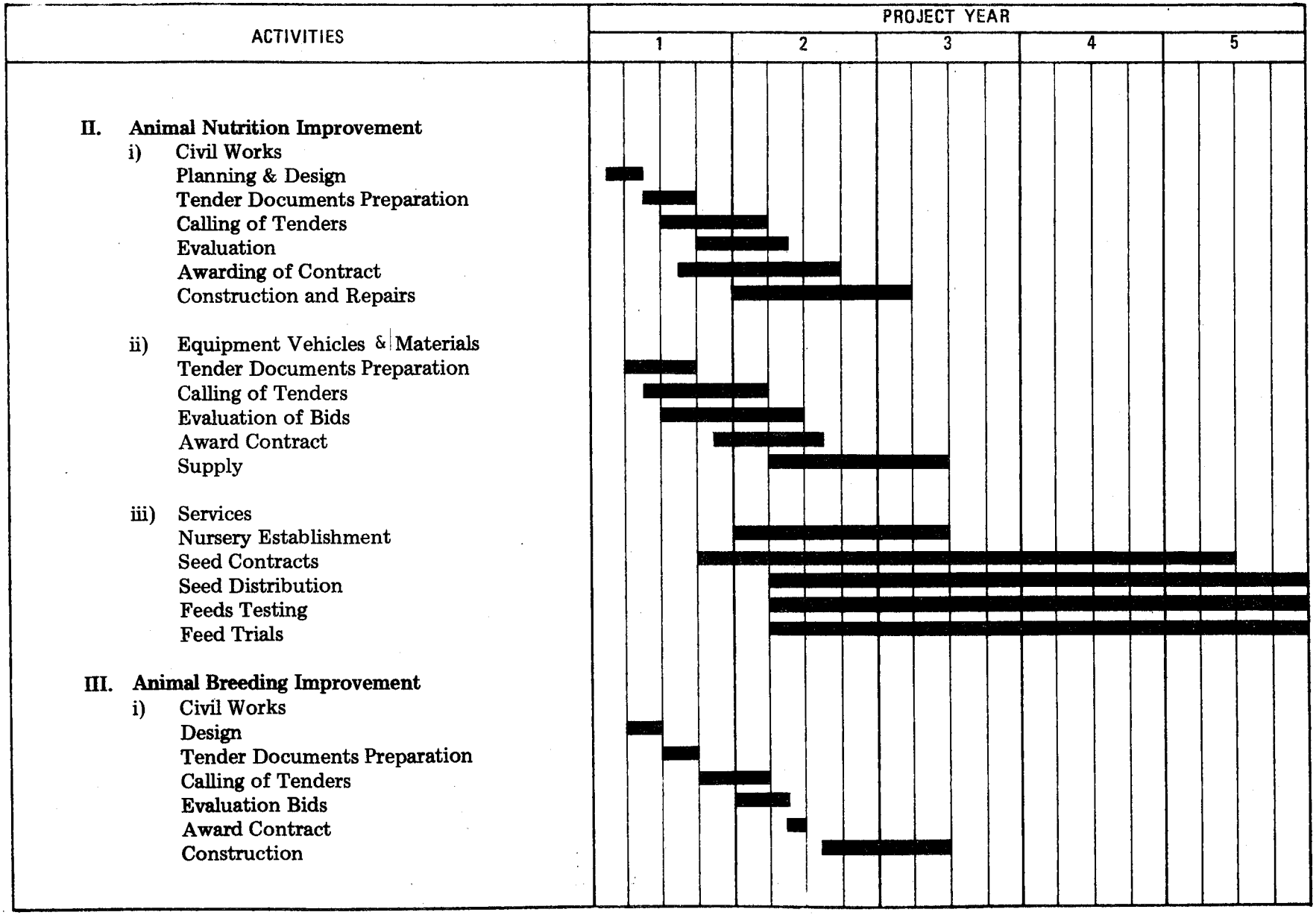
(b) within three months after the commencement of the study, an interim report will be submitted to the Government and the Bank which will form the basis for joint discussions between the Government, the Bank and the consultant;

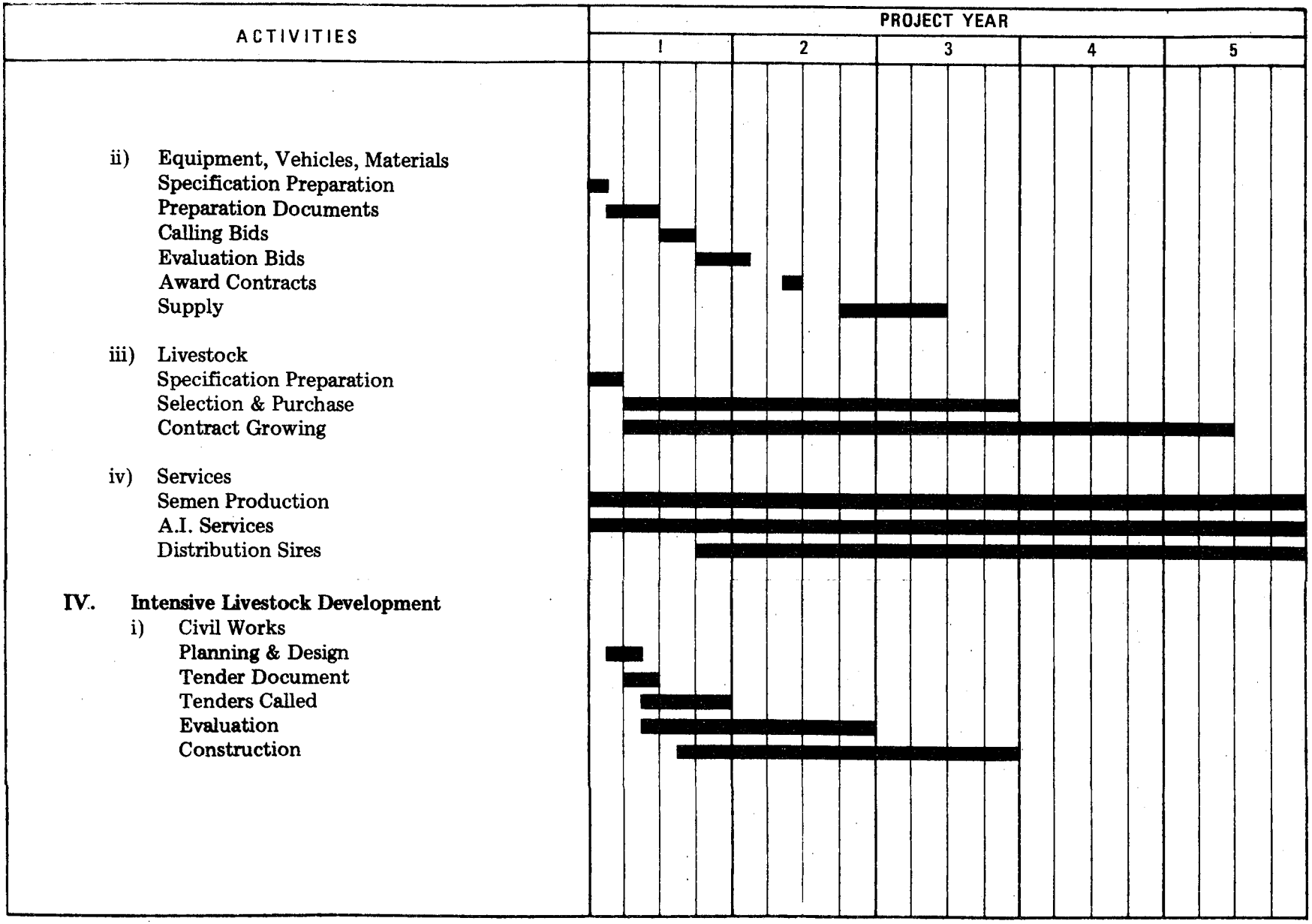
(c) on the basis of these discussions, appropriate plans for further action (including a detailed time-bound implementation program) will be drawn up by the consultant for consideration/agreement by the Government and the Bank.

