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Appraisal of Rajasthan Dairy Development Project in India

November 4, 1974

South Asia Projects Department
General Agricultural Division

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CURRENCY EQUIVALENTS

US\$1	=	Rs	8.00
Rs 1	=	US\$	0.125
Rs 1,000,000	=	US\$125,000.00	

WEIGHT AND MEASURES

Metric System

ABBREVIATIONS

AI	-	Artificial Insemination
AMUL	-	Anand Milk Union Limited (Kaira)
ARC	-	Agricultural Refinance Corporation
BVVI	-	Biological Veterinary Vaccine Institute
CCB	-	Central Cooperative Banks
CVAS	-	College of Veterinary and Animal Sciences
DCS	-	Dairy Cooperative Society
DLAB	-	Diagnostic Laboratory
GOI	-	Government of India
GOR	-	Government of Rajasthan
IDC	-	Indian Dairy Corporation
LDB	-	Land Development Bank (Rajasthan State Cooperative Bank System)
PSG	-	Project Supervision Group
RDDC	-	Rajasthan Dairy Development Corporation
NDDB	-	National Dairy Development Board
NDRI	-	National Dairy Research Institute
PLDB	-	Primary Land Development Banks
RBI	-	Reserve Bank of India
RSCB	-	Rajasthan State Cooperative Bank
l	-	Liter

FISCAL YEAR

July 1 - June 30

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

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This report is based on the findings of an appraisal mission which visited India from March 11, 1974 to April 12, 1974. The mission was composed of Messrs. C. Wolffelt, A.K. Seth (IDA), A. Pursell, C. Percival and J.D. von Pischke (consultants). Mr. N. Krafft (IDA) also contributed to the report.

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MAP

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

SUMMARY AND CONCLUSIONS

Dairying in India

i. This project in Rajasthan will contribute to the development of Indian agriculture, which accounts for about 40% of Indian GNP and employs 70% of the total work force. Although Government of India's (GOI) emphasis in the sector in recent years has been to increase the output of foodgrains, it is attempting to diversify, where appropriate, with special attention to the dairy sub-sector. Over the past two decades there has been a marked decline in per capita consumption of milk, a primary source of animal protein for the bulk of the population. Efforts are now being made to increase milk production from 21 million tons in 1972 to 30 million by 1979. The project and its companion, the Madhya Pradesh Dairy Development Project, appraised at the same time, are the second and third of a series designed to make a significant contribution towards this target. The first was the Karnataka Dairy Development Project presented on June 13, 1974.

ii. A large proportion of the world's bovine population is in India, which has 17% of the world's cattle and 50% of its buffalo. However, indigenous varieties produce very low milk yields. Their main contribution has been to provide draft power and to support a small livestock industry accounting for 14% of the total agricultural sector's share of GNP and about 5% of total exports. To increase milk production significantly, a large-scale effort to develop higher yielding animals and expansion of animal health care and breeding facilities are required.

iii. Crossbreeding of indigenous cattle with exotic varieties to produce higher yielding dairy cattle has been conducted in India for many years, so far with only limited success. With one rather notable exception, it has not been accompanied by adequate institutional support, effective organization of small and marginal farmers (who produce most of the milk) into economically viable units, development of adequate milk collection, processing and marketing. Nor has there been adequate provision of animal health care and technical services to farmers. Few farmers use their land principally for dairy production, which is essentially a subsidiary farm activity. If a significant increase in milk production is to be achieved, additional feed must be made available or more of the available feed must be reserved for high producing animals. The demand for cereal grains as human food and the favorable export position of oilseeds and oilcake preclude any significant increase in the supply of concentrate feed for livestock. It is, therefore, important to develop animal production systems which will result in more efficient use of available supplies and encourage development of higher quality forages where these are now grown. However, by integrating leguminous fodder into the existing farming systems, higher overall crop yields would result which would largely compensate for some diversion of land to fodder.

iv. A notable bright spot in the Indian dairy picture is the successful experience over the past 25 years, of the Kaira District Cooperative Milk Producers Union Ltd (AMUL). AMUL is centered on the formation and operation of hundreds of village milk producers cooperatives (a typical member owns two buffalo and tills less than 1 ha). The village cooperatives are welded together into a cooperative Union which owns and operates facilities for milk and feed processing, collection and distribution and provides its members with a full range of technical services. The Union is responsible for setting milk prices and obligated to buy milk in any quantity from members. Thus, the farmer is assured of year round outlet for his milk at fair prices. Members are provided with a package of services which includes artificial insemination (AI) and routine veterinary health coverage, sale of concentrate feed and fodder seed, and training. The outstanding success of AMUL has encouraged GOI and several states to foster the establishment of similar programs in other parts of the country.

Status of Dairy Development in Rajasthan

v. Rajasthan, has considerable potential for dairy development due to high agricultural potential and crop yields in the eastern districts where the project is situated. Rajasthan is in the northwest of India, and is the country's second largest state in area but among the smallest six in population. It is almost the size of Spain and its population of 27 million is slightly less than that of Burma. About 73% of the population is engaged in agriculture, which in 1971/72 accounted for 40% of total state income. Of the 14.5 million ha. under cultivation, about 2.5 million ha. are irrigated. The annual 1962/63-1971/72 rate of agricultural growth during the period was 2.8%. The average holding is 6.8 ha; 60% are 2 ha. or less.

vi. In this agricultural environment dairying, although a subsidiary activity, provides many farmers with their only source of cash income. Dairy animals are mainly low yielding nondescript native types. Crossbreeding of cattle through AI was initiated in the mid-sixties, but the effectiveness of the AI and health services has been limited due to shortage of qualified personnel and facilities.

vii. The feed situation in the state is comparatively better than average for India, but there is, nevertheless, a shortage. There is considerable scope for increasing production of high quality leguminous forages by small farmers through the integration of these crops into existing farming systems.

viii. Total Rajasthan milk production is about 5 million liters per day or about 190 grams per capita, well above the national average of 112 grams per capita per day. However, dairy processing and marketing are largely undeveloped, therefore, village milk is mostly converted into ghee and only about 40% of the milk is consumed in fluid form. The only dairy plant (Government owned) in Jaipur (project area), supplies about 8% of the urban milk market.

ix. A dairy cooperative movement based on the AMUL pattern was started in 1970 in connection with the Government milk schemes to assure milk supply. The

movement is slowly picking up momentum and societies with bylaws similar to AMUL would be included in the proposed project.

The Project Description

x. The proposed IDA credit of US\$27.7 million would assist in the development of an integrated program for increasing milk production in rural areas, involving about 240,000 farm families, most of whom farm less than 2 ha or are landless, through a six-year program focusing on quality cross-breeding, animal health, increased fodder production and the development of milk collection, processing and marketing facilities. Village cattle owners would form Dairy Cooperative Societies (DCS), which would in turn be grouped into five milk producers' unions following the AMUL pattern in Gujarat. Each union would own and operate dairy and feed plants and would be capable of providing AI, animal health, training and extension, milk collection and marketing services to the DCS. In addition to the establishment of about 1,800 DCS and the five unions, a Rajasthan Dairy Development Corporation (RDDC) would also be formed to coordinate project implementation and produce purebred exotic breeding stock. The State Department of Animal Husbandry in consultation with the College of Veterinary & Animal Sciences, would operate a Biological Veterinary Vaccine Institute (BVVI), a diagnostic laboratory, with funds provided under the project. An extensive training program would also be provided. Each union would also operate an extension service involving one trained extension worker for ten DCS. Consultant services would be provided to assist RDDC in dairy engineering and plant construction, marketing of milk and dairy products, milk processing plant operation, the organization of DCS and fodder animal production. About 50 farms of progressive owners would be improved for demonstration purposes in fodder production, crossbred rearing and milking hygiene.

The Project Implementation

xi. The RDDC would be the main body for implementation and coordination of project activities and would play an essential role in the initial establishment of dairy cooperative societies and milk producers' unions. RDDC would build dairy plants and other facilities under the project for the Unions which would operate them once they are adequately capitalized and staffed and a sufficient number of DCS's organized.

xii. RDDC would engage the National Dairy Development Board (NDDB) to help in recruitment, training and field supervision of each spearhead team and the union staff. The NDDB would also assist RDDC in design and construction of milk and feed plants and carry out marketing studies to determine plant product mix capacities, prepare specifications for requesting construction bids, and supervise construction.

xiii. Total estimated project cost is US\$51.8 million equivalent including duties and taxes and the foreign exchange component of US\$12.7 million is about 25%. The proposed IDA credit of US\$27.7 million would cover 53% of total project cost. The remaining 47% would be financed by GOI (16%), GOR (19%), ARC and participating banks (11% and farmers (1%). IDA funds would be

channelled in two ways. (i) Credit funds for union and RDDC investments in facilities, totalling US\$22.3 million, would be made available by GOI to the Agricultural Refinance Corporation (ARC) repayable over 15 years at 7.5% annual interest, minimum. GOI would bear the exchange risk. ARC would in turn on-lend the funds to participating banks at a minimum annual interest rate of 8%. The banks would lend to RDDC and the unions at 11% per annum minimum. Loans to the unions and RDDC would have upto 6 years grace and repayment over 9 years. Repayments to ARC would be scheduled to coincide with those by the unions and RDDC to the banks. The interest rates would be in line with prevailing interest rates, and the margins, reasonable in relation to the risk element involved, and the need for appraisal and supervision of individual loans. (ii) US\$5.4 million for consultants, importation of exotic cattle, BVVI and diagnostic laboratory, the union training centers and extension programs, would be channelled through GOI to GOR.

xiv. Materials and equipment valued at US\$18.2 million or 35% of total project cost would be procured on the basis of international competitive bidding in accordance with the IDA Guidelines. Domestic suppliers would be accorded the usual preference of 15% or the rate of customs duty, whichever is lower. Procurement of imported exotic dairy heifers, bulls, and frozen semen (US\$0.2 million) would be on the basis of quotations from at least three countries free from foot and mouth disease where suitable animals are available.

xv. Other equipment valued at US\$11.7 million would be procured locally due to the small sizes of individual items and the time spread.

xvi. Buildings and civil works (valued at about US\$9.4 million) for the RDDC farms, union dairies and feed mills would be dispersed in time and place and would be unsuitable for international bidding. They would be constructed by local contractors selected through local competitive bidding.

xvii. The proceeds of the IDA credit would be disbursed against the full c.i.f. costs of imported equipment and materials and the ex-factory cost of local equipment bid internationally; against the full c.i.f. costs of imported cattle and semen; against the full expenditures for consultant services and fellowships; against 70% of expenditures on locally procured equipment and civil works; and against 80% of the cost of the union training centres and the extension programs.

Economic Benefits

xviii. The project would provide a number of important economic and social benefits. The direct economic benefit would be the increased production of milk, estimated at 475,000 tons/year by year ten (26% of state total). Some 240,000 farming households, or approximately 1.3 million people, would benefit by raising of their standard of living and providing increased cash family income. The project's establishment of 1800 DCS, five unions and RDDC would provide employment for about 8,000 as well as supporting a milk transport service, consisting largely of 100 owner-operators. Consumers would also

benefit from better milk supply. Milk borne diseases, such as TB, would decrease significantly. Based on the quantified incremental costs and benefits, the economic rate of return of the project is about 31%.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

I. INTRODUCTION

1.01 The Government of India (GOI) has asked IDA to help finance a second dairy development project, in the state of Rajasthan. ^{1/} The project was prepared by the staff of the Animal Husbandry and Veterinary Services Department in Rajasthan along guidelines from the GOI Animal Husbandry Division of the Ministry of Agriculture. Two Bank Group missions assisted with preparation in February/March and April/May 1973.

1.02 Bank Group finance for agricultural projects in India totals about US\$714 million up to June 30, 1974. Dairy development would help GOI implement its plans to diversify agriculture and provide increased emphasis on an important food subsector which has so far received relatively little attention.

1.03 This report is based on the findings of an appraisal mission to India from March - April 1974 comprising Messrs. C. Wolffelt, A. Seth (IDA) and A. Pursell, C. Percival and J. D. von Pischke (consultants). Mr. N. Krafft (IDA) also contributed to the report.

II. BACKGROUND

A. General

2.01 Rajasthan is in north west India. It is the second largest state with an area of 34 million ha (10% of India's total) and a population of 27 million (5% of India's total). The capital is Jaipur with a population of 800,000. The state has three main ecological regions: eastern, with an annual rainfall of 400-800 mm, with mostly alluvial soils and high agricultural production; southern, with an annual rainfall above 600 mm, which is hilly with red soils mostly suitable for limited livestock production, and western, with less than 400 mm precipitation and sandy soils, which is mostly arid or semiarid.

Agriculture

2.02 About 73% of the population is engaged in agriculture. Approximately 13 million ha (37%) of the state is desert and largely uncultivated.

^{1/} The first dairy development project for the state of Karnataka was approved by IDA on June 13, 1974 (Report 431a-IN of May 21, 1974).

Of the rest, forests cover one million ha and 11.5 million are under rainfed crops mainly millet, jowar (sorghum) and maize. About 2.5 million ha (18%) is irrigated. Irrigated crops include wheat, cotton, paddy, sugarcane, millet, pulses, oilseeds, fodder crops (alfalfa and berseem), fruit and vegetables. The annual rate of agricultural growth during 1962/63 to 1970/71 was 2.8% (Population growth rate was 2.3%). The average holding is 6.8 ha.

B. The Dairy Subsector 1/

The AMUL Model

2.03 The Kaira District Cooperative Milk Producers Union Ltd. (AMUL), headquartered at Anand in Gujarat State, is a model for dairy development well adapted to India. AMUL is centered on the formation of hundreds of village milk producers' cooperatives welded together into a cooperative Union which owns and operates its own milk and feed processing, collection and distribution facilities. The Union now numbers about 225,000 families in 785 village cooperatives and processes about 150 million l annually. The Union is governed by a farmer-elected Board and operated by hired market-oriented managers responsible for setting milk prices. AMUL members are provided with a package of services, including veterinary health coverage and training facilities, financed by the Union from milk levies, and concentrate feed and fodder seed paid for by producers through deductions from their milk sales. Five similar Unions have been formed in Gujarat and were recently amalgamated into a Federation. The success of AMUL has encouraged GOI and several states to promote similar programs in other parts of the country (Annex 3).

National Dairy Development Board (NDDB)

2.04 NDDB was registered in 1965 to step up planning and execution of dairy development on a national scale. It is located in Anand, Gujarat, and its close association with AMUL has enabled it to build up the most authoritative expertise in India on dairy technology and the AMUL model.

Livestock and Breeds

2.05 The present bovine population of Rajasthan is about 12.5 million cattle (7% of India's total) and 4.7 million buffalo (9% of India's total). Respectively, 4.6 and 2.5 million represent the breedable milking stock. Around 50% of these are in milk. Most cattle do not conform to any specific breed although there are seven well defined breeds in the state. Milk production varies considerably with breeds, feeding and management practices; it averages about 500 l/lactation for cows and 800 l/lactation for buffalo. Crossbreeding with exotic purebreds mainly Jersey was successfully initiated in 1971 in Jaipur through the services of the Government of Rajasthan (GOR)

1/ The Rajasthan dairy subsector is described in Annex 1.

Animal Husbandry Department. There are now eight cattle breeding farms in the state producing pedigree bulls of the main breeds.

Feeds and Feeding

2.06 The most common cattle feeds are byproducts of agricultural crops, cultivated fodders, perennial pasture grasses and concentrates. Increased dairy herds and milk production under the project (Annex 3) depend on an adequate supply of high quality forage and balanced premixed feed (Annex 1). GOR measures to encourage fodder production include demonstration farms for improved pastures and better management, seed multiplication farms, distribution of hybrid napier seedlings, loans and grants for pasture improvement and for fencing of pasture land and subsidies for fodder seed and chaffcutters. However, the largest scope for increased production of high quality forage is by integration of these fodder crops into existing irrigated farms by effective extension work.

2.07 In 1971-72 Rajasthan produced 6.4 million tons of foodgrains (6% of India's total) equivalent to about 240 kg yearly per capita (India average: 190) (Annex 1). This agricultural production comes mostly from eastern Rajasthan where the project would be sited (3.01). This would assure the supply of the balanced feed ingredients required under the project. By year ten, the incremental foodgrain requirements would only represent about 0.9% of total state production.

2.08 The marginal productivity of a crossbreed would be about 1 l of milk per kg. of balanced feed (0.25 kg. foodgrain ingredient). The nutritive value of 1 l of milk would be about 35 g. protein and 750 calories, comparable to 25 g. protein and 850 calories for 0.25 kg. foodgrain (as meal). At the village level the cost of milk is about Rs 1 per l and the cost of 0.25 kg. of foodgrain only about Rs 0.25; but milk has a higher content of minerals (Ca) and a broader spectrum of vitamins (A, B₂, C, D). GOI rightly considers the trade off fully justified in view of the need for increasing the availability of milk in fluid or powdered form to the Indian population not only to improve the diet of infants but also for the large low-income urban population whose average daily intake of milk and milk products is less than 100 g. Milk and milk products provide the only acceptable source of animal protein for the large vegetarian segment of the population.

Milk Production

2.09 Dairying in Rajasthan is largely a subsidiary activity to crop farming though in many instances it provides a daily cash income. Over 80% of the cows and buffalo are kept in villages. The average size herd is 2 - 3 breedable head per family. Milk producers are of 3 categories: (a) the landless who represent 15% of the rural population, keep one to two animals and purchase all feeds and fodders; (b) the mixed farmer (cropping and livestock) whose main income is from sale of crops surplus to household needs, to whom dairying is a sideline which utilizes crop by-products. He may use a small area of his land for growing fodder (alfalfa and berseem) purchasing small amounts of concentrate, herd size is about two

to five animals; (c) the urban milk producer with herds up to 20 head, who purchases all the feed and fodder and buys cows at peak production, selling them when dry. In west Rajasthan, nomads keep herds of up to 200 head. Total milk production in the state is about 5 million l/day equivalent to about 190 grams/capita, well above the national average of 110/115. The urban centers are the natural markets for village milk, but lack of adequate transportation compel distant villagers to convert most of that surplus into ghee (butter oil), wasting some of the skimmed milk. Only about 40% of the milk is consumed as fluid.

2.10 Rajasthan has an undeveloped dairy processing and marketing structure resulting in severe shortage in the urban centers during the lean season with marked price escalations. The first milk processing plant was established by GOR in Jaipur in 1965. However, during the Fourth Five-Year Plan (1969-1974), construction was initiated on four dairy plants in the cities of Bikaner (Operation flood), ^{1/} Jodhpur, Ajmer (Project Area) and Kota and are now in the completion stage. Milk would be supplied through dairy cooperative societies organized along the AMUL model with introduction of crossbreeding. There are already eight milk producers unions registered in the state, and two are in the Project area (3.08). These unions are still in a developing stage.

Government Services, Research, Education

2.11 Government services for animal health and livestock development are provided by the GOR Animal Husbandry Department. It operates 342 Veterinary hospitals and dispensaries, and 144 AI centers. Due to lack of qualified personnel and transportation, AI services are not very effective and only 25% of the semen produced is utilized. Endemic cattle diseases as elsewhere in India, are rinderpest, foot and mouth, blackquarter, hemorrhagic septicaemia and anthrax. Limited vaccines are produced in the Biological Production Institute of Jaipur which is obsolete and would be replaced under the project to meet the needs of the state. The Danish Project Assistance Program has under consideration the production of foot and mouth vaccine. It is already committed to a 125,000 dose/year frozen semen bank for Bikaner. The state has a Faculty of Veterinary and Animal Sciences at Bikaner, a constituent college of the University of Udaipur. There is also an Animal Husbandry School and an AI training center, both at Jaipur, and a livestock field investigation center at Bassi, near Jaipur.

^{1/} A GOI ongoing project for increasing milk supplies to the cities of Delhi, Bombay, Calcutta and Madras with financial assistance from WFP in the form of milk powder (126,000 tons) and butter (42,000 tons). Estimated completion: 1977.

C. Government Policies

2.12 The policies followed by the GOR in the dairy subsector are essentially those established by the GOI in its Five-year plans. Allocations for the dairy subsector in the first three development plans were inadequate. GOI objectives in the Fourth and current Fifth Plan are to attain food grain self-sufficiency and to diversify agricultural production. Within the livestock sector, dairy development has been given greatest emphasis in GOI's Fifth Plan since milk and milk products provide the primary source of animal protein for the large vegetarian segment of the population. The daily per capita availability has however fallen from 120 (1970) to 112 g. (1973). GOI plans for dairy development have been stimulated by the successful AMUL experience and in the Fifth Five-Year Plan, GOI is encouraging the AMUL model as the basic means to increase milk production. In addition, animal production, health and AI facilities are proposed to be improved at state level and more emphasis placed on increasing crossbred cattle. GOI would provide a crossbred calf subsidy of Rs 200 per head, in the form of pre-mixed calf feed, to encourage farmers to adopt better feeding practices and so avoid losses of valuable crossbred heifers due to malnutrition. The Fourth Plan provides funds for the construction of a total eight dairy plants in Rajasthan, four of which are soon to be commissioned.

D. Agricultural Credit

2.13 Institutional agricultural credit is provided directly by cooperative banks, commercial banks and GOI indirectly through the Reserve Bank of India (RBI) and the Agricultural Refinance Corporation (ARC) (Annex 2).

Agricultural Refinance Corporation (ARC)

2.14 ARC is an intermediary channel for 15 current IBRD/IDA credit projects. ^{1/} It was established in 1963 as a subsidiary of the Reserve Bank of India (RBI) to provide the on-lending agricultural credit institutions with a supplemental source of medium and long-term finance. With the RBI it sponsors orientation and training programs for management and technical staff of banking institutions. Its expanding technical division assists banks in appraising the techno-economical feasibility of projects and supervision of ongoing schemes.

Cooperative Banks

2.15 The cooperative banking system is the villager's most important source of institutional credit. The Rajasthan Cooperative Banks, which

^{1/} Full details of ARC's organization and financial operations are given in Annex 4 of the Uttar Pradesh Agricultural Credit Appraisal Report No. 107a-IN, April 12, 1973.

supply short and medium-term loans, have a three-tier structure: State Apex Cooperative Bank, 25 Central Cooperative Banks and 7,700 primary agricultural credit societies. The State Cooperative Land Development Bank, which supplies long-term credit, is a federation of 37 Primary Land Development Banks (PLDB), at least one for each district. LDB lending has been about Rs 35 M to Rs 45 M annually, with almost 98% being for minor irrigation (wells and pumpsets). Credit needs for minor irrigation in Rajasthan have been assessed by Government and the Rajasthan Groundwater Board, and ARC refinance is available to meet these needs. Interest rates to the ultimate borrowers have recently been revised and now range from 11 - 13% per annum. The on-lending institutions generally receive a spread of 2 - 3%. Cooperative Banks have been plagued with problems of low recoveries and overdues partially related to droughts and crop failures but largely due to inefficient management. These problems in turn affect their ability to lend. Only banks meeting the criteria listed in Annex 2 Appendix 1 would be eligible to participate in the project.

Commercial Banks

2.16 Since 1969 commercial banks have increased their role in providing institutional rural credit. Designated banks were charged with assessing local resources and credit needs, mobilizing capital and improving rural credit supply, in specific districts and rehabilitation of weak credit societies. Experience to date has been modest. Commercial banks are nevertheless attempting to expand into agricultural operations based on sound lending principles with good technical support. Prevailing interest rates are 11 - 13% per annum.

III. THE PROJECT AREAS

General Description

3.01 The project would be in eastern Rajasthan, see Map, in the milksheds approximately identified with the districts of Jaipur, Ajmer, Alwar, Bharatpur, Sawai-Madhopur and Tonk selected for their potential for growing feed and forage and for dairy livestock development. Each district capital is also an important urban center for marketing fluid milk and dairy products. These districts are not involved in any other on-going or proposed IDA project for Rajasthan.

3.02 The June-September monsoon accounts for most of the rain varying from about 500 mm (Ajmer) to 700 mm (Sawai-Madhopur) in the project area. Rajasthan is known for extreme climatic variations, its minimum temperature is about 5°C with maximum over 40°C in summer (March - June). Total rural population in the project area is about 6.6 million, distributed between 9900 villages, each of about 120 households.

3.03 The project area covers approximately 5.6 million ha, (16% of the state) 3.4 million ha (60%) under cultivation and 0.4 million ha (12%) under irrigation. The average holding is 5 ha with 70% less than 3 ha. The breedable stock is about 1.3 million cows and 1 million buffalo. The average household owns about 1.3 cows and 1 buffalo.

Status of Dairy Development

3.04 Approximately one third of the facilities operated by the Department of Animal Husbandry (2.11) for animal health services are located in the project area. However due to shortage of trained staff and poor communications the services lack effectiveness. The milk production in the area is estimated at 2 million l/day with capacity for processing only about 5% of this total in four plants.

Milk Marketing

3.05 In Rajasthan, as in most of India, there are three main channels for milk supply to the urban market: (i) traditional village agents, (ii) city producers; (iii) cooperative sector. The traditional village agent, acting as a collector/middleman for private vendors in the cities is the main supplier. The supply from city producers is also significant representing about 20% - 30% of the market.

3.06 Milk prices in Rajasthan are not controlled and the urban market price for raw milk varies according to type and season from about Rs 1.50 to 2.00 per l. GOR dairies market pasteurized milk in 1/2 l bottles at subsidized prices: Rs 1.35 per l of 3% fat (Jaipur). This subsidy does not permit paying fair prices to the village producers, therefore, procurement volume is low and operating losses result from low throughput. Accordingly, the GOR milk scheme in Jaipur accommodates only about 8% of the urban demand (presently 110,000 l/day). In addition to the Jaipur plant (20,000 l/day), the following plants are also in the project area: Ajmer, (Union owned) (30,000 l/day) to be completed in 1974 and Alwar, (Union owned) (10,000 l/day). In Bharatpur there is a private milk powder plant of 40,000 l/day. The milk is brought to the processing plants, in 40 l cans, by contract trucker while at the village level, agent/collectors procure and transport it to collection points by bicycle or oxcart.

3.07 Most agent/collectors pay the village producer between Rs 1 - and 1.50 per l; though usually offering an inferior product, they operate from villages comparatively close to the urban centers and are serious competitors to organized milk schemes which have to bear the higher cost of processing. Under the present marketing system, the city producer selling direct to a regular consumer clientele is also competitive with the agent/collector even though the former must buy all his feed supply. To reduce feed costs many city producers purchase cows in milk and sell them at the end of their lactation; they do not therefore generally rear calves. The unions would gradually displace the private suppliers, who by year eight would only control about 20% of the urban markets.

Dairy Cooperatives

3.08 The Dairy Cooperative movement in the project area came into existence with the creation of the government milk schemes to assure supply for their processing plants. Due to the subsidized milk price policy of the GOR dairies and other organizational shortcomings, the cooperative movement did not develop. As a result in 1972 the Animal Husbandry Department commenced the implementation of dairy cooperative societies organized along the AMUL pattern. In the project area there are now about 100 such societies formed under two unions: (Ajmer and Alwar), which would form part of the project (4.05).

IV. THE PROJECT

A. General Description

4.01 In an area of suitable potential (eastern Rajasthan), the project would provide, over six years, the necessary inputs to develop an enclave of high milk production. It would not only benefit the area itself but also generate a significant surplus of milk that would be channeled to other large deficit markets outside the state. It would organize village cattle owners to form Dairy Cooperative Societies (DCS) which would be grouped into unions similar to the AMUL scheme in Gujarat. The unions would employ technicians and managers, and be controlled by farmers. Each union would own and manage its own dairy and feed plant and would provide milk collection, marketing, veterinary, AI and extension services to the member DCS. About 240,000 families, most of whom farm less than 2 ha or are landless, would be involved. The Rajasthan Dairy Development Corporation (RDDC) would be set up to coordinate and implement the project through the unions.

4.02 The project comprises:

- (a) Establishment of about 1,800 DCS, five milk producers unions and the RDDC,
- (b) Importation and multiplication of purebred exotic breeding stock and an associated AI program of crossbreeding native village cattle with high producing exotic breeds. Provision of extension programs to encourage production of fodder, mixed farming and improved animal husbandry,
- (c) Construction of five union dairy plants and cattle feed mills; and the establishment of milk collection routes and milk chilling centers,

- (d) Establishment of one regional diagnostic laboratory (DLAB) and a plant for production of biological veterinary vaccines (BVVI),
- (e) Provision of consultant services to assist RDDC,
- (f) Provision of a training center for each union (UTC), an extensive training program for developing instructors for training technical and field staff, and fellowships for key personnel.

The project does not include a farm credit component, as crossbreds are not available for purchase. Credit for dug wells for increasing fodder production would be available through existing ARC schemes for minor irrigation (4.09).

B. Detailed Features

New Institutions

4.03 The Rajasthan Dairy Development Corporation (RDDC) to be established under the project, would be the center for coordination and implementation of project activities. It would be the base from which consultants and other expertise would schedule and direct the organization of the unions and through them the implementation of the DCS. To ensure that the essential AMUL features are adopted when establishing the DCS and the unions, RDDC would engage the services of NDDDB on a contract basis. NDDDB would assist in recruiting and training the nucleus staff of RDDC, unions and spearhead teams. NDDDB would supervise the implementation of the DCS during the first year. NDDDB would also assist in a marketing study (4.12) and furnish consulting services to the RDDC in the preparation of engineering specifications for the procurement of equipment and construction of the dairy plants and feed mills as well as for evaluation of tenders (6.10). It is a condition of credit effectiveness that (i) RDDC had been established under articles of association acceptable to IDA; and (ii) that RDDC had engaged NDDDB to assist in the training of consultants and RDDC and union management staff, and provide other consulting services. Assurances were also given that about year five, the future role of RDDC either as a corporation, a federation of the unions, or other, would be reviewed with IDA.

4.04 Five unions ^{1/} would be established each incorporating about 300/400 DCS implemented over a five year period, making a total about 1,800 DCS. By-laws would be similar to AMUL's (Annex 3). The principal functions and

^{1/} RDDC would organize the unions which would implement the DCS; RDDC would bear the initial cost as the unions could only be legally constituted after at least 25 DCS had been registered.

responsibilities of a union would be to: (a) organize and effect the implementation of the DCS; (b) assist the DCS with organization, management, inspection and auditing; (c) establish and supervise milk and cattle feed transportation; (d) process and market the members' milk and operate the feed mills; (e) provide animal health and breeding services; (f) demonstrate improved mixed farming and fodder production techniques.

4.05 The principal functions and responsibilities of a DCS would be to: (a) act as a center for milk collection (b) effect regular payments to producers; (c) sell balanced feed; (d) provide AI services; (e) communicate cooperative and technical information to members. The two existing unions in the project area and their 70 odd AMUL Type societies would be incorporated under the project after a review by ARC and approval by IDA of their by-laws, capitalization and management structure (assurances would be sought). No other type of existing society would be incorporated with the project. Assurances were given by GOR that the five unions and the 1,800 DCS would be formed under by-laws acceptable to IDA.

Crossbreeding and Milk Production

4.06 Milk production would begin from native cattle and buffalo and would be gradually increased, primarily by upgrading low producing native cows through an AI program of crossbreeding with high producing exotic breeds (mainly Jersey, although other exotic breeds would also be considered) and by better nutrition.

4.07 RDDC would own and operate an exotic bull breeding farm near Jaipur, to be financed under the project. The breeding farm would supply bulls (exotic and buffalo) to the five union bull farms (AI centers). Initially a foundation herd of about 100 in-calf heifers would be imported for the breeding farm and 30 bulls to be supplied to the bull farms of the unions. The bull farms would supply fresh semen that would be delivered daily to the DCS by the milk collection trucks, following the pattern of the AMUL model.

4.08 The low quality crop residues, which traditionally comprise the main roughage component of the native animal's diet are inadequate to maintain crossbreds and would be supplemented with high quality green fodder and balanced concentrate feed in pellet form. Advised by the proposed extension services, farmers with irrigated land would be encouraged to grow fodder for their own use and also for sale to other members. Under present conditions production of alfalfa renders a net income to the farmer comparable to that from wheat.