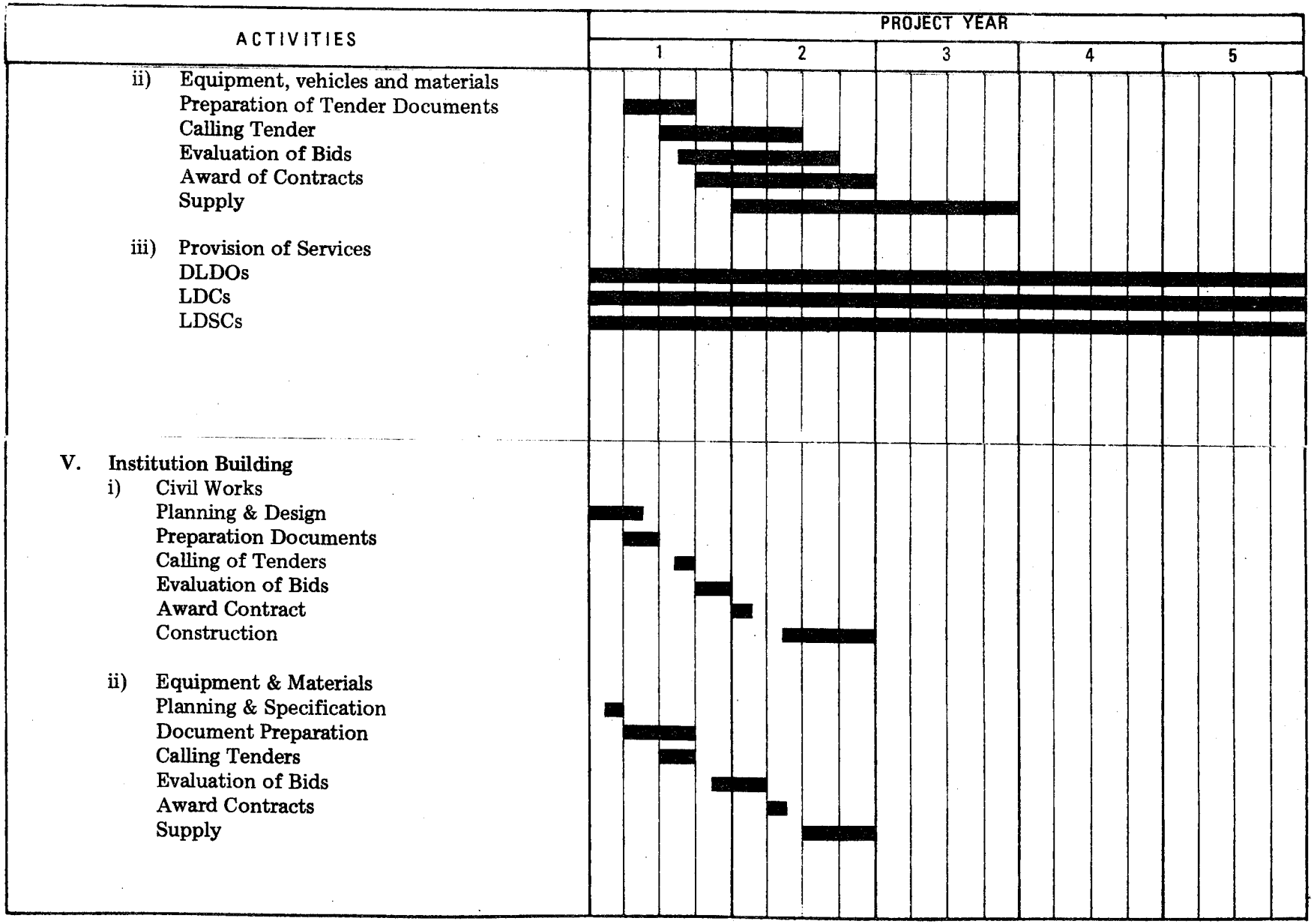
# IMPLEMENTATION SCHEDULE




(Reference in Text: page 35, para 113)


ACTIVITIES
PROJECT YEAR
1
2
3
4
5
II. Animal Nutrition Improvement
i) Civil Works
Planning & Design
Tender Documents Preparation
Calling of Tenders
Evaluation
Awarding of Contract
Construction and Repairs
ii) Equipment Vehicles & Materials
Tender Documents Preparation
Calling of Tenders
Evaluation of Bids
Award Contract
Supply
iii) Services
Nursery Establishment
Seed Contracts
Seed Distribution
Feeds Testing
Feed Trials
III. Animal Breeding Improvement
i) Civil Works
Design
Tender Documents Preparation
Calling of Tenders
Evaluation Bids
Award Contract
Construction


ACTIVITIES
PROJECT YEAR
1
2
3
4
5
ii) Equipment, Vehicles, Materials
Specification Preparation
Preparation Documents
Calling Bids
Evaluation Bids
Award Contracts
Supply
iii) Livestock
Specification Preparation
Selection & Purchase
Contract Growing
iv) Services
Semen Production
A.I. Services
Distribution Sires
IV. Intensive Livestock Development
i) Civil Works
Planning & Design
Tender Document
Tenders Called
Evaluation
Construction


ACTIVITIES
PROJECT YEAR
1
2
3
4
5
ii) Equipment, vehicles and materials
Preparation of Tender Documents
Calling Tender
Evaluation of Bids
Award of Contracts
Supply
iii) Provision of Services
DLDOs
LDCs
LDSCs
V. Institution Building
i) Civil Works
Planning & Design
Preparation Documents
Calling of Tenders
Evaluation of Bids
Award Contract
Construction
ii) Equipment & Materials
Planning & Specification
Document Preparation
Calling Tenders
Evaluation of Bids
Award Contracts
Supply

| ACTIVITIES | PROJECT YEAR 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| iii) Training | | | | | |
| In-service Training | | | | | |
| In-country Study Tours | | | | | |
| iv) Fellowship | | | | | |
| Overseas Study Tours | | | | | |
| Overseas Courses | | | | | |
| Local Courses | | | | | |
| v) Consultants | | | | | |
| Pasture/Fodder Specialist (12 mm) | | | | | |
| FMD Laboratory Management (3 mm) | | | | | |
| Bacteriologist (3 mm) | | | | | |
| Virologist (3 mm) | | | | | |
| Marketing/Milk Processing (4 mm) | | | | | |
| Artificial Breeding (6 mm) | | | | | |
| Extension/Training/Communication (3 mm) | | | | | |
| Maintenance Engineer (1 mm) | | | | | |
| Management Firm (Local) | | | | | |
| — Monitoring/Evaluation (8 mm) | | | | | |
| — Dairy Institutional Study (7 mm) | | | | | |
| — Vaccine Facility Study (6 mm) | | | | | |
| — Accounting/Auditing Services (8 mm) | | | | | |
| — Legal/Regulatory Review (4 mm) | | | | | |
| — Manpower Development ( 3mm) | | | | | |

# ASSUMPTIONS FOR THE FINANCIAL AND ECONOMIC EVALUATION

## A. Methodology Used

1. The overall economic internal rate of return (EIRR) of the Project was calculated based on the total investment as well as operating costs pertaining to this Project (exclusive of all duties and taxes) plus the related investment costs under the First Livestock Project. All other investments made under the First Livestock Project in Nepalganj area are not taken into account. Physical contingencies are included.

2. The financial internal rate of return (FIRR) for the only commercial component of the Project, i.e. the vaccine facility, was separately estimated. Investment costs include all incremental costs under the proposed Project plus the estimated "salvage value" of the fixed investment costs under the First Livestock Project.