4.09 The incremental fodder demand of the crossbreedes by year ten, would require a total 20,000 ha of irrigated land (Annex 1). There are about 280,000 wells in the six districts of the project and about 25%, equivalent to an irrigated area of 40,000 ha would belong to farmers expected to join the DCS. This area would appear ample for fodder production, however, about 15,000 additional wells would be dug (over a 10 year period) allowing for members with irrigated land who would continue growing other crops. Ground water is

available and assurances were given at negotiations that GOI, GOR and ARC would ensure that loans would be available to eligible DCS members for minor irrigation for fodder production. Each union would also operate a feed mill of about 75 tons per day capacity for producing premixed balanced concentrate feed. Construction of these mills would be matched to the growth of demand for feed.

4.10 By year ten of a DCS, all native cows would have been replaced by crossbreds. However mainly due to improved calving rates, the average DCS member cattle herd would have increased from about 210 Animal Units (AU) in year three to 260 (22% increase) in year ten. The membership of a typical DCS would be about 30% (58) of the total village households in the first year, 50% (97) in the second year, stabilizing at 70% (136) in the third year. Based on the experience at AMUL, the DCS would be implemented with the following phasing, similar for all five unions: year one: 60 DCS, year two: 70; year three: 80; year four: 80 and year five: 70. Thus total project milk collection 1/ would only be 12 million l in year one, increasing to 195 million l in year five and 571 million l in year ten (Annex 4 Table 4). The incremental milk production 2/ would be 106 million l (100% increase) in year five and 512 million l (280% increase in year ten).

Milk Collection, Processing and Marketing

4.11 Milk would be collected from the DCS along defined and economically viable routes involving about 13 - 15 DCS in each route. Milk from the DCS would be picked up daily and transported to the dairy plants by a fleet of both owned and hired trucks operated by the union; 15 chilling centers would be provided for pooling milk from distant routes serviced by five 13,000 l capacity road tankers for freighting the milk to the plants.

4.12 The project provides for the construction of five milk processing plants each with an initial capacity of 100,000 l/day, which would be expanded in two stages (Year 4 and 6) to 200,000 l/day to match the increase in milk supplies under the project (Annex 4 Table 4). One of the plants would involve the expansion of the 30,000 l/day plant being completed at Ajmer. The existing plants at Jaipur and Alwar are too small and outdated and assurances were given by GOR that they would be phased out or relocated after the new plants come on stream in year 3. General layouts and building design would allow this expansion in a functional manner. Due to surplus production, on an average, plants would be equipped to retail about one third of their volume in the urban market, one third for bulk shipment in rail tankers (assurances were given that these would be available) and one third for conversion into milk powder (Annex 4 Table 10). Jaipur and Ajmer plants would be equipped to meet a comparatively large urban demand, the other three plants located in smaller urban centers would be equipped principally to produce milk powder

1/ Excludes milk retained by farmer for family and calf feeding.

2/ Includes milk retained by farmer for family and calf feeding and assumes that the present traditional production would remain static.

and deliver pasteurized milk in bulk by rail to Delhi which is expected to remain a deficit area for several years. The NDDB would assist in conducting marketing studies prior to plant construction to determine the appropriate product mix for each plant. With these provisions the unions would not have to cut back milk collections during the life of the project, even in the flush season, for lack of processing capacity. Milk would be retailed both in bulk and bottles (1/2 l), from union owned booths and private foodstores in the major urban centers.

Biological Veterinary Vaccine Institute and Diagnostic Laboratory

4.13 The project would include a new facility for the production of veterinary vaccines (BVVI) to meet the state's requirements of 5 million doses a year. Supply of vaccine is inadequate in Rajasthan. The plant would be administered by the Animal Husbandry Department in consultation with RDDC. The unions would purchase their vaccine requirements from the Institute (Annex 7). To improve the crossbreeding, animal health and veterinary support programs, the project would provide for one fully equipped diagnostic laboratory (DLAB) which would be located in the project area. The laboratory would be administered by GOR in consultation with the College of Veterinary and Animal Science at Bikaner.

Technical Assistance, Training and Extension

4.14 The project provides for the following consultants, some expected to be available in India, to assist RDDC in implementing the project:

- (a) A dairy plant engineer to check plans, layouts, specifications, evaluate tenders and supervise construction.
- (b) A dairy processing expert to train union plant personnel in operating the new plants, process monitoring and quality control.
- (c) A mass-media communications expert to assist spear head teams in developing visual and other aids to transmit effectively the concept of the AMUL model to the farmers and motivate them to join the DCS.
- (d) A marketing expert to advise on optimization of production schedules and marketing strategy within the context of five dairy plants.
- (e) A fodder/livestock expert to select about 50 farms owned by progressive farmers and set them up for demonstration purposes, in applied animal husbandry and milking hygiene and incorporating permanent pasture/fodder crops grown exclusively for milk production.

4.15 Assurances were given by GOI and GOR that these consultants, acceptable to IDA, would be recruited for RDDC; for consultants' terms of reference see Annex 6.

4.16 Establishment and operation of five Union Training Centers (UTC) with training equipment and staff would be financed under the Project. Each center would provide about 1,000 man months of training annually during formation of the DCS. Trainees would range from dairy farmers to DCS and Union staff and Board members. Course content would relate to the AMUL model, and in the case of DCS trainees would involve AI, milk testing and basic record keeping, and cooperative principles. The project also provides for intensive extension effort during the development phase involving some 50 village extension workers (VEW) per union. The VEW would assist producers in the application of basic principles of animal husbandry, milking hygiene, feeding, fodder production and mixed farm management as directed by the fodder/livestock consultant and practiced on the demonstration farms. The VEW and UTC instructors, along with key union staff, and spearhead teams would be trained by NDDB and the National Dairy Research Institute (NDRI). Overseas fellowships for three key staff of each union would also be provided. Assurances were given that project funds for training and extension would be channeled to the unions, quarterly, through RDDC. Training and Extension programs are in Annex 6; timing and duration of training and extension activities are in Annex 6 Chart 1.

4.17 The animal health services to be furnished to the DCS by the unions include a mobile veterinary unit for every 35 societies involving a vehicle equipped with animal health and vaccination kits and staffed by a veterinarian and trained assistant which would visit the DCS weekly without charge. Emergency service would be available on call, at all times, to members free of charge, and to nonmembers for a fee.

V. COST ESTIMATES AND FINANCING

A. Cost Estimates

Detailed cost estimates are in Annex 7 and summarized below:

<u>Category</u>	<u>Rs (Thousand)</u>			<u>US\$ (Thousand)</u>		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
<u>DCS Investments</u>						
Equipment	3,600	--	3,600	450	--	450
Establishment Costs	4,120	--	4,120	510	--	510
Sub-total	7,720	--	7,720	960	--	960
<u>Union Investments</u>						
Processing Plants	89,840	45,660	135,500	11,230	5,710	16,940
Feed Mills	20,270	7,080	27,350	2,540	880	3,420
Technical Services	17,110	3,750	20,860	2,140	460	2,600
Establishment Costs	27,750	--	27,750	3,470	--	3,470
Sub-total	154,970	56,970	211,460	19,380	7,050	26,430
<u>RDDC Investments</u>						
Bull Breeding Farm and Management	2,190	990	3,180	280	120	400
Establishment Costs	480	--	480	60	--	60
Sub-total	2,670	990	3,660	340	120	60
<u>Supporting Activities</u>						
BVVI and DLAB	5,640	6,610	12,250	700	830	1,530
Establishment Cost	1,110	--	1,110	140	--	140
Calf Rearing Grant	40,000	--	40,000	5,000	--	5,000
Sub-total	46,750	6,610	53,360	5,840	830	6,670
<u>Training & Extension</u>						
Consultant Services & Fellowships	990	6,300	7,280	120	790	910
Union Training Center & Extension Services	17,790	590	18,380	2,230	70	2,300
Farmers' Training Camps	1,880	120	2,000	230	20	250
Sub-total	20,650	7,010	27,660	2,580	880	3,460
<u>Total Before Contingencies</u>						
	232,760	71,100	303,860	29,100	8,880	37,980
<u>Contingencies:</u>						
Physical (6.1%)	13,580	5,190	18,770	1,700	650	2,350
Price (30%)	66,340	25,410	91,750	8,290	3,180	11,470
Sub-total	79,920	30,600	110,520	9,990	3,830	13,820
<u>Total Project Cost</u>	312,680	101,700	414,380	39,090	12,710	51,800

5.01 Estimates are based on mid-1974 prices. Establishment costs during development are initial operating losses and working capital. A physical contingency of 10% has been applied to DCS investments to allow for the failure of some DCS, although the equipment would be recovered. A 10% physical contingency has been applied to all milk plant and feed mill investments to account for unforeseen building and equipment corresponding to final plant product mix. A 5% physical contingency has been applied to investments in RDDC, BVVI and DLAB. No physical contingencies are needed for establishment costs, training and extension and the calf rearing grant. Price contingencies have been applied to all items, except the calf rearing grant, on the following assumptions: for civil works, 9% for the second half of 1974, 15% in 1975 and 12% thereafter to 1980; for equipment and local cost expenditures, 7% for the second half of 1974, 11% in 1975 and 7.5% thereafter to 1980.

B. Proposed Financing

Financing for total project cost of \$51.8 m (Rs 414.4 m) would be:

	DCS						
	<u>Members</u>	<u>GOI</u>	<u>GOR</u>	<u>ARC</u>	<u>Banks</u>	<u>IDA</u>	<u>Total</u>
<u>Processing Facilities</u>							
Unions	--	1,445	1,445	1,720	1,160	8,660	14,430
<u>Other Equipment & Civil Works</u>							
DCS	--	--	200	--	--	460	660
Unions	--	1,910	1,910	380	1,530	13,370	19,100
RDDC	--	35	35	10	30	260	370
BVVI & DLAB	--	--	600	--	--	1,400	2,000
Sub-total	--	1,945	2,745	390	1,560	15,490	22,130
<u>Cattle & Semen</u>							
Unions & RDDC	--	20	10	10	60	150	250
<u>Establishment Costs</u>							
DCS	250	--	490	--	--	--	740
Unions	--	--	3,820	--	720	--	4,540
RDDC	--	--	70	--	--	--	70
BVVI & DLAB	--	--	160	--	--	--	160
Sub-total	250	--	4,540	--	720	--	5,510
<u>Training & Extension</u>							
Consultant Service & Fellowships	--	--	150	--	--	980	1,130
UTC & Extension Program	--	--	600	--	--	2,420	3,020
Farmer Training Camps	--	--	330	--	--	--	330
Sub-total	--	--	1,080	--	--	3,400	4,480
<u>Calf Rearing Grants</u>							
	--	5,000	--	--	--	--	5,000
<u>Total (US \$ Thousands)</u>	250	8,410	9,820	2,120	3,500	27,700	51,800
<u>Percent of Total</u>	0.5	16.2	19.0	4.1	6.8	53.4	100

5.02 The proposed IDA credit of US\$27.7 M would be to GOI and would finance about 53% of the project costs. IDA financing would cover all foreign exchange expenditures (US\$12.7 M) and about 38% of local costs. IDA funds for BVVI and DLAB support programs, the purchase of imported cattle, DCS equipment and for training and extension services would be channelled by GOI to RDDC through GOR (US\$5.4 M). All other IDA funds (US\$22.3 M) would be channelled through ARC and participating banks, to RDDC and the unions under subsidiary loan agreements satisfactory to IDA. Project lending terms and conditions are detailed in Annex 2, Appendix 1. Details of the financing plan are shown in Annex 7, Table 2.

5.03 GOI-GOR contributions (US\$18.25 M) would finance about 35% of project costs. They would cover the equity financing for investments (US\$6.8 M) of the institutions set up under the project and provide the necessary start-up costs (US\$4.6 M) to cover the expected deficits over the first four years of operations. In addition, GOI-GOR would provide funds for BVVI and DLAB (US\$0.75 M), support training and extension (US\$0.9 M) and subsidize the sale of calf rations for rearing of the first crossbred calves (US\$5.0 M) and provide for local cost financing of technical services and imported cattle (US\$0.25 M). ARC and participating banks would contribute US\$5.6 M, about 11% of project costs, for financing investments and working capital of RDDC and the unions. Farmers' contribution to the project is estimated at US\$0.25 M, their minimum capital subscription to become DCS members. Assurances regarding GOI, GOR, ARC and participating banks financing commitments were given at negotiations. During negotiations, GOR demonstrated that substantial progress had been made on a pre-project training program recommended by IDA, for project personnel. Completion of this program prior to project commencement would be essential and IDA financing for such expenditures from June 1974, subject to a maximum of \$50,000, would be provided.

C. Procurement

5.04 RDDC would be the sole procurement agent for all RDDC and Union investment items financed by IDA. Procurement for BVVI and DLAB items would be through normal GOR channels. All major equipment (Annex 4) for the five milk-processing plants and feedmills (US\$18.2 M) would be bulked in accordance with phased construction and expansions (Annex 4 Table 4) and subject to international competitive bidding in accordance with IDA Guidelines. Suitable assurances were given by GOI. As most leading manufacturers of the equipment are well represented in India and are competitive, tenders would be advertised locally, and the representatives of potential supplier countries informed. Locally manufactured equipment would be allowed a 15% preference or the prevailing customs duty, whichever is lower. Appropriate assurances were given. Consultants services (US\$ 0.7 M) would also be procured according to IDA guidelines. Minor equipment, items for the plants such as electrical components, equipment fittings, and furniture (US\$8.5 M) would not be amenable to bulking and would be purchased over six years as phasing requires. Since ready availability of service and spare parts is essential, these would be purchased locally as needed from reputable suppliers.

5.05 As civil works for the construction of milk processing plants, feedmills, BVVI, DLAB, RDDC and the unions, (US\$9.4 M) would be dispersed in time and place, they would each be too small to attract international bidding and would be subject to local contracting by competitive tender.

5.06 Equipment for the DCS (US\$0.7 M), and for RDDC and unions such as farm machinery, irrigation equipment, breeding equipment, trucks, and vehicles (about US\$2.1 M) would be purchased following local competitive bidding, since these items would be purchased in small quantities over the project period. For procurement of imported bulls and dairy heifers for the RDDC breeding farm and the unions' bull farms (US\$0.2 M), assurances were given by GOI that tenders would be called from at least three countries free from foot and mouth disease where animals of the required breed, type, and adaptability are available.

5.07 The equipment, chemicals and glassware for the DLAB and BVVI (about US\$1.4 M) would be procured following local competitive bidding because it would be difficult to bulk orders. Most of the world's leading manufacturers of scientific equipment are represented in India and they are competitive. The local maintenance service offered by established representatives would also be available to maintain the equipment to be purchased under the project. Orders would be bulked to the extent possible. The remaining project costs (US\$11.6 M) would be for union and DCS establishment costs (initial operating deficits), training and extension services, working capital and calf rearing grant.

D. Disbursements

5.08 IDA disbursements are expected to extend over seven years (Annex 7 Table 5) and would be against appropriate documentation:

- (a) 100% of cif expenditures, or of ex-factory costs, if locally manufactured of milk and feed-processing equipment to be procured under ICB;
- (b) 100% of cif expenditures for imported cattle and 100% of the cost of consultant services and fellowships;
- (c) 70% of expenditures for locally procured equipment and civil works, including engineering;
- (d) 80% of project expenditures on local training, union training centers and extension program.

E. Accounts and Audit

5.09 Assurances were given that ARC would maintain project accounts, audited by independent and qualified auditors, the audited accounts to be submitted to IDA within four months after the close of each fiscal year. Commercial firms audit the accounts of the commercial banks. Accounts of cooperative institutions (LDB, RSCB, DCS and Unions) are audited by the Department of Audit and Inspection under the Registrar of Cooperatives in a manner satisfactory to IDA. However, AMUL experience has shown that a single annual audit of DCS is insufficient. Efficient management of AMUL village dairy cooperatives called for intensive and continuous audit service involving about 50 field inspectors from the State of Gujarat Cooperative Department. This service has been highly satisfactory and has proven to be a major factor contributing to AMUL's success. Assurances were also given that the GOR Department of Audit would: (a) audit the accounts of the unions, submitting the audited accounts to IDA within six months of the end of each fiscal year; (b) provide audit to each DCS, with at least one full audit and two book supervisions per year; (c) strengthen its staff to carry out the above functions; and also that RDDC would maintain audited project accounts, submitting the audited accounts to IDA within six months after the end of each fiscal year.

VI. ORGANIZATION AND MANAGEMENT

A. Rajasthan Dairy Development Corporation

6.01 GOI and GOR would subscribe equally to all of RDDC's initial paid up capital **suitable assurances were given**. As a condition of effectiveness, (i) GOI and GOR would invest an initial equity capital of Rs 0.30 M each (Annex 5 Table 3); and (ii) GOR would provide redeemable equity capital to cover the first year's estimated startup costs (Rs 0.5 M). GOI and GOR would also provide additional equity financing to ensure that RDDC qualifies to borrow funds from participating banks for project investments, according to criteria listed in Annex 2 Appendix 1. An assurance was also given that, not later than year six (1980) of the Project, both GOI and GOR would offer for sale their shares in RDDC to the unions, at par value, until the unions had attained at least 75% ownership.

6.02 RDDC would be established under articles acceptable to the Association and governed by a fifteen member board of directors (Annex 5). A Managing Director with qualifications and experience acceptable to IDA, would carry out executive duties assisted by about five Divisional Managers (Annex 5 Chart 1).

B. Unions and Cooperatives

6.03 Each cooperative milk producer's union would have an eleven member board of directors (Annex 4). Initial farmer representation would be six, elected from among and by the chairmen of the affiliated DCS. Once the DCS become majority shareholders (year eight-nine) they would acquire the right to appoint the Chairman of the board. A General Manager appointed by the board and approved by RDDC for the first year following establishment of the unions, would be responsible for day-to-day management of the union and would also be an exofficio board member.

6.04 GOI and GOR would finance as equity at least 20% of union investments (Rs 54 M), so as to maintain a suitable debt: equity ratio and to ensure the unions' creditworthiness. GOR would also provide additional redeemable equity capital to cover the unions' initial operating deficits (Rs 31 M). Assurances as to these financial commitments were given by GOR and GOI. Under cooperative law DCS are required to allocate 25% of their net income to a reserve fund and DCS bylaws (Annex 3) would require that 80% of this reserve fund be held as union shares. With these funds, DCS would buy out Government equity in the unions, expecting to become majority shareholders by about year eight (1982), of the project. Assurances were given by GOR and GOI would not later than in year six (1980) of the project and each year thereafter, offer for sale their shares in the unions, at par value, to individual DCS, until the DCS had attained at least 75% ownership. In addition, assurance were given by GOR share capital subscriptions for initial operating deficit, would be redeemed once the loans are repaid. Government equity financing and its acquisition by the DCS is estimated in Annex 4, Table 14. After debt service, paying dividends and bonuses to DCS, retained earnings (estimated at about Rs 32 M by year ten) would be used for a further stage of dairy and feed plant expansion.

The Village Dairy Cooperative Societies

6.05 The village dairy cooperative society (DCS) would be the basic organization unit. Each would be normally managed by a committee of nine members, elected for a three-year term. The committee would elect a chairman and nominate a member to represent the cooperative and to stand for election to the union board of directors. During the first year of operation the DCS would be managed by a smaller 5 member committee. The committee would appoint a paid secretary who would be responsible for day-to-day operations. There would also be one to four helpers to assist the secretary. All would be trained in AI, emergency first aid and milk testing as well as in simple bookkeeping, at the Union Training Center (Annex 6). They would be paid from the revenues of the society derived from commission on milk sold to unions and feed sold to members (Annex 3, Table 5).

6.06 Each DCS would be capitalized by share subscriptions by members and entrance fees. For each newly formed DCS, GOR would grant the capital

equipment (Rs 2,000/DCS) and operating deficit in the first year (Rs 1,000/DCS). Initial working capital needs would be financed by the shares subscriptions. Total cost to GOR is estimated at Rs 5.5 M for capital equipment and initial operating deficit. Assurances were given that GOR would meet this financial commitment. Similar grants are available elsewhere in India where Government promotes producer cooperatives, including AMUL, and are essential to bring about a rapid transformation in the rural institutional framework that the AMUL model implies.

C. Project Implementation

6.07 The project has a defined scope and its implementation would be planned with each step scheduled in a critical path fashion. The RDDC would be set up immediately, all five unions within one year and the 1800 DCS would be established progressively over a period of five years.

6.08 The project authority and center of coordination would be the RDDC. This would be the seat of the hired consultants and other experienced executives (Divisional Managers) who would be coordinated by the Managing Director. The Divisional Managers would each be responsible for carrying out a specific phase of the project. This would be done by working through their respective counterparts in the unions, who in turn would be responsible for the same specific phase within their own union.

6.09 Major initial steps in implementing the project would be to organize the RDDC, recruit, train and appoint the executive staff of the RDDC, and the five unions. In coordination with its respective RDDC Divisional Manager, each union Divisional Manager would determine the workload of his Division, the schedule, the staff required, including spearhead teams and arrange for its recruitment and training. The participation of NDDB would be essential in selecting and training staff and supervise spearhead teams and also in assisting in the marketing study and in the preparation of specifications and evaluation of tenders for construction of the plants (Annex 4 Appendix 1).

D. Supporting Activities

Diagnostic Laboratory

6.10 A cross breeding health program would be instituted and coordinated by the GOR Department of Animal Husbandry. The proposed diagnostic field laboratory to be located in the project area would have an active participation in this program. The Laboratory would be staffed and operated by GOR in consultation with CVAS. It would also work in close collaboration with the new BVVI. Assurances to this effect were given.

Biological Veterinary Vaccine Institute

6.11 The project would finance the construction of a plant principally for production of vaccines against rinderpest, hemorrhagic septicaemia, black-quarter and anthrax. The Institute would function under the GOR Department of Animal Husbandry. To ensure representation of the organizations involved in animal disease control in Rajasthan, a board of management would be established. It would be responsible for major policy matters including integration of disease control programs with production of the appropriate vaccines. The board would consist of the Secretary of Agriculture (chairman) with two representatives each from the RDDC and the GOR, Department of Veterinary Services and one from the University of Agriculture Science. It would appoint a director who would be responsible for the management of the institute and who would also be a board member, ex-officio.

6.12 Assurances were given that project funds for equipment for the DLAB and BVVI (Rs 16 M) would be made available by GOR. Requests for such financing under the project would be prepared each year by DLAB and BVVI directors, respectively, and approved by GOR and IDA. Assurances were also given by GOR that the initial operating deficit of BVVI (Rs 1.1 M; Annex 7, Table 4) and cost of operating DLAB would be financed by GOR.

E. Lending Operations

6.13 ARC would invite all banks operating in the project area to participate in the project. Based on eligibility criteria agreed to with IDA, ARC would determine the eligible banks. To ensure effectiveness and uniformity of supervision the minimum number of banks required to adequately service the six subloans would be selected by ARC in consultation with the unions and RDDC. ARC would provide at least 80% refinance for the banks' loans. Subloans proposals, on behalf of the unions, would be prepared by RDDC in consultation with NDDB and submitted to the participating banks. The conditions of effectiveness would be that (a) a subsidiary loan agreement between GOI and ARC, approved by IDA, had been executed, (b) loan agreements, satisfactory to IDA, between ARC and participating banks had been concluded.

6.14 Project lending terms and criteria are detailed in Annex 2 Appendix 1. Unions and RDDC would pay at least 11% per annum, the participating banks, 8% and ARC, 7.5%. These rates are in line with the current rates in the agriculture sector in India. The participating banks would be required to operate a project supervision group, in consultation with ARC to continuously monitor the progress of the project, submit quarterly reports and make recommendations to the banks, ARC and IDA. The necessary assurances were given. Funds for training and extension would not be refinanced through banks as these would be a GOI-GOR grants.

VII. PRODUCTION, MARKETING, PRICES, SUBSIDIES,
AND FINANCIAL RESULTS

Production

7.01 Initially production would be increased from existing native cattle and buffalo by adoption of better management and feeding practices, but the greatest increase would come from an intensive program of cross-breeding native cattle with high producing exotic breeds. The first cross-bred cows would come into production in year four increasing in significant numbers thereafter (Annex 3). In year three of a DCS (full membership) milk collected daily (cows and buffalo) would be about 110 l; in year five, 180 l; and in year ten, 400 l. In year five the total daily increase in milk production from present levels would be 290,000 l and 1,400,000 l in year ten.

Marketing

7.02 Despite growth of the cities in the project area, after year six, project milk production would be far in excess of the urban demand (about 350,000 l/day). Allowing for the private vendors who would supply about 20% of the urban demand, the remaining 80%, supplied by the unions, would only represent about one third of their production. The Union milk sold in the cities, would be about 50% in bottles (1/2 l) and the balance in bulk form sold at union owned booths and from vending machines installed in grocery shops. The booths would also serve as outlet for union milk (chilled, raw) during the first two years when plants are under construction. Another third part of the production would be channeled into the National Milk Grid by freighting to Delhi in bulk form in insulated rail cars. The balance of the milk production would be converted into butter, ghee and skimmed powder, for which there is a ready market in big milk deficit centers like Delhi, Bombay, Calcutta and Madras. Marketing and product mix assumptions are shown in Annex 4, Table 10. The marketing study proposed under the project would establish the optimal product mix for each plant, before construction.

Prices

7.03 Assurances were given by GOR that each union would be free to set the sale price of its products, the procurement price of milk and charges for services to members. The unions would supply wholesome milk at prices in competition with the private producers and vendors. The average prices in the urban markets would be expected to decline particularly during the lean season when they are over Rs 2 per liter. Following the AMUL model, village producers would be paid according to butter fat content of their raw milk or about Rs 25/kg butter fat, a price higher than the average Rs 21/kg under the traditional intermediary system. (Annex 3, Table 7). Village producers would also increase their purchasing power for feed supplies and would retain more of the fodder now sold to urban producers.

Grants, Subsidies and Cost Recovery

7.04 The present policy of Government dairies implies a subsidization of consumer milk prices that would come to an end in the project area when the unions determine prices in their members' interest. The only non-recoverable expenditures under the Project are Government startup grants to the DCS (training, extension and calf rearing), justified to facilitate the setup of new cooperative organizations and the spread of proven crossbreeding technology to rural areas. Loan components under the project are all recoverable at commercial interest rates. Farm income and the sale of milk are not taxed, but the Government would earn sales tax on processed milk products and income taxes on RDDC and the unions.

7.05 To ensure the proper care of the early crossbred calves during the critical first three months of their lives and to encourage the spread of crossbreeding, GOI would subsidize the provision of calf starter rations for their first crossbred female calf to members of the DCS up to a maximum of Rs 200 per member. Assurances were given that the GOR Animal Husbandry Department would administer the calf rearing subsidy program.

Financial Results

7.06 All institutions set up under the project would be financially viable and would generate a satisfactory rate of return. DCS would earn surpluses from year two onward. Financial rates of return at the unions' overall activities would be about 18% (see Annex 4, Table 13). RDDC would charge a yearly levy from each union to cover the cost of services starting year five. The RDDC bull farm would be an independent profit center. Its financial rate of return would be about 13%. BVVI vaccine production would also generate profits. The typical smallholder in the project area now owns one nondescript native cow, yielding about 500 l of milk per lactation. Part of this milk is consumed by the calf and the household, so that cash income from the sale of surplus milk would seldom exceed Rs 100 per lactation. In addition to providing for increased domestic consumption of milk, net cash income from a crossbred cow would be about Rs 400 per year (Annex 3, Table 6). As the smallholders in the project area are predominantly subsistence farmers, dairying would be their main source of cash income and link to the money economy.

7.07 In addition, the project would afford small farmers the opportunity to adopt a mixed farming system through the integration of a profitable live-stock enterprise (commercial dairying) into their traditional cropping system. Since such a change would involve the introduction of pasture/fodder crop rotation, it would result in long-term improvement in soil structure and fertility which would largely compensate for some diversion of land to fodder.

VIII. ECONOMIC COSTS, BENEFITS AND JUSTIFICATIONS

8.01 The direct economic benefit of the project would be the increased production of milk. The incremental annual milk production is estimated at 475,000 tons by year ten. Although ample markets would exist, potential increase in milk production after year ten has not been taken into account because additional processing capacity required then is not included in the project investments.

8.02 The project would directly benefit, through increased incomes, about 240,000 agricultural households most of whom farmless than 2 ha (15% landless), or approximately 1.3 million people, which is about 20% of the rural population in the project area. The establishment of 1,800 DCS, five milk unions with their own milk plants and feed mills would provide direct employment for about 8,000 people. It would also support a milk transport service of about 100 vehicles mostly owner operated.

8.03 Social benefits would be derived after the village DCS become firmly established with a regular surplus of funds (estimated at Rs 12,000 annually by year eight). These funds would most likely be used to augment or initiate village development schemes such as education, health, family planning, minor public works and infrastructure (AMUL model). A further benefit would accrue from improved nutrition due to increased intake of milk, particularly by children and infants. The benefits to the consumers would also come from an improvement in nutrition due to increased availability of unadulterated pasturized milk in the urban areas. Also, as the share of hygienic pasturized milk to raw milk increases, the risk of milk borne diseases such as TB, Brucellosis and gastrointestinal infections (particularly with infants) will decrease greatly.

8.04 The assumptions for computing the economic rate of return are in Annex 8. Labor costs for feed and green fodder production are included at their market price. Skilled and semi-skilled labor for milk plants and feed mill operations is costed at market price. Incremental family labor requirements for twice daily milking of crossbreds as opposed to native cows are minimal (about 10 minutes/day) and would not affect alternative employment and are thus not considered significant. Milk is valued at Rs 1.50/l which is a composite price of ex-plant fluid milk and the portion of the farm production that would bypass the plants. This price is at the lower end of the price range in urban markets. Based on these costs and benefits assumptions, the estimated economic rate of return is 31%.

8.05 The most significant risk facing the project is the task of creating DCS and unions to establish a new cooperative controlled production and marketing channel for the increased amount of rurally produced milk. NDDB's experience in replicating the AMUL pattern in Gujarat and other parts of the country indicates that human responses to such a program are varied but that the obstacles, though many, are surmountable. Intensive training, extension

and organizational support are essential in replicating the AMUL model and the project places considerable emphasis on these inputs. A sensitivity analysis to test the effect of higher costs and lower benefits on the estimated rate of return was carried out. If investment and operating costs are 10% higher while the benefits due to delays in farmer response or decreased production are 10% lower, the economic rate of return is estimated to drop to 22%. A sensitivity analysis to test the effect of slower formation of successful DCS, assuming that plant investments are not delayed, shows that if successful DCS can only be formed at half the rate envisaged, the expected rate of return would still be 24%.

IX. RECOMMENDATIONS AND AGREEMENTS REACHED

9.01 During negotiations agreement was reached on the following major points:

With GOI that:

- (a) All major equipment of the milk processing and feed mill facilities would be procured through international competitive bidding, in accordance with IDA guidelines. Locally manufactured equipment would be allowed a 15% preference or the prevailing customs duty, whichever is lower (5.04);
- (d) Exotic dairy heifers, bulls and frozen semen would be procured on the basis of quotations requested from at least three countries free from foot and mouth disease where animals suitable to the project are available (5.06);

With GOI and GOR that:

- (c) Consultants acceptable to IDA would be recruited by RDDC to assist the unions in the following activities: dairy plant engineering, milk and dairy products marketing, dairy processing engineering, mass-media communication expertise, and forage/animal production (4.14);
- (d) They would, for the first time not later than 1980, and each year thereafter, offer for sale their shares (i) in RDDC to the unions at par value until the unions had attained at least 75% ownership (6.01); and (ii) in the unions to the individual DCS, at par value until the DCSs had attained at least 75% ownership (6.04);

- (e) They would provide equity financing required to ensure that the RDDC and the Unions qualify for project loans from participating banks (6.04);

With GOR that:

- (f) The DCS and the unions would be formed under bylaws acceptable to IDA (4.05) and existing societies and unions would be eligible to participate only after the capitalization, bylaws and management had been approved by IDA (4.05);
- (g) It would finance the start-up costs and initial operating deficits of the DCS, unions, and RDDC; such financing for the unions and RDDC would be in the form of redeemable share capital, to be redeemed once the loans from banks are repaid (6.04);
- (h) Each union would be free to set prices for its products and services, and for milk procurement from members (7.03).