## B. Production Parameters

3. For the EIRR, the benefits were estimated for the "with" and "without" Project situation. The annual incremental benefits derived from livestock production have been estimated mainly as a result of reduced animal mortality, increased growth rates, higher fertility and improved feed conversion. In addition, some incremental benefits from fodder (i.e. mainly berseem used as feeds) were considered after taking into account the opportunity cost of using a small portion of land (about 5 per cent of a typical farm size) that otherwise would have been utilized for crops.

4. The incremental benefits from the Project have been estimated based on a progressively increasing proportion of farms/livestock in the Project area being benefitted by the Project, as follows: (i) for the animal health component and based on the national livestock and poultry population, beginning with 2 per cent in Year 2 up to 20 per cent by Year 20 for cattle and buffaloes, up to 30 per cent for goats and up to 80 per cent for chicken; (ii) for the intensive livestock development component and based on the estimated total number of farms in the 14 districts of the Central Region, beginning with 2 per cent in Year 1 up to 20 per cent by Year 20; and (iii) for the animal breeding component and based on the estimated cattle and buffalo population in the entire Central Region (except two districts), beginning with less than 1 per cent in Year 1 up to 10 per cent by Year 20.

5. The incremental revenues for the FIRR of the vaccine facility at Tripureshwar was based on progressive utilization of its production capacity assuming a 300-day/8 hour shift operation.

## C. Prices

### 1. Financial Prices

6. Prevailing market prices of inputs and outputs in the Project area at the time of appraisal have been used. For the FIRR on the vaccine

facility, selling prices were assumed at 20 per cent of the prevailing prices (June 1985) of imported vaccines from India in Year 1 and increasing progressively to 40 per cent, 60 per cent, 80 per cent and 100 per cent in subsequent years up to Year 5 when a parity price is assumed. The cost of production by type of vaccine was calculated taking into account consultants' estimate and DLDAH's experience at Tripureshwar.

2. Economic Prices

7. Duties and taxes on the investment costs were excluded. A Standard Conversion Factor (SCF) of 0.90 was applied on the financial prices of Project outputs such as meat, milk and eggs. As regards local investment costs and labor costs (as inputs), the SCF was not applied to be conservative. For the EIRR on the vaccine facility, the full imported price was applied from Year 1.

D. Economic Life

8. It was assumed that the economic life of the entire Project will be 20 years with provisions for periodic replacement of equipment and transport during this period. For the vaccine facility, the economic life is assumed to be 15 years.

F. Others

9. Detailed assumptions are given in tables as follows:

Table 1.0. Economic Internal Rate of Return of the Project (Overall)
1.2. Estimated Livestock Benefits by Component (Summary)
2.0. Incremental Livestock Benefits from Animal Health Component (Buffalo)
2.1. Incremental Livestock Benefits from Animal Health Component (Cattle)
2.2. Incremental Livestock Benefits from Animal Health Component (Goats)
2.3. Incremental Livestock Benefits from Animal Health Component (Chicken)
3.0. Incremental Livestock Benefits from Intensive Livestock Development Component (Livestock)
3.1. Incremental Crop Benefits from Intensive Livestock Development Component (Crops)
3.2. Typical Farm Model (Terai)
3.3. Typical Farm Model (Hills)
3.4. Typical Farm Model (Livestock)
4.0. Incremental Livestock Benefits from Breeding Component (Buffalo)
4.1. Incremental Livestock Benefits from Breeding Component (Cattle)
5.0. Financial/Economic Unit Prices Used
6.0. EIRR Calculation - Vaccine Facility
6.1. FIRR Calculation - Vaccine Facility
6.2. Projected Income Statement - Vaccine Facility
6.3. Estimated Unit Cost of Production - by Type of Vaccine

Table 1.0. Economic Internal Rate of Return of the Project
(Rs Million)

| Project Year | Investment Costs Institution | Investment Costs Farm | On-Farm P/Costs [b] | Increm. Benefits Crops | Increm. Benefits Livestock | Net Increm. Benefits |
|---|---|---|---|---|---|---|
| 0 | 194.9 [a] | 0.0 | 0.0 | 0.0 | 0.0 | -194.9 |
| 1 | 11.7 | 62.3 | 8.8 | 0.9 | 31.6 | -50.5 |
| 2 | 47.1 | 62.3 | 26.9 | 1.3 | 103.2 | -31.8 |
| 3 | 70.6 | 62.3 | 21.9 | 1.6 | 120.2 | -33.0 |
| 4 | 82.3 | 62.3 | 46.4 | 2.0 | 154.2 | -34.8 |
| 5 | 23.5 | 62.3 | 46.8 | 2.3 | 202.2 | 71.9 |
| 6 | | 62.3 | 47.4 | 3.2 | 245.1 | 138.6 |
| 7 | 0.5 | 62.3 | 75.6 | 4.2 | 340.5 | 206.3 |
| 8 | 0.7 | 62.3 | 93.0 | 5.1 | 438.1 | 287.2 |
| 9 | 1.1 | 62.3 | 100.4 | 6.0 | 519.1 | 361.3 |
| 10 | | 62.3 | 128.6 | 7.0 | 624.1 | 440.2 |
| 11 | | 15.6 | 137.2 | 7.2 | 723.3 | 577.7 |
| 12 | 0.5 | 15.6 | 128.2 | 7.4 | 762.3 | 625.4 |
| 13 | 0.7 | 15.6 | 148.1 | 7.7 | 833.5 | 676.8 |
| 14 | 1.1 | 15.6 | 149.4 | 7.9 | 904.4 | 746.2 |
| 15 | | 15.6 | 140.3 | 8.1 | 950.9 | 803.1 |
| 16 | | 15.6 | 158.9 | 8.4 | 1022.4 | 856.3 |
| 17 | 2.1 | 15.6 | 159.9 | 8.6 | 1096.5 | 927.5 |
| 18 | 5.5 | 15.6 | 150.3 | 8.8 | 1149.3 | 986.7 |
| 19 | 2.7 | 15.6 | 169.0 | 9.0 | 1235.7 | 1057.4 |
| 20 | -28.1 | 15.6 | 170.1 | 9.3 | 1325.9 | 1177.6 |

EIRR = 32.7 %

[a] Includes Rs 190 million in investment cost under the First Livestock Project (excluding Nepalganj).
[b] Represents estimated production costs of participating farmers in the intensive livestock development components of the Project.

Table 1.2. Total Estimated Economic Value of Livestock Benefits [b]
(Rs million)