With ARC that it would:

- (i) Invite all banks operating in the project area to determine interest in participating, establish a list of eligible banks based on criteria agreed to with IDA and lend through the minimum number of banks selected in consultations with the unions and RDDC (6.13); basic eligibility criteria for cooperative banks would be that collection rate must be above 65% and any amount required to reduce overdues as a percentage of demand to 25%, to be financed by GOR by purchase of redeemable equity; participating banks would provide an adequate project supervision group to oversee the project investments, submitting quarterly reports to ARC and IDA (6.14).

9.02 It was agreed that the following would be conditions of credit effectiveness:

- (a) RDDC had been established under the articles approved by IDA and its Managing Director having qualification and experience acceptable to IDA, appointed (4.03); and GOI and GOR had contributed Rs 0.30 M each as share capital subscription of RDDC and GOR had contributed an additional Rs 0.5 M as redeemable share capital for the first year start-up costs (6.01);
- (b) RDDC had made arrangements satisfactory to IDA to (i) train consultants, executive staff of RDDC and unions and spearhead teams; (ii) provide first year field supervision; (iii) furnish consulting services for effecting a dairy marketing study; and

(iv) assist in preparing specifications for tenders for procurement of equipment and construction of the dairy plants and feed mills (4.03);

- (c) RDDC had recruited three consultants (Dairy plant engineer, mass media communications specialist, and livestock/forage specialist), and the RDDC divisional managers of institutional development, livestock development and engineering.
- (d) A subsidiary loan agreement between GOI and ARC had been approved by IDA and executed.
- (e) Loan agreements, satisfactory to IDA, had been concluded between ARC and participating banks.

9.03 Given the above assurances and conditions, the project is suitable for an IDA credit of US\$27.7 M.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

The Dairy Sub-Sector

A. Background

General

1. Annex 1 of Report NP: 431-IN of Karnataka Dairy Development Project contains a comprehensive review of the Dairy Sub-sector in India in general.

Agriculture

2. About 73% of the Rajasthan population is engaged in agriculture which contributes about 40% of state income. Approximately 13 million ha (37%) of the state are desert. Forests cover 1 million ha (3%) and, 11.5 million ha (40%) are under rainfed crops mainly millet, Jowar (sorghum) and maize. About 2.5 million ha (18%) is irrigated. Irrigated crops include wheat, paddy, cotton, sugarcane, millet, pulses, oilseeds, fodder crops (alfalfa and berseem), fruit and vegetables. The annual rate of agricultural growth during 1962/63 to 1970/71 was 2.8%. The average holding is 6.8 ha.

3. The production of foodgrains in Rajasthan in 1971-72 was as follows:

<u>Crop</u>	<u>Production</u> <u>'000 Tons</u>	<u>% of India's Total</u>
Rice	159	0.3
Sorghum (Jowar)	255	3.2
Bajra (spiked millet)	1,371	25.5
Maize	752	14.9
Wheat	1,904	7.1
Barley	590	25.5
Small Millets	24	1.5
Gram	886	4.7
Tur	20	1.2
Other Kharif Pulses	395	25.2
Other Rabi Pulses	18	0.6
	6,373	6
<u>Other Crops</u>	<u>Production</u>	<u>% of India's Total</u>
Oilseeds	531	6
Cotton (1,000 bales)	229	5
Sugarcane	122	1

4. Average production of foodgrain per capita is 270 kg/year comparing favorably with 190 kg/year for all of India. This agricultural production comes mostly from western Madhya Pradesh where the Project would be located.

B. Dairy Livestock

Livestock and Breeds

5. The present bovine population of Madhya Pradesh is about 26 million cattle and 6 million buffalo. This represents 15% and 11% respectively of the Indian total. Some 8.1 million cattle and 2.5 million buffalo above 3 years of age are breedable milking stock. Only about 50% of these females are in milk. Most animals do not conform to any specific breed, the following breeds can be identified: cattle: Malwi, Mariana, Gaolao, Nimari, Gir and Kankathar. The prevalent buffalo breed is the Murrah for milk production, also the Bhadawi.

6. There are seven government cattle breeding farms in the state producing pedigree bulls of the main breeds, but only one maintains Jersey bulls. Until 1970 the cattle breeding policy in the state was to upgrade the local cattle with bulls of the dominant breeds in the state. However because of the slow rate of genetic improvement through selection and the relatively low potential for milk production of the indigenous milking breeds of cattle, it is now proposed to introduce exotic breeds of dairy cattle to upgrade local cattle to a level of 2/3 exotic blood.

7. It is only in the last two years that exotic purebred breeding of dairy cattle have been introduced into the state for the purpose of producing bulls for crossbreeding with the indigenous cattle. This will be the breeding method used in the project for improving milk production. The Jersey breed, because of its high fat content, low maintenance requirements (small mature body size), and availability of high quality stock, would be the preferred cross. However other exotic breeds are being tested under controlled conditions such as the Brown Swiss under the Indo-Swiss Breeding Project (Kerala) and the Red Dane under the Danish Project Assistance Program (Karnataka). Management of exotic stock and crossbreeding in India requires close supervision. Some important features are:

- (a) it takes two to three years to acclimatize exotic animals;
- (b) even after such acclimatization the exotic population does not normally reach the production level which could be expected in its home country;
- (c) it takes time for local management to adapt to the requirements of the exotic breeds and their cross breeds;

- (d) crossbred heifers show a much earlier maturity than their native mother but in mating, consideration must be given to their lower body weight and measurements as compared with the exotic animals;
- (e) under Indian conditions the optimum proportion of exotic blood is about 2/3. The Indo-Swiss Project is aiming at a 50% dual purpose (dairy and draught) crossbred where the indigenous parental stock is a crossbred between Hariana (dairy and draught) and Sahiwal (dairy) breeds;
- (f) an improved animal can express its higher production potential only under adequate management and feeding.

Milk Production

8. Indian native cattle and buffalo mature late, calving for the first time around four years of age, with an intercalving period of two years (50% calving) and have low milk production. Cows in milk average 1-1/2 l. per day (500 l. per lactation) and buffalo around 2.5 l. per day (800 l. per lactation). First cross project heifers by Jersey bulls are capable of producing about 2,300 l per lactation.

9. The following selected data show the milk yields of crossbreds compared with their indigenous dams:

Rajasthan, Records of the State Department of Animal Husbandry:

<u>Breed</u>	<u>Age of First Calving Months</u>	<u>Average Milk Production Per Lactation: kg</u>
Hallikar	44	500
Hallikar x Jersey (F ₁)	25	1,945
Hallikar x Red Dane (F ₁)	27	2,686
Gir	48	786
Gir x Holstein Freisian (F ₁)	33	3,150
Haryana	48	600
Haryana x Holstein Freisian (F ₁)	33	3,050
Haryana x Jersey (F ₁)	27	2,350

Kerala, Records of the Indo-Swiss Breeding Project:

Average of 120 indigenous cows: 650 kg/lactation

Results of first generation crossbreds (x Brown Swiss):

<u>Lactations</u>	<u>Age of Calving Month</u>	<u>Days in Milk</u>	<u>Milk Yield Average Kg</u>	<u>No. of Animals</u>
1st	38	301	1,699	12
2nd	34	301	2,029	77
3rd	46	299	2,564	57
4th	59	300	2,700	24
5th	69	305	4,069	3

C. Feed Requirements

Feeds and Feeding

10. The most common cattle feeds available are: byproducts of agricultural crops: straw, sugarcane tips; cultivated fodders: alfalfa, berseem (clover) and hybrid napier; perennial pasture grasses; concentrates from rainfed crops: barley, cottonseed, gram (chickpea); and oilcake from groundnut, sesame, rape, cottonseed. The low quality crop residues which comprise the main roughage component of the native animal's diet are inadequate to maintain crossbreds. Therefore increased dairy herds and milk production (Annex 3) under the Project would depend on an adequate supply of high quality forage and balanced premixed feed. GOR measures to encourage fodder production include demonstration farms for improved pastures and better management, seed multiplication farms, distribution of hybrid napier seedlings, loans and grants for pasture improvement and for fencing of pasture land, and subsidies for fodder seed and chaff-cutters. However the largest scope for increased production of high quality forage is by intergration of fodder crops into existing irrigated farms.

11. The comparatively high agricultural production in eastern Rajasthan, where the Project area would be located, would assure the supply of the food grain ingredient (25%) and the agricultural byproducts (75%) of the balanced concentrate feed. In view of the need of increased supplies of milk for better human nutrition, together with the social impact dairy development has for small farmers, the trade off between increased milk production and a greater demand for cereal grains is readily accepted by government, particularly as milk constitutes an important source of protein for the large vegetarian segment of the population.

Incremental Feed Demand Under the Project:

12. Indigenous cattle currently consume about 3 tons of straw, 3 tons of green fodder, and 0.5 tons of concentrates during the year of lactation (500 l every second year). Crossbred cattle when seasonally well managed require an additional 4 tons of green fodder and 1 ton of concentrate mix in a year for producing about 2,300 l per lactation. The replacement of indigenous cows by crossbred stock in each DCS is also projected to increase its member cow herd size from 210 AU to about 260 AU at maturity. Allowing for the phased implementation of the 1,800 DCS over five years and increased membership in each DCS during the first three years, the total numbers of crossbred cows, in year ten, would be about 170,000.

The total additional feed requirements, by year ten would then be:

Green fodder:

(a) for crossbreds: 170,000 X 4	680,000 tons
(b) for increased milk production of buffalo and indigenous cows: 100 million liters X 2 ton/1,000 l	<u>200,000 tons</u>
Total	880,000 tons

at a yield of 50 tons/ha/year this would require about 20,000 ha of irrigated land and approximately 30,000 dug wells.

Premixed feed:

(a) for crossbreds: 170,000 X 1	170,000 tons
(b) for increased milk production of buffalo and indigenous cows: 100 million liters X 0.5 ton/1,000 l	<u>50,000 tons</u>
Total	220,000 tons

The additional requirements of premixed feed would involve about 55,000 tons (25%) of cereal grain or about 0.9% of Rajasthan's total present grain production.

13. There are at present about 280,000 wells in the six districts of the Project and about 25% (70,000) would belong to farmers expected to join the DCS. As only about 10% have access to electric power for pumps, a dug well of about 20 ft in diameter and 80 ft deep can only irrigate 0.6 ha extracting the water with bullock power. The presently irrigated area to come under the Project would thus be about 40,000 ha. This area would appear ample for fodder production, however about 15,000 additional wells **would** to dug (over a ten year period) allowing for members with irrigated land who would continue growing

other crops. Ground water is available, and also on-farm credit to farmers, through ARC, for minor irrigation schemes involving wells. Advised by the proposed extension services under the Project, farmers with irrigated land would be encouraged to grow fodder for their own use and also for sale to other members. Under present conditions, production of berseem and alfalfa renders a net income to the farmer comparable to wheat on irrigated land. In addition, and most important, long term improvement in soil structure and fertility through introduction of leguminous fodders into the crop rotation would increase yields of other crops grown on the irrigated land.

D. Milk Production and Marketing

Milk Producers

14. Dairying in Rajasthan is largely a subsidiary activity to crop farming though in many instances it provides a daily cash income. Over 80% of the cows and buffalo are kept in villages. The average size herd is 2 - 3 breedable head per family. Milk producers are of 3 categories: (a) the landless who represent about 15% of the rural population, keep 1 to 2 animals and purchase all feeds and fodders; (b) the mixed farmer (cropping and livestock) whose main income is from sale of crops surplus to household needs, dairying is a sideline which utilizes crop byproducts. He may use a small area of his land for growing fodder (alfalfa and berseem) purchasing small amounts of concentrate, herd size is about 2 to 5 animals (c) the urban milk producer with herds up to 20 head, he purchases all the feed and fodder and buys the cows at peak production selling them when dry. In west Rajasthan nomads keep herds of up to 200 head. Total milk production in the State is about 5,000,000 l/day equivalent to about 190 gr/capita, well above the national average of 110/115.

Dairy Cooperatives

15. The Dairy Cooperative movement in the Project area came into existence with the creation of the government milk schemes to assure supply for their processing plants. Due to the subsidized milk price policy of the government dairies and other organizational shortcomings, the cooperative movement did not develop. As a result, in 1972, the Animal Husbandry Department commenced the implementation of dairy cooperative societies, based on the AMUL model, formed under two Unions: Ajmer and Alwar, which would come into the project.

Milk Marketing

16. The urban centers are the natural markets for village surplus milk and in Rajasthan as in most of India there are three main type of suppliers of milk to the urban markets: (i) traditional village agents, (ii) city producers; (iii) cooperative sector. The traditional village agent, acting as a collector/middleman for private vendors in the cities is still the main supplier. The supply from city producers is also significant representing about 20% - 30% of

the urban demand. Villages that are remote from main roads and urban centers, due to lack of adequate transportation, are compelled to convert most of their milk into ghee (butteroil) wasting some of the skimmed milk. Only about 40% of the milk is consumed as fluid.

17. Most agent/collectors pay the village producer between Rs 1 - and 1.50/1, they operate from villages comparatively close to the urban centers. Though offering a poorer product, they are serious competitors to organized milk schemes which have to bear the higher cost of processing. Under the present marketing system, the city producer selling direct to a regular consumer clientele is also very competitive with the agent/collector even though the city producer must buy all his feed supply. To reduce feed costs many city producers purchase cows in milk and sell them at the end of their lactation, they do not, therefore, generally rear calves. Rajasthan has an undeveloped dairy processing and marketing structure resulting in severe milk shortage, with marked price escalation in the urban centers, during the lean season.

18. Milk prices of private vendors in Rajasthan are not controlled and the urban market price for raw milk varies according to type and season from about Rs 1.50 to 2.0 per 1. The GOR dairies market pasteurized milk in 1/2 1 bottles at significantly lower prices: Rs 1.35 per 1 of 3% fat (Jaipur) and this makes them unable to pay village producers a competitive price. This results in low procurement volume and operating losses due to low throughput. Accordingly the GOR milk scheme in the city of Jaipur accomodates only about 8% of the urban demand. In addition to the Jaipur plant which has a capacity of 20,000 1/day, the following government owned plants are also located in the project area: Ajmer of 30,000 1/day to be completed in 1974 and Alwar of 10,000 1/day. In Bharatpur there is a private milk powder plant of 40,000 1/day. Milk reaches the processing plants, in 40 1 cans, by contract truckers while at the village level agent/collectors often procure and transport it to collection points by bicycle or oxcart. These four plants represent a processing capacity equivalent to 5% of the total present milk production in the Project area which is about 2,000,000 1/day.

19. During the 4th Five year plan construction was initiated on dairy plants in the cities of Bikaner (Operation flood). Jodpur, Ajmer (Project Area) and Kota and are now in the completion stage. Milk would be supplied through dairy cooperative societies organized along the AMUL model with introduction of crossbreeding. There are already eight milk producers Unions registered in the state.

E. Technical Services

Veterinary Services

20. Disease prevention and control measures in the state are the responsibility of the Department of Veterinary Services and Animal Husbandry. The Department employs over 1,000 Veterinary graduates. For the 26 districts the

state has 342 Veterinary Hospitals, 144 AI centers over 50 Rural Veterinary Dispensaries and 37 Mass Immunization and Mobile Veterinary Units. The Mobile Veterinary Units' function is to control epidemics and carry out free of charge routine vaccinations for rinderpest and to a lesser extent for blackquarter and hemorrhagic septicaemia.

21. Approximately one third of the facilities operated by the Department of Animal Husbandry for animal health services are located in the Project area. The existing diagnostic station located at Jaipur has insufficient facilities and staff to provide an efficient back-up service for field veterinarians and mobile veterinary units. A new central diagnostic laboratory (CVAS) would be established under the Project.

Vaccine Production

22. The present vaccine production facilities at Jaipur are very inadequate and production has been curtailed because of low quality standards. A new vaccine production unit known as the Biological Veterinary Vaccine Institute (BVVI) would be established under the Project at Jaipur. The new laboratory would concentrate on vaccine production for the state's livestock requirements. Vaccine production is of particular importance to the exotic and crossbred animals who are more susceptible to the infectious diseases that are endemic in the country. The vaccines of importance to the Project are hemorrhagic septicaemia, blackquarter, anthrax and rinderpest. The capacity would be about 5,000,000 doses per year. Those are offered without charge, government bearing the cost. The proposed Institute would be the responsibility of the State Veterinary Services and Animal Husbandry Department but subject to quality control by the Indian Veterinary Research Institute. National production of foot and mouth vaccine is currently being reorganized with the establishment of regional production plants under the Danish Project Assistance Program. At present Hoechst operates a small plant in Bombay of a capacity of 500,000 doses/year. The FM vaccine would be sold at Rs 8/dose which would include a 50% GOI subsidy.

Artificial Insemination

23. Artificial insemination is effected with fresh semen through 144 AI centers in the state. Due to shortage of trained staff and poor communications and transport facilities only about 25% of the semen is actually utilized. The following statistics on AI in the district of Jaipur confirm the present trend to crossbreeding:

<u>Year</u>	<u>Exotic Jersey</u>	<u>Haryana</u>	<u>Buffalo</u>	<u>Total</u>
1970-71	5,662 (48%)	2,890	3,185	11,737
1971-72	7,446 (54%)	2,401	3,992	13,839
1972-73	6,712 (54%)	2,570	3,168	12,450

24. Frozen semen from exotic stock is imported under bilateral aid programs (Swiss, Danish, Canadian, and others) in limited quantities and used mostly for the bull breeding farms. Frozen semen gives low conception rates (25%) with buffalo and this has precluded its use in the AMUL model where AI services are done with fresh semen delivered daily with the milk collecting trucks. Conception rates at AMUL average 45%.

25. The Danish Project Assistance Program has provided five frozen semen banks, one is scheduled for installation at Bikaner. Each bank has a capacity of 125,000 doses/year for distribution through 50 AI units. It can receive, store and distribute frozen semen and includes a liquid N₂ plant. An additional nine such units are under consideration for India under a US\$40 M grant by the Danish government. The first five units would operate on imported supplies of frozen semen. The subsequent nine would include twenty exotic bulls each.

F. Government Policies

26. The policies followed by the GOR in the dairy subsector are essentially those established by the GOI in its Five-year plans. Allocations for the dairy subsector in the first three development plans were inadequate causing Government to reconsider its policies in the Fourth and current Fifth plan. Together with the objective of food grain self-sufficiency, livestock development in India and in Rajasthan is now gaining importance as a means to diversify agricultural production. Within the livestock sector, dairy development has been given greatest emphasis in GOI's Fifth plan since, despite milk and milk products providing the primary source of animal protein availability has fallen from 120 (1970) to 112 g (1973). GOI plans for dairy development have been stimulated by the successful AMUL experience and in the Fifth five-year Plan GOI is encouraging the AMUL model as the basic means to increase milk production. In addition, animal production, health and AI facilities are proposed to be improved at state level and more emphasis placed of increasing crossbred cattle. GOI would provide a crossbred calf subsidy of Rs 200 per head, in the form of pre-mixed calf feed, to encourage farmers to adopt better feeding practices and so avoid losses of valuable crossbred heifers due to malnutrition. The Fourth plan provides funds for the construction of a total eight dairy plans in Rajasthan four of which are soon to be commissioned.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Project Lending Institutions

1. IDA funds for loans to the RDDC and the Unions would be on-lent by GOI, through the Agricultural Refinance Corporation (ARC). ^{1/} ARC is well known to the Bank group, being the intermediary refinancing channel for 15 ongoing IBRD/IDA credit projects.

A. Agricultural Refinance Corporation (ARC)

2. ARC was established in 1963 as a subsidiary of RBI to provide a supplemental source of medium- and long-term finance for agricultural credit institutions and to guide them toward a development-oriented approach in their operations. In support of the latter objective, ARC sponsors orientation and training programs for management and technical staff of financial institutions, helps strengthen the management and financial operations of banks, especially the land development banks and, with the expansion of its own technical division, is increasingly assisting financing institutions in appraising the economic and technical feasibility of development schemes as well as their supervision.

3. During its first ten years of operations, ARC disbursed Rs 2,190 M (US\$274 M) against a total commitment of Rs 4,010 M (US\$626 M). About 90% of its refinance assistance has been for minor irrigation and land development schemes. Other minor lending includes farm mechanization, plantation and horticulture, poultry, fishery, dairy cattle, storage facilities and market yards. About 90% of ARC's refinance and assistance so far has been disbursed through Cooperative Land Development Banks, 5% through State Cooperative Banks and 5% through commercial banks.

4. The spread between ARC's borrowing and lending rates is sufficient to meet expenses and after declaring dividends, it showed a profit of Rs 3.7 M (US\$463,000) in 1973-74. ARC is in good financial condition, its equity position is unimpaired by losses, and its assets in GOI securities and debentures of land development banks are guaranteed in principal and interest by GOI and State Governments.

1/ Full details of ARC's organization and financial operations are given in Annex 4 of the Uttar Pradesh Agricultural Credit Appraisal Report No. 1071-IN, April 12, 1973.

5. ARC would be required under the Project to:
- (a) establish participation criteria with IDA based on conditions listed in Appendix 1; invite all banks operating in the Project area to participate in the Project; and make a list of eligible banks;
 - (b) channel funds through not more than two banks selected by the borrowing Unions & RDDC from the list of eligible banks, providing 90% refinance for project loans by these banks; and
 - (c) chair and direct the operations of a Project Supervision Group to be established by the banks (Appendix 1).

B. Cooperative Banks

6. There are two separate cooperative banking systems in Rajasthan--the Cooperative Land Development Bank (LDB) System which provides long-term development credit--and the State Cooperative Bank System (RSCB) which provides credit mostly for crop production. However, these systems are independent of each other, though both are supervised by the GOR Registrar of Cooperatives.

Rajasthan State Cooperative Land Development Bank (LDB)

7. The LDB System is a federation of 37 Primary Land Development Banks (PLDB) with most districts having at least one PLDB. The LDB has its headquarters in Jaipur and also five regional offices. Annual lending increased from Rs 2.2 million in 1964-65 to almost 46.5 million in 1970-71 but fell to Rs 31.4 in 1971-72 due to poor collection and the consequent shortage of lendable funds. The emphasis is on development, mainly irrigation wells, pumpsets, tractors and implements and land preparation. At the end of 1972, 1/ LDB portfolio was:

1/ Based on LDB Annual Report for 1972.

<u>Purpose</u>	<u>Number of Loans</u>	<u>Total Amount (Rs millions)</u>
New dug wells construction	16,900	68.2
Pumpsets: Electric	4,400	17.9
Diesel	4,300	24.0
Tube wells	150	1.7
Tractors & Machinery	1,900	3.9
Well Repairs	3,050	8.9
Water Tanks and Field Channels	1,400	7.8
Land Development	1,050	2.8
Farm Buildings	500	1.8
Others	<u>2,300</u>	<u>35.6</u>
	25,950	172.6

Average loan Rs. 4,800

8. Principal LDB sources of funds are paid up share capital, reserves and debentures. PLDB's are required to hold 5% of their borrowings from LDB as share capital. As of February 28, 1974, paid up share capital was Rs. 14.7 million, of which 37% belonged to GOR, 62% to the PLDB's and less than 1% to the Central Cooperative Banks (para. 6). Reserves were Rs. 1.4 million, undistributed profits 5.2 million, and issued debentures Rs. 205 million. Net earnings improved from Rs. 0.25 million in 1967-68 to Rs. 2.1 million in 1971-72.

9. Collection performance of PLDB's, and thus the LDB, is unsatisfactory. The PLDB's overdues as a percentage of demand (arrears plus amounts due that year) have, since 1969-70, been continually above 40%, while that of LDB have risen from 4% in 1969-70 to 48% as of December 1973. Of the PLDB's, only 9 reported overdues below 25%, which is the maximum permissible for participation under ongoing IDA credit projects in other states of India. GOR would provide redeemable equity capital to make up for the difference between the actual overdues and the 25% requirement for LDB to participate in the Project. Other conditions for Project participation are given in Annex 1.

Rajasthan State Cooperative Bank (RSCB)

10. The Rajasthan State Cooperative Bank (RSCB), established in 1953, has a three-tier structure based on 11,000 primary cooperative societies federated into 28 Central Cooperative Banks (CCB), one for each district. About 7,700 of primary societies are agricultural while others are consumer, marketing or small agro-industrial societies. Borrowing members hold share capital (12-1/2% of borrowings) in the primary society in the CCB. Similarly, a CCB must hold 8.5% of its borrowings from the RSCB as share capital. GOI and GOR provide substantial financial assistance as equity capital, by subsidies, placing of long-term, interest-free or low interest deposits or by

contribution to a stabilization fund for converting short-term uncollectibles into medium-term credit. The financial position of the RSCB 1/ at the end of FY 1973 was:

<u>Assets</u>	<u>(Rs million)</u>
Cash & short call deposits	20.4
Investments	25.7
Loans & Advances	169.3
Other Assets	<u>7.9</u>
Total Assets	223.3
<u>Liabilities</u>	
Capital--Paid up	20.6
Reserves & Other Funds	38.2
Deposits	47.3
Borrowings	110.6
Other Liabilities	<u>6.6</u>
Total Liabilities	223.3

11. The RSCB loan portfolio is about 67% of short-term loans and cash credits (a form of revolving credit), 30% medium-term and a very small amount of long-term loans for cooperative processing. Borrowings are almost exclusively from the RBI which annually provides 40-50% of the funds of the cooperative banking system.

12. Profits improved from about Rs 1.0 M in 1965-66 to about 1.9 M in 1970-71 but have since declined to 1.2 M as a result of reduction in lending operations associated with severe overdue problems since 1971. The ratio of overdues to amounts outstanding for the CCB's and the RSCB is unsatisfactory. Thus, at the end of 1973 overdues with the CCB's stood at 42% of demand with two reporting as high as 93% but two below 25%. The RSCB's overdues, at Rs 30.7 M against a loan portfolio of Rs 135 M in 1972, were about 56% of demand.

13. RSCB given its limited experience in financing long-term processing investments of cooperatives would be invited to participate in the Project provided conditions for participation listed in Appendix 1 were satisfied.

C. Commercial Banks

14. Direct financing of agriculture by commercial banks is a recent development, beginning primarily after the nationalization of major banks in 1969. Government has attempted to set targets for the opening of new

1/ Based on RSCB annual report 1972-73.

branches in rural areas. Performance to date has been modest with the commercial banks slowly building up expertise for agricultural lending. Loans to date have been for tractors and pumpsets, with crop loans and short-term credit limited to individuals who have taken medium-term credit. Collection record, in agricultural operations except for the specialized Agricultural Development Branches, ADB, is believed to be generally similar to that of cooperative banks.

15. The most important commercial bank operating in Rajasthan is the State Bank of Bikaner & Jaipur (SBBJ), a subsidiary of the State Bank of India, followed by the Bank of Baroda and the Punjab National Bank. SBBJ is currently experimenting with two Agricultural Development Branches, one of which is in the Project area at Alwar. Operating since January 1973, ADB Alwar, had achieved the following results by March 1974:

<u>Purpose of Loan</u>	<u>Number of Loans</u>	<u>Amounts Rs million</u>
Crop Loans	610	29.7
Wells	220	6.8
Tractors	65	14.1
Pumpsets	140	4.2
Animals	<u>45</u>	<u>1.2</u>
	1,080	56.0

16. ADB's experience to date has been very encouraging as it has no overdues. ADB management is in the hands of a well trained agricultural graduate, supported by one technician. The field staff are charged with filling bimonthly supervision reports on every account. Based on experience to date, to be effective, an ADB should concentrate on a maximum geographical area of about 20-30 mile radius. A total of 10 ADB's are to be set up in Rajasthan by December 1974 and 10 additional ADB's are likely to be established during the next two years in the Rajasthan Canal Command area under an IDA Project.

17. In summary, commercial banks are financially sound and are strengthening their agricultural staff capabilities to expand their role in agriculture. However, they lack experience in long-term financing of investments for processing plants and are reluctant to move into the cooperative sector. Given the changed emphasis following nationalization, it is expected that commercial banks would be keen to participate in the Project for long-term lending to the cooperative sector for milk processing and cattle feed plants. Conditions for participation are given in Appendix 1. Considering the problems of overdues and management of the LDB and RSCB, the participation of commercial banks would be critical to the implementation of the Project. Assurances would be sought that GOI and ARC, GOR would facilitate the participation of commercial banks in the Project and that GOI and GOR would provide guarantees, if necessary, for their project loans to the Unions and RDDC.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Project Lending Terms and Conditions

- Borrower: India
- Beneficiaries: Rajasthan Dairy Development Corporation (RDDC) and five dairy cooperative unions.
- Relending Terms: For credit for project investments by RDDC and Unions
- (i) From GOI to ARC: repayable over 15 years at 7-1/2% per annum, minimum.
 - (ii) From ARC to Lending Banks: Repayable over a period of up to 15 years at 8% per annum minimum. Grace and repayment terms would be set to coincide with collections from RDDC and Unions.
 - (iii) From Lending Banks to Unions & RDDC: Repayable over up to 10 years after up to five years grace on interest and principal, at 11% per annum, minimum.

Conditions for Project Participation by Banks:

In the case of SLDB & RSCB:

- (a) Collection rate to be at least 65% and the amount required to reduce overdues from the actual value at the end of the previous fiscal year to 25%, to be financed by purchase of redeemable equity by the GOR;
- (b) ARC to review the bank's credit management and effectiveness of supervision and to require the appointment of suitable personnel and/or training programs, if necessary;

For All Banks:

- (c) All banks participating in the Project to jointly organize and operate within one year of effectiveness a Project

Supervision Group (PSG) consisting of suitable experts 1/ and constituted with ARC approval; the PSG would be charged with continuous supervision of the Project, with special emphasis on the organizational and institutional aspects.

1/ ARC would determine in consultation with IDA the composition of the PSG and qualification of its members. Basically, two full-time staff and a panel of consultants in cooperatives, financial management and dairy business. PSG to meet at least quarterly under ARC chairmanship and to provide the banks, ARC and IDA with information and recommendations and other reports on the progress of the Project.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

The Dairy Cooperative Societies

The AMUL Story

1. DCS and Unions under the project would be organized along the well known and highly successful AMUL ^{1/} cooperatives operating in Gujarat. The core of AMUL's success was the organizing of thousands of small farmers, each cultivating an average of three acres, into hundreds of village cooperative milk producer societies which, in turn, were federated into a union known as the Kaira District Cooperative Milk Producers' Union Ltd., Anand. The term "AMUL", an abbreviation for Anand Milk Union Ltd., in the Sanskrit language means "priceless" and is used as the trade name for all milk products sold by the Union.

2. The Union was started in 1946 with two village milk producers' societies. From a handful of producers in two village societies, producing about 250 l of milk daily, the AMUL system today is based on some 785 village cooperatives with total membership of 225,000 individual milk producers, all affiliated with the Union, which is now collecting about 150 million liters annually.

3. Several unique features contributing to the success of the AMUL pattern stand out. Its development was based on self-help; its leadership grew while overcoming strong resistance from vested private interests. AMUL is unique in its ability to provide numerous economic and social benefits to thousands of small farmers. Some of the more significant features include: (a) technical services on animal husbandry and fodder programs; (b) availability of prompt veterinary health and AI services; (c) concentrate feed; (d) seed and fodder seedlings; (e) training programs for men and women; (f) continuous supervision of the village cooperatives and quarterly audit; payment for milk based on butter fat content; (g) supply of startup equipment for each new society.

The DCS Model

4. The DCS model (Table 1) is built upon data for the "average village" in the project area which includes 9,860 villages (30% of Rajasthan's total)

^{1/} Also see IBRD report on the Survey of Successful Experiences in assisting the Smallholder Livestock Producer dated December 1973 by Dr. E. McCauley (Consultant), and Annex 2 of the Karnataka Dairy Development Project Report (431a-IN) of May 21, 1974.

having a population of about 6.5 million (about 30% of the State's rural population). The Project is aimed at 3,600 villages, or approximately 60% of those accessible. The area contains 1.0 million (about 40%) of the State's breedable buffaloes and 1.3 million (about 30%) of its breedable cows. The average village in the project area has a population of 670, constituting about 120 households. Of these households, about 80% own breedable animals and approximately 15% are agricultural laborers who own no land or insufficient land to meet their subsistence requirements.