| Year | Cattle A.I. | Cattle A/Health | Buffalo ILD | Buffalo A.I. | Buffalo A/Health | Goat ILD | Goat A/Health | Chicken ILD | Chicken A/Health | Total Eco. Value |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 0.0 | 14.7 | 0.0 | 0.0 | 1.0 | 2.8 | 0.6 | 12.5 | 31.6 |
| 2 | 0.0 | 0.0 | 81.1 | 0.0 | 0.0 | 1.6 | 5.7 | 1.0 | 13.8 | 103.2 |
| 3 | 0.0 | 0.0 | 96.7 | 0.0 | 0.0 | -1.4 | 8.6 | 1.3 | 15.0 | 120.2 |
| 4 | 0.0 | 1.4 | 122.4 | 0.0 | 3.2 | -2.3 | 11.6 | 1.6 | 16.3 | 154.2 |
| 5 | 1.6 | 2.9 | 157.3 | 0.0 | 6.7 | 0.3 | 13.9 | 1.9 | 17.6 | 202.2 |
| 6 | 4.3 | 5.7 | 182.0 | 0.4 | 13.6 | 1.4 | 16.3 | 2.6 | 18.8 | 245.1 |
| 7 | 8.0 | 8.9 | 255.1 | 1.2 | 21.3 | 3.8 | 18.7 | 3.4 | 20.1 | 340.5 |
| 8 | 14.5 | 12.3 | 329.2 | 2.2 | 29.9 | 3.3 | 21.1 | 4.2 | 21.4 | 438.1 |
| 9 | 22.7 | 16.0 | 385.3 | 3.0 | 39.2 | 1.6 | 23.6 | 5.0 | 22.7 | 519.1 |
| 10 | 32.2 | 19.9 | 458.4 | 4.6 | 49.4 | 2.8 | 26.9 | 5.8 | 24.1 | 624.1 |
| 11 | 44.4 | 24.2 | 521.5 | 6.5 | 60.4 | 4.5 | 30.2 | 6.2 | 25.4 | 723.3 |
| 12 | 58.5 | 29.0 | 520.9 | 8.6 | 72.5 | 6.1 | 33.6 | 6.4 | 26.7 | 762.3 |
| 13 | 74.4 | 34.4 | 546.9 | 11.4 | 85.8 | 8.9 | 37.0 | 6.6 | 28.1 | 833.5 |
| 14 | 93.1 | 39.0 | 572.2 | 14.4 | 97.1 | 11.8 | 40.5 | 6.8 | 99.5 | 904.4 |
| 15 | 114.3 | 44.2 | 571.7 | 17.8 | 109.3 | 13.4 | 42.4 | 7.0 | 30.8 | 950.9 |
| 16 | 137.1 | 48.4 | 597.7 | 21.4 | 119.1 | 14.9 | 44.4 | 7.2 | 32.2 | 1022.4 |
| 17 | 162.7 | 53.9 | 623.0 | 25.2 | 129.9 | 14.3 | 46.5 | 7.4 | 33.6 | 1096.5 |
| 18 | 190.9 | 60.5 | 622.4 | 29.0 | 141.7 | 13.6 | 48.5 | 7.6 | 35.1 | 1149.3 |
| 19 | 221.4 | 68.2 | 648.5 | 33.0 | 154.5 | 15.2 | 50.6 | 7.8 | 36.5 | 1235.7 |
| 20 | 254.3 | 77.2 | 673.8 | 38.2 | 168.3 | 16.7 | 51.5 | 8.0 | 37.9 | 1325.9 |

[b] For the estimated technical parameters used, see Appendix 2, Table 5.2

Notes: A.I. = Artificial Insemination
A/Health = Animal Health
ILD = Intensive Livestock Development

Table 2.0. Incremental Benefits from Animal Health Component from Buffalo

| Year | Prop. Total Buffalo Benefitted (%) | No. of Buffalo Benefitted ('000) | Increm. Meat per 100 Head (tons LW) | Total Increm. Meat (tons) | Value Total Increm. Meat (Rs M) | Increm. Milk per 1000 Head (tons) | Total Increm. Milk (tons) | Value Total Increm. Milk (Rs M) |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 2.0 | 56.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 4.0 | 112.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 6.0 | 168.6 | 3.2 | 178.3 | 1.6 | 7.7 | 435.2 | 1.6 |
| 5 | 8.0 | 224.8 | 3.5 | 377.1 | 3.4 | 7.7 | 870.4 | 3.3 |
| 6 | 10.0 | 281.0 | 7.2 | 781.6 | 7.0 | 15.5 | 1740.9 | 6.6 |
| 7 | 12.0 | 337.2 | 8.2 | 1241.0 | 11.2 | 16.9 | 2692.9 | 10.2 |
| 8 | 14.0 | 393.4 | 9.2 | 1755.2 | 15.8 | 18.4 | 3726.5 | 14.1 |
| 9 | 16.0 | 449.6 | 10.1 | 2324.3 | 20.9 | 19.8 | 4841.7 | 18.3 |
| 10 | 18.0 | 505.8 | 11.1 | 2948.3 | 26.5 | 21.3 | 6038.6 | 22.8 |
| 11 | 20.0 | 562.0 | 12.1 | 3627.0 | 32.6 | 23.0 | 7330.6 | 27.7 |
| 12 | 20.0 | 562.0 | 13.1 | 4360.7 | 39.2 | 26.1 | 8799.5 | 33.3 |
| 13 | 20.0 | 562.0 | 14.0 | 5149.2 | 46.3 | 29.3 | 10445.1 | 39.5 |
| 14 | 20.0 | 562.0 | 15.0 | 5814.2 | 52.3 | 32.4 | 11832.4 | 44.7 |
| 15 | 20.0 | 562.0 | 16.0 | 6513.6 | 58.6 | 35.6 | 13396.4 | 50.6 |
| 16 | 20.0 | 562.0 | 17.0 | 7062.1 | 63.6 | 38.5 | 14688.4 | 55.5 |
| 17 | 20.0 | 562.0 | 17.2 | 7569.5 | 68.1 | 46.2 | 16334.1 | 61.7 |
| 18 | 20.0 | 562.0 | 17.6 | 8042.6 | 72.4 | 54.0 | 18333.3 | 69.3 |
| 19 | 20.0 | 562.0 | 17.8 | 8474.5 | 76.3 | 61.7 | 20686.2 | 78.2 |
| 20 | 20.0 | 562.0 | 18.2 | 8872.3 | 79.9 | 69.5 | 23392.5 | 88.4 |

Table 2.1. Incremental Benefits from Animal Health Component from Cattle

| Year | Prop. Total Cattle Benefitted (%) | No. of Cattle Benefitted ('000) | Incremental Milk per 1000 Head (tons) | Value Total Incremental Milk (tons) | Total Increm. Milk (Rs M) |
|---|---|---|---|---|---|
| 1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 2.0 | 124.6 | 0.0 | 0.0 | 0.0 |
| 3 | 4.0 | 249.2 | 0.0 | 0.0 | 0.0 |
| 4 | 6.0 | 373.8 | 3.2 | 398.7 | 1.4 |
| 5 | 8.0 | 498.4 | 3.2 | 797.4 | 2.9 |
| 6 | 10.0 | 623.0 | 6.4 | 1594.9 | 5.7 |
| 7 | 12.0 | 747.6 | 7.0 | 2467.0 | 8.9 |
| 8 | 14.0 | 872.2 | 7.6 | 3414.0 | 12.3 |
| 9 | 16.0 | 996.8 | 8.2 | 4435.8 | 16.0 |
| 10 | 18.0 | 1121.4 | 8.8 | 5532.2 | 19.9 |
| 11 | 20.0 | 1246.0 | 9.5 | 6715.9 | 24.2 |
| 12 | 20.0 | 1246.0 | 10.8 | 8061.6 | 29.0 |
| 13 | 20.0 | 1246.0 | 12.1 | 9569.3 | 34.4 |
| 14 | 20.0 | 1246.0 | 13.4 | 10840.2 | 39.0 |
| 15 | 20.0 | 1246.0 | 14.7 | 12273.1 | 44.2 |
| 16 | 20.0 | 1246.0 | 15.9 | 13456.8 | 48.4 |
| 17 | 20.0 | 1246.0 | 19.1 | 14964.5 | 53.9 |
| 18 | 20.0 | 1246.0 | 22.3 | 16796.1 | 60.5 |
| 19 | 20.0 | 1246.0 | 25.5 | 18951.7 | 68.2 |
| 20 | 20.0 | 1246.0 | 28.7 | 21431.2 | 77.2 |