6. The average DCS is projected to reach its maximum membership in the third year, covering about 70% of the village households and about 70% of the village breedable cattle. In order to obtain the volume necessary for viable operations, two average villages would be included in each DCS. The project would consist of 1,800 DCS and at maturity, it would cover an estimated 245,000 rural households, 260,000 breedable buffaloes and 320,000 breedable cows (see Table 1).

Milk Collection & Services

7. DCS would collect milk twice daily. The collection point would be a building in the society's home village rented by the DCS. Collections would be handled on a first-come-first-served basis and samples for fat testing would be taken from every batch of milk. The quantity delivered by each member would be noted at the time of delivery by the DCS secretary trained in milk testing (Annex 6), in a pocket record book carried by each member. The payment according to fat content would be determined and recorded, along with the volume delivered, in society records. Milk would be brought to the main collection center from sub-centers in outlying villages. At each collection sub-center a DCS helper would take a sample of each member's delivery and note the volume. These deliveries would be bulked and transported by the DCS helper to the main collection center, where the samples would be tested and entries made in the DCS records. DCS staff would be trained (Annex 6) to provide AI and animal first aid services. Village extension workers would provide technical assistance in crossbreeding and fodder production through twice monthly contact with DCS members.

Payment

8. Payment would be based on quantity and fat content. Payouts would be made at regular, frequent intervals as specified by a majority vote of the membership. DCS bylaws would not allow payments to be made less frequently than once a week. Daily payments would be recommended. Prices would have to be established in competition with the village traditional agent/collector and improved on to attract producers to the DCS. Bylaws (Appendix 1) would permit price differential between members and non-members for milk as well as feed. This would be in addition to the bonus of Rs. 0.05/liter the DCS members would receive starting year 5.

Transportation

9. DCS milk would be bulked in 40 liter cans and transported from the DCS's collection center initially by union owned trucks, later expanding with private contractors, engaged by the Unions. Each contractor would be required to provide tangible security which could be realized by the Union in the event of breach of contract, which would follow the AMUL format. The maximum time between the first pickup on a route and the time of delivery of milk to the dairy plant or chilling center would not exceed 4.5 hours. Any spoilage of milk would be for the contractor's account. At the dairy plant or chilling center each DCS batch delivered would be sampled and tested for fat content and SNF (solids-non-fat) and the DCS would be paid according to volume, SNF and fat content. Union payments for milk to DCS would be made every other day for the first five years. Payments made in cash would be delivered by the transport contractor, or else by depositing in the DCS account at the nearest bank.

Investments and Financial Operations

10. The physical investment for a DCS would consist of milk collection and testing equipment, an AI crate, veterinary first aid equipment and some furniture. Table 4 shows the projected investment requirements of a typical DCS and the total for the 1800 DCS to be formed under the Project. Table 2 shows the projections for milk collection and financial operations of a typical DCS. Suppliers who are not DCS members would be charged extra commission. The initial year's loss would be covered by Government financing the salary of staff for four months including two months in training. Equipment would be provided. Working capital needs would be minimal as the Unions would pay the DCS every other day for its milk (DCS would pay the members daily). These requirements would initially be financed from membership fee and share capital and further increases, as the volume expands, would be financed from surpluses. Application of annual surplus would be governed by the bylaws, with the first 25% applied to a reserve fund, 80% of which would be held in Union shares. The typical DCS would be able to declare a small patronage bonus of about 1 p/lit in year 2 increasing to 5 p/lit by year 5. At the same time a DCS would be able to purchase, in addition to one share required to become a Union member, additional shares worth Rs. 700 in year 2, rising to Rs. 3,100 by year 5, out of the funds allocated to Reserves. By year 10, a DCS is expected to have a Reserve Fund of Rs. 83,000 of which Rs. 30,000 would be in the form of Union shares, Rs. 8,000 as working capital and the balance available for other allocations, including village development, according to membership decisions.

Accounts and Auditing

11. DCS accounts would be maintained by the society secretary, who would also supervise milk collection, record members' deliveries and compute payments and disburse payments due each member. DCS secretaries would be

trained in basic record keeping and other functions at the UTC (Annex 6). Field managerial assistance would also be available to new DCS from the Union's division of institutional development. The accounts of each DCS would be audited at least every four months by the audit staff of the Registrar of Cooperatives or the Union's supervisor. Results of each audit would be communicated to the appropriate Union. The financial position of the DCS would be communicated to members, along with the auditor's report, at the annual meeting. Any significant irregularities would be reported by the Registrar of Cooperatives to a special membership meeting. DCS would not be charged for audits for the first three years but thereafter, would be charged according to a schedule of fees to be specified by the Registrar of Cooperatives.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

DCS By-Law Highlights 1/

1. Objectives: Increase milk production of members' dairy animals through improved husbandry; sale of balanced feed concentrates; increase fodder production; maintain profitable marketing facilities for members' milk production through milk producer unions; support and assist member activities and maintain profitable operations.
2. Membership: Only milk producers residing in the area, in good standing, owning at least one cow or buffalo; not engaged in milk collection or sale except under society or Union auspices; owning at least one share (Rs. 10 par value); willing to serve in elected or appointed positions; services available to non-members only on terms as specified by majority vote of membership; no bonuses to non-members; and limited liability.
3. Membership Meetings: Supreme authority vested in general meeting of members; review management performance; provide policy guidelines; approve or rejects budgets, new programs; elect management committee; special meetings called as needed; one member one vote; majority rule.
4. Management: Delegated by membership meeting to elected management committee, seven to nine members; fixed terms of office; chairman elected annually by the committee; committee employs staff; oversees operations; distributes bonuses; and works to keep society viable, profitable and progressive. Registrar of Cooperatives may appoint administrator when mismanagement is demonstrated.
5. Funds: Share subscriptions, donations, loans, deposits; share transactions at par value (Rs. 10) only; no member's share to exceed 1/10 of paid-up capital; and loan and deposit liabilities not to exceed five times net worth. 1/
6. Payments to Members: Daily milk payments unless otherwise specified by majority vote of membership, subject to seven-day maximum payment period.
7. Credit: No loans or advances in cash or kind, excepting trade credit extended to the Union of which the society is a member; no undertakings of any kind with respect to a member's or any other party's debts.

1/ Subject to the requirements of the State Cooperative Act.

8. Allocation of Earnings: 25% of net profit allocated to Reserve Fund (80% or more of this invested in the Union shares at least for first 10 years); 2%, to Cooperative Education Fund; maximum dividend 9% of share capital; balance distributed as follows: 65% bonus to members based on patronage, 10% to the cattle relief fund, 10% to community development fund, 10% to cooperative information fund, and 5% bonus to staff.

9. By-Law Changes: Subject to approval by a two-thirds majority and at least 50% of members present at a general meeting called with due notice, approval of Registrar of Cooperatives also required.

INDIA
RAJASTHAN DAIRY DEVELOPMENT PROJECT
Village Dairy Cooperative Society

Source Data

	Number of Villages ^{1/}	Rural Population '000 ^{1/}	Population per Village	Households per Village ^{2/}	Breedable Buffaloes			Breedable Cows		
					Herd '000 ^{3/}	Per Village	Per Household	Herd '000 ^{3/}	Per Village	Per Household
Total Rajasthan	32,241	21,195	657	119	2,323	72	0.61	4,608	142	1.19
Project Districts										
Ajmer	950	715	753	137	84	88	0.64	211	222	1.62
Alwar	1,853	1,255	677	123	183	99	0.80	170	92	0.75
Bharatpur	1,838	1,285	699	127	222	121	0.95	151	82	0.65
Jaipur	2,694	1,734	644	117	255	95	0.81	338	125	1.07
Sawai Madhopur	1,523	1,057	694	126	186	122	0.97	215	141	1.12
Tonk	1,002	517	516	94	87	87	0.93	168	168	1.79
Totals and Averages	9,860	6,563	666	121	1,017	103	0.85	1,253	127	1.05
Livestock per Household ^{4/}										
Mixed Farmers				82		88			107	
Agricultural Laborers (15% of all households)				15		15			20	
Total				97		103	1.06		127	1.31
Geographical Coverage										
Villages Accessible by All-Weather Roads (60%)	6,200									
Number of Villages under Project (60%)	3,700									
Feasible number of villages covered by each society: about 2										
Society Model		Percent Participation		Households		Breedable Buffaloes			Breedable Cows	
Year 1		30%		58		61			76	
Year 2		50%		97		103			127	
Year 3 Onwards		70%		136		144			178	
Total Project										
Year 7 Onwards (1800 Societies)				244,800		2,592,00			320,400	

^{1/} Source: Directorate of Economics and Statistics, Jaipur. Basic Statistics, Rajasthan, 1971.

^{2/} The average household is composed of 5.5 persons.

^{3/} Source: 1972 livestock census.

^{4/} Assumed 20% of all households do not keep dairy livestock.

I N D I A
RAJASTHAN DAIRY DEVELOPMENT PROJECT
Typical Village Cooperative Society 1/
Herd Projections - Crossbreeding of Local Cows

ANNEX 3
 Table 2

	Years											
	1	2	3	4	5	6	7	8	9	10	11	12
Cows												
Local	64	107	150	151	143	123	92	44	10	--	--	--
Crossbred	--	--	--	--	12	29	55	88	118	136	145	154
1st Calf Heifers-Local	12	20	28	17	9	--	--	--	--	--	--	--
1st Calf Heifers-crossbred	--	--	--	12	21	37	41	47	52	53	55	56
Total mated 1/	76	127	178	180	185	189	191	179	180	189	200	210
Less deaths	4	7	9	7	7	8	6	5	5	6	6	6
Less sales	8	13	18	18	26	31	53	46	39	38	40	42
On hand at end of yr.	64	107	151	155	152	150	132	128	136	145	154	162
Heifers (2-3 Yr.)												
Local	13	22	18	9	--	--	--	--	--	--	--	--
Crossbred	--	--	13	22	39	43	48	54	55	56	58	61
Less deaths	1	2	2	1	2	2	1	2	2	1	2	2
Less sales	--	--	--	--	--	--	--	--	--	--	--	--
On hand at end of yr.	12	20	29	30	37	41	47	52	53	55	56	59
Heifers (1-2 yr.)												
Local	15	10	10	--	--	--	--	--	--	--	--	--
Crossbred	--	15	25	42	46	51	57	58	59	61	64	68
Less deaths	1	3	4	3	3	3	3	3	3	3	3	3
Less sales	--	--	--	--	--	--	--	--	--	--	--	--
On hand at end of yr.	14	22	31	39	43	48	59	55	56	58	61	65
Calves (1 yr.)												
Born during year	38	63	98	109	120	126	129	130	134	142	150	158
Males	19	32	49	55	60	63	65	65	67	71	75	79
Less deaths	4	6	8	8	9	7	7	7	7	7	8	8
Less sales	15	26	41	47	51	56	58	58	60	64	67	71
Females	19	31	49	54	60	63	64	65	67	71	75	79
Less deaths	4	6	7	8	9	6	6	6	6	7	7	8
On hand at end of yr.	15	25	42	46	51	57	58	59	61	64	68	71
Total Animal Units	90	149	211	224	232	239	233	235	245	258	271	286
Local females milked	38	63	98	101	99	80	60	29	6	--	--	--
Crossbreds milked	--	--	--	8	21	46	69	101	128	142	150	158
Total females milked	38	63	98	109	120	126	129	130	134	142	150	158
Parameters												
Calving rate %												
Local cows	50	50	55	60	65	65	65	65	65	75	75	75
Crossbreds	--	--	--	65	65	70	70	75	75	75	75	75
Mortality rate %												
Cows	5	5	5	4	4	4	3	3	3	3	3	3
Others 1 - 2 year	10	10	10	8	7	6	5	5	5	5	5	5
Calves up to 1 year	20	20	15	15	15	10	10	10	10	10	10	10
Age at 1st calving (mo.)												
Local cows	45	45	45	45	--	--	--	--	--	--	--	--
Crossbreds	--	--	--	30	30	30	30	30	30	30	30	30
Milk/Lactation (l.)												
Local cows 2/	500	610	680	750	750	750	750	750	750	--	--	--
Crossbreds	--	--	--	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300
Milk Production ('000 l.)												
Local cows	19.0	38.4	66.6	75.8	74.3	60.0	45.0	21.8	4.5	--	--	--
Crossbreds	--	--	--	18.4	48.3	105.8	158.7	232.3	294.4	326.6	345.0	363.4
Total												
Animal Sold												
Cull cows	8	13	18	18	26	31	53	46	39	38	40	42
Male calves	15	26	41	47	51	56	58	58	60	64	67	71

1/ Over years 1 to 3, DCS membership increases from 58 households to 138 households resulting in a corresponding increase in the number of animals in the "DCS herd."
 2/ Milk yield would increase about 50% through improved nutrition in the 4th year.

I N D I A
RAJASTHAN DAIRY DEVELOPMENT PROJECT
Typical Village Cooperative Society
Herd Projections - Local Buffaloes

	----- Y e a r s -----											
	1	2	3	4	5	6	7	8	9	10	11	12
Total mated	61	103	144	144	144	144	144	144	144	144	144	144
Total milked	31	51	79	86	94	94	94	94	94	94	94	94
Milk/Lactation (1) <u>1/</u>	800	900	1000	1100	1100	1100	1100	1100	1100	1100	1100	1100
Milk Production ('000 l) <u>2/</u>	24.8	45.9	79.0	94.6	103.4	103.4	103.4	103.4	103.4	103.4	103.4	103.4

1/ Reflects increased calving rate from 50 to 65% in 5 years.

2/ Milk yield would increase about 40% through improved nutrition in the 4th year.

Consolidated Figures - Milk Production

	----- Y e a r s -----											
	1	2	3	4	5	6	7	8	9	10	11	12
Milk Production												
Local cows: In Milk (no.)	38	63	98	101	99	80	60	29	6	--	--	--
Yield ('000 l)	19.0	38.4	66.6	75.8	74.3	60.0	45.0	21.8	4.5	--	--	--
Crossbreds: In Milk (no.)	--	--	--	8	21	46	69	101	128	142	150	158
Yield ('000 l)	--	--	--	18.4	48.3	105.8	158.7	232.3	294.4	326.6	345.0	363.4
Buffaloes : In Milk (no.)	31	51	79	86	94	94	94	94	94	94	94	94
Yield ('000 l)	24.8	45.9	79.0	94.6	103.4	103.4	103.4	103.4	103.4	103.4	103.4	103.4
Totals:												
Animals in milk (no.)	69	114	177	195	214	220	223	224	228	236	244	252
Milk Production ('000 l)	43.8	84.3	145.6	188.8	226.0	269.2	307.1	357.5	402.3	430.0	448.4	466.8
Calf Milk Consumption ('000 l) <u>1/</u>	5.9	9.8	19.4	21.6	31.6	33.2	33.8	34.0	34.8	36.4	37.8	39.4
Producers Milk Consumption ('000 l) <u>2/</u>	11.6	19.5	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3
Milk Sales ('000 l)	26.3	55.0	98.9	139.9	167.1	208.7	246.0	296.2	340.2	366.3	383.3	400.1
Milk Sales from non-members <u>3/</u>	13.2	16.5	9.9	14.0	16.7	20.9	24.6	29.6	34.0	36.6	38.3	40.0
Total Milk sales	39.5	71.5	108.8	153.9	183.8	229.6	270.6	325.8	374.2	402.9	421.6	440.1

1/ litres per calf; years 1 and 2; 120 l; years 3 and 4; 150 l; thereafter 200 l.

2/ Assumed an average 550 grams/day per producer-family (100 grams/capita)

3/ Computed as a % of total milk sales from members; 50% in year 1, 30% in year 2, 10% thereafter

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RAJASTHAN DAIRY DEVELOPMENT PROJECT

Dairy Cooperative Societies: Investment Projections

	-----Years-----					<u>Total</u>
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	
<u>Investment Per Society</u>						
Equipment Rs 2000/Society ^{1/}	2,000	-	-	-	-	2,000
Start-up Cost Rs 1000/Society ^{2/}	1,000	-	-	-	-	1,000
Working Capital ^{3/}	500	400	300	500	400	2,100
<u>Number of Societies Formed</u>	300	350	400	400	350	1,800
			(Rs, 000)			
<u>Total Investment</u>						
Equipment	600	700	800	800	700	3,600
Start-up	300	350	400	400	350	1,800
Working Capital	<u>150</u>	<u>300</u>	<u>430</u>	<u>615</u>	<u>825</u>	<u>2,320</u>
<u>Total Without Contingencies</u>	1,050	1,350	1,630	1,815	1,875	7,720
<u>Physical Contingencies (10%)</u>	90	105	120	120	105	540
<u>Price Contingencies</u>	<u>150</u>	<u>335</u>	<u>570</u>	<u>820</u>	<u>1,050</u>	<u>2,925</u>
<u>Total Investment</u>	<u>1,290</u>	<u>1,790</u>	<u>2,320</u>	<u>2,755</u>	<u>3,030</u>	<u>11,185</u>

- ^{1/} DCS-owned equipment for milk testing, first aid and AI service: centrifuge, lactometer and petrometers, first aid kit, AI crutch, ledgers and office supplies, lantern, etc.
- ^{2/} Start-up costs are salaries for Society staff for the first four months, paid into the Societies' account by Government in advance to provide a working capital cushion and include allowances during 2 months in training.
- ^{3/} Working capital equivalent to 4 days' business given a Union payment every 2nd day for the first five years.

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RAJASTHAN DAIRY DEVELOPMENT PROJECT

Typical Dairy Cooperative Society: Sales Volume, Income & Cash Flow Projections

	-Years-									
	1	2	3	4	5	6	7	8	9	10
<u>Sales Volume</u>										
Members' Milk Sales to DCS ^{1/}	26	55	99	140	167	209	246	296	340	367
Non-Members' Milk Sales to DCS	13	16	10	14	17	21	25	30	34	37
Total DCS Milk Sales in 000 litres/year in kg fat/year	39	71	109	154	184	230	271	326	374	404
	2,300	4,215	6,280	8,605	10,040	11,940	13,620	15,870	17,840	19,000
Cattle Feed Sold (tons/yr.)	13	27	36	51	61	76	90	108	108	108
<u>Income Statement</u> (Rs)										
-----constant prices-----										
Revenue ^{2/}										
Commission on Milk (@ Rs 1.50/kg fat)	3,450	6,320	9,430	12,900	15,060	17,910	20,430	23,800	26,760	28,500
Commission on Cattle Feed (Rs 30/ton)	390	715	1,090	1,540	1,840	2,290	2,700	3,260	3,260	3,260
Retention on non-members' deliveries (@ Rs 1/kg fat)	770	1,050	570	780	910	1,090	1,240	1,440	1,620	1,730
Total Revenue	4,610	8,085	11,090	15,220	17,810	21,290	24,370	28,500	31,640	33,490
Operating Costs										
Wages	4,000	3,600	3,600	3,600	4,500	4,500	4,500	4,500	4,500	4,500
Rent	700	700	700	700	700	700	700	700	700	700
Milk Testing & First Aid Supplies	760	1,300	1,900	2,800	2,800	2,800	3,350	3,750	3,750	3,750
Replacement & Miscellaneous	150	250	350	550	550	650	650	750	750	750
Total Operating Costs	5,610	5,850	6,550	7,650	8,550	8,650	9,200	9,700	9,700	9,700
Operating Surplus (Deficit) -	(1,000)	2,235	4,540	7,570	9,260	12,640	15,170	18,800	21,940	23,790
-----current prices ^{3/} -----										
Bonus from Union ^{4/}	-	-	-	-	1,440	3,220	12,280	19,940	21,390	23,330
Net Surplus (Deficit)	(1,130)	2,235	6,010	10,780	15,620	24,010	38,480	56,020	63,170	70,910
<u>Cash Flow</u> (Rs)										
<u>Sources of Funds</u>										
Share Capital & Membership Fees	640	440	440	-	-	-	-	-	-	-
Management & Equipment Grant ^{5/}	3,390	-	-	-	-	-	-	-	-	-
Net Surplus	(1,130)	2,750	6,010	10,780	15,620	24,010	38,480	56,020	63,170	70,910
Total Sources of Funds	2,900	3,190	6,450	10,780	15,620	24,010	38,480	56,020	63,170	70,910
<u>Uses of Funds</u> ^{6/}										
Testing & Collection Equipment	2,260	-	-	-	-	3,290	-	-	-	-
Dividend on Share Capital	-	100	130	130	130	130	130	130	130	130
Bonus to Members	-	1,220	3,150	6,370	9,270	14,300	22,980	33,510	37,800	42,440
Reserve Fund										
(i) Purchase of Union Shares ^{7/}	100	700	1,550	2,150	3,120	4,500	7,700	10,230	-	-
(ii) Working Capital ^{8/}	500	400	300	500	400	1,400	500	500	3,000	500
(iii) DCS Savings Account	40	30	90	40	380	100	1,420	3,270	12,790	17,230
Sub-total (Reserve Fund)	640	1,130	1,940	2,690	3,900	6,000	9,620	14,000	15,790	17,730
Other Applications	-	740	1,230	1,590	2,320	290	5,750	8,380	9,450	10,610
Total Uses of Funds	2,900	3,190	6,450	10,780	15,620	24,010	38,480	56,020	63,170	70,910
Cumulative Reserve Fund	640	1,770	3,710	6,400	10,300	16,300	25,920	39,920	55,710	73,440

^{1/} See Annex 3 Table 3 for consolidated figures for DCS milk production and sales.^{2/} Non-members pay an additional commission which is held as a share capital reserve (up to a maximum of Rs11), giving the non-member an option to use it towards buying a share and becoming a member within one year.^{3/} 14% for 1974, 11% for 1975, 7.5% for 1976-80 and 5% compounded subsequently. All items below this line are in current prices.^{4/} Total bonus allocations are distributed to DCS's in proportion to milk business; here, even distribution among 400 DCS is assumed.^{5/} The grant covers the cost of equipment, plus the salary of staff during the first four months, including training. Each farmer (Annex 3 Table1) purchases 1 share of Rs 10 and pays a membership fee of Rs 1 on becoming a member.^{6/} Under DCS bylaws a minimum of 25% of the annual surplus and the full amount of share capital must be placed in a Reserve Fund. Maximum bonus allocation under DCS bylaws is 80% of the annual surplus after required application to Reserve Fund and declaration of dividend. "Other Applications" represents surplus funds over and above the statutory minimum. These latter funds could be used for village development, education, etc.^{7/} Union shares are purchased at the rate of 80% of the year's application to the Reserve Fund after all allowances for adequate working capital.^{8/} For the first five years the Union pays the DCS every other day while the DCS pays daily, resulting in maximum working capital needs of equivalent to four days' business; from year six the Union pays every third day and from year 9 every 4th day. Working capital needs thus increase.

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RAJASTHAN DAIRY DEVELOPMENT PROJECT
Returns from Crossbreeding

ANNEX 3
Table 6

Basis: 10 Cow Herd ^{1/}

	<u>Native Cow</u> ^{2/}	<u>Crossbred Cow</u>
<u>Physical Parameters</u>		
Cows	10	10
No. Calving and Milked	5	6.5
No. dry	5	3.5
Calves sold	4	5.5
No. of cows purchased	1	1
Milk yield/lactation	500	2,300
Feeding: tons/year/cow including progeny		
Green fodder	--	3
Straw	5	5.0
Concentrates	0.2	0.9

Financial Operations ^{3/}

Costs

Feed Costs ^{4/}	2,000	11,400
Miscellaneous	100	150
<u>Total Costs</u>	2,100	11,550

Income

Manure	900	1,500
Milk @ 1.05 ^{5/}	1,970	14,330
<u>Total Income</u>	2,870	15,830

Gross Margin

Per 10 cows	870	4,280
Per cow ^{6/} =====	90 ===	430 ===

^{1/} For the purposes of the model only; a typical project dairy farmer has 1-2 cows only.

^{2/} Assuming traditional husbandry and a non-upgraded native breed.

^{3/} Concentrates @ Rs 1,000/ton, cost of production inputs for green fodder is about Rs 60-80/ton while purchased fodder is Rs 120/ton, and straw is a by-product of agriculture and is free of financial cost. Part of the fodder requirements could be met from grazing.

^{4/} Manure @ 30 ton and 50 ton/year respectively @ Rs 30/ton.

^{5/} Calf consumption is 125 l for natives and 200 l for crossbreds.

^{6/} Incremental income per cow is about Rs 340/year as a result of replacement through AI. Most producers currently receive about Rs 0.80/l for milk, partly in the form of ghee. Based on this price, the gross margin for native cows would be about Rs 70/cow/year. DCS would pay the higher price.

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RAJASTHAN DAIRY DEVELOPMENT PROJECT

Current Milk Prices

Location Source	Purchase Price Paid To Producer			Sales Price To Urban Consumer	
	Rs/l	% Butter Fat	Rs/kg Butter Fat	Rs/l	% Butter Fat
Delhi, private vendor	--	--	--	2.30	
" Government Milk Scheme	--	--	--	1.30	Std. 3.5%
Jaipur, producer (a) near city	1.-	4%	25.-		
" Government Milk Scheme	0.80	4%	20.-	1.35	Std. 3.-%
" private vendor	--	--	--	2.-	
" private collector	1.-	5%	20.-	--	
" Dairy coop. (a) (cow)	1.08	4%	24.-	--	
" " (a) (buff.)	1.25	7%	18.-	--	
" producer (b) (cow)	0.90	4%	22.50	--	
" " (b) (buff.)	1.05	7%	15.-	--	
" producer (c) (cow)	1.-	4%	25.-	--	
" " (c) (buff.)	1.25	7%	18.-	--	
Ajmer, Dairy Coop. (a) (cow)	1.0	4%	25.-	--	
" " (a) (buff.)	1.25	7%	18.-	--	
" producer (b) (buff.)	1.25/1.50	7%	20.-	--	
" " (c) (mixed)	1.25/1.50	6%	23.-	--	
" Government Milk Scheme	--	--	--	1.45	
" Dairy Coop. (d) (cow)	1.-	4%	25.-	--	
Alwar " " (a) (buff.)	1.40	7%	20.-	--	
" " (b)	--	--	--	1.50	
" producer	1.10	6%	18.-	--	
" Dairy Coop. (c) (buff.)	1.40	7%	20.-	--	
" " (d) (cow)	0.80	4%	20.-	--	
Bharatpur, producer	produces ghee, sold at Rs 20/kg.				
Sawai Madhopur-Ton, producer	produces ghee, sold at Rs 19/20 kg.				
Ganga Nagar, private vendor	--	--	--	2.20	
" " producer	1.06	4.-	26.50		
" " private collector	1./1.25	4%	28.-)		
" " (cow)			21.50)	2.-	--
" " private collector	1.4/1.6	7%	21.50)		
" " (buff.)					
<u>Average:</u>			21.40		

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Dairy Cooperative Union

A. Functions

1. Under the Project, the DCS in each district (milkshed) would be federated into a Union, established according to the State Cooperative law. Once 25 DCS had been formed and operating in a district, a Union would be formally registered. At full development there would be about 360 DCS in each Union. The Union, like DCS, would be a farmer service organization providing the following services: AI, animal health, cattle feed production, milk collection, processing and marketing, institutional development and technical extension services in fodder production and mixed farm management.

Artificial Insemination Service--Bull Farm

2. The Union would make a daily delivery of fresh semen to each DCS. Each Union would invest in and operate a bull farm to produce fresh semen from Jersey and Buffalo males, for AI service in the village. Trucks leaving for milk pickup would collect iced semen packs for delivery to the DCS. The DCS secretary and helpers would be trained at the Union Training Center to provide AI services (Annex 6).

Animal Health Service

3. For each route covering about 35 DCS's the Union would operate a mobile unit with vaccination and animal health kits and staffed by a qualified veterinarian and helper to provide routine veterinary services to the DCS. Each society would be visited once weekly on fixed days and at a fixed time. There would be no charge for such routine visits. However, emergency 24-hour service which would also be available, would cost a member Rs 15 per visit, and a non-member Rs 20. A total of 75 mobile units (30 Union owned and others hired) by year five would be equipped to provide routine health services, pregnancy diagnosis, and vaccinations. A union would not operate a veterinary hospital as this service is available from the Government hospitals in the Project area.

Milk Collection and Processing

4. Milk would be collected from the DCS along defined and economically viable routes involving about 13-15 DCS each. Milk in 40 l cans from the

DCS would be picked up daily and transported to the dairy plants by a fleet of both owned and hired trucks operated by the Union; 15 chilling centers would be provided for pooling milk from distant routes services by five 13,000 l capacity road tankers for freighting the milk to the plants. Processing plants are discussed in Appendix 1.

Institutional Development and Technical Extension Services

5. A Union Training Center (UTC) would be operated to cater to the training needs of the DCS staff, members of the DCS Management Committee DCS farmer membership as well as to Union staff. UTC investment estimates and a description of the various training programs to be organized are given in Annex 6. A total of 1,100 man months of training is expected to be provided by the UTC annually. Management and organizational support to the DCS would be provided by the Union, through frequent supervisory visits, by supervisory staff from the Institutional Development Division. Extension needs of the DCS would be considerable, especially during the early years. Union's extension services, described in Annex 6, provide for one full time village extension worker during the first three months of a DCS operation, and subsequently, once fortnightly supervision visits by the extension staff. Cross-breeding, calf rearing, animal health, milking hygiene, feeding, fodder production and mixed farming management would be the main subjects. Practical demonstrations would be provided through the operation of about 10 demonstration farms by each Union. These farms of 2 ha. size would be operated by their owners, under close supervision of the Union and the RDDC livestock/fodder consultant, and would be guaranteed adequate incomes in order to encourage their participation in the program.

Financial Operations

7. Equity capital to enable a Union to borrow for investments in fixed assets would initially come almost totally from Government, except for funds resulting from the share purchases required from each member DCS. Lending institutions would finance up to 80% of the cost of investments in milk plants, feed mills, technical services and administration. Operating deficits (See Table 13) would be small in the first two years and are expected to increase in year three when the milk plant comes into operation, all on account of small milk volume. Operating surpluses are expected from year five when the milk from the crossbreeds starts to increase. Operating deficits, including feed mill operations, are expected to total Rs 3.8 M over years one to three. These would be financed by equity-capital subscriptions by Government to be redeemed at par in equal installments over years seven-nine.

8. Union bylaws would require that 25% of the net income in each year be automatically transferred to a Reserve Fund. Up to 80% of the balance can be returned to the DCS as a patronage bonus effectively increasing the members' selling price of milk. Cooperative Unions are assessed income tax at 44%. Tax liabilities would be minimized by declaring the maximum permissible

bonus while retaining sufficient funds for debt services and future expansions. The unions are projected to reach and, after tax and after bonus, rate of return of about 13.5%. The rate of return including the bonus paid to DCS would be 18%.

9. Purchases by DCS of Government equity holding in the Unions are shown in Table 14. By year nine, it is expected that DCS, applying 80% of their Reserve Fund allocations for the purchase of Government shares in the union, would have a 75% interest in the Union. Union's purchase of RDDC shares would occur from the Reserve Fund allocations in year seven, enabling the five unions to jointly own 75% of the RDDC paid-up capital. GOI and GOR would hold the remaining 25%. By year ten, when a plant expansion may be due, a union is expected to have reserves of Rs 32 M to enable it to raise funds without Government involvement.

D. Management and Bylaws

10. Key requirements of the bylaws governing the Union operations are summarized in Appendix 2. They provide for limited liability of members, one vote per DCS, and the constitution of an 11 member board of directors. The board, to be chaired during majority ownership by the district Collector, would have the following representation: from member DCS, (6); GOR, (2); RDDC, (1); and the Union's financing institution, (2). However, until a Union has 80 DCS members, there would be only 1 DCS nominee on the Board. Once the DCS have majority shareholdings they would have the right to elect the Chairman of the Board.

11. Operational authority and responsibility would be vested in a General Manager appointed by the board working through 5 divisional managers responsible for Institutional Development, Livestock Development, Plant Operations, Administration and Marketing (see Chart 1). The staff of the union (Table 11) would expand from 100 in year one to about 430 in year five. Union Division managers would work closely with the RDDC division managers and consultants in planning and implementing their programs.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Milk Processing Plants and Feed Mills

A. Milk Processing Plants

Milk Supply Projections--Plant Capacities

1. The fluid milk available to the unions during the initial five years of the project is comparatively small because the crossbreds from local cows become productive only in the fourth year which is equivalent to year nine for those societies implemented in year five. Table 4 shows the projected milk supplies to the Unions which have served to determine the capacities of the proposed dairy plants. To reduce operational deficits during the early years the dairy plants would be expanded to match the increased milk supplies. The first expansion from 100,000 lts./day to 150,000 lts./day would take place in year 4 and the second expansion to 200,000 lts./day in year 6. As the project would not provide for disbursements beyond year 6, throughputs and operating results have been based on this maximum capacity which would be filled in year eight. The milk supplies expected to continue increasing beyond year eight would be processed in new plants or further plant expansions financed by new or other loans.

Urban Market Demand--Product Mix

2. No adequate study has been made to determine present and future demand of milk and milk products of the urban markets in the Project area. Consequently to determine plant equipment requirements a representative and viable product mix, similar for all plants, was assumed. This is indicated in Table 10.

3. As soon as NDDB had been contracted and the divisional managers of marketing of the RDDC and Unions had been recruited, they would collaborate with NDDB in making a market study involving the urban centers and the potential demand of the regional and national milk grids, to determine the appropriate product mix for each plant within the project context of five unions, to avoid installing excess capacity in any one plant and to minimize freight of fluid milk.

4. General Design: The successive expansion of the plants has been planned to defer investment and improve cash flow. However, general layouts and particularly building design from the very first phase of construction

would allow for the subsequent expansions to assure a functional flow at all times. Civil works, utilities, equipment and dairy processing equipment have been detailed on the corresponding investment estimates (Table 1 and 2). Effluent treatment would be of the secondary type either in the form of trickling filter or anaerobic lagoons. Power would be purchased.

5. All plants would include a milk drying plant for balancing purposes and eventual production of infant food, a triblender for reconstitution of milk during the lean season, and bottling facilities. For transportation of milk from chilling centers to the plants and freighting surplus milk between plants, one road tanker of a capacity of 13,000 liters would be provided for each plant. Surplus milk to be diverted to the city of Delhi (National Milk Grid) would go by rail utilizing Government rail tankers which would be available.

6. The Unions are only loosely identified with their respective districts and milk routes would transverse the district borders as dictated by the respective milksheds. Existing Government-owned chilling centers in the region remaining in use would be incorporated as needed into the assets of the respective Unions. In addition, the Project would provide for three chilling centers for each Union for pooling milk from remote DCS.

B. Feed Mills

Balance Feed Demand

7. This has been computed on the basis of a rate of 1 kg feed per 3 lt of milk, allowing for members that would not purchase feed. The milk supply projections (Table 4) have served to establish the yearly requirements of feed, as well as the peak capacities on a per day basis, for each of the five plants.

Feed Mill Capacities and Constructions

8. The feed mills would not undergo successive expansions but be built in a phased manner each to its nominal capacity of 75 tons/day. Accordingly, the first plant would be built in years one-two, the second in years two-three and the last three in years four-five.

Feed Mill Operations

9. Plants would have facilities for receiving raw materials in bulk by truck and carry inventories for one month's production. Equipment would be suitable for producing typical varieties of balanced feed formulas with about 10 ingredients, sold in pellet form in 70 kg bags. To assure regular supplied of feed to the DCS, each plant would be equipped with its own fleet of trucks. Income and operating cost assumptions are shown on Tables 9-10.

C. Plant Construction

Engineering

10. The NDDB has developed considerable capability and expertise in dairy plant modular design and coordination of all phases of construction with contractors. After having effected the recommended market study, NDDB would assist the RDDC (Engineering Division) in preparing layouts, building design and specification of equipment to meet recommended capacities and product mix, **on which**, bids would be requested. Procurement of equipment, installation and construction would be bulked into as few contracts as possible, as NDDB, due to previous commitments, would not be available to handle all the engineering and it would not be justified to build up the RDDC Engineering Division to do this work considering difficulty in recruiting experienced staff. This would also apply to the construction of the feed mills.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Model Union By-Laws Highlights 1/

1. Objectives: Promote village level cooperative dairy development through improved animal husbandry, supported by an integrated package of services for affiliated DCS and their members; increase production and utilization of green fodder and feed concentrates; and provide reliable milk marketing channels.
2. Membership: DCS in good standing and Government, subscribing to at least one Union share (Rs 100 per share); limited liability; non-Government member's holding may not exceed one-fifth of total paid-up share capital.
3. Membership Meetings: Each shareholder entitled one delegate; one member one vote; majority rule; supreme authority vested in membership meetings; reviews operations, plans, budgets, expenses, audits, loans, management performance and all union activities; Union directors selected to assure representation of farmers and interested agencies.
4. Management: Ultimate authority vested in membership meeting, as delegated to a 11 member board of directors. Directors appoint and fix remuneration of General Manager and divisional managers. General Manager responsible to Board for all Union operations as Chief Executive Officer. Directors have one vote each, majority rule.
5. Funding: Share capital subscriptions, deposits, loans, grants, donations, subsidies; share transactions at per value only (Rs 100); loan and deposit liabilities not to exceed ten times the net worth 2/ of the Union.
6. Distribution of Earnings: 25% of net profit allocated to reserve fund; 2% contribution to the Cooperative Education fund; maximum dividend 9% of paid-up share capital; and maximum 80% of the balance as bonuses to members and staff, credits to funds and other reserves as approved by membership; changes in distribution of earnings subject to approval of Registrar of Cooperatives.
7. By-Law Changes: Approval of two-thirds vote of general meeting; with approval of Registrar of Cooperatives.

1/ Subject to the requirements of the State Cooperative Act.

2/ Paid-up share capital plus reserves, less accumulated losses.

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Milk Processing Plants 1/

Investment Projections

Investment Items 2/	Capacity or Total Units	Cost Per Unit	Years				Total	% Foreign Exchange
			1	2	4	6		
Total Capacity: Liters/day 3/			'000 Rs.					
Fixed Investment			*= 100,000	150,000	200,000			
Land and Infrastructure			'000 Rs.					
Land	40,000 m ²	5 Rs./m ²	200	--	--	--	200	--
Site Preparation			70	--	--	20	90	--
Sub-total			270	--	--	20	290	--
Civil Works								
Plant yards, fencing, infrastructure	5,000 m ²	100 Rs./m ²	100	300	--	100	500	--
Processing and refrigerated storage bldg.	2,000 m ²	1,000 Rs./m ²	900	570	110	420	2,000	10
Administration, lab, dressing-rooms, auxil.	800 m ²	700 Rs./m ²	200	200	60	100	560	5
Garage, store, auxiliary bldgs.	1,000 m ²	500 Rs./m ²	200	100	100	100	500	--
Water storage tank	200 m ²	1,000 Rs./m ²	200	--	--	--	200	--
Secondary effluent treatment system	500 m ² /day	700 Rs./m ²	50	200	--	100	350	--
Staff housing	5 x 120 m ² /ea.	700 Rs./m ²	120	200	100	--	420	10
Sub-total			1,770	1,570	370	820	4,530	3.9
Utilities								
Water Wells, pumps, supply lines	3 x 200 Lts./min/ea.	150,000 Rs./ea.	250	50	--	150	450	30
Power H.T. line, substation, switchgear	3 x 200 Kw.	800 Rs./Kw.	100	220	--	160	480	30
Package steam generator, fuel tank, auxil.	3 x 6,000 kg/hr.	300,000 Rs./ea.	100	500	--	300	900	20
Refrigerating equipment, cooling units, auxil.	3 x 100 Tons	3,000 Rs./Ton	100	500	--	300	900	70 14/
Service lines, maintenance equipment 4/	10%	--	60	130	--	90	280	20
Installation 5/	15%	--	90	210	--	150	450	--
Sub-total			700	1,610	--	1,150	3,460	33.5
Machinery and Equipment								
Milk reception and can washing	200,000 Lts./day	600 Rs./1000Lts/hr	100	600	200	300	1,200	80 14/
Milk pasteurization, chilling, C.I.P.	200,000 Lts./day	700 Rs./1000Lts/hr	200	700	200	300	1,400	80 14/
Milk storage tanks and siles	300,000 Lts./day	350 Rs./1000Lts/hr	150	700	200	300	1,350	30
Milk by-product making equipment	10 Tons/day Butter and Chee	--	--	350	100	200	650	80 14/
Bottling line and bulk vending units	30,000 Lts./day/ea.	--	--	300	150	150	600	80 14/
Milk condensing and spray drying unit.	75 Tons/day	200	2,300	--	300	--	2,800	80 14/
S.S. piping and fittings 6/	5%	30	250	40	80	--	400	80 14/
Chilling centers, complete	3 x 20,000 Lts./ea.	400,000 Rs./ea.	--	--	400	800	1,200	60
Installation 7/	15%	100	780	130	240	--	1,350	30
Office, lab equipment		--	100	100	--	--	100	20 14/
Sub-total			780	6,080	1,420	2,670	10,950	60.8
Transportation Equipment								
Insulated tank trucks	1 x 13,000 Lts.	350,000 Rs./ea.	--	--	350	--	350	30
Pick-up trucks, vans 8/	10 x 5,000 Lts./ea.	90,000 Rs./ea.	--	630	270	--	900	25
Jeeps, cars	2	45,000 Rs./ea.	90	--	--	--	90	20
Aluminum cans	5,000 x 40 Lts./ea.	180 Rs./ea.	--	400	250	250	900	--
Sub-total			90	1,030	870	250	2,240	18.7
Total Fixed Investment W/O Duties And Taxes			3,610	10,290	2,660	4,910	21,470	42.2
Import Duties And Taxes 9/	70%		440	3,570	480	1,140	5,630	--
Total Fixed Investment W/O Contingencies			4,050	13,860	3,140	6,050	27,100	33.7
Contingencies: Physical 10/			400	1,390	310	610	2,710	--
Price 11/			580	2,500	1,480	4,170	8,730	--
Sub-total			980	4,890	1,790	4,980	12,640	33.7
Total Fixed Investment:			5,030	18,750	4,930	11,030	39,740	33.7
Working Capital 12/			130	--	--	--	130	--
Contingencies: Physical 13/			10	--	--	--	10	--
Price	5%		30	--	--	--	30	--
Sub-total			40	--	--	--	40	--
Total Investment			5,200	18,750	4,930	11,030	39,910	33.7

1/ All three plants have been assumed equal.

2/ All machinery and equipment costs include crating, insurance and freight to site and their share of engineering and overhead costs.

3/ Plants would be built in years 1 and 2 commence operations in year 3 and undergo expansion in years 4 and 6.

4/ 10% of the four preceding items.

5/ 15% of the five preceding items.

6/ 5% of the six preceding items.

7/ 15% of the eight preceding items excluding chilling centers.

8/ 10 trucks would be purchased initially of a total 50 required. - The balance would be contracted as needed.

9/ Assumed 70% on total cost of items marked 14/ resulting from 220% on stainless steel, 70% on components and refrigerating equipment,

40% on items not manufactured locally and 12% sales tax.

10/ Physical contingencies applied at 10% on all plant investments.

11/ In accordance with March 29, 1974 guidelines, costs and prices as of mid. 1974.

12/ Corresponds to 1 month expenses in year 1 and 1 week milk purchases.

13/ At 5%.

14/ Items considered imported under ICB and subject to import duty.

I N D I A

ANNEX 4
Table 2

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Feed Mills 1/

Investment Projection

Investment Items	Capacity or Total Units	Cost Per Unit	Years					Total	Foreign Exchange
			1	2	3	4	5		
Total Capacity Tons/Day 2/			--	75	150	150	375	375	--
Fixed Investment			----- '000 Rs. -----						
Land And Infrastructure									
Land	20,000 m ²	5 Rs/m ²	100	--				100	--
Site Preparation			50	--				50	--
Sub-total			150	--				150	--
Civil Works									
Plant yards, fencing, infrastructure	3,000 m ²	100 Rs/m ²	100	200				300	--
Main processing bldg.	800	625 Rs/m ²	450	50				500	5
Office, lab, dressing-rooms	300	600 Rs/m ²	90	90				180	5
Raw material storage sheds, weigh bridge	1,200 m ²	400 Rs/m ²	240	240				480	15
Product storage shed, aux. sheds, misc.	400 m ²	400 Rs/m ²	80	80				160	--
Sub-total			960	660				1,520	6.9
Utilities 3/									
Water well, pump, tank	1 x 100 Lts/min.	100,000 Rs/ea.	100	--				100	30
Power H.T. line, substation, switchgear	2 x 200 Kw	800 Rs/Kw.	80	240				320	30
Package steam generator, fuel tank, auxil.	1 x 1,000 kg/hr	30,000 Rs/ea.	50	250				300	20
Service lines, maintenance equipment 4/	10%		20	50				70	20
Installation 5/	15%		30	90				120	--
Sub-total			280	630				910	22.0
Machinery And Equipment 3/									
Raw material hoppers, conveyors, grinders	4 Tons/hr.		50	170				220	80 13/
Ground material bins, conveyors, mixers	4 Tons/hr.		100	340				440	80 13/
Feed mix bins and bagging scale	4 Tons/hr.		--	100				100	80 13/
Pellet mill, cooler and aux.	5 Tons/hr.		50	180				230	80 13/
Dust collecting system			--	90				90	20
Installation 6/	15%		30	130				160	30
Office and laboratory equipment			--	60				60	30
Sub-total			230	1,070				1,300	67.7
Transportation Equipment									
Trucks 2/	9 x 5,000 kg/ea.	90,000 Rs/ea.	--	810				810	25
Jeeps and cars	2	45,000 Rs/ea.	90	--				90	25
Sub-total			90	810				900	25.6
Total Fixed Investment W/O Duties and Taxes			1,710	3,170				4,880	29.0
Import Duties And Taxes 8/	60%		120	470				590	--
Total Fixed Investment W/O Contingencies: One Plant			1,830	3,640				5,470	25.9
Total Fixed Investment W/O Contingencies: Four Additional Plants			--	1,830	3,640	5,490	10,920	21,880	25.9
Contingencies:									
Physical: First Plant 9/			180	360				540	
Physical: Four Additional Plants 9/			--	180	360	540	1,080	2,160	
Price : First Plant 10/			270	940	--	--	--	1,210	
Price : Four Additional Plants 10/			--	500	1,340	2,890	6,660	11,390	
Total Fixed Investment: : First Plant			2,280	4,940				7,220	25.9
Total Fixed Investment: : Four Additional Plants				2,510	5,340	8,920	18,660	35,430	25.9
Working Capital 11/				970	970		2,910		
Contingencies: Physical 12/				50	50		150		
Price 10/				230	320		1,540		
Total Investment: First Plant			2,280	6,190				8,470	16.7
Total Investment: Four Additional Plants				2,510	6,680	8,920	23,260	41,370	25.9
Total Investment: All Plants			2,280	8,700	6,680	8,920	23,260	49,840	16.7

- 1/ All three plants have been assumed equal.
- 2/ Plants would be built as follows: 1st years 1-2, 2nd years 3-4, 3rd years 4-5.
- 3/ Cost of machinery and equipment includes crating, insurance and freight to site.
- 4/ 10% of the three preceding items.
- 5/ 5% of the four preceding items.
- 6/ 15% of the five preceding items.
- 7/ For distribution of feed to village societies.
- 8/ Assumed 60% as most of this equipment is currently manufactured locally.
- 9/ Physical contingencies applied at 10% on all mill investments.
- 10/ In accordance with March 29, 1974 guidelines, costs and prices as of mid. 1974.
- 11/ Corresponds to 1/2 month's operating costs and purchases of raw materials.
- 12/ At 5%.
- 13/ Items considered imported under ICB and therefore subject to import duty.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Dairy Cooperative Union: Investment in
Technical Services and Administration 1/

(Rs, 000)

	-----Years-----						Total	% Foreign Exchange
	1	2	3	4	5	6		
Artificial Insemination Service 2/								
Land & Roads	141	-	21	7	7	-	176	3
Construction: Bull shed & yard	65	20	30	60	30	20	225	10
Lab., office & housing	178	162	80	130	130	-	680	10
Equipment	185	25	20	40	20	-	290	44
Vehicles (2)	50	-	50	-	-	-	100	25
Livestock: Imported Jersey	72	-	-	-	-	-	72	90
Local Jersey & Buffalo Bulls	8	-	60	64	-	-	132	-
Engineering	55	20	15	30	20	-	140	-
Sub-total	754	227	276	331	207	20	1,815	18
Physical Contingencies	37	11	14	16	10	1	89	
Price Contingencies	91	70	119	174	164	22	640	
Sub-total	128	81	133	190	174	23	729	
Total	882	308	409	521	381	43	2,544	18
Animal Health Service 3/ (6)								
Mobile Units	150	150	-	-	-	-	300	25
Equipment	50	115	-	-	-	-	165	90
Sub-total	200	265	-	-	-	-	465	48
Physical Contingencies	10	15	-	-	-	-	25	
Price Contingencies	27	65	-	-	-	-	92	
Sub-total	37	80	-	-	-	-	117	
Total	237	345	-	-	-	-	582	48
Administration								
Buildings & Furniture	165	375	-	-	-	-	540	10
Vehicles	100	100	50	-	-	-	250	25
Staff Quarters 4/	300	800	-	-	-	-	1,100	10
Sub-total	565	1,275	50	-	-	-	1,890	12
Physical Contingencies	30	65	3	-	-	-	98	
Price Contingencies	90	390	17	-	-	-	497	
Sub-total	120	455	20	-	-	-	595	
Total	685	1,730	70	-	-	-	2,485	12
Total Without Contingencies	1,519	1,767	326	331	207	20	4,170	18
Physical Contingencies	77	91	17	16	10	1	212	
Price Contingencies	208	525	136	174	164	22	1,229	
Sub-total Contingencies	285	616	153	190	174	23	1,441	
Total with Contingencies	1,804	2,383	479	521	381	43	5,611	18

1/ Investments in AI and Animal Health; Training and Extension for project implementation are in Annex 6 Table 2. All figures correspond to one union; all five unions have been assumed equal.

2/ Investments in a Bull Farm for producing about 180,000 semen doses annually in year 4 (280,000 by year 8) to be transported to DCS for AI activity. 8 ha of land; construction of 50 bull pens, 500 sq.ft. of collection yard, 1000 sq.ft. of storage sheds, laboratory and office space, and 30 units for staff & labor housing; equipment for laboratory, 1 set of farm machinery (Rs 80,000) and 2 sets of irrigation equipment (Rs 50,000); initial herd of 6 Jersey bulls to be imported, and subsequent requirement of 12 Jerseys to be obtained from the Corporation's breeding farm; 16 buffalo bulls to be purchased locally.

3/ Each route covering 6-7 societies is visited every week, i.e., 1 unit for 5 routes, plus emergency call units. Additional requirement after year 3 would be met through hiring vehicles for this service.

4/ 6 quarters for senior staff at Rs 50,000/unit and 30 others @ Rs 25,000/unit and 30 others @ Rs 10,000/unit.

I N D I A

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Milk Processing Plants and Feed Mills

Volume and Capacity Projections

	----- Y e a r s -----									
	1	2	3	4	5	6	7	8	9	10
<u>Milk Plants</u>										
Cooperative societies implemented, each union <u>1/</u>	60	70	80	80	70	--	--	--	--	--
Fluid milk procured, each union., Million Lts. <u>2/</u>	2.4	7.1	14.7	25.7	39.0	52.7	66.9	82.3	98.1	114.2
Average daily, 1000 Lts.	6.5	19.3	40.3	70.5	105.8	144.3	183.4	225.6	268.8	312.7
Average daily during flush month, 1000 Lts. <u>3/</u>	7.7	22.8	47.6	82.3	122.8	167.5	212.9	257.2	306.4	356.5
Milk processing capacity required 1000 Lts./day <u>4/</u>	10.0	25.0	100.0	100.0	150.0	150.0	200.0	200.0	200.0	200.0
Milk plant yearly volume, million Lts. <u>5/</u>	2.4	7.1	14.7	25.7	39.0	52.1	66.0	73.0	73.0	73.0
Milk plant construction/expansion schedule <u>6/</u>	<u>Construction</u>			<u>Expansion</u>		<u>Expansion</u>				
<u>Feed Mills</u>										
Total Yearly Volume, each union, 1000 Tons <u>7/</u>	0.8	2.4	4.9	8.6	13.0	17.4	22.0	24.3	24.3	24.3
Average Daily Demand, each union Tons/day	2.2	6.4	13.4	23.5	35.3	48.1	61.1	66.7	66.7	66.7
Average Daily demand, all unions Tons/day	11	32	67	118	177	241	306	334	334	334
No. of 75 Tons/day capacity plants required <u>8/</u>	--	--	1	2	3	4	4	5	5	5
Feed Mill construction schedule <u>9/</u>	<u>Constr. of 1st Plant</u>			<u>Constr. of 2nd Plant</u>		<u>Constr. of 3rd, 4th & 5th Plant</u>				

- 1/ There would be 5 unions of about 360 ± 50 societies each, however all unions are assumed equal for the purpose of this model. - Each union is approximately identified with the district bearing the same name.
- 2/ Based on model of typical village dairy cooperative society Annex 3 Table 1
- 3/ Ratio of milk supply between flush and lean seasons has been assumed to decrease from 1.4 in years 1 - 4 to 1.35 in years 5 - 7 and 1.3 in year 8 and onwards due to introduction of crossbreeding and other inputs.
- 4/ Determined on basis of average daily volumes during the peak month of the flush period.
- 5/ Yearly throughput becomes constant after year 7 as project does not provide for further plant expansions after year 6.
- 6/ The Ajmer Union would take over the new plant under construction which would be expanded during years 1 - 2.
- 7/ Computed on basis of 1 kg. feed/ 3 Lts. of milk allowing for members that would not purchase premix feed.
- 8/ Initially premix feed would be purchased outside.
- 9/ To avoid staged expansions plants would be built to 75 ton/day capacity as required. - The first and second plant supplying feed to all unions would initially be run by the corporation. - Each union would take over its own plant in year 6.

I N D I A
RAJASTHAN DAIRY DEVELOPMENT PROJECT

ANNEX 4
Table 5

Milk Processing Plants:
Income and Operating Cost Projections 1/

	Years							
	1	2	3	4	5	6	7	8-20
<u>Volume 2/</u>	----- Million Lts. -----							
Total Milk Processed, Million Lt.	2.4	7.1	14.7	25.7	39.0	52.1	66.0	73.0
<u>Income 3/</u>	----- Million Rs. -----							
Pasteurized Milk in Bulk (Tankers)	--	--	7.20	12.59	19.11	25.52	32.34	35.77
Pasteurized Milk in Bulk (Cans)	4.08	12.07	3.75	6.56	9.95	13.28	16.83	18.62
Pasteurized Milk in Bottles	--	--	3.97	6.94	10.54	14.07	17.82	19.72
Milk By-products (Butter and Ghee)	--	--	7.17	12.53	19.02	25.40	32.18	35.59
Milk Powder	--	--	5.09	8.91	13.51	18.05	22.87	25.29
<u>Total Sales</u>	4.08	12.07	27.18	47.53	72.13	96.32	122.04	134.99
<u>Operating Cost 4/</u>								
<u>Direct Costs</u>								
Cow Milk Purchases)	3.41	9.94	20.58	35.21	52.65	67.21	83.16	89.06
Buffalo Milk Purchases)								
Direct Labor	0.04	0.04	0.31	0.31	0.59	0.59	0.84	0.84
Utilities	0.03	0.08	0.95	1.61	2.44	3.22	4.08	4.50
Materials and Retailing Expenses	0.19	0.57	0.85	1.48	2.24	3.00	3.80	4.20
Freight	0.43	1.28	2.07	3.62	4.33	5.78	4.69	5.18
Excise Tax	--	--	1.23	2.14	3.25	4.35	5.51	6.09
<u>Sub total Direct Cost</u>	4.10	11.91	25.99	44.37	65.50	84.15	102.08	109.87
<u>Overhead Costs</u>								
Maintenance Labor	0.01	0.01	0.10	0.10	0.14	0.14	0.18	0.18
Maintenance Materials	0.01	0.01	0.45	0.45	0.60	0.60	0.80	0.80
Supervisory Personnel	0.01	0.01	0.12	0.12	0.13	0.13	0.15	0.15
Technical Personnel	--	--	0.12	0.12	0.13	0.13	0.14	0.14
Administrative Personnel	0.01	0.01	0.06	0.06	0.10	0.10	0.12	0.12
Administration Expenses	0.01	0.01	1.00	1.00	1.50	1.50	2.00	2.00
Plant Manager and Assistant	--	--	0.06	0.06	0.06	0.06	0.06	0.06
<u>Sub total Overhead Cost</u>	0.05	0.05	1.91	1.91	2.66	2.66	3.45	3.45
<u>Total Operating Cost</u>	4.15	11.96	27.90	46.28	68.16	86.81	105.53	113.32
<u>Net Operating Surplus^{5/}</u>	(0.07)	0.11	(0.72)	1.25	3.97	9.51	16.51	21.67

1/ All figures correspond to one plant, all five plants are assumed equal

2/ Based on Annex 4 Table 4

3/ Based on Annex 4 Table 10

4/ Based on Annex 4 Table 8

5/ Plant operations start in year 3, and in years 1-2, now chilled milk is sold.

I N D I A
RAJASTHAN DAIRY DEVELOPMENT PROJECT

ANNEX 4
Table 6

Feed Mills:
Income and Operating Cost Projections 1/

	Y e a r s							
	1	2	3	4	5	6	7	8-20
<u>Volume</u>	----- 1000 Tons -----							
<u>Total Production '000 Tons 2/</u>	--	--	24.5	43.0	65.0	87.0	110.0	121.5
<u>Income</u>	----- Rs. Million -----							
<u>Total Sales 3/</u>	--	--	24.5	43.0	65.0	87.0	110.0	121.5
<u>Operating Cost 4/</u>								
<u>Direct Costs 5/</u>								
Raw Materials	--	--	20.30	35.70	54.00	72.20	91.30	100.80
Direct Labor	--	--	0.17	0.34	0.34	0.85	0.85	0.85
Utilities	--	--	0.52	0.92	1.36	1.89	2.35	2.58
Materials, Freight	--	--	1.41	2.49	3.75	5.02	6.35	7.01
<u>Sub Total Direct Cost</u>	--	--	22.40	39.45	59.45	79.96	100.85	111.24
<u>Overhead Costs</u>								
Maintenance Labor	--	--	0.07	0.14	0.14	0.36	0.36	0.36
Maintenance Materials	--	--	0.15	0.26	0.39	0.52	0.66	0.73
Supervisory Personnel	--	--	0.04	0.08	0.08	0.21	0.21	0.21
Technical Personnel	--	--	0.02	0.04	0.04	0.11	0.11	0.11
Administrative Personnel	--	--	0.02	0.05	0.05	0.12	0.12	0.12
Administrative Expenses	--	--	0.50	1.00	1.00	2.50	2.50	2.50
Plant Manager and Assistant	--	--	0.06	0.12	0.12	0.30	0.30	0.30
<u>Sub Total Overhead</u>	--	--	0.86	1.69	1.82	4.12	4.26	4.33
<u>Total Operating Cost</u>	--	--	23.26	41.14	61.27	84.08	105.01	115.57
<u>Net Operating Surplus</u>	--	--	1.24	1.86	3.73	2.92	4.99	5.93

1/ All data is cumulative for the five feed mills together.

2/ The first plant would commence operations in year 3, the second plant in year 4 and the third, fourth and fifth in year 6, consequently year 3 data corresponds to one plant, year 4 and 5 to two plants and year 6 and onwards to five plants in operation. - Sales and costs for each union are obtained by dividing all figures by five.

3/ Based on a sales price of 1000 Rs/Ton delivered at the societies.

4/ Based on Annex 4 Table 9

5/ No taxation on production or sale of livestock feed.

INDIA
RAJASTHAN DAIRY DEVELOPMENT PROJECTDairy Cooperative Union: Operating Costs
of Technical Services & Administration 1/

(Rs, 000)

	Years						7-20
	1	2	3	4	5	6	
<u>Artificial Insemination Service</u>							
Staff Salaries	60	70	80	80	80	80	80
AI Materials	5	10	15	20	25	25	25
Replacement Bulls 2/	-	-	-	-	55	55	55
Laborers @ Rs 4,000/year	20	25	40	40	40	40	40
Seeds & Fertilizer	5	10	15	20	20	25	25
Concentrate Feeds	5	10	15	20	25	30	30
Transport Miscellaneous 3/	40	40	40	50	50	50	50
Sub-Total	135	165	205	230	295	305	305
<u>Animal Health Service 4/</u>							
Staff Salaries	65	125	195	260	325	325	325
Medicines & Equipment	90	180	270	360	450	450	450
Transportation Union Fleet 5/	50	100	100	100	100	100	100
Hired Units @ Rs 30,000/year 5/	-	-	90	180	270	270	270
Sub-Total	205	405	655	900	1,145	1,145	1,145
<u>Training & Extension Services 6/</u>							
Staff Salaries	75	75	75	75	75	350	350
Transportation	-	-	-	-	-	100	100
Training Materials	-	-	-	-	-	50	50
Miscellaneous	10	10	10	10	10	10	10
Sub-Total	85	85	85	85	85	510	510
<u>Organizational Services 7/</u>							
Staff Salaries	70	70	100	100	100	115	115
Transportation	20	20	20	20	20	40	40
Communication Materials 8/	5	10	15	20	25	25	25
Sub-Total	95	100	135	140	145	180	180
<u>Administration</u>							
Salaries	205	310	385	480	510	510	510
Transportation	100	100	100	100	100	100	100
Building Maintenance	5	10	10	10	10	10	10
Office Supplies, etc.	20	25	30	30	30	30	30
Sub-Total	330	445	525	620	650	650	650
<u>Total Operating Costs</u>	<u>860</u>	<u>1,200</u>	<u>1,605</u>	<u>1,975</u>	<u>2,320</u>	<u>2,790</u>	<u>2,790</u>

1/ Investments in training and extension for organizing new DCS are shown in Annex 6 Table 2.

2/ 6 replacement Jersey bulls annually from year 5 and 6 Buffalo bulls from MPDDC. (Annex 5 Table 2)

3/ Includes cost for 2 vehicles plus cost for maintenance and replacement.

4/ Salaries for mobile unit staff and Animal Husbandry Officer.

5/ Route of 20 mi/day for the Union-owned fleet of 6 mobile units; Additional requirements are obtained as hired vehicles.

6/ Operating expenses during years 1-5 are promotional investments (Annex 6 Table 2) borne by Government;

Salaries here are for the Director Extension, Director Training, Fodder Specialist and Livestock Specialist.

7/ Salaries here are for staff other than spearhead team members.

8/ Communication materials @ about Rs 50/DCS/year.

I N D I A
RAJASTHAN DAIRY DEVELOPMENT PROJECT
Milk Processing Plants 1/
Assumptions for Computing Operating Costs

	Y e a r s								Average Quality	Price or Cost per Unit
	1	2	3	4	5	6	7	8		
<u>Raw Milk</u>										
Cow Milk % 2/	43	46	46	50	54	62	66	71	Fat 4% SNF 8.5%)	25.-Rs./Kg Butter Fat paid to Societies
Buffalo Milk % 2/	57	54	54	50	46	38	34	29	Fat 7% SNF 9.-%)	
Average Price per Liter 3/	1.42	1.40	1.40	1.37	1.35	1.29	1.26	1.22		
				Y e a r s						
<u>Direct Labor</u>			1-2 4/	3-4	5-6	7-20				
Unskilled			4	45	80	105				300.-Rs./man month
Skilled			4	75	50	75				500.-Rs./man month
<u>Utilities</u>										
Labor			2	12	16	20				500.-Rs./man month
Fuel, Lubricants, Water Treatment			--)	0.06	0.06	0.06				Rs./Lt.
Electric Power			0.01)							
<u>Materials, Freight, Taxes</u>										
Materials and retailing for bottled milk			--							0.13 Rs./Lt.
Packaging materials for milk products			--							0.05 Rs./Lt.
Cleaning and general materials										0.01 Rs./Lt.
Freight of milk procured 5/			0.18	0.12	0.09	0.05				Rs./Lt.
Retailing of milk sold in bulk										0.07 Rs./Lt.
Freight to Delhi of milk in tankers			--							0.06 Rs./Lt.
Excise tax on milk products			--							10% on sales
				Y e a r s						
<u>Overhead</u>			1 - 2	3 - 4	5 - 6	7 - 20				
Maintenance labor			2	16	24	30				500.-Rs./man month
Maintenance materials			10,000	450,000	600,000	800,000				Rs./year
Supervisory personnel			1	14	16	18				700.-Rs./man month
Technical personnel			--	16	18	20				600.-Rs./man month
Administrative personnel			1	10	16	20				500.-Rs./man month
Administrative expenses			10,000	1,000,000	1,500,000	2,000,000				Rs./year
Plant manager and assistant			--	2	2	2				2,500.-Rs./man month average

- 1/ There would be one plant for each union. Same as the five unions all plants have been assumed equal for the purpose of this model.
The Ajmer Union has an existing plant which would be expanded. See Annex 4 Table 4 .
- 2/ Derived from Annex 3 Table 3 .
- 3/ Average price per liter drops due to increasing proportion of cow milk with lower fat content.
- 4/ All unions except Ajmer would operate a chilling center for bulk sale of its milk in year 1 and 2 until their plants come on stream in year 3.
- 5/ Based on contracted trucking at 1 Rs/km. and on data from Annex 3 Table 3 and Annex 4 Table 4.