Table 2.2. Incremental Benefits from Animal Health Component from Goats

| Year | Prop. Total Goats Benefitted (%) | No. of Goats Benefitted ('000) | Incremental Meat per 1000 Head (tons) | Total Incremental Meat (tons) | Value Total Increm. Meat (Rs M) |
|---|---|---|---|---|---|
| 1 | 0.0 | 0.0 | 2.50 | 240.5 | 2.8 |
| 2 | 2.0 | 96.2 | 2.55 | 485.8 | 5.7 |
| 3 | 4.0 | 192.4 | 2.60 | 735.9 | 8.6 |
| 4 | 6.0 | 288.6 | 2.65 | 990.9 | 11.6 |
| 5 | 8.0 | 384.8 | 2.70 | 1185.8 | 13.9 |
| 6 | 9.5 | 457.0 | 2.75 | 1389.1 | 16.3 |
| 7 | 11.0 | 529.1 | 2.80 | 1596.1 | 18.7 |
| 8 | 12.5 | 601.3 | 2.85 | 1806.7 | 21.1 |
| 9 | 14.0 | 673.4 | 2.90 | 2020.9 | 23.6 |
| 10 | 15.5 | 745.6 | 2.95 | 2298.6 | 26.9 |
| 11 | 17.5 | 841.8 | 3.00 | 2581.2 | 30.2 |
| 12 | 19.5 | 938.0 | 3.05 | 2868.7 | 33.6 |
| 13 | 21.5 | 1034.2 | 3.10 | 3160.9 | 37.0 |
| 14 | 23.5 | 1130.4 | 3.15 | 3457.9 | 40.5 |
| 15 | 25.5 | 1226.6 | 3.20 | 3627.2 | 42.4 |
| 16 | 26.4 | 1269.8 | 3.25 | 3798.7 | 44.4 |
| 17 | 27.3 | 1313.1 | 3.30 | 3972.4 | 46.5 |
| 18 | 28.2 | 1356.4 | 3.35 | 4148.2 | 48.5 |
| 19 | 29.1 | 1399.7 | 3.40 | 4326.2 | 50.6 |
| 20 | 30.0 | 1443.0 | 3.45 | 4398.3 | 51.5 |

Table 2.3. Incremental Benefits from Animal Health Component from Chicken

| Year | Prop. Total Chicken Benefitted (%) | No. of Chicken Benefitted ('000) | Increm. Meat per 1000 Head (kgs LW) | Total Increm. Meat (mt) | Value Total Increm. Meat (Rs M) | Increm. Egg per 1000 bird ('000 eggs) | Total Increm. Eggs ('000 eggs) | Value Total Increm. Eggs (Rs M) | Total Value Meat & Eggs (Rs M) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 30.00 | 3.000 | 500.0 | 1500.0 | 12.5 | 30.0 | 90.0 | 0.1 | 12.5 |
| 2 | 32.65 | 3.265 | 505.0 | 1647.5 | 13.7 | 30.5 | 99.5 | 0.1 | 13.8 |
| 3 | 35.30 | 3.530 | 510.0 | 1796.3 | 14.9 | 31.1 | 109.2 | 0.1 | 15.0 |
| 4 | 37.95 | 3.795 | 515.0 | 1946.5 | 16.2 | 31.6 | 119.0 | 0.1 | 16.3 |
| 5 | 40.60 | 4.060 | 520.0 | 2098.0 | 17.4 | 32.1 | 129.0 | 0.1 | 17.6 |
| 6 | 43.25 | 4.325 | 525.0 | 2250.8 | 18.7 | 32.6 | 139.0 | 0.2 | 18.8 |
| 7 | 45.90 | 4.590 | 530.0 | 2404.9 | 20.0 | 33.2 | 149.3 | 0.2 | 20.1 |
| 8 | 48.55 | 4.855 | 535.0 | 2560.3 | 21.3 | 33.7 | 159.6 | 0.2 | 21.4 |
| 9 | 51.20 | 5.120 | 540.0 | 2717.1 | 22.6 | 34.2 | 170.1 | 0.2 | 22.7 |
| 10 | 53.85 | 5.385 | 545.0 | 2875.2 | 23.9 | 34.7 | 180.8 | 0.2 | 24.1 |
| 11 | 56.50 | 5.650 | 550.0 | 3034.6 | 25.2 | 35.3 | 191.6 | 0.2 | 25.4 |
| 12 | 59.15 | 5.915 | 555.0 | 3195.4 | 26.5 | 35.8 | 202.5 | 0.2 | 26.7 |
| 13 | 61.80 | 6.180 | 560.0 | 3357.5 | 27.9 | 36.3 | 213.6 | 0.2 | 28.1 |
| 14 | 64.45 | 6.445 | 565.0 | 3520.9 | 29.2 | 36.8 | 224.8 | 0.2 | 29.5 |
| 15 | 67.10 | 6.710 | 570.0 | 3685.6 | 30.6 | 37.4 | 236.1 | 0.3 | 30.8 |
| 16 | 69.75 | 6.975 | 575.0 | 3851.6 | 32.0 | 37.9 | 247.6 | 0.3 | 32.2 |
| 17 | 72.40 | 7.240 | 580.0 | 4019.0 | 33.4 | 38.4 | 259.2 | 0.3 | 33.6 |
| 18 | 75.05 | 7.505 | 585.0 | 4187.7 | 34.8 | 39.0 | 271.0 | 0.3 | 35.1 |
| 19 | 77.70 | 7.770 | 590.0 | 4357.7 | 36.2 | 39.5 | 282.9 | 0.3 | 36.5 |
| 20 | 80.35 | 8.035 | 595.0 | 4529.1 | 37.6 | 40.0 | 294.9 | 0.3 | 37.9 |

Table 3.0. Incremental Benefits from Intensive Livestock Development Component Farm Model (Livestock)

| Year | Prop. Total Farms Benefitted (%) | No. of Farms Benefitted ('000) | Incremental Livestock Benefit Per Farm (Rs) | Total Incremental Livestock Benefits (Rs M) |
|---|---|---|---|---|
| 1 | 2.00 | 11.60 | 1399.2 | 16.2 |
| 2 | 2.75 | 15.95 | 6685.0 | 83.6 |
| 3 | 3.50 | 20.30 | 5287.0 | 96.5 |
| 4 | 4.25 | 24.65 | 5481.0 | 121.7 |
| 5 | 5.00 | 29.00 | 6685.0 | 159.6 |
| 6 | 7.00 | 40.60 | 5584.0 | 186.0 |
| 7 | 9.00 | 52.20 | 5886.0 | 262.3 |
| 8 | 11.00 | 63.80 | 6793.0 | 336.7 |
| 9 | 13.00 | 75.40 | 5574.0 | 391.9 |
| 10 | 15.00 | 87.00 | 5778.0 | 466.9 |
| 11 | 15.50 | 89.90 | 6793.0 | 532.2 |
| 12 | 16.00 | 92.80 | 5682.0 | 533.3 |
| 13 | 16.50 | 95.70 | 5778.0 | 562.4 |
| 14 | 17.00 | 98.60 | 6685.0 | 590.8 |
| 15 | 17.50 | 101.50 | 5682.0 | 592.0 |
| 16 | 18.00 | 104.40 | 5886.0 | 619.7 |
| 17 | 18.50 | 107.30 | 6685.0 | 644.6 |
| 18 | 19.00 | 110.20 | 5574.0 | 643.6 |
| 19 | 19.50 | 113.10 | 5886.0 | 671.4 |
| 20 | 20.00 | 116.00 | 6793.0 | 698.5 |

Table 3.1. Incremental Benefits from Intensive Livestock Development Component Farm Model (Crops)

| Year | Prop. Total Farms Benefitted (%) | No. of Farms Benefitted ('000) | Gross Incremental Crop Benefit (Rs) | Total Incremental Crop Benefits (Rs M) |
|---|---|---|---|---|
| 1 | 2.00 | 11.60 | 80.0 | 0.9 |
| 2 | 2.75 | 15.95 | 80.0 | 1.3 |
| 3 | 3.50 | 20.30 | 80.0 | 1.6 |
| 4 | 4.25 | 24.65 | 80.0 | 2.0 |
| 5 | 5.00 | 29.00 | 80.0 | 2.3 |
| 6 | 7.00 | 40.60 | 80.0 | 3.2 |
| 7 | 9.00 | 52.20 | 80.0 | 4.2 |
| 8 | 11.00 | 63.80 | 80.0 | 5.1 |
| 9 | 13.00 | 75.40 | 80.0 | 6.0 |
| 10 | 15.00 | 87.00 | 80.0 | 7.0 |
| 11 | 15.50 | 89.90 | 80.0 | 7.2 |
| 12 | 16.00 | 92.80 | 80.0 | 7.4 |
| 13 | 16.50 | 95.70 | 80.0 | 7.7 |
| 14 | 17.00 | 98.60 | 80.0 | 7.9 |
| 15 | 17.50 | 101.50 | 80.0 | 8.1 |
| 16 | 18.00 | 104.40 | 80.0 | 8.4 |
| 17 | 18.50 | 107.30 | 80.0 | 8.6 |
| 18 | 19.00 | 110.20 | 80.0 | 8.8 |
| 19 | 19.50 | 113.10 | 80.0 | 9.0 |
| 20 | 20.00 | 116.00 | 80.0 | 9.3 |

Table 3.2. Annual Inputs and Outputs Valued at Economic Prices
(Farm Model - Terai)

| | WITHOUT THE PROJECT | | | | | WITH THE PROJECT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Area Cultivated | Yield Kg/ha | Total Kg Yield | Price Rs/ Unit | Total Value | Area Cultivated | Yield Kg/ha | Total Kg Yield | Price Rs/ Unit | Total Value |
| REVENUE FROM CROPS | | | | | REVENUES | | | | | |
| CASH CROPS | | | | | | | | | | |
| Main paddy | 1.07 | 2000 | 2140 | 3.70 | 7918 | 1.07 | 2000 | 2140 | 3.70 | 7918 |
| Early paddy | 0.37 | 1667 | 617 | 3.70 | 2282 | 0.37 | 1667 | 617 | 3.70 | 2282 |
| Wheat | 0.46 | 1360 | 626 | 5.06 | 3166 | 0.38 | 1360 | 517 | 5.06 | 2615 |
| Maize | 0.15 | 1220 | 183 | 4.36 | 798 | 0.15 | 1220 | 183 | 4.36 | 798 |
| Pulses | 0.31 | 600 | 186 | 4.55 | 846 | 0.31 | 600 | 186 | 4.55 | 846 |
| Mustard | 0.20 | 364 | 73 | 4.55 | 331 | 0.20 | 364 | 73 | 4.55 | 331 |
| Millet | 0.10 | 1100 | 110 | 1.59 | 175 | 0.10 | 1100 | 110 | 1.59 | 175 |
| Subtotal | 2.66 | | | | 15516 | 2.58 | | | | 14965 |
| FORAGE CROPS | | | | | | | | | | |
| Berseem and etraloid | 0.00 | 0 | 0 | 0.00 | 0 | 0.08 | 45000 | 3600 | 0.17 | 616 |
| TOTAL | 2.66[a/] | | | | 15516 | 2.66[a/] | | | | 15581 |
| PRODUCTION COSTS | | | | | | | | | | |
| | Area Cultivated | Cost Per Ha | | | Total Cost | Area Cultivated | Cost Per Ha | | | Total Cost |
| CASH CROPS | | | | | | | | | | |
| Main paddy | 1.07 | 2550.00 | | | 2729 | 1.07 | 2550.00 | | | 2729 |
| Early paddy | 0.37 | 2550.00 | | | 944 | 0.37 | 2550.00 | | | 944 |
| Wheat | 0.46 | 2121.00 | | | 976 | 0.38 | 2121.00 | | | 848 |
| Maize | 0.15 | 1798.00 | | | 270 | 0.15 | 1798.00 | | | 270 |
| Pulses | 0.31 | 920.00 | | | 285 | 0.31 | 920.00 | | | 285 |
| Mustard | 0.20 | 2117.00 | | | 423 | 0.20 | 2117.00 | | | 423 |
| Millet | 0.10 | 53.00 | | | 5 | 0.10 | 53.00 | | | 5 |
| Subtotal | 2.66 | | | | 5632 | 2.58 | | | | 5504 |
| FORAGE CROPS | | | | | | | | | | |
| Berseem and etraloid | 0 | 0 | | | 0 | 0.08 | 2588 | | | 207 |
| TOTAL PRODUCTION COSTS | 2.66[a/] | | | | 5632 | 2.66[a/] | | | | 5711 |
| NET REVENUE FROM CROPS | | | | | 9885 | | | | | 9870 |

a/ Represents typical farm size of 1.6 ha with a cropping intensity of 160 per cent.

Table 3.3. Annual Inputs and Outputs Valued at Economic Prices
(Farm Model - Hills)

| | WITHOUT THE PROJECT | | | | | WITH THE PROJECT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Area Culti-vated | Yield Kg/ha | Total Kg Yield | Price Rs/ Unit | Total Value | Area Culti-vated | Yield Kg/ha | Total Kg Yield | Price Rs/ Unit | Total Value |
| REVENUE FROM CROPS | | | | | REVENUES | | | | | |
| Main paddy | 0.36 | 2000 | 720 | 4.95 | 3564 | 0.36 | 2000 | 720 | 4.95 | 3564 |
| Early paddy | 0.11 | 1958 | 215 | 4.95 | 1066 | 0.11 | 1958 | 215 | 4.95 | 1066 |
| Wheat | 0.23 | 900 | 207 | 7.23 | 1497 | 0.15 | 900 | 135 | 7.23 | 976 |
| Maize | 0.22 | 1400 | 308 | 6.54 | 2014 | 0.22 | 1400 | 308 | 6.54 | 2014 |
| Pulses | 0.02 | 700 | 14 | 6.67 | 93 | 0.02 | 700 | 14 | 6.67 | 93 |
| Mustard | 0.05 | 420 | 21 | 6.67 | 140 | 0.05 | 420 | 21 | 6.67 | 140 |
| Millet | 0.07 | 1200 | 84 | 2.38 | 200 | 0.07 | 1200 | 84 | 2.38 | 200 |
| Subtotal | 1.06 | | | | 8574 | 0.98 | | | | 8053 |
| FORAGE CROPS | | | | | | | | | | |
| Berseen and etraloid | 0.00 | 0 | 0 | 0.00 | 0 | 0.08 | 45000 | 3600 | 0.17 | 616 |
| TOTAL | 1.06[a/] | | | | 8574 | 1.06[a/] | | | | 8669 |

| | Area Culti-vated | Cost Per Ha | Total Cost | Area Culti-vated | Cost Per Ha | Total Cost |
|---|---|---|---|---|---|---|
| PRODUCTION COSTS | | | | | | |
| CASH CROPS | | | | | | |
| Main paddy | 0.36 | 3042.00 | 1095 | 0.36 | 3042.00 | 1095 |
| Early paddy | 0.11 | 3042.00 | 335 | 0.11 | 3042.00 | 335 |
| Wheat | 0.23 | 2323.00 | 534 | 0.15 | 2323.00 | 395 |
| Maize | 0.22 | 2139.00 | 471 | 0.22 | 2139.00 | 471 |
| Pulses | 0.02 | 1143.00 | 23 | 0.02 | 1143.00 | 23 |
| Mustard | 0.05 | 3625.00 | 181 | 0.05 | 3625.00 | 181 |
| Millet | 0.07 | 79.00 | 6 | 0.07 | 79.00 | 6 |
| Subtotal | 1.06 | | 2645 | 0.98 | | 2506 |
| FORAGE CROPS | | | | | | |
| Berseen and etraloid | 0 | 0 | 0 | 0.08 | 2893 | 231 |
| TOTAL PRODUCTION COSTS | 1.06[a/] | | 2645 | 1.06[a/] | | 2737 |
| NET REVENUE FROM CROPS | | | 5929 | | | 5932 |

a/ Represents typical farm size of 0.6 ha with a cropping intensity of 177 per cent.