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Feed Mills 1/

Assumptions for Computing Operating Costs

<u>Raw Materials</u> 2/	Number of Units or Rates		Price or Cost Per Unit
	Representative Formula	Formula Specifications	
Maize, Sorghum, Gram, Wheat	20%)		1100 Rs/Ton at plant
Rice Polish	25%)	Minimum Crude Protein	500 Rs/Ton at plant
Wheat Bran, Gram Husks	15%)	Maximum Moisture	500 Rs/Ton at plant
Molasses	7%)	Maximum Fiber	500 Rs/Ton at plant
Oilcakes (Groundnut, Cottonseed, Sesame, Rape, Niger)	30%)		1200 Rs/Ton at plant
Minerals, Salts, Vitamins	3%)		600 Rs/Ton at plant
Balanced Feed	100%		830 Rs/Ton at plant
<u>Direct Labor</u>			
Unskilled		30 men	300 Rs/man month
Skilled		10 men	500 Rs/man month
<u>Utilities</u>			
Labor		5 men	500 Rs/man month
Fuel, water treatment		20 kg/ton	0.1 Rs/kg. fuel, etc.
Electric Power		60 kwh/ton	0.3 Rs/kwh.
<u>Materials, Freight</u>			
Bags		70 kgs. each	2.5 Rs/bag
General Materials		--	6 Rs/ton
Freight		--	16 Rs/ton
<u>Overhead</u>			
Maintenance labor		12 men	500 Rs/man month
Maintenance materials, lubricants		--	6 Rs/ton
Supervisory Personnel		5 men	700 Rs/man month
Technical Personnel		3 men	600 Rs/man month
Administrative personnel		4 men	500 Rs/man month
Administration expenses		--	500000 Rs/year
Operating manager and assistant		2 men	2500 Rs/man month average

1/ The five plants will be identical, however all data corresponds to one plant-plants will not undergo phased expansions but built directly to their design capacity of 75 Tons/day.

2/ Typical mix of a variety of balanced formulas

I N D I A
RAJASTHAN DAIRY DEVELOPMENT PROJECT
Milk Processing Plants and Feed Mills
Assumptions for Computing Sales Revenues

<u>Milk Processing Plants</u>	<u>Jaipur</u>		<u>Ahmer</u>		<u>Alwar</u>		<u>Baranthur</u>		<u>Tonk-Sawa Madhopur</u>		<u>Adopted</u> <u>Average</u> <u>For Model</u>	<u>Average Yield</u>	<u>Sales Price</u>
	--- Years ---		Years		Years		Years		Years---				
	4	8	4	8	4	8	4	8	4	8			
Urban Population, '000 ^{1/}	884	995	493	555	152	171	239	269	292	328			
Milk demand of urban centers-'000 Lt./day ^{2/}	125	189	69	105	21	32	33	51	41	62			
Milk processing plant average volume-'000 Lt./day	71	226	71	226	71	226	71	226	71	226			
<u>Feasible Product Mix</u> ^{3/}	----- % of Yearly Volume -----												
Pasteurized, bulk in tankers	--	20%	25%	30%	40%	45%	35%	40%	30%	40%	35%		1.40 Rs./Lt. at Delhi
Pasteurized, bulk in urban booths ^{4/}	50%	30%	25%	15%	10%	5%	15%	10%	15%	10%	15%		1.70 Rs./Lt. at Booth
Pasteurized, in bottles ^{5/}	40%	30%	25%	15%	5%	5%	10%	5%	15%	10%	15%		1.80 Rs./Lt. at Booth
Milk Products: ^{6/}	10%	20%	25%	30%	45%	45%	40%	45%	30%	40%	35%		in ½ Lt. bottles
					<u>Year 4</u>	<u>Year 8</u>							
Butter) Kg/1000 Lt. of total milk					20	14					15)	0.005% from cows)
Ghee) Kg/1000 Lt. for milk products					55	49					50)	0.035% from buffaloes)
)	0.04 % from cows)
)	0.07 % from buffaloes)
Powdered Skimmed Milk ^{7/}												9%	11.-Rs./kg at plant
<u>Feed Mills</u> ^{8/}													
Balanced Feed													1000.-Rs./Ton at society

- 1/ Urban population assumed increases 3% yearly.
- 2/ Based on daily intake of fluid milk and products of 140 grams/capita in year 4 and 190 grams/capita in year 8.
- 3/ Standard quality of milk sold; 3.5% fat - 8.5% S.N.F. - Urban demand assumed to be 80% fluid milk and 20% in products. Bottled milk would be 30% of the fluid volume in year 4 & 40% in year 8.
- 4/ Sold in bulk at union booths from 40 Lt. cans. The union would capture 50% of the bulk volume in year 4 and 70% in year 8.
- 5/ Sold in ½ Lt. bottles at union booths. The union would capture 100% of the bottled milk volume.
- 6/ Butter and Ghee would be obtained from standardizing fat content at 3.5% and from production of skimmed milk powder.
- 7/ Surplus milk would have two destinations in about equal proportions; as fluid milk shipped in bulk to Delhi by tanker and as powder produced at the plant.
- 8/ See Annex 4 Table 6

INDIA
RAJASTHAN DAIRY DEVELOPMENT PROJECT
Dairy Cooperative Union: Staffing Plan ^{1/}

	Years -----					Monthly Salary (Rs)
	1	2	3	4	5	
General Manager	1	1	1	1	1	2,500
Administrative Assistant	1	1	1	1	1	1,200
Clerical Staff	1	1	1	1	1	500
Divisions						
Administration						
Manager	-	-	1	1	1	2,000
Support Staff	-	1	1	1	1	500
Director: Manpower	1	1	1	1	1	1,600
Personnel Officer	-	1	1	2	2	1,200
Labor Officers	-	1	1	2	2	1,200
Clerical Staff	1	1	1	1	1	400
Director: Budget & Finance	-	1	1	1	1	1,600
Accounts Officer	1	1	1	1	1	1,200
Accountants	2	2	3	4	5	800
Clerical Staff	1	1	1	1	1	400
Internal Auditor	-	1	1	1	1	1,600
Audit Assistants	1	2	3	4	5	800
Clerical Staff	-	1	1	2	2	400
Livestock Development						
Manager	1	1	1	1	1	2,000
Fodder Specialist	1	1	1	1	1	1,600
Livestock Specialist	1	1	1	1	1	1,600
Support Staff	1	1	1	1	1	500
Director: Extension Services	1	1	1	1	1	1,600
Extension Supervisors ^{2/}	3	5	5	5	5	1,200
Village Extension Workers ^{2/}	30	40	50	50	50	450
Clerical Staff ^{2/}	2	2	2	2	2	400
Animal Husbandry Officer	1	1	1	1	1	1,600
Vet. Officer: Mobile Units	3	6	9	12	15	1,200
Vet. Field Assistants	3	6	9	12	15	600
Bull Farm Supervisor	1	1	1	1	1	1,600
Stockmen	3	4	5	5	5	800
Livestock Attendants	2	2	3	3	3	400
Institutional Development						
Manager	1	1	1	1	1	2,000
Spearhead Team Staff ^{2/}	6	6	6	6	6	1,600
Support Staff	2	2	2	2	2	500
Director: Training Center	1	1	1	1	1	1,600
UTC Staff ^{2/}	5	5	5	5	5	1,200
Training Assistants ^{2/}	4	4	4	4	4	450
Clerical Staff ^{2/}	1	1	1	1	1	450
Director: Organisational Services	1	1	1	1	1	1,600
Evaluation Officers	1	1	2	2	2	1,200
Mass Communications Officers	1	1	1	2	2	1,200
Member Relations Officers	1	1	2	2	3	1,200
Clerical Staff	1	1	1	2	2	400
Plant Operations						
Manager	1	1	1	1	1	2,000
Assistant Manager: Milk Plant	-	-	1	1	1	1,600
Administrative Personnel	1	1	10	10	16	500
Technical Personnel	-	-	16	16	18	600
Supervisory Personnel	1	1	14	14	16	700
Operators & Labor	12	12	96	96	170	500
Assistant Manager: Feed Mill	-	1	1	1	1	1,600
Administrative Personnel	-	4	4	4	4	500
Technical Personnel	-	3	3	3	3	600
Supervisory Personnel	-	5	5	5	5	700
Operators & Labor	-	55	55	55	55	500
Marketing & Procurement						
Manager: Marketing & Procurement ^{3/}	-	-	-	1	1	1,600
Market Analyst	-	-	1	1	1	1,600
Marketing Officers	-	-	-	5	8	800
Procurement Analyst	-	1	1	1	1	1,600
Procurement Officers	-	1	1	2	2	800
Clerical Staff	-	1	1	1	1	400

^{1/} Refer to Organization Chart (Annex 4, Chart 1).

^{2/} Operating & investment cost of training extension and organization services during years 1-5 are borne by Government as a promotional investment. (Annex 4, Table 2) After year 5, staff requirements would diminish as new DCS formation slows down.

^{3/} A separate division could be established in about year 4, depending on feed mill establishment and takeover of marketing function from the Corporation. Till then, this function is managed by the Manager, Plant Operations.

INDIA
RAJASTHAN DAIRY DEVELOPMENT PROJECT

Dairy Cooperative Union: Investment Projections Summary
(Rs '000)

	----- Years -----						Total	%
	1	2	3	4	5	6		
<u>Milk Processing</u> ^{1/}	4,050	13,860		3,140		6,050	27,100	
Physical Contingencies	400	1,390		310		610	2,710	
Price Contingencies	580	3,500		1,480		4,370	9,930	
Sub-Total	<u>5,030</u>	<u>18,750</u>		<u>4,930</u>		<u>11,030</u>	<u>39,740</u>	33.7
<u>Feed Mill</u> ^{2/}	1,830	3,640					5,470	
Physical Contingencies	180	360					540	
Price Contingencies	270	940					1,210	
Sub-Total	<u>2,280</u>	<u>4,940</u>					<u>7,220</u>	25.9
<u>Administration & Technical Services</u> ^{3/}	1,520	1,770	320	330	210	20	4,170	
Physical Contingencies	70	90	20	20	10	-	210	
Price Contingencies	210	530	140	170	160	20	1,230	
Sub-Total	<u>1,800</u>	<u>2,390</u>	<u>480</u>	<u>520</u>	<u>380</u>	<u>40</u>	<u>5,610</u>	18.0
<u>Working Capital</u> ^{4/}	130	970					1,100	
Physical Contingencies	10	50					60	
Price Contingencies	30	230					260	
Sub-Total	<u>170</u>	<u>1,250</u>					<u>1,420</u>	-
<u>Total W/O Contingencies</u>	7,530	20,240	320	3,470	210	6,070	37,840	30.1
<u>Physical Contingencies</u>	660	1,890	20	330	10	610	3,520	
<u>Price Contingencies</u>	<u>1,090</u>	<u>5,200</u>	<u>140</u>	<u>1,650</u>	<u>160</u>	<u>4,390</u>	<u>12,630</u>	
<u>Total Contingencies</u>	1,750	7,090	160	1,980	170	4,710	16,150	30.1
<u>Total Investment</u>	9,280	27,330	480	5,450	380	11,070	53,990	30.1

^{1/} See Annex 4 , Table 1 , excluding working capital--See footnote 4.

^{2/} See Annex 4 , Table 2 , excluding working capital--See footnote 4. Feed mill shown constructed in years 1 and 2, corresponding to Jaipur; for phasing of feed mills for other Unions, see Annex 4 Table 4 .

^{3/} See Annex 4 , Table 3 . Totals have been rounded.

^{4/} See Annex 4 , Tables 1, 2 & 3.

INDIA
RAJASTHAN DAIRY DEVELOPMENT PROJECT
Dairy Cooperative Union: Protected Income Statement ^{1/}

ANNEX 4
Table 13

(Million Rs)

	Years													14-20
	1	2	3	4	5	6	7	8	9	10	11	12	13	
	----- Constant Prices -----													
Revenues														
Milk processing ^{2/}	4.08	12.07	27.18	47.53	72.13	96.32	122.04	134.99						
Cattle feed ^{3/}	-	-	24.50	24.50	24.50	24.50	24.50	24.50						
Total Revenues	4.08	12.07	51.68	72.03	96.63	120.82	146.54	159.49						
Operating Costs														
Dairy Plants ^{2/}	4.15	11.96	27.90	46.28	68.16	86.81	105.53	113.32						
Feed Mills ^{3/}	-	-	23.26	23.26	23.26	23.26	23.26	23.26						
Union Services ^{4/}	0.86	1.20	1.60	1.98	2.32	2.79	2.79	2.79						
Total Operating Costs	5.01	13.16	52.76	71.52	93.74	112.86	131.58	139.37						
Surplus on Feed Mill	-	-	1.24	1.24	1.24	1.24	1.24	1.24						
Surplus on other activities	(0.93)	(1.09)	(2.32)	(0.73)	1.65	6.72	13.72	18.88						
Operating Surplus (Deficit) ^{5/}	(0.93)	(1.09)	(1.08)	0.51	2.89	7.96	14.96	20.12	20.12	20.12	20.12	20.12	20.12	20.12
	(1.05)	(1.34)	(1.43)	0.73	4.42	13.09	25.84	36.50	38.32	40.24	42.25	44.37	46.58	48.91
Depreciation (5% per annum)	-	-	1.85	2.12	2.14	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
Interest (@ 9% per annum) ^{13/}	-	-	-	-	-	5.50	5.02	4.48	3.89	3.25	2.54	1.77	0.93	-
Statutory Allocation ^{6/}	-	-	-	-	0.05	0.10	0.36	0.59	0.63	0.69	0.74	0.80	0.86	0.92
Levy to Corporation ^{7/}	-	-	-	-	0.15	0.16	0.17	0.18	0.19	0.20	0.21	0.22	0.23	0.24
Bonus to DCS ^{8/}	-	-	-	-	0.52	1.16	4.42	7.18	7.77	8.40	9.07	9.78	10.53	11.33
Gross Income	(1.05)	(1.34)	(3.28)	(1.39)	1.56	3.47	13.17	21.37	23.14	25.00	26.99	29.10	31.33	33.72
less														
Income Tax @ 44%	-	-	-	-	-	-	4.90	9.40	10.18	11.00	11.88	12.80	13.79	14.84
Net Income	(1.05)	(1.34)	(3.28)	(1.39)	1.56	3.47	8.27	11.97	12.96	14.00	15.11	16.30	17.54	18.88
Funds from Operations ^{9/}	(1.05)	(1.34)	(1.43)	0.73	4.22	12.83	20.29	26.27	27.25	28.28	29.35	30.47	31.63	32.83
	(0.93)	(1.09)	(1.08)	0.51	2.76	7.79	11.75	14.47	14.31	14.42	13.97	13.83	13.66	13.49
Financial rate of return after income taxes & before bonus to DCS ^{10/}	= 18.0%													
Financial rate of return after income taxes and after bonus to DCS ^{10/}	= 13.5%													
Consolidated Operating Deficit for All 5 Unions														
Surplus on Feed Mills ^{11/}	-	-	1.24	1.86										
Surplus (Deficits) on Other Activities ^{12/}	(4.65)	(5.45)	(11.60)	(3.65)										
Total Operating Surplus (Deficit)	(4.65)	(5.45)	(10.36)	(1.79)										

^{1/} All data correspond to Bhopal union with feed mill constructed in years 1 and 2. See footnote 3.

^{2/} See Annex 4, Table 5.

^{3/} See Annex 4, Table 6. Assumes this feed mill continues at this level of production to year 20.

^{4/} See Annex 4, Table 7.

^{5/} All items below this are in current terms using the following rates of price contingencies: 1974 (14%); 1975 (11%); 1976-1979 (7.5%), 1980 onwards (5%).

^{6/} Cooperative Law stipulates the use of 2% of the surplus for specific cooperative purposes or institutions.

^{7/} See Annex 5, Tables 3 and 4.

^{8/} Bylaws require 25% of net income after tax be allocated to a Reserve Fund. Bonus paid to DCS may not exceed 80% of the remaining balance. Maximum bonus allowable under law is paid from year 8 onwards. In years 5-7 the bonus paid is 55-90% of the maximum.

^{9/} Operating surplus less taxes, levy to RDCC and statutory applications, later deflated to mid-1974 prices. Higher interest payment would reduce tax and slightly increase this stream.

^{10/} Rate of return is calculated on investments, including physical contingencies, (Annex 4, Table 12) and the "Funds from Operations" (constant). The rate of return before bonus shows the overall financial implications of the Union investments. However, if the Union were in fact not to declare a bonus, the rate would be lower (18.7%) since all of the additional income would be liable to income taxes @ 44%.

^{11/} All Unions would not build their feed mills in years 1 and 2. For consolidated feed mills surplus, see Annex 4, Table 6. Thus, consolidated operating deficit is not equal to 3 times the operating deficit for the model Union.

^{12/} Three times the "Surplus on Other Activities" shown above.

^{13/} If Union borrowings are at 11% per annum rate of interest, the interest expense would be about 15% higher, but income taxes would be reduced, and the overall impact would be to depress net income over the loan repayment period by 1% in year 7, 2% in year 10 and 1/2% in year 13.

INDIA
RAJASTHAN DAIRY DEVELOPMENT PROJECT

Dairy Cooperative Union: Projected Cash Flow ^{1/}

(Rs. millions)

	Years													14-15 (Average)
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Sources of Funds														
Equity														
Government subscription for Fixed Assets ^{2/}	1.86	5.47	0.10	1.10	0.08	2.21	(3.16)	(1.92)	(1.91)	(1.75)	(1.36)	(0.72)	-	-
Government subscription for start-up Costs ^{3/}	1.05	1.34	1.43	-	-	-	-	-	-	-	-	-	-	-
DCS Subscription ^{4/}	-	-	-	-	-	-	3.16	1.92	1.91	1.75	1.36	0.72	-	-
Sub-total	2.91	6.81	1.53	1.10	0.08	2.21	-	-	-	-	-	-	-	-
(Equity Structure: % DCS Ownership)	-	-	-	-	-	-	(37%)	(45%)	(65%)	(80%)	(90%)	(100%)	-	-
Loans for fixed assets & working capital ^{2/}	7.42	21.86	0.38	4.35	0.30	8.86	-	-	-	-	-	-	-	-
Funds from operations ^{5/}														
Operating surplus ^{3/}	-	-	-	0.73	4.42	13.09	25.84	36.50	38.32	40.24	42.25	44.37	46.58	48.91
less tax, statutory applications and levy	-	-	-	-	0.20	0.26	5.55	10.23	11.07	11.96	12.90	13.90	14.95	16.08
Sub-total	-	-	-	0.73	4.22	12.83	20.29	26.27	27.25	28.28	29.35	30.47	31.63	32.83
Total Sources of Funds	10.33	28.67	1.91	6.18	4.60	23.90	20.29	26.27	27.25	28.28	29.35	30.47	31.63	32.83
Uses of Funds														
Investments ^{6/}														
Dairy Plants	5.03	18.75	-	4.93	-	11.03	-	-	-	-	-	-	-	-
Feed Mills	2.28	4.94	-	-	-	-	-	-	-	-	-	-	-	-
Services & Administration	1.80	2.39	0.48	0.52	0.38	0.04	-	-	-	-	-	-	-	-
Working Capital ^{3/}	0.17	1.25	-	-	-	-	-	-	-	-	-	-	-	-
Start-up Costs ^{3/}	1.02	1.25	1.43	-	-	-	-	-	-	-	-	-	-	-
Sub-total	10.33	28.67	1.91	5.45	0.38	11.07	-	-	-	-	-	-	-	-
Debt Service ^{7/}														
Interest	-	-	-	-	-	5.50	5.02	4.48	3.89	3.25	2.54	1.77	0.93	-
Amortization	-	-	-	-	-	5.16	5.64	6.18	6.77	7.41	8.12	8.89	9.73	-
Sub-total	-	-	-	-	-	10.66	10.66	10.66	10.66	10.66	10.66	10.66	10.66	-
Dividends & Transfers ^{8/}														
Dividends on share capital ^{8/} (@ 6%)	-	-	-	-	-	-	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Bonus to DCS	-	-	-	-	0.52	1.14	4.42	7.18	7.83	8.40	9.07	9.78	10.59	11.33
Redemption of Government subscription for start-up ^{10/}	-	-	-	-	-	-	1.27	1.27	1.28	-	-	-	-	-
Sub-total	-	-	-	-	0.52	1.14	6.57	9.33	9.99	9.28	9.95	10.66	11.47	12.25
Inflow ^{11/}														
To Statutory Reserve Fund	-	-	-	-	0.39	0.87	1.96	2.99	3.24	3.50	3.78	4.08	4.39	4.72
To purchase of RDDC shares	-	-	-	-	-	-	0.11	-	-	-	-	-	-	-
To other Reserves	-	-	-	0.73	3.31	0.16	0.99	3.29	3.36	6.84	4.96	5.34	4.84	15.84
Sub-total - Annual Inflow	-	-	-	0.73	3.70	1.03	3.06	6.28	6.60	10.34	8.74	9.42	9.23	20.56
Cumulative Inflow	-	-	-	0.73	4.43	5.46	8.52	14.80	21.40	31.74	40.48	49.90	59.13	203.05
Total Uses of Funds	10.33	28.67	1.91	6.18	4.60	23.90	20.29	26.27	27.25	28.28	29.35	30.47	31.63	32.83

1/ In current prices.

2/ See Annex 4, Table 12. Loans are for 80% of investment in fixed assets and working capital, the balance being equity capital, all from Government.

3/ Operating deficits (Annex 4 Table 13) in years 1, 2 and 3 are shown under Investments as start-up costs; start up deficits are financed as Government equity to be redeemed at par in equal installments over years 7 to 9.

4/ See footnote 12, Annex 3, Table 5. DCS funds allocated for subscriptions in Union shares during years 1 - 6 are in the model assumed to be held in a reserve for displacement of Government equity. Total DCS subscription is obtained by multiplying individual DCS allocation for purchase of Union shares (Annex 3, Table 5) with the phased formation of DCS. The accumulated balance at the end of year 6 (Rs. 1.85 m) plus further subscriptions would be used from year 7 onwards until Government equity is fully bought out by year 12.

5/ See Annex 4 Table 13; operating surplus less income tax, statutory applications and levy to corporation.

6/ Includes price contingencies, see Tables 1, 2, and 3.

7/ Six years of grace with interest capitalized at 9% and eight years to repay principal and capitalized interest on loans shown above.

8/ See Annex 4 Table 13.

9/ A minimum of 25% of net income (see Annex 4 Table 13) must be placed in a statutory Reserve Fund. In year 7, Rs. 110,000 of this would be used to purchase 15% of total Government equity in the corporation.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Breakdown of Consumer Price ^{1/} of Milk

	Rs/lit	
<u>Farmer Level</u>		
Cost of Feeding ^{2/}	0.80	
Miscellaneous	0.05	
Profit & Reserve ^{3/}	0.33	
<u>Farmer's Effective Selling Price ^{3/}</u>	<u>1.18</u>	<u>1.18</u>
<u>DCS Level</u>		
DCS Services	0.03	
DCS Reserves	<u>0.04</u>	<u>0.07</u>
<u>DCS Effective Selling Price ^{4/}</u>		<u>1.25</u>
<u>Union Level</u>		
Transportation	0.05	
Technical Services	0.04	
Processing of Milk	0.20	
Overheads ^{2/}	0.05	
Interest & Amortization ^{5/}	0.08	
Excise & Income Taxes	0.13	
Reserves	<u>0.05</u>	<u>0.60</u>
Consumer Purchase Price for Product Line ^{6/} (Rs/Liter)		<u><u>1.85</u></u>

-
- ^{1/} In constant mid-1974 prices, for year 8 of the Project.
^{2/} Based on balanced cattle feed at Rs 1000/ton, green fodder at Rs 120/ton and straw at Rs 30/ton, all market prices.
^{3/} Profit and reserve and effective selling price includes Rs 0.05/lit bonus paid out by DCS.
^{4/} DCS effective selling price includes Rs 0.03 litre bonus paid out by the Union.
^{5/} Only for the milk plants; feed mills are assumed to break even.
^{6/} Total union sales divided by total milk processed to give an average price for the product line.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

List of Equipment and Materials to
be procured on the basis of
International Competitive Bidding

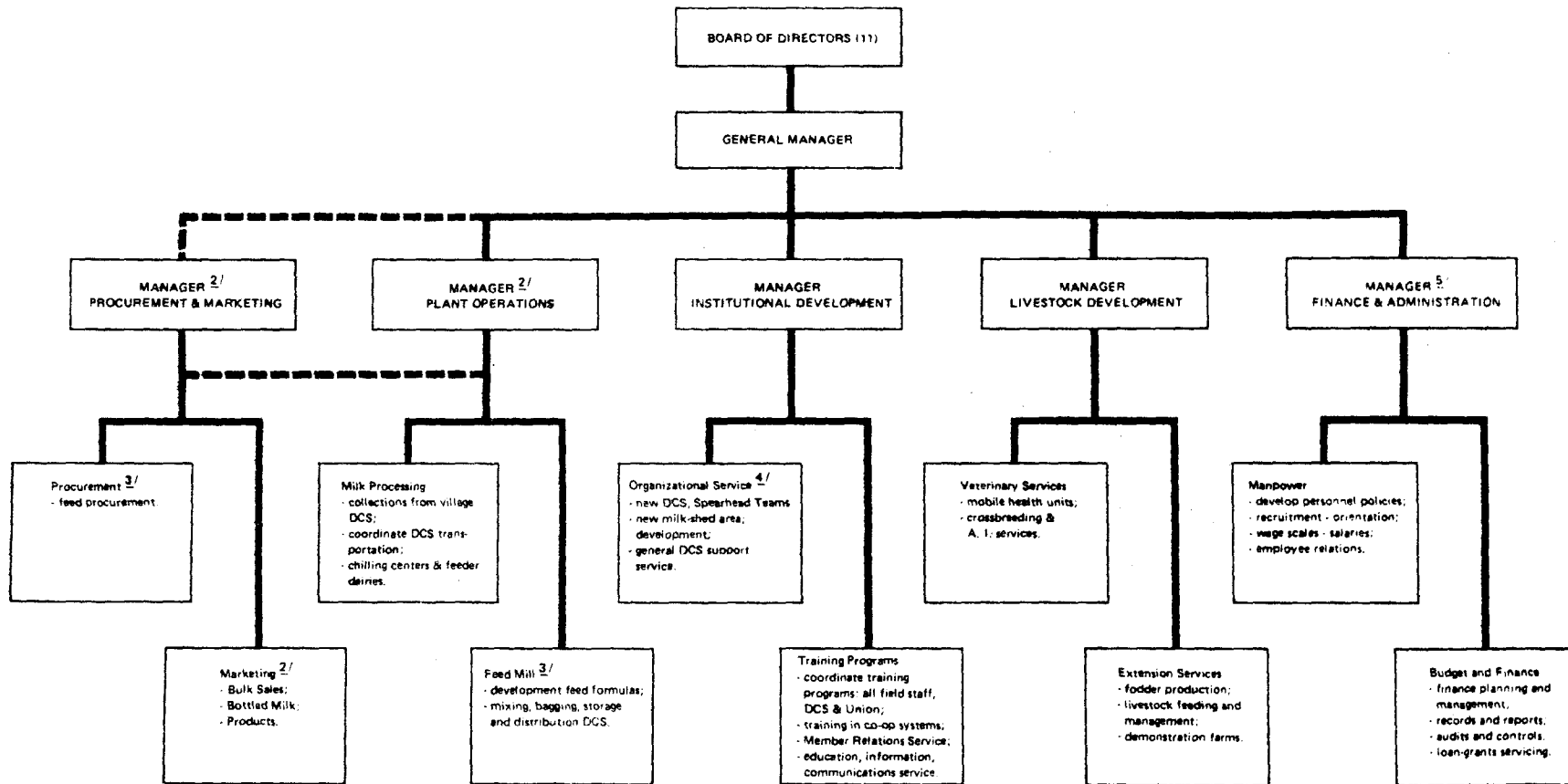
For Dairy Processing Plants

1. Refrigerating Equipment
2. Milk Reception and Can Washing Equipment
3. Milk Pasteurization and Chilling Equipment
4. Milk Storage Tanks
5. Cheese, Ghee and Butter Production Equipment
6. Filling Equipment
7. Milk Condensing and Spray Drying Units
8. Stainless Steel Piping and Fittings
9. Chilling Center Equipment
10. Insulated Motorized Tankers
11. Steam Generating Equipment

For Feed Processing Plants

12. Raw Material Hoppers, Conveyors and Grinders
13. Ground Material Hoppers, Conveyors and Mixers
14. Mixing Bins and Bagging Scales
15. Pellet Mill and Cooler
16. Dust Collection System

INDIA
 RAJASTHAN DAIRY DEVELOPMENT PROJECT
 Dairy Cooperative Union
 Organization Chart ^{1/}



^{1/} Only for management staff; other staff, as in staffing plan.

^{2/} Marketing initially handled by the Corporation; Manager, Plant Operations to manage marketing through the Corporation and procurement till year 4, when a separate Marketing & Procurement Division would be established.

^{3/} To be established when the feed mill is established.

^{4/} Even after DCS are implemented, support services would be necessary.

^{5/} To be appointed in year 3.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Rajasthan Dairy Development Corporation

A. Functions

1. The Rajasthan Dairy Development Corporation would be established to direct and coordinate the implementation of the project. The main functions of the corporation would be the following:

- (a) Overall coordination and execution of the Project with assistance from NDDB.
- (b) Act as the sole procurement agent for goods and services financed under the Project;
- (c) Develop and operate a bull breeding farm to provide quality Jersey 1/ bulls for the member unions' AI services;
- (d) Direct the construction of the union's plants and feed mills;
- (e) Assist the unions in preparing requests including cost estimates and detailed engineering, for financing by participating banks;
- (f) Provide the Unions with marketing services, including a marketing study to determine product mix capability of the dairy plants to be built under the project.
- (g) To engage five consultants according to terms of reference provided in Annex 6 Appendix 1, to assist in Project implementation;
- (h) To coordinate the development of dairy operations and livestock production in the area of operation of the member Unions.

1/ Other exotic breeds would also be considered.

B. Investments

2. RDDC's main investments would be for a Jersey Bull Breeding farm for producing good quality Jersey bulls annually for sale to the unions. Table 1 summarizes the investment requirements of the RDDC.

C. Financing Operations

3. GOI and GOR would subscribe shares of RDDC to provide 20% of the cost of Project investments. The remaining 80% would be borrowed from participating banks. In addition, the operating deficit expected during years one-three (Rs 0.55 M) would be financed as redeemable share capital by GOR. Main source of RDDC revenues would be the sale of Jersey Bulls at Rs 9,000/head to the unions. On the operations of the Bull Breeding Farm, RDDC would earn a rate of return of 13% (Table 3). To cover its administrative expenses for services provided to the unions, the RDDC would assess a levy on the unions. Table 4 shows the consolidated cash flow of RDDC, indicating that funds would be adequate for debt service and reserves. Table 4 also shows the purchase of Government share holdings by the Unions in year six, which would give the Unions a combined 75% interest in the RDDC. The GOI and GOR jointly would hold the remaining 25% of the shares. The redemption of GOR subscriptions for start-up costs would be separate from the above and is expected to occur in years six and seven in equal instalments.

D. Management

4. RDDC would administer the Project and would be governed by a 15 member Board of Directors, with the following representation: GOI: (2) Department of Planning/Finance and Agriculture; GOR (2) Department of Animal Husbandry; and Registrar of Cooperatives; NDDB (1); RDDC's financing institutions (2), including Lead Bank or Cooperative Bank; University of Veterinary and Animal Sciences (1); Managing Director (1) and representatives from the Unions (5). A secretary to GOR dealing with the Project, would be the chairman of the Board during Government majority ownership. As the Unions progressively buy out Government's equity, Board composition in year six and thereafter would be as follows: GOI and GOR representatives (4), including Registrar of Cooperatives, Department of Animal Husbandry, NDDB, University of Veterinary and Animal Sciences; financing institutions (2); Managing Director (1) and representatives from the Unions (8), all elected by DCS. The Managing Director, whose qualifications and experience would be subject to IDA approval, would carry out executive duties assisted by about five divisional managers (Annex 5, Chart 1). RDDC articles of association would also require IDA approval before incorporation.

5. The RDDC staff in year three would be about 40 persons (See Table 5). In year five, an overall review of the RDDC functions and staff requirements would take place with IDA since by then the marketing and engineering would cease to be an operational responsibility of RDDC. However, the RDDC could continue to provide advisory support in these fields, besides operating the bull breeding farm.

RAJASTHAN DAIRY DEVELOPMENT PROJECTDairy Development Corporation: Investment Projections

(Rs, '000)

	-----Years-----				Total	% Foreign Exchange
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>		
<u>Bull Breeding Farm</u> ^{1/}						
Land and Roads (24ha)	424	32	-	-	456	2
Construction	660	470	-	-	1,130	10
Equipment	130	70	-	-	200	25
Vehicles (1)	50	-	-	-	50	25
Livestock imported (100 hd)	800	-	-	-	800	90
Semen Imported	3	3	2	-	8	90
Others	190	50	-	-	240	-
Sub-Total	<u>2,257</u>	<u>625</u>	<u>2</u>	<u>-</u>	<u>2,884</u>	<u>32</u>
Contingencies:						
Physical	113	31	-	-	144	
Price	335	194	1	-	530	
Sub-Total	<u>448</u>	<u>225</u>	<u>1</u>	<u>-</u>	<u>674</u>	
Total	<u>2,705</u>	<u>850</u>	<u>3</u>	<u>-</u>	<u>3,558</u>	<u>32</u>
<u>Management Facilities</u> ^{2/}						
Furniture and Equipment	50	-	-	-	50	25
Vehicles (5)	250	-	-	-	250	25
Sub-Total	<u>300</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>300</u>	<u>25</u>
Contingencies:						
Physical	15	-	-	-	15	
Price	40	-	-	-	40	
Sub-Total	<u>55</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>55</u>	
Total	<u>355</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>355</u>	<u>25</u>
<u>Total Without Contingencies</u>	<u>2,557</u>	<u>625</u>	<u>2</u>	<u>-</u>	<u>3,184</u>	<u>31</u>
Physical Contingencies	128	31	-	-	159	
Price Contingencies	<u>375</u>	<u>194</u>	<u>1</u>	<u>-</u>	<u>570</u>	
Sub-Total Contingencies	503	225	1	-	729	
<u>Total Investment</u>	<u>3,060</u>	<u>850</u>	<u>3</u>	<u>-</u>	<u>3,913</u>	<u>31</u>

1/ A breeding farm producing 36 Jersey bulls annually by year 4; cattle sheds for 140 A. U.; 2000 sq. ft. of storage sheds and an administrative block of about 1500 sq. ft.; 35 units of staff & labor housing; 1 set of farm machinery (Rs 80,000) and 2 sets of irrigation equipment; and imported semen for the first 3 years' requirements; and 100 head of Jersey heifer-in-calf imported.

2/ Office space to be rented; vehicles are for management staff.

I N D I A

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Dairy Development Corporation: Projected Income Statement

(Rs. '000)

	Y e a r s										
	1	2	3	4	5	6	7	8	9	10	11-20
<u>Breeding Farm</u>											
<u>Revenues</u>	----- constant prices -----										
Sale of Jersey Bulls	--	305	300	330	330	330)					
Milk Sales	50	265	310	310	310	310)	Constant				
Cull Cows	---	40	80	80	80	80)					
Heifers-in-Calf	--	95	60	85	85	85)					
Sub-Total	50	705	750	805	805	805					
<u>Operating Cost</u> ^{1/}											
Pasture Maintenance	40	60	60	60	60	60)					
Concentrate Feed	25	80	80	80	80	80)					
Salaries and Wages	70	70	80	80	80	80)					
Fuel and Power	25	40	40	40	40	40)	Constant				
Veterinary Supplies and Semen	5	10	10	10	10	10)					
Maintenance and Replacement of Equipment	--	30	40	50	60	60)					
Miscellaneous	10	10	10	10	10	10)					
Sub-Total	175	300	320	330	340	340	340	340	340	340	340
<u>Surplus (Deficit) on Breeding Farm</u> ^{2/}	(125)	405	430	470	465	465	465	465	465	465	465
<u>Levy on the Unions</u> ^{2/}	--	--	--	--	500	500)					
<u>Administrative Expenses</u> ^{3/}											
Staff Salaries	185	255	265	235	215	145)					
Transportation	80	100	100	100	100	60)	Constant				
Office Space and Supplies	50	60	75	75	75	50)					
Miscellaneous	5	10	10	10	10	10)					
Sub-Total	320	425	450	420	400	265					
<u>Surplus on Levy</u>	(320)	(425)	(450)	(420)	100	235	235	235	235	235	235
<u>Total Operating Surplus:</u> ^{4/}	(445)	(20)	(20)	50	565	700	700	700	700	700	700
	(505)	(25)	(25)	70	835	1,155	1,205	1,290	1,355	1,420	1,605
<u>Depreciation</u> ^{5/}	30	50	50	50	50	50	50	50	50	50	50
<u>Interest</u> ^{6/}	230	320	350	380	420	460	430	400	360	320	165
<u>Gross Income</u>	(765)	(395)	(425)	(350)	365	675	725	840	945	1,050	1,390
<u>Income Taxes</u> ^{@ 55%}	--	--	--	--	--	--	--	370	520	575	765
<u>Net Income</u>	(765)	(395)	(425)	(350)	395	675	755	440	425	475	625

1/ Concentrate @ 1 kg per 3 ltr. of milk; staff of the Breeding Program division (Staffing plan Table 5); 90 hours/ha/year of tractor operation at Rs 25/hour; 1 vehicle A 10,000 miles/year; Vet supplies @ Rs 60/A.U. per year and maintenance and replacement @ 15% and 20% per year for equipment and vehicles respectively.

2/ Rate of Return on the Breeding Farm is projected at 13.5%, the levy on the Unions is set to cover costs of services.

3/ See Staffing Plan (Table 5) excluding the Breeding Program Division.

4/ Conversion from constant mid-1974 prices to current prices at average rates 1974: 14% 1975 11%; 1976-1980 @ 7.5% and 5% thereafter.

5/ Land and Livestock are not subject to depreciation; here, only buildings since vehicles and equipment are covered under operating costs.

6/ Interest for years 1-5 is capitalized so that loans at end of year 5 are Rs 3.60 million, of which 1.3 million is capitalized interest.

I N D I A
RAJASTHAN DAIRY DEVELOPMENT PROJECT
Dairy Development Corporation: Projected Cash Flow ^{1/}
(Re. '000)

Sources of Funds	Years										<u>11-15</u> (Average) ^{6/}
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	
<u>Equity</u> ^{2/}	<u>Equity Structure</u>										
GOI subscription for fixed assets	305	85	--	--	--	(275)	12.5%	GOI			
GOR subscription for fixed assets	305	85	--	--	--	(275)	12.5%	GOR			
GOR subscription for establishment costs ^{3/}	505	25	25	--	--	--	75%	Unions			
Unions subscription	--	--	--	--	--	550					
Sub-Total	1,115	195	25	--	--						
<u>Loans</u>											
From a bank for fixed assets and working capital	2,450	680	3	--	--	--	--	--	--	--	
<u>Funds from Operations</u> ^{3/}											
Operating Surplus (Deficit)	--	--	--	70	835	1,155	1,205	1,290	1,355	1,420	1,605
Less Taxes	--	--	--	--	--	--	--	370	520	575	765
Sub-Total	--	--	--	70	835	1,155	1,205	920	835	845	840
<u>Total Sources of Funds</u>	3,565	875	28	70	835	1,155	1,205	920	835	845	840
<u>Uses of Funds</u>											
<u>Investments</u> ^{4/}											
Fixed assets and working capital	3,060	850	3	--	--	--	--	--	--	--	--
Establishment Costs ^{3/}	505	25	25	--	--	--	--	--	--	--	--
Sub-Total	3,565	875	28	--	--	--	--	--	--	--	--
<u>Debt Service</u> ^{5/}											
Interest	--	--	--	--	--	460	430	400	360	320	165
Amortization	--	--	--	--	--	310	340	370	410	450	605
Sub-Total	--	--	--	--	--	770	770	770	770	770	770
<u>GOR Redemptions for Establishment Costs</u> ^{3/}	--	--	--	--	--	275	280	--	--	--	--
<u>Annual Inflow</u>	--	--	--	70	835	160	205	150	65	75	70
<u>Total Uses of Funds</u>	3,565	875	28	70	835	1,155	1,205	920	835	845	840
<u>(Cumulative Inflow)</u> ^{7/}	--	--	--	70	905	1,065	1,270	1,420	1,485	1,560	1,910

^{1/} In current prices.

^{2/} Initially equity equivalent to 20% of the investments in fixed assets and working capital is split equally between GOI and GOR. In addition, initial operating deficits are financed by additional equity purchase by GOR to be redeemed in years 6 and 7. The Unions apply 20% of their Reserve Fund allocations in year 6 to purchase GOI and GOR equity, resulting in the equity structure shown above.

^{3/} Initial year operating deficits are shown as establishment costs and financed of GOR equity subscription, to be redeemed in years 6 and 7. See Table 2 for details.

^{4/} See Table 1 for details of investments.

^{5/} 9½% interest; 5 years grace and 10 years of repayment of principal and capitalized interest.

^{6/} Average figures for these years.

^{7/} Funds available for re-investment and expansion of operations.

I N D I A
RAJASTHAN DAIRY DEVELOPMENT PROJECT
Corporation Bull Breeding Farm

Herd Projection

<u>Inventory</u>	----- Years -----				
	1	2	3	4	5
<u>Cows</u>					
On hand	--	95	82	77	78
1st calf heifers	--	--	18	23	22
Total mated	100 ^{1/}	95	100	100	100
Less deaths	5	3	3	2	2
Less sales	--	10	20	20	20
On hand at end	95	82	77	78	78
<u>Heifers (1-2 yr.)</u>					
On hand	--	35	34	37	37
Less deaths	--	1	1	1	1
Less sales	--	16	10	14	14
On hand at end	--	18	23	22	22
<u>Calves (1 yr.)</u>					
Born during year	80	76	80	80	80
Males	40	38	40	40	40
Less deaths	5	4	3	3	3
On hand at end	35	34	37	37	37
Females	40	38	40	40	40
Less deaths	5	4	3	3	3
On hand at end	35	34	37	37	37
<u>Males (1-2 yr.)</u>					
On hand	--	35	34	37	37
Less deaths	--	1	1	1	1
Less sales ^{2/}	--	34	33	36	36
On hand at end	--	--	--	--	--
T o t a l: AU	95	134	133	136	136
Milked	80	76	80	80	80
<u>Parameters</u>					
Calving %	80	80	80	80	80
Mortality					
Cows %	5	3	2	2	2
Others > 1 yr. %	--	3	3	3	3
Calves < 1 yr. %	12	10	8	8	8
Milk/lactation (l.)	2,700	3,000	3,300	3,300	3,300
<u>Sales</u>					
Cows No.	--	10	20	20	20
Heifers No.	--	16	10	14	14
Males No.	-- ^{4/}	34	33	36	36
Milk ^{3/} lts. '000	38.0	212.8	248.0	248.0	248.0

^{1/} Imported in-calif heifers
^{2/} Sold at end of year to union bull farms
^{3/} After deducting 100 l. per calf for calf feeding
^{4/} Milk production for 3 months only.

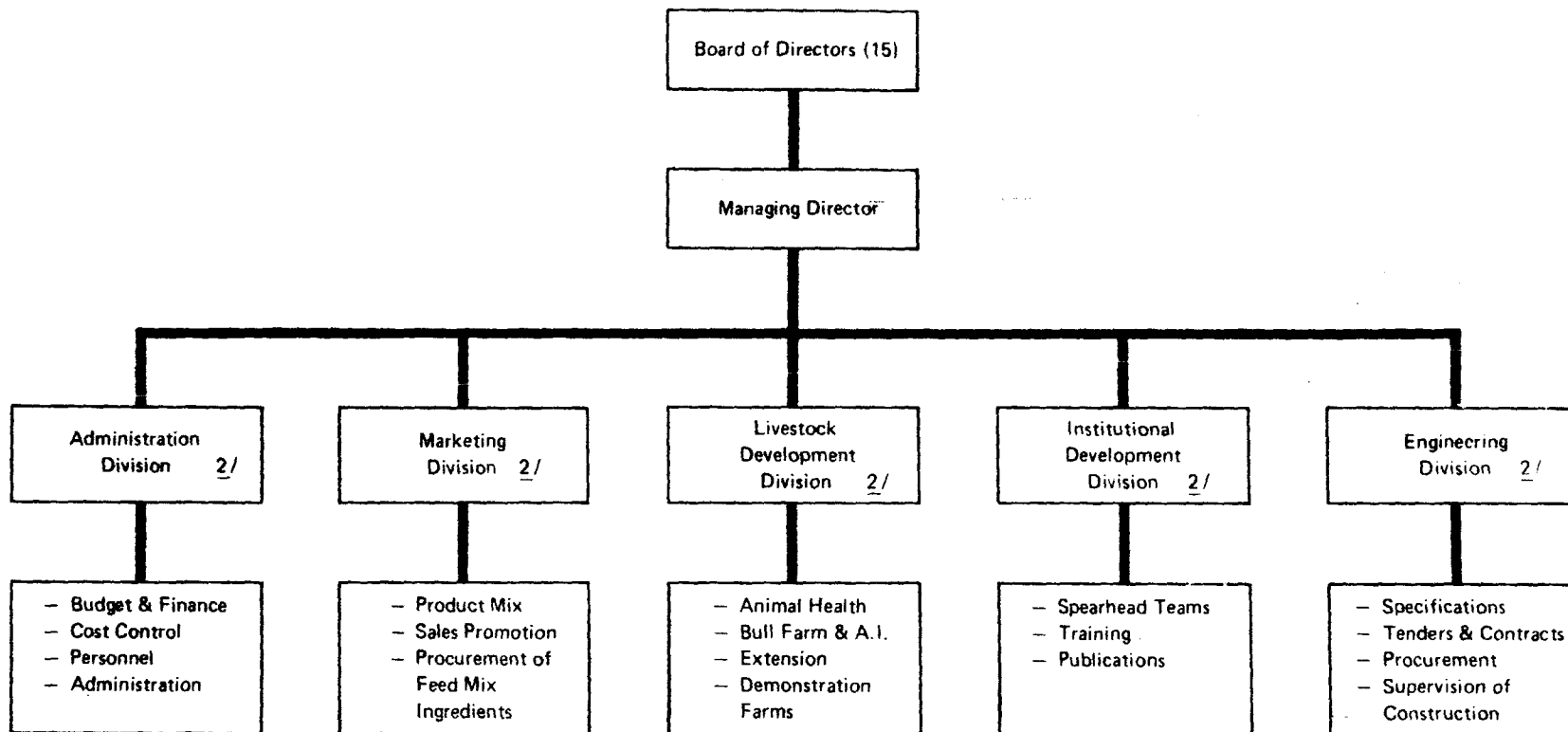
I N D I A
RAJASTHAN DAIRY DEVELOPMENT PROJECT
Dairy Development Corporation: Staffing Plan 1/

ANNEX 5
Table 5

	----- Years -----						Monthly Salary (Rs)
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	
<u>Managing Director</u>	1	1	1	1	1	1	2,500
Support Staff	1	1	1	1	1	1	400
<u>Divisions:</u>							
<u>Administration</u>							
Controller-Treasurer	1	1	1	1	1	1	2,000
Personnel Officer	1	1	1	1	1	-	1,200
Auditor	1	1	1	1	1	1	1,200
Audit and Accounts Assistants	2	2	2	2	2	2	800
Support Staff	1	1	1	1	1	1	400
<u>Engineering 2/</u>							
Chief Engineer	1	1	1	1	1	1	2,000
Consultant: Dairy Plant Engineering	1	1	1	-	-	-	--
Consultant: Dairy Plant Operations	-	-	-	1	1	-	--
Construction Supervisors	2	2	2	1	1	-	1,200
Technical Staff	-	2	2	1	1	-	1,200
Support Staff	2	2	2	2	1	1	400
<u>Livestock Development</u>							
Manager	1	1	1	1	1	1	2,000
Livestock/Fodder Consultant	1	1	1	-	-	-	--
Breeding Farm Supervisor	1	1	1	1	1	1	1,200
Livestock Officers	2	2	2	2	2	2	400
Farm Officers	3	3	3	3	3	3	400
<u>Institutional Development</u>							
Manager	1	1	1	1	1	1	2,000
Cooperative Consultant	1	1	1	-	-	-	--
Field Supervisor	1	1	1	1	1	1	1,200
Support Staff	2	2	2	2	2	2	400
<u>Marketing 3/</u>							
Manager	-	1	1	1	1	1	2,000
Marketing Consultant	-	1	1	-	-	-	--
Marketing Assistant	-	1	2	2	-	-	800
Support Staff	1	2	2	2	1	1	400

- 1/ An overall review of Corporation functions would take place in year 5 and staffing plan amended to reflect the advisory and coordination function of the Corporation thereafter. Hired consultants would fill the positions of divisional managers as far as possible to assume full responsibility for their duties.
- 2/ With most construction complete by year 6, and Unions operating their own plants, engineering function would be modified in year 6; one senior staff engineer would continue to function in an advisory capacity.
- 3/ Activities to be transferred to the Unions in year 4/5; however, one senior marketing expert would continue in an advisory capacity.

INDIA
RAHASTHAN DAIRY DEVELOPMENT PROJECT
 Rajasthan Dairy Development Corporation
 Organization Chart ^{1/}



^{1/} For Management staff only; for others, see staffing plan (Annex 5, Table 5).

^{2/} Hired consultants would fill the positions of divisional manager as far as possible, working through their respective counterparts at the Unions. The Dairy Processing consultants would work out of the Engineering Division but report directly to the Managing Director.

^{3/} Functions & organization of RDCC would be reviewed in year 6 as Project implementation is completed.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Training and Extension

A. Training

1. The factor most critical to the success of the Project is the availability of trained and motivated manpower at all levels. While graduates in the various technical disciplines involved in the Project are available, further orientation and job related training would be required for them to handle the responsibilities envisaged under the Project. In addition, the task of creating 1,800 new cooperative societies would require acceptance of cooperative principles on part of 245,000 project farmers, 16,000 members of DCS management committees and 5,500 paid officers of DCS. This can only be achieved through extensive education and demonstration, organized specifically for the Project. Table 1 gives the course content, frequency and training methods for the various training programs while Table 2 provides a cost estimate for this promotional investment. Chart 1 presents the relative timing and duration of the training and extension activities relating to a single DCS.

DCS Level

2. At the DCS level, the training involves a two-day visit to AMUL of 10 farming couples for each DCS prior to the formation of the DCS. These farmers would see AMUL in action and cooperation at work. Spending a day at the AMUL villages, they would learn firsthand about the duties and benefits involving cooperatives. On their return to their own villages, the farmers would be expected to participate in or lead group discussions during the village base camps organized by the spearhead teams. These camps, of 4 days' duration for 3 hours/day, would be held during the period of pre-DCS activity aiming to communicate cooperative principles and AMUL experience, identify potential leaders and build membership in preparation for the DCS operation.

Union Level

3. At the Union Training Center (UTC), courses would be organized for training the three-man staff of each new DCS in AI, animal first aid, milk testing and basic record keeping. These basic courses would be of 2 months' duration immediately preceding the village base camp, followed by a 1 week refresher course every year. A one-week course would be organized for the members of the management committee of each DCS in the village by the Union's Training Center about 2 months after a DCS had commenced operations. The management committee from two or three DCS would be trained simultaneously. The course would use the DCS by-laws, and the record of operations as the

training material and focus on the objectives, potentials and pitfalls open to a DCS with a view to formulating an annual plan of action for each individual DCS. Cooperative principles would also be discussed. A third course also organized at the Union level would be for the Village Extension Workers (VEWs) of the Unions. A 2-month course, followed by 2-week refresher courses every year, would deal with animal production, crossbreeding, fodder production as well as on cooperative principles and practices. The RDDC consultants would contribute their expertise to the course (para. 5).

RDDC Level

4. Most of the training of the project implementation teams, the UTC staff and the extension supervisors would be organized by the RDDC at NDDDB and NDRI. For the five spearhead teams the program at NDDDB would focus on the AMUL principles and practices and on the experience of NDDDB with replicating the AMUL model. The objectives would be to establish the specific systematic approach to be followed in setting up DCS, milk collection routes, AI and animal health services and DCS supervision, etc. (Outline of a recommended approach to DCS implementation is given in Chart 1.) The NDRI course would deal with the technical aspects of crossbreeding, crossbred rearing, fodder production and feeding.

5. The RDDC's animal production and fodder experts would organize seminars for the extension and animal production officers of the Unions. The results from Project demonstration farms would be evaluated and other improved techniques would be discussed at these seminars. Similarly, the RDDC Dairy Processing and Dairy Engineering consultants would formulate training programs for the Union's engineers and plant managers. Terms of reference of RDDC five consultants are given in Appendix 1.

6. A total of 15 overseas fellowships (3 per Union) of 6 months duration in the field of dairy plant management, dairy livestock production and crossbreeding, and cooperative communication would be arranged by the RDDC for the Union staff. Suitable training courses would be found in Denmark, New Zealand, Australia and Sweden. These overseas fellowships would follow a 3-month orientation course at NDDDB, and would be organized in the first and second year of the Project so that the trained staff would be available when the dairy plants come into operation early year three.

B. Extension

7. To spread the concept of crossbreeding, improve animal management and stimulate fodder production, special extension efforts would have to be undertaken under the Project. These changes in dairy practices would have to be implemented in a reasonably short period in order that the DCS and the Union become financially viable institutions.

Extension System

8. Existing extension systems (Annex 1) attempt to cover very large areas in all kinds of activities, and these tend to be slow in inculcating new practices. Extension under the Project would be intensive and centralized under the Union's divisional manager of institutional development. Training of the Union extension staff at NDRI, along with the expertise provided by the consultants and that developed at the Project demonstration farms, would provide sufficient material for the extension effort, which would need to be very vigorous during the early life of a DCS. For this purpose, one Village Extension Worker (VEW) would be placed in each new DCS for the initial period of 3 months. The VEW would be a member of the spearhead team during the village base camp and would stay behind in the village to attend to its extension needs. The resident VEW would be charged with identifying and training 10 Progressive Dairy Farmers (PDF) during the 3-month assignment. Following the resident assignment, each group of 10 DCSs would be supervised by one VEW through 1 day stay at each DCS once every fortnight. A supervising VEW would basically operate through PDFs, although he would devote 50% of his time in the DCS to individual member's problems. Each Union Extension Supervisor would direct the activities of 10 VEW's. Considering the enormous importance of the farmer's wife in the process of changing any farming or dairy practice, the participation of the VEW's wife in the extension activities would be encouraged. An extra allowance in the VEW's salary for such participation would be provided by the Union.

Selection of Staff

9. During the 5-year Project development period when the extension activity is very intense and totally promotional in nature, each Union's requirement of 30 VEW's in year 1 and 50 by year 2 could be met by the secondment of VEWs by GOR to the Union, where they would be directed by the Union's divisional managers. The selection of VEWs for secondment to the Union would be made by the Union and would have to be particularly meticulous because of the very demanding nature of the assignment. Factors like technical training and degrees would be assigned as much importance as motivation, cooperative thinking, devotion to the welfare of farm families and ability to work hard. The Union would be allowed to pay extra compensation in addition to the regular salary in order to reward good performance by a VEW. At the end of 5 years of DCS implementation, the Union would have the option to absorb as many or as few of these VEWs as it requires into its own staff with the rest returning to GOR.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Rajasthan Dairy Development Corporation

Terms of Reference of Consultants

Dairy Plant Engineer

1. Qualifications: University graduate in construction, mechanical, chemical or dairy engineering or have equivalent training with at least ten years experience in positions of responsibility involving dairy plant design, construction and equipment. Candidate must have adequate knowledge of modern trends within the dairy industry and able to prepare specifications for tender covering construction of dairy plants that will meet Danish or U.S. or equivalent sanitary standards. Prior experience with engineering contracts and in a developing country would be desirable. Candidate should also be familiar with feed mill construction. Knowledge of English would be essential.

Duties and Responsibilities

2. He would report directly to the Managing Director (RDDC) and, unless he himself is the manager of the Engineering Division, to be co-responsible with such manager, whom he would train, for the construction of the new Milk Processing Plants and Feed Mills under the Project. He would coordinate with his respective counterparts under the divisional manager of plant operations at the Unions who would later become the chief engineers of each dairy plant. He would prepare specifications, request and evaluate tenders, and assist in the supervision of construction. 1/ His appointment would last three years, starting in year one.

Dairy Processing Engineer

3. Qualifications: University graduate in chemical or dairy engineering or have equivalent training with at least ten years experience in positions of responsibility operating dairy plants of at least 100,000 lts./day capacity. Candidate should be fully conversant with current Danish or U.S. or equivalent sanitary standards and the equipment, process monitoring and quality controls required for production of such dairy products as butter, yoghurt, casein, cheese and milk powder in addition to pasteurized and aseptic fluid milk packaged in various forms. Prior experience in a developing country would be desirable and knowledge of English would be essential.

1/ In consultation with NDDB.

4. Duties and Responsibilities: He would report directly to the Managing Director (RDDC) and be responsible for training the dairy plant managers and operating staff at the Union level in operating plant equipment correctly and enforcing the proper process and quality controls that would yield satisfactory and competitive products. The position would last two years starting at end of year two. He would coordinate with the divisional managers of marketing for production of the most profitable product mix feasible and marketable.

Dairy Marketing Specialist

5. Qualifications: University graduate in business administration, marketing, or economics or have equivalent training with at least ten years experience in positions of responsibility involving production and marketing of packaged fluid milk and such dairy products as butter, yoghurt, casein, cheese and milk powder. He would have experience in effecting marketing studies or analysis and would be fully conversant with dairy product yields and production costs. Prior experience in a developing country would be desirable. Knowledge of English would be essential.

6. Duties and Responsibilities: He would report directly to the Managing Director (RDDC) and, unless he himself is the manager for Marketing (RDDC), to be responsible for training the divisional manager of marketing (RDDC) and his counterparts at the Union level in the marketing techniques of dairy products and particularly sale of packaged fluid milk in the urban markets in the face of strong competition from the agent/collectors and city producers. He would also advise on coordinating production between all plants to optimize product mix and minimize transport, processing and marketing costs. His duties would commence at the end of year two and cease at end of year four.

Mass Media Communication Specialist

7. Qualifications: University graduate in social sciences with emphasis in visual and oral means of communication or equivalent training including knowledge of modern teaching techniques, cooperative extension and advertising. Candidate should have at least ten years of experience in positions of responsibility involving effective techniques in oral and visual communication to groups of about 50-100 people. He should offer proof of successful communication of simple pragmatic concepts to people of a comparatively low level of education including samples of visual aids or other devices designed for and utilized with success in those instances. Prior experience with cooperative organizations and in a developing country would be desirable. Knowledge of English would be essential.

8. Duties and Responsibilities: The communication specialist would report directly to the Managing Director (RDDC) and work in coordination with the divisional manager for Institutional Development, his counter parts at the Union level and all the way down to the spearhead teams out in the villages, to determine:

- (a) the most appropriate technique for transmitting to the villagers in an effective and comprehensive way the concepts of the AMUL model and the extension services included;
- (b) that the technique once developed is followed and utilized by the spearhead teams to its full effectiveness;
- (c) detect and analyze reasons for any lack of response, and modify the technique as required. The candidate would take up his duties at the beginning of year one terminating at the end of year three without replacement. However, he would train counterparts at the Union level.

Forage/Animal Production Specialist:

9. Qualifications: A degree in agriculture, animal husbandry, or related field with at least five years experience in dairy livestock and forage production in the tropics with emphasis on management and utilization of irrigated fodder. Knowledge of English would be essential.

Duties and Responsibilities

10. He would report to the Managing Director (RDDC) and, unless he himself is the manager for Livestock Development (RDDC), work in coordination with the divisional manager for Livestock Development and his counterparts at the Union level who he would train and through who he would select and organize the demonstration farms of mixed farming management proposed under the project. He would collaborate in training union instructors and VEW supervisors in aspects related to improved management of mixed farms, animal husbandry, milking hygiene, fodder production, crossbreeding and crossbred calf rearing. The duration of the position would be three years starting beginning of year one.