Table 3.4. Annual Revenues from Livestock (Farm Model)
(at Economic Prices)

| | WITHOUT THE PROJECT | | | WITH THE PROJECT | | |
|---|---|---|---|---|---|---|
| | Prod.n Kgs. | Price Rs/kg LW | Total Value | Prodn. Kgs | Price Rs/kg LW | Total Value |
| Buffalo - Meat | 75 | 9.00 | 675 | 216 | 9.00 | 1944 |
| - Milk | 240 | 3.78 | 907 | 1560 | 3.78 | 5897 |
| - Manure | 6000 | 0.09 | 540 | 14000 | 0.09 | 1260 |
| Cattle - Meat | 36 | 8.24 | 296 | | | |
| - Milk | 210 | 3.60 | 756 | | | |
| - Manure | 5000 | 0.09 | 450 | | | |
| Goat - Meat | 36 | 11.70 | 421 | 41 | 11.70 | 480 |
| - Manure | 600 | 0.09 | 54 | 600 | 0.09 | 54 |
| - Culls | 6 | 11.70 | 70 | 7 | 11.70 | 82 |
| Chicken - Meat | 3 | 20.70 | 62 | 12 | 20.70 | 248 |
| - Eggs (pcs) | 95 | 1.08 | 103 | 80 | 1.08 | 86 |
| TOTAL REVENUE FROM LIVESTOCK PER YEAR | | | 4335 | | | 10051 |

Table 4.0. Incremental Benefits from Artificial Insemination Component from Buffalo

| Year | Prop. Total Buffalo Benefitted (%) | No. of Buffalo Benefitted ('000) | New C/Bred Milk Buff (Head) | Stock C/Bred Milk Buff (Head) | No. of Lactating C/Bred Buff (Head) | Incremental Yield/C/Buff (Liters) | Total Increm. Milk ('000 tons) | Value Total Increm. Milk (Rs M) |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.19 | 1.10 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 |
| 2 | 0.31 | 1.80 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 |
| 3 | 0.43 | 2.50 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 |
| 4 | 0.55 | 3.20 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 |
| 5 | 0.74 | 4.30 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 |
| 6 | 0.93 | 5.40 | 280.6 | 280.6 | 196.4 | 600.0 | 0.12 | 0.4 |
| 7 | 1.10 | 6.40 | 464.0 | 738.9 | 517.2 | 600.0 | 0.31 | 1.2 |
| 8 | 1.36 | 7.90 | 651.2 | 1375.3 | 962.7 | 600.0 | 0.58 | 2.2 |
| 9 | 1.60 | 9.30 | 842.3 | 1909.5 | 1336.7 | 600.0 | 0.80 | 3.0 |
| 10 | 1.84 | 10.70 | 1184.0 | 2774.7 | 1942.3 | 625.0 | 1.21 | 4.6 |
| 11 | 2.09 | 12.10 | 1502.3 | 3757.5 | 2630.3 | 650.0 | 1.71 | 6.5 |
| 12 | 2.34 | 13.60 | 1799.1 | 4830.3 | 3381.2 | 675.0 | 2.28 | 8.6 |
| 13 | 2.59 | 15.00 | 2271.2 | 6162.6 | 4313.8 | 700.0 | 3.02 | 11.4 |
| 14 | 2.83 | 16.40 | 2673.7 | 7529.1 | 5270.3 | 725.0 | 3.82 | 14.4 |
| 15 | 3.09 | 17.90 | 307.2 | 8952.3 | 6266.6 | 750.0 | 4.70 | 17.8 |
| 16 | 3.33 | 19.30 | 3478.7 | 10452.9 | 7317.0 | 775.0 | 5.67 | 21.4 |
| 17 | 3.57 | 20.70 | 3909.9 | 11882.5 | 8317.8 | 800.0 | 6.65 | 25.2 |
| 18 | 3.81 | 22.10 | 4312.4 | 13283.6 | 9298.5 | 825.0 | 7.67 | 29.0 |
| 19 | 4.07 | 23.60 | 4714.9 | 14656.6 | 10259.6 | 850.0 | 8.72 | 33.0 |
| 20 | 4.31 | 25.00 | 5146.1 | 16030.9 | 11221.7 | 900.0 | 10.10 | 38.2 |

Table 4.1. Incremental Benefits from Artificial Insemination Component from Cattle

| Year | Prop. Total Cattle Benefitted (%) | No. of Cattle Benefitted ('000) | New C/Bred Milk Cow (Head) | Stock C/Bred Milk Cow (Head) | No. of Lactating C/Bred Cow (Head) | Incremental Yield/C/Cow (Liters) | Total Increm. Milk ('000 tons) | Value Total Increm. Milk (Rs M) |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.44 | 3.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 |
| 2 | 0.74 | 5.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 |
| 3 | 1.03 | 7.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 |
| 4 | 1.32 | 9.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 |
| 5 | 1.76 | 12.00 | 805.5 | 805.5 | 563.9 | 800.0 | 0.45 | 1.6 |
| 6 | 2.21 | 15.00 | 1342.5 | 2131.8 | 1492.3 | 800.0 | 1.19 | 4.3 |
| 7 | 2.65 | 18.00 | 1899.2 | 3988.4 | 2791.9 | 800.0 | 2.23 | 8.0 |
| 8 | 3.24 | 22.00 | 2467.6 | 6376.3 | 4463.4 | 900.0 | 4.02 | 14.5 |
| 9 | 3.82 | 26.00 | 3406.2 | 9655.0 | 6758.5 | 933.3 | 6.31 | 22.7 |
| 10 | 4.41 | 30.00 | 4302.1 | 13227.0 | 9258.9 | 966.7 | 8.95 | 32.2 |
| 11 | 5.00 | 34.00 | 5216.4 | 17622.1 | 12335.4 | 1000.0 | 12.34 | 44.4 |
| 12 | 5.59 | 38.00 | 6520.4 | 23221.7 | 16255.2 | 1000.0 | 16.26 | 58.5 |
| 13 | 6.18 | 42.00 | 7706.0 | 29524.6 | 20667.2 | 1000.0 | 20.67 | 74.4 |
| 14 | 6.76 | 46.00 | 8891.5 | 36929.7 | 25850.8 | 1000.0 | 25.85 | 93.1 |
| 15 | 7.35 | 50.00 | 10077.0 | 45353.9 | 31747.8 | 1000.0 | 31.75 | 114.3 |
| 16 | 7.94 | 54.00 | 11262.6 | 54405.4 | 38083.7 | 1000.0 | 38.08 | 137.1 |
| 17 | 8.53 | 58.00 | 12448.1 | 64579.8 | 45205.9 | 1000.0 | 45.21 | 162.7 |
| 18 | 9.12 | 62.00 | 13633.6 | 75736.3 | 53015.4 | 1000.0 | 53.02 | 190.9 |
| 19 | 9.71 | 66.00 | 14818.2 | 87855.2 | 61498.7 | 1000.0 | 61.50 | 221.4 |
| 20 | 10.29 | 70.00 | 16004.7 | 100917.3 | 70642.1 | 1000.0 | 70.64 | 254.3 |

Table 5.0. Financial and Economic Unit Prices of Livestock Inputs and Outputs (1985 Prices)

| | Unit | Financial | | Economic | |
|---|---|---|---|---|---|
| | | Terai | Hill | Terai | Hill |
| **INPUTS** | | | | | |
| 1. Concentrates | kg | 3.00 | 4.00 | 3.00 | 4.00 |
| 2. Green Fodder | kg | 0.10 | 0.10 | 0.10 | 0.10 |
| 3. Paddy Straw | kg | 0.10 | 0.10 | 0.10 | 0.10 |
| 4. Minerals and Salt | kg | 2.00 | 2.00 | 2.00 | 2.00 |
| 5. Labor | hr | 1.15 | 1.27 | 1.15 | 1.27 |
| **OUTPUTS** | | | | | |
| 1. Buffalo Milk | liter | 4.20 | 4.20 | 3.78 | 3.78 |
| 2. Cow Milk | liter | 4.00 | 4.00 | 3.60 | 3.60 |
| 3. Buffalo Meat (LW) | kg | 10 | 10 | 9 | 9 |
| 4. Goat Meat (LW) | kg | 13 | 13 | 11.70 | 11.70 |
| 5. Chicken (LW) | kg | 23.00 | 23.00 | 20.70 | 20.70 |
| 6. Eggs | pc | 1.20 | 1.20 | 1.08 | 1.08 |
| 7. Manure | kg | 0.10 | 0.10 | 0.09 | 0.09 |

Note: Standard conversion factor of 0.90 was used to convert financial prices to economic prices.

Table 6.0. EIRR Calculation - Vaccine Facility
(Rs'000)

| Year | Investment Cost a/ | Production Costs | Benefits b/ | Net Benefits |
|---|---|---|---|---|
| 1 | 5570 | 1955 | 1697 | -5828 |
| 2 | 1500 | 2103 | 2309 | -1294 |
| 3 | 1500 | 2250 | 2982 | -768 |
| 4 | 1500 | 2398 | 3518 | -380 |
| 5 | 1000 | 2546 | 4058 | 512 |
| 6 | 1201 | 2688 | 4512 | 623 |
| 7 | - | 2831 | 4967 | 2136 |
| 8 | - | 2973 | 5422 | 2449 |
| 9 | - | 3116 | 5877 | 2761 |
| 10 | - | 3259 | 6332 | 3073 |
| 11 | 201 | 3259 | 6332 | 2872 |
| 12 | - | 3259 | 6332 | 3073 |
| 13 | - | 3259 | 6332 | 3073 |
| 14 | - | 3259 | 6332 | 3073 |
| 15 | -8500 | 3259 | 6332 | 11573 |

EIRR = 16 %

Table 6.1. FIRR Calculation - Vaccine Facility
(Rs'000)

| Year | Investment Cost a/ | Production Costs | Benefits c/ | Net Benefits |
|---|---|---|---|---|
| 1 | 5570 | 1955 | 339 | -7186 |
| 2 | 1500 | 2103 | 924 | -2679 |
| 3 | 1500 | 2250 | 1789 | -1961 |
| 4 | 1500 | 2398 | 2815 | -1083 |
| 5 | 1000 | 2546 | 4058 | 512 |
| 6 | 1201 | 2688 | 4512 | 623 |
| 7 | - | 2831 | 4967 | 2136 |
| 8 | - | 2973 | 5422 | 2449 |
| 9 | - | 3116 | 5877 | 2761 |
| 10 | - | 3259 | 6332 | 3073 |
| 11 | 201 | 3259 | 6332 | 2872 |
| 12 | - | 3259 | 6332 | 3073 |
| 13 | - | 3259 | 6332 | 3073 |
| 14 | - | 3259 | 6332 | 3073 |
| 15 | -8500 | 3259 | 6332 | 11573 |

FIRR = 10.0 %

a/ Comprises "salvage value" of investment costs under First Livestock Project plus incremental investment costs (including working capital provision) under the proposed Project for Years 1-6. For Years 6 and 11, figures include replacement cost of various equipment; and for Year 15, the reimbursement of the working capital provision and the salvage value of the investment costs.

b/ Assuming benefits are based on the full imported price from Year 1 onwards.

c/ Assuming benefits from Year 1 to Year 4 are based on 20%, 40%, 60% and 80% of full price of equivalent imported vaccines and Year 5 onwards at full price.

Table 6.2. Projected Income Statement - Vaccine Utility
(In Rs'000)

| | 1st Year | 5th Year | 10th Year | 15th Year |
|---|---|---|---|---|
| A. Revenues (Value of Vaccine Production) | | | | |
| Rinderpest | 15 | 363 | 363 | 363 |
| HS | 257 | 2409 | 4015 | 4015 |
| NCD | 99 | 1320 | 1980 | 1980 |
| FP | 40 | 248 | 396 | 396 |
| BQ | 14 | 169 | 282 | 282 |
| Subtotal | 424 | 4508 | 7036 | 7036 |
| Less: Handling Losses | 85 | 451 | 704 | 704 |
| B. Net Revenues | 339 | 4058 | 6332 | 6332 |
| C. Operating Costs | | | | |
| Indirect Labor | 203 | 203 | 203 | 203 |
| Direct Labor | 317 | 457 | 632 | 632 |
| Laboratory Materials | 156 | 289 | 437 | 437 |
| Quality Control | 8 | 14 | 22 | 22 |
| Packaging Materials | 241 | 528 | 790 | 790 |
| Repair & Maintenance | 615 | 615 | 615 | 615 |
| Rent | 382 | 382 | 382 | 382 |
| Utilities | 33 | 57 | 178 | 178 |
| Total Operating Costs | 1955 | 2546 | 3259 | 3259 |
| D. Other Operating Costs | | | | |
| Depreciation | 1818 | 1818 | 1854 | 1890 |
| Interest | 0 | 918 | 692 | 159 |
| Total Other Operating Costs | 1818 | 2736 | 2546 | 2049 |
| E. Profit (Loss) Before Tax | -3434 | -1224 | 527 | 1024 |

Table 6.3. Estimated Unit Cost of Production by Type of Vaccine
(Rs)

| | R'Pest | HS | NCD | FP | BQ | Total |
|---|---|---|---|---|---|---|
| A. Operating Costs | | | | | | |
| Indirect Labor | 10,679 | 118,119 | 58,250 | 7,767 | 8,285 | 203,100 |
| Direct Labor | 33,268 | 367,966 | 181,463 | 24,195 | 25,808 | 632,700 |
| Laboratory Materials | 57,000 | 285,000 | 68,400 | 13,300 | 13,300 | 437,000 |
| Quality Control | 2,850 | 14,250 | 3,420 | 665 | 665 | 21,850 |
| Packaging Materials | 58,900 | 294,503 | 342,000 | 57,000 | 38,000 | 790,403 |
| Repair & Maintenance | 32,361 | 357,927 | 176,412 | 23,535 | 25,104 | 615,438 |
| Rent | 20,074 | 222,036 | 109,497 | 14,600 | 15,573 | 381,780 |
| Utilities | 9,338 | 103,289 | 50,937 | 6,792 | 7,244 | 177,600 |
| Subtotal | 224,470 | 1,763,089 | 990,379 | 147,854 | 133,979 | 3,259,871 |
| B. Other Operating Costs | | | | | | |
| Depreciation | 95,600 | 1,057,395 | 521,455 | 69,527 | 74,162 | 1,818,139 |
| Interest | 24,511 | 271,103 | 133,694 | 17,826 | 19,014 | 466,148 |
| Subtotal | 120,111 | 1,328,498 | 655,149 | 87,353 | 93,176 | 2,284,287 |
| Total Operating Costs | 344,581 | 3,091,587 | 1,645,528 | 235,207 | 227,155 | 5,544,159 |
| Volume of Production ('000 doses) | 1,500 | 2, 500 | 12,000 | 2,400 | 200 | 18,600 |
| Unit Cost/Dose (cash cost basis) | 0.15 | 0.71 | 0.08 | 0.06 | 0.67 | |
| Unit Cost/Dose (cash cost plus depreciation) | 0.21 | 1.13 | 0.13 | 0.09 | 1.04 | |
| Unit Cost/Dose (total cost basis) | 0.23 | 1.24 | 0.14 | 0.10 | 1.14 | |
| Unit Price of Imported Vaccine (per dose) | 0.24 | 1.61 | 0.17 | 0.11 | 1.41 | |