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RAJASTHAN DAIRY DEVELOPMENT PROJECT

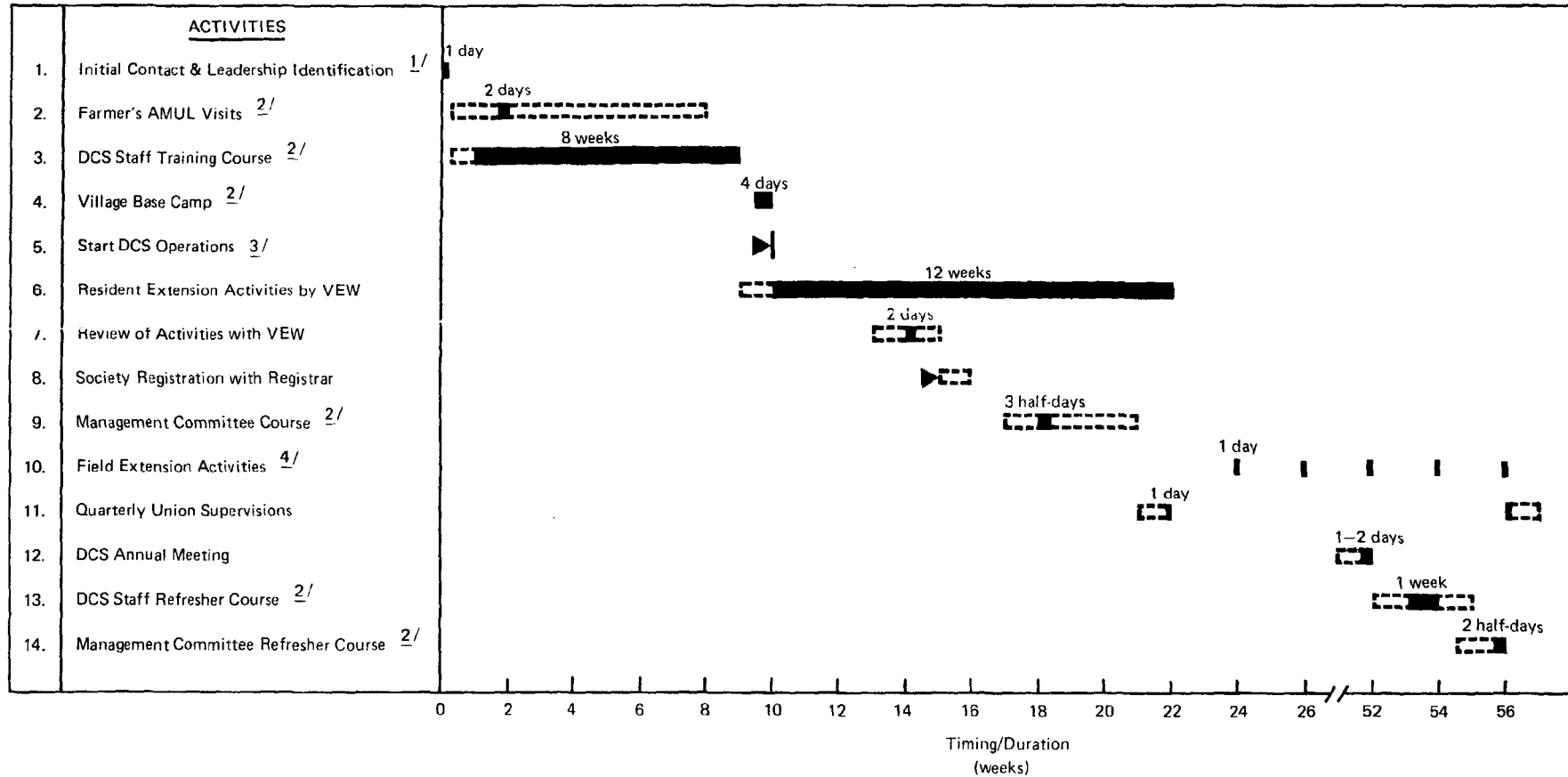
ANNEX 6
Table 2

Project Investment in Training and Extension
(Rs, 000)

	Years					Total	% Foreign Exchange
	Pre Project	1	2	3	4		
<u>Fellowships (15) 1/</u>		85	95	-	-	180	85
Travel		100	120	-	-	220	100
Course Fee		480	600	-	-	1,080	100
Subsistence		665	815	-	-	1,480	
Sub-Total		85	190	-	-	275	
Price Contingencies		750	1,005	-	-	1,755	97
Total							
<u>Training at NDDB & NDRI 2/</u>		10	5	-	-	50	-
Travel	35	85	25	10	-	120	-
Course Fee	200	60	30	-	-	190	-
Subsistence	320	95	45	-	-	460	-
Sub-Total	10	15	10	-	-	35	-
Price Contingencies	330	110	55	-	-	495	-
Total							
<u>Consultant Services 3/</u>		250	-	-	-	250	25
Vehicles (5)		50	-	-	-	50	-
Furniture & Equipment		1,050	1,400	1,400	750	4,600	90
Consultant Fees & Travel		200	300	200	200	900	90
Research Materials		1,550	1,700	1,600	950	5,800	
Sub-Total		200	395	520	400	1,515	
Price Contingencies		1,750	2,095	2,120	1,350	7,315	84
Total							
<u>Union Training Centers (5) 4/</u>		500	-	-	-	500	25
Vehicles (10)		400	-	-	-	400	-
Buildings & Furniture		1,100	1,100	1,100	1,100	5,500	-
Staff Expense		200	225	225	225	1,100	10
Field Visits & Training Materials		2,200	1,325	1,325	1,325	7,500	
Sub-Total		285	310	430	560	2,285	
Price Contingencies		2,185	1,635	1,755	1,885	9,785	3.2
Total							
<u>Union Extension Program 5/</u>		450	125	-	-	575	25
Vehicles		375	375	375	375	1,875	10
Transportation		50	50	50	50	250	10
Extension Materials		1,100	1,450	1,725	1,725	7,725	-
Staff Expenses		1,975	2,000	2,150	2,150	10,125	
Sub-Total		250	460	700	910	3,160	
Price Contingencies		2,225	2,160	2,850	3,060	13,885	3.4
Total							
<u>Farmer Visits to AMUL 6/</u>		200	200	200	200	200	1,000
Transportation		150	150	150	150	150	750
Subsistence		350	350	350	350	350	1,750
Sub-Total		45	80	115	150	185	575
Price Contingencies		395	430	465	500	535	2,325
Total							5.7
<u>Village Base Camps 7/</u>		35	35	35	35	35	175
Transportation		15	15	15	15	15	75
Training Materials		50	50	50	50	50	250
Sub-Total		5	10	15	20	25	75
Price Contingencies		55	60	65	70	75	325
Total							6.8
Total Without Contingencies	320	6,685	6,285	5,475	4,825	3,875	27,665
Price Contingencies	10	885	1,455	1,780	2,040	2,050	8,220
Total with Contingencies	330 8/	7,770	7,740	7,255	6,865	5,925	35,885
							25.0

- 1/ 3 officers per Union to be trained in plant management, animal production and cooperative communication.
2/ Training load: 100 trainees in the preproject year: 300 in year 1 and 15 in year 2. Travel at Rs 350/trainee, subsistence Rs 650/man month.
3/ 5 Consultants at Rs 350,000/man year for fee, including travel, 1 vehicle for each at Rs 50,000/vehicle, research materials at Rs 40,000/man year.
4/ One training center per Union providing an average of 1000 man months of training annually. Staff consisting of 1 principal, 5 regular staff members and 2 supporting staff. Teaching materials @ Rs 5/man month and transportation at Rs 20/man month and Rs 50/day for each spearhead team--includes spearhead team staff expenses and 5 vehicles.
5/ 100 miles per day for 5 vehicles @ Rs 1/mile, 25 motor bikes at Rs 0.50/mile and 250 bicycles; Staff: 1 Director, 5 Extension Supervisors and 30 VEW in year 1 to 50 VEW by year 3.
6/ 10 dairy farming couples per new DCS for two days--Rs 50/couple transportation and Rs 35/couple for subsistence.
7/ One 4-day village camp for 2 new DCS.

INDIA
RAJASTHAN DAIRY DEVELOPMENT PRODUCT
Training & Extension Activities for DCS Implementation



1/ Objective is to select 10 progressive dairy farms cum village leaders for Amul visits, and to select 3 potential DCS Staff for training at UTC.

2/ See Annex 6 Table 1 for details of training requirements.

3/ Milk collection and sale of cattle feed should start together, followed, within one week, by Veterinary Services.

4/ After 12 weeks of extension activities by a VEW stationed in the village, a DCS would be served once fortnightly by field extension staff.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Project Implementation: Initial Steps

1. The project has a defined scope and its entire implementation would require careful planning with each step scheduled in a "critical-path" fashion. The RDDC and the five Unions would be organized in year one and their corresponding DCS would be implemented progressively over a period of five years, only the second expansion of the dairy plants would take place in year six.
2. The Project authority and center of coordination would be the RDDC. This would be the seat of the hired consultants and other experienced executives (divisional managers). They would be coordinated by the Managing Director. The divisional managers, assisted by the consultants, would each carry out a specific phase of the Project. This would be done by working through his respective counterpart in the Unions who in turn would be responsible for the same specific phase within his own Union.
3. Major initial steps in implementing the project would be the following:
 - (a) Government would appoint a key team to assist in organizing the RDDC, nominate its board, establish its headquarters and appoint its Managing Director. NDDB's services would be contracted.
 - (b) With assistance of the NDDB, the team would recruit the executive staff, including three of the five consultants, for RDDC and the five Unions, and train the selected candidates at NDDB.
 - (c) The General Managers of each Union and the Divisional Managers of the RDDC and the Unions would be appointed.
 - (d) The headquarters would be established for each Union in the main urban center of their respective district or milk-shed regions.
 - (e) Each Union division would determine its workload, schedule, staff and other facilities required in coordination with the respective RDDC divisional manager:

- (i) The Division of Institutional Development of each Union would schedule the implementation of cooperative societies, determine strength of spearhead teams and arrange for their recruitment, coordinate their training at NDDB with the teams for the other Unions and arrange for purchase of vehicles and other facilities.
- (ii) The Division of Livestock Development of each Union would schedule the implementation of the extension services: animal health; AI, demonstration farms, etc. and arrange for recruitment and training of its staff at NDDB and NDRI also coordinated with the teams from other Unions. Vehicles and other facilities would be purchased.
- (iii) The Division of Marketing of each Union would promptly be organized for selling the milk collected from the DCS in the urban centers. Until the plants are commissioned in year two, the milk would be sold chilled in bulk from one or two Union owned chilling centers temporarily installed in the cities.
- (f) The Division of Marketing (RDDC) with assistance from NDDB, would effect a marketing study to determine the most appropriate product mix for each dairy plant, to effect economies of scale in investment and minimize transportation of fluid milk.
- (g) The Engineering Division (RDDC) would promptly procure and install chilling centers in the urban areas for sale of Union milk.
- (h) The Engineering Division (RDDC) in consultation with the other divisions of RDDC and the Unions would locate and purchase suitable sites for the bull breeding farm, bull farms (AI centers) and dairy and feed plants.
- (i) The Engineering Division (RDDC) would prepare specifications in consultation with NDDB for calling tenders for the construction of the feed mills and the dairy plants based on the marketing study. NDDB would also be consulted for evaluation of tenders received and award of contracts.
- (j) Each union would be formally registered on completing the implementation and registration of 25 of its DCS (see Annex 6, Chart 4).

I N D I A
RAJASTHAN DAIRY DEVELOPMENT PROJECT
Project Cost by Major Investment

ANNEX 7
Table 1

	Years						Total	% Foreign Exchange
	1	2	3	4	5	6		
Dairy Cooperative Societies ^{1/}								
Equipment	600	700	800	700	700	--	3,600	--
Establishment Costs	450	650	830	1,110	1,180	--	4,120	--
Sub-Total	1,050	1,350	1,630	1,810	1,880	--	7,720	--
Contingencies								
Physical	90	105	120	120	100	--	535	--
Price	150	335	570	820	1,050	--	2,925	--
Sub-Total	240	440	690	940	1,150	--	3,460	--
Total	1,290	1,790	2,320	2,750	3,030	--	11,180	--
Union Investments ^{2/}								
Milk Processing Plants	20,250	69,300	--	15,700	--	30,250	135,500	34
Feed Mills	1,830	5,470	3,640	5,490	10,920	--	27,350	26
Services	7,600	8,840	1,630	1,650	1,040	100	20,860	18
Working Capital	650	970	970	--	2,910	--	5,500	--
Establishment	4,650	5,450	10,360	1,790	--	--	22,250	--
Sub-Total	34,980	90,030	16,600	24,630	14,870	30,350	211,460	27
Contingencies								
Physical	2,610	7,990	500	2,170	1,130	3,050	17,450	--
Price	4,960	23,060	5,710	11,920	9,020	21,960	76,630	--
Sub-Total	7,570	31,050	6,210	14,090	10,150	25,010	94,080	--
Total	42,550	121,080	22,810	38,720	25,020	55,360	305,540	27
Dairy Development Corporation ^{3/}								
Bull Breeding Farm	2,260	620	--	--	--	--	2,880	32
Management Facilities	300	--	--	--	--	--	300	25
Establishment Cost	440	20	20	--	--	--	480	--
Sub-Total	3,000	640	20	--	--	--	3,660	27
Contingencies								
Physical	130	30	--	--	--	--	160	--
Price	430	200	10	--	--	--	640	--
Sub-Total	560	230	10	--	--	--	800	--
Total	3,560	870	30	--	--	--	4,460	27
Supporting Activities ^{4/}								
BVVI and Diagnostic Lab.	2,300	6,400	2,950	600	--	--	12,250	54
Establishment Costs	600	510	--	--	--	--	1,110	--
Calf Rearing Grant	860	2,430	5,030	7,760	10,670	13,250	40,000	--
Sub-Total	3,760	9,340	7,980	8,360	10,670	13,250	53,360	12
Contingencies								
Physical	120	320	150	30	--	--	620	--
Price	390	1,680	1,000	270	--	--	3,340	--
Sub-Total	510	2,000	1,150	300	--	--	3,960	--
Total	4,270	11,340	9,130	8,660	10,670	13,250	57,320	12
Training and Extension ^{5/}								
Consultant Service Fellowships	2,220	2,510	1,600	950	--	--	7,280	87
UTC and Extension Program	4,590	3,370	3,470	3,480	3,470	--	18,380	3,5
Farmer Training Camps	400	400	400	400	400	--	2,000	6
Sub-Total	7,210	6,280	5,470	4,830	3,870	--	27,660	25
Price Contingencies								
	890	1,460	1,780	2,040	2,050	--	8,220	--
Total	8,100	7,740	7,250	6,870	5,920	--	35,880	25
Total Without Contingencies	50,030	107,670	31,740	39,510	31,310	43,600	303,860	23
Contingencies								
Physical	2,950	8,445	770	2,320	1,230	3,050	18,765	--
Price	6,820	26,735	9,070	15,050	12,120	21,960	91,755	--
Sub-Total	9,770	35,180	9,840	17,370	13,350	25,010	110,520	28
Total Project Costs	59,770	142,820	41,540	57,000	44,660	68,610	414,380	25

1/ See Annex 3 Table 4

2/ See Annex 4 Table 12, but for establishment costs which are in Annex 4, Table 13.

3/ See Annex 5 Table 1, but for establishment costs which are in Annex 5, Table 2.

4/ See Annex 7 Table 3

5/ See Annex 6 Table 2

6/ Preproject year costs are included in year 1 costs on this table.

INDIA
RAJASTHAN DAIRY DEVELOPMENT PROJECT
Project Financing Plan

	Total Cost	%	IDA Financing		(Rs. Thousands)		GOI		GCR		ARC ^{1/}	Banks ^{2/}	DCS Members
			Loans Thru/ ARC	Public Ex- penditures	Equity ^{3/}	Grants	Equity ^{3/}	Grants	Loans	Equity			
<u>Processing Facilities</u>													
Unions	115,430	100% CIF	69,300	-	11,540	-	11,540	-	13,810	9,240	-	-	-
<u>Other Equipment & Civil Works</u>													
DCS	5,300	70	-	3,710	-	-	1,590	-	-	-	-	-	-
Unions	152,790	70	106,950	-	15,280	-	15,280	-	3,060	12,220	-	-	-
RDDC	2,960	70	2,070	-	300	-	300	-	60	230	-	-	-
BVVI & CVAS	16,010	70	-	11,210	-	-	4,800	-	-	-	-	-	-
Sub-total	177,060	62	109,020	11,920	15,580	-	15,580	6,390	3,120	12,450	-	-	-
<u>Cattle and Semen</u>													
Unions	1,020	100% CIF	-	320	70	-	70	-	60	500	-	-	-
RDDC	950	100% CIF	-	850	-	100	-	-	-	-	-	-	-
Sub-total	1,970	60	-	1,170	70	100	70	-	60	500	-	-	-
<u>Establishment Costs</u>													
DCS	5,880	-	-	-	-	-	3,880	-	-	-	-	-	2,000
Unions ^{2/}	36,300	-	-	-	-	-	30,520	-	-	5,780 ^{1/}	-	-	-
RDDC	550	-	-	-	-	-	550	-	-	-	-	-	-
BVVI & CVAS	1,310	-	-	-	-	-	-	1,310	-	-	-	-	-
Sub-total	14,040	-	-	-	-	-	31,070	5,190	-	5,780	-	-	2,000
<u>Training & Extension</u>													
Consultant Services & Fellowships	9,070	2/	-	7,850	-	1,220	-	1,220	-	-	-	-	-
UTC & Extension Programs	24,170	80	-	19,340	-	-	-	4,830	-	-	-	-	-
Farmer Training Camps	2,640	-	-	-	-	-	-	2,640	-	-	-	-	-
Sub-total	35,880	-	-	27,190	-	1,220	-	8,690	-	-	-	-	-
<u>Calf Rearing Grants</u>	40,000	-	-	-	-	40,000	-	-	-	-	-	-	-
<u>Total RS Thousands</u>	414,380	52	178,320	43,280	27,190	40,100	58,210	20,270	23,030	27,970	2,000		
<u>Total by Institution (Rs Thousands)</u>			221,600		67,290		78,530		16,990	27,970	2,000		
<u>Total US \$ Thousands</u>	51,800		27,000		8,410		9,820		2,120	3,500	250		
<u>% of Total</u>	100		53.4		16.2		19.0		4.1	6.8	0.5		

^{1/} Working capital is financed by participating banks without ARC refinance.

^{2/} 100% of foreign expenditures or equivalent % expenditures, if local consultants.

^{3/} Higher equity may be required to satisfy the requirements of lending institutions. For this table it is assumed that lending institutions would require 20% of investments to be financed as equity.

^{4/} Here 90% refinance by ARC is assumed.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Biological Veterinary Vaccine Institute (BVVI)
and Diagnostic Laboratory (CVAS): Investment Projections

(Rs '000)

	----- Years -----						<u>Total</u>	<u>% Foreign Exchange</u>
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>		
Buildings	1000	2000	500	-	-	-	3500	-
Equipment ^{1/}	400	3000	1000	-	-	-	4400	80
Vehicles	600	-	-	-	-	-	600	25
Chemicals & Glassware	<u>-</u>	<u>800</u>	<u>1000</u>	<u>600</u>	-	-	<u>2400</u>	<u>80</u>
Sub-Total	2000	5800	2500	600	-	-	10900	
Diagnostic Laboratory ^{2/}	<u>300</u>	<u>600</u>	<u>450</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>1350</u>	<u>60</u>
Total	2300	6400	2950	600	-	-	12250	54
Contingencies:								
Physical Price	120	320	150	30			620	
	<u>310</u>	<u>1560</u>	<u>1000</u>	<u>270</u>	<u>-</u>	<u>-</u>	<u>3140</u>	<u>-</u>
Sub-Total	430	1880	1150	300			3760	54
GRAND TOTAL	2730	8280	4100	900			16010	54

^{1/} eg. Freeze drier, cold storage, incubators, hot air ovens, automatic bottling.

^{2/} Costs are for fully equipped field laboratory to be located strategically in Project area. Operating costs, about Rs 400,000 per year, would be covered by ongoing Government programs.

I N D I A

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Biological Veterinary Vaccine Institute (BVVI)

Production, Sales and Operating Expenses

	Years				
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
<u>Vaccine Production - ('000 doses/year)</u>					
Rinderpest	--	500	1,000	1,500	2,000
Others	--	500	2,000	2,500	3,000
<u>Sales</u> ----- ('000 Rs.) -----					
Rinderpest (at Rs. 0.30/dose)	--	150	300	450	600
Others (at Rs. 0.80/dose) <u>1/</u>	--	<u>400</u>	<u>1,600</u>	<u>2,000</u>	<u>2,400</u>
T o t a l	--	550	1,900	2,450	3,000
<u>Operating Expenses</u> ----- ('000 Rs.) -----					
Salaries <u>2/</u>	360	540	720	740	760
Allowances	200	300	400	400	400
Replacement Chemicals & Equipment	--	--	100	350	500
Test Animals	--	120	160	200	200
Others	<u>40</u>	<u>100</u>	<u>200</u>	<u>200</u>	<u>200</u>
T o t a l	600	1,060	1,580	1,890	2,060
Operating Surplus	(600)	(510)	320	560	940

1/ Hemorrhagic septicæmia blackquarter. Anthrax. - Sheep pox.
2/ The Institute would employ about 50 qualified staff.

INDIA
RAJASTHAN DAIRY DEVELOPMENT PROJECT

Estimated Disbursement Schedule

<u>IDA Fiscal Year and Quarter</u>	<u>Cumulative Disbursements at End of Quarter ^{1/}</u> (US\$ millions)
<u>FY 1975</u>	
3rd	-
4th ^{2/}	-
<u>FY 1976</u>	
1st	0.22
2nd	0.49
3rd	1.37
4th	2.18
<u>FY 1977</u>	
1st	4.13
2nd	6.02
3rd	8.67
4th	11.31
<u>FY 1978</u>	
1st	12.62
2nd	13.81
3rd	15.20
4th	16.59
<u>FY 1979</u>	
1st	17.38
2nd	17.93
3rd	18.86
4th	19.78
<u>FY 1980</u>	
1st	20.74
2nd	21.56
3rd	22.09
4th	22.62
<u>FY 1981</u>	
1st	23.40
2nd	24.18
3rd	25.31
4th	26.43
<u>FY 1982</u>	
1st	27.06
2nd ^{3/}	27.70

^{1/} Calculated from Annex 7 Tables 1 and 2 assuming a 1-2 quarter lag on expenditures.

^{2/} Estimated date of effectiveness.

^{3/} Estimated closing date December 31, 1982.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Economic Rate of Return

1. Primary Project benefit to the Indian economy would be increased milk production, mainly pasturized milk and milk products (475,000 tons/year by year ten). This represents about 22% of Rajasthan's and 2% of India's present production.
2. Key assumptions and adjustments made in computing the economic rate of return were that:
 - (a) The prices of investment items, operating cost and milk would remain in real terms at mid-1974 price levels;
 - (b) Milk production is valued at Rs 1.50/lit., which is the composite price for ex-plant fluid milk and the portion of the incremental farm production that does not reach the plant. Milk products (skim milk powder and associated butter) are valued at Rs 1.50 liter fluid milk equivalent which is comparable to the cif price of skim milk powder and butterfat. In the local markets, the prime impact of the Project would be a substitution of raw milk by pasteurized milk, with the excess being converted to powder and products. Powder production in the winter and reconstitution to fluid milk in the summer would dampen out the wide fluctuations in the price of milk over the year. Overall, a slight supply effect (10-15%) on prices would be expected and is included in the price assumptions.
 - (c) Labor for plant operations and administration is priced at the financial wage rate, and labor cost for fodder and cattle-feed production is included in the market price of these inputs;
 - (d) Cost of training and extension is charged to the Project, as are all administrative costs of the DCS, Unions and RDDC;
 - (e) Milk production, without the Project, is assumed to grow to 3% per annum, which is slightly higher than the 1950-1970 rate of growth of 2%;

- (f) Incremental production beyond year 10 is not taken into account since the additional processing investments required then are not part of this Project;
- (g) The residual value of the Project crossbred herd would be the difference in market price between an indigenous cow and a crossbred;
- (h) The expected long-term increase in soil fertility and crop yields as a result of the introduction of leguminous fodder crops and mixed cropping systems is not included.

3. Based on these assumptions, the economic rate of return is projected to be about 31% (Table 1).

4. A sensitivity analysis has been carried out with respect to costs and benefits. Table 2 summarizes the results. If costs were 10% higher and benefits 10% lower, the rate of return would fall to 22%.

5. To test the sensitivity of the estimated economic rate of return to the rate of formation of successful DCS, the following assumptions were made:

- (a) The timing and the amount of investments was not altered even though investments are to be made in three distinct phases according to success in DCS formation;
- (b) A DCS was termed "successful" if it yielded the milk production stream of Annex 3, Table 3 ^{1/} from the first year of its implementation. An "unsuccessful" DCS was assumed to take 5 years from the year of implementation before starting on the milk production stream above. During these five years, upgrading of native cattle by crossbreeding was assumed not to take place;
- (c) For testing the sensitivity it was assumed that DCS were implemented at the same rate but that half of all DCS implemented in years 1-5 were unsuccessful, as defined above, and thus begin to yield benefits only 5 years after being implemented. Thus the number of successful DCS operating from year one onwards was 150, 325, 525, 725, 900, 1050, 1225, 1425, 1625, 1800 respectively, as opposed to the original schedule of 300, 650, 1050, 1450, and 1800, thereafter;

^{1/} Even for a "successful" DCS, it is projected that it would take 3 years before the full level of participation (70% of village herd) is reached; also it takes 3 years before a native breedable cow is replaced by a crossbred in milk.

- (d) The new project incremental milk production stream is obtained from the new phased formation of "successful" DCSs and the incremental milk production stream for one successful DCS (Annex 3, Table 3);
- (e) Costs of operation of the DCS, union services, BVVI, DLAB, and RDDC were assumed to be unchanged even when there are fewer number of successful DCS during years 1-9;
- (f) New operating costs for the milk plants, feed mills, and fodder production were derived from the corresponding costs in Annex 8, Table 1, by splitting the latter into "fixed" and "variable" costs. "Fixed" costs were assumed to be independent of, and the "variable" costs directly proportional to, the level of operation. The level of operation itself was assumed to be directly related to the amount of incremental milk production. Thus,
 - (i) for milk plants, from Annex 4, Table 5 (excluding taxes and raw milk purchases), it was derived that (at most) 30% of the costs were fixed while (at least) 70% were variable;
 - (ii) for feed mills, from Annex 4, Table 6, it was derived that (at most) 10% of the costs were fixed and (at least) 90% variable; and
 - (iii) for fodder production charged to the project, 100% of the costs were assumed variable.

6. Given the above assumptions, when the rate of formation of successful DCS is reduced to half, but the same number is eventually formed, the estimated rate of return is about 24% (Annex 8, Table 3).

I N D I A

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Economic Rate of Return

(Rs. '000)

	Y e a r s											
	1	2	3	4	5	6	7	8	9	10-14	15	
<u>Incremental Investment</u> ^{1/}												
DCS Equipment	580	675	770	675	675	--	--					
Union Milk Plants and Feed Mills	13,680	46,300	2,400	13,290	7,210	18,630	--					
Union Services	6,780	7,890	1,450	1,470	930	90	--					
Corporation Investments	2,280	550	--	--	--	--	--					
BVVI and DLAB	2,050	5,710	2,630	540	--	--	--					
Training and Extension	6,490	5,650	4,920	4,350	3,480	--	--					
Farm Dairy Investment ^{2/}	--	--	--	5,000	5,000	5,000	5,000	5,000	--	--	--	--
	31,860	66,775	12,170	25,325	17,295	23,720	5,000	5,000	--	--	--	--
<u>Incremental Operating Costs</u>												
DCS ^{3/}	1,680	3,710	6,250	9,170	12,170	13,310	14,560	15,700	16,440	16,890	16,890	16,890
Union Milk Plants ^{4/}	3,350	9,100	27,350	40,200	55,200	68,650	75,850	81,750	81,750	81,750	81,750	81,750
Union Feed Mills ^{2/}	--	--	20,930	37,000	55,140	75,670	94,500	104,000	104,000	104,000	104,000	104,000
Union Services ^{5/}	3,875	5,400	7,200	8,900	10,450	12,550	12,550	12,550	12,550	12,550	12,550	12,550
Corporation ^{7/}	445	650	690	680	670	550	550	550	550	550	550	550
BVVI and DLAB ^{8/}	900	1,310	1,780	2,060	2,210	2,210	2,210	2,210	2,210	2,210	2,210	2,210
Fodder Production ^{2/}	--	600	2,500	8,900	18,200	34,200	53,700	74,900	96,000	114,000	114,000	114,000
	10,250	20,770	66,700	106,910	154,040	207,140	253,920	291,660	313,500	331,950	331,950	331,950
<u>Incremental Benefits</u>												
<u>Incremental Milk Production</u> ^{10/}	--	3,750	22,200	55,600	114,700	213,700	336,000	468,000	600,000	712,500	712,500	712,500
@ Rs 1.50/lit												
<u>Residual Project Herd Value</u> ^{11/}												1,084,100
<u>Net Benefits</u>	(42,110)	(67,130)	(56,670)	(76,635)	(56,635)	(17,160)	77,080	171,340	286,500	380,050	1,464,650	1,464,650

Economic Rate of Return = 31%

- 1/ See Annex 7 Table 1 for investments including taxes and duties; for economic analysis the following taxes have been deducted: DCS Equipment (15%), Union Plants (44% based on 70% duties and taxes on imported equipment and 30% on locally procured equipment; 15% on corporation (breeding farm) investments; Union Feed Mills (40% based on 60% on imports and 30% on local); 15% on other investments; 10% on training and extension items.
- 2/ About Rs. 100/household from years 4 to 8 for shelter, watering trough, etc. Total of 250,000 households (Annex 3 Table 1).
- 3/ Phasing of DCS is shown in Annex 3, Table 4, and operating costs for a typical DCS are given in Annex 3, Table 5.
- 4/ Excluding milk procurement and taxes at 10%. See Annex 4 Table 5 for 1 milk plant. There are 5 plants in the Project.
- 5/ Including cost of ingredients and excluding taxes--See Annex 4 Table 6 for all 5 feed mills.
- 6/ Taxes (@ 10%) are excluded from costs given in Annex 4 Table 7, which is for one Union.
- 7/ Corporation operating costs are given in Annex 5 Table 2; 10% taxes are excluded.
- 8/ Annex 5 Table 4.
- 9/ Market price for green fodder is about 12p/kg in the project villages and this includes the cost of labor. 2 kg fodder per litre of milk is required.
- 10/ Incremental production after year 10 is not included.
- 11/ The incremental value of the project herd as a result of crossbreeding and the 10% increase in the herd size @ Rs. 3,000/hd for replacement by crossbred and Rs. 4,000/hd. for the increase. Surplus male calves and heifers are not included.

INDIA

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Economic Rate of Return: Sensitivity Analysis

<u>Economic Rate of Return Assuming that</u>			
<u>COSTS ARE</u>	<u>BENEFITS ARE</u>		
	Standard	-10%	-15%
Standard	31.0	26.5	24.0
+ 10%	27.0	22.5	20.0
+ 15%	25.0	20.5	18.0

I N D I A

RAJASTHAN DAIRY DEVELOPMENT PROJECT

Economic Rate of Return: Sensitivity to DCS Formation ^{2/}

	Y e a r s														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<u>Incremental Investment</u> ^{1/}	31,860	66,775	12,170	25,325	17,295	23,720	5,000	5,000							
Additional Training ^{1/}	-	-	-	-	-	3,480	3,480	3,480	3,480	3,480	-	-	-	-	-
<u>Incremental Operating Costs</u>															
DCS ^{2/}	1,680	3,710	6,250	9,170	12,170	13,310	14,560	15,700	16,440	16,890	16,890	16,890	16,890	16,890	16,890
Union Milk Plants ^{3/}	3,350	5,910	17,600	25,800	35,900	44,600	49,300	54,000	55,300	57,100	63,900	70,300	77,170	81,750	81,750
Union Feed Mills ^{3/}	-	-	11,500	20,300	30,300	41,600	52,000	58,800	60,800	63,800	75,000	85,300	96,300	104,000	104,000
Union Services ^{4/}	3,875	5,400	7,200	8,900	10,450	12,250	12,250	12,250	12,250	12,250	12,250	12,250	12,250	12,250	12,250
Corporation ^{4/}	445	650	690	690	690	690	690	690	690	680	670	670	670	670	670
BFWI & DLAB ^{4/}	900	1,310	1,780	2,060	2,210	2,210	2,210	2,210	2,210	2,210	2,210	2,210	2,210	2,210	2,210
Fodder Production ^{5/}	-	310	1,250	4,350	9,100	17,700	26,900	38,700	51,700	65,000	78,400	91,000	104,900	114,000	114,000
	10,250	17,290	46,270	71,270	100,820	132,360	157,910	182,350	199,390	217,930	249,320	278,820	310,390	331,700	331,700
<u>Incremental Benefits</u>															
Milk Production @ Rs. 1.50/liter ^{5/}	-	1,900	11,130	27,200	57,400	106,400	168,450	242,350	323,500	406,500	489,700	570,700	654,400	712,000	712,000
Residual Herd Value ^{6/}															950,000
<u>Net Benefits</u>	(42,110)	(82,165)	(47,310)	(69,395)	(60,715)	(53,160)	2,060	51,660	120,630	185,090	240,380	291,880	344,010	380,230	1,330,230

Economic Rate of Return = 24.5%

- ^{1/} The timing and amount of investments (except training) is assumed unchanged. Training activity is continued at the intensive level for 5 additional years.
- ^{2/} DCS are implemented and spending costs incurred at the previous level. However, it is assumed that only 50% yield the full projected benefits while the balance 50% yield none at all for first five years after implementation.
- ^{3/} 30% of costs on Annex 8 Table 1 are fixed, and the balance 70% are directly proportional to milk handled; for feed mill, only 10% of corresponding costs on Table 1 are fixed and the balance 90% are directly proportional to milk handled. (See paragraph 5 of Annex 8). Full 100% of the cost of fodder is directly proportional to incremental milk production.
- ^{4/} These are assumed unchanged from Table 1.
- ^{5/} Derived from the incremental production stream of 1 successful DCS (Annex 3 Table 3) and the rate of successful DCS formation given in Paragraph 5 (c) of Annex 8
- ^{6/} Herd replacement is complete by year 15 but herd increase of Annex 8 Table 1 is not complete, and only the former benefit is included here.

