

PPA:SRI 16056

# ASIAN DEVELOPMENT BANK

## PROJECT PERFORMANCE AUDIT REPORT

ON THE

LIVESTOCK DEVELOPMENT PROJECT  
(Loan No. 606-SRI [SF] )

IN

SRI LANKA

November 1995

## CURRENCY EQUIVALENTS

Currency Unit - Sri Lankan Rupee (SLRs)

		At Appraisal	At Project Completion	At Postevaluation
SLRs1.00	=	\$0.0478	\$0.0238	\$0.0202
\$1.00	=	SLRs20.91	SLRs42.00	SLRs49.50

## ABBREVIATIONS

AI	-	Artificial Insemination
AR	-	Appraisal Report
DAPH	-	Department of Animal Production and Health
EIRR	-	Economic Internal Rate of Return
NLDB	-	National Livestock Development Board
PCC	-	Project Coordinating Committee
PCR	-	Project Completion Report
PEM	-	Postevaluation Mission
PMO	-	Project Management Office
PPAR	-	Project Performance Audit Report
TA	-	Technical Assistance

## NOTES

- (i) The fiscal year (FY) of the Government ends on 31 December.
- (ii) In this Report, "\$" refers to US dollars.

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**BASIC PROJECT DATA**  
**Livestock Development Project (Loan No. 606-SRI[SF])**

**PROJECT PREPARATION:**

T.A. No.	TA Project Name	Type	Estimated Person-months	Amount	Approval Date
371-SRI	Livestock Development Project	PP	15	200,000	3 November 1980

KEY PROJECT DATA (\$ million):	As per Bank Loan Documents	Actual
Total Project Cost	20.72	16.67
Foreign Currency Cost	12.00	11.42
Bank Loan Amount/Utilization	15.20	14.15 <sup>1</sup>
Bank Loan Amount/Cancellation		1.05

KEY DATES:	Expected	Actual
Fact-Finding		28 October-19 November 1981
Appraisal		29 June-17 July 1982
Loan Negotiations		18-20 October 1982
Board Approval		7 December 1982
Loan Agreement		16 February 1983
Loan Effectivity	17 May 1983	11 May 1983
Project Completion	30 June 1989	31 December 1991
Loan Closing	30 June 1989	25 March 1992
Months (Effectivity to Completion)	74	104

KEY PERFORMANCE INDICATORS:	Appraisal	PCR	PPAR
Economic Internal Rate of Return			
- Project	40	n.c.	6.7
- Smallholder Producer Units	21-50	n.c.	n.c. <sup>2</sup>
- Producers Associations	16-48	n.c.	n.c.
Financial Internal Rate of Return			
- Smallholder Producer Units	21-34	n.c.	n.c. <sup>3</sup>
- Producers Associations	16-40	n.c.	n.c.

**BORROWER:** Democratic Socialist Republic of Sri Lanka

**EXECUTING AGENCY:** Department of Animal Production and Health  
Bank of Ceylon  
People's Bank  
Regional Rural Development Bank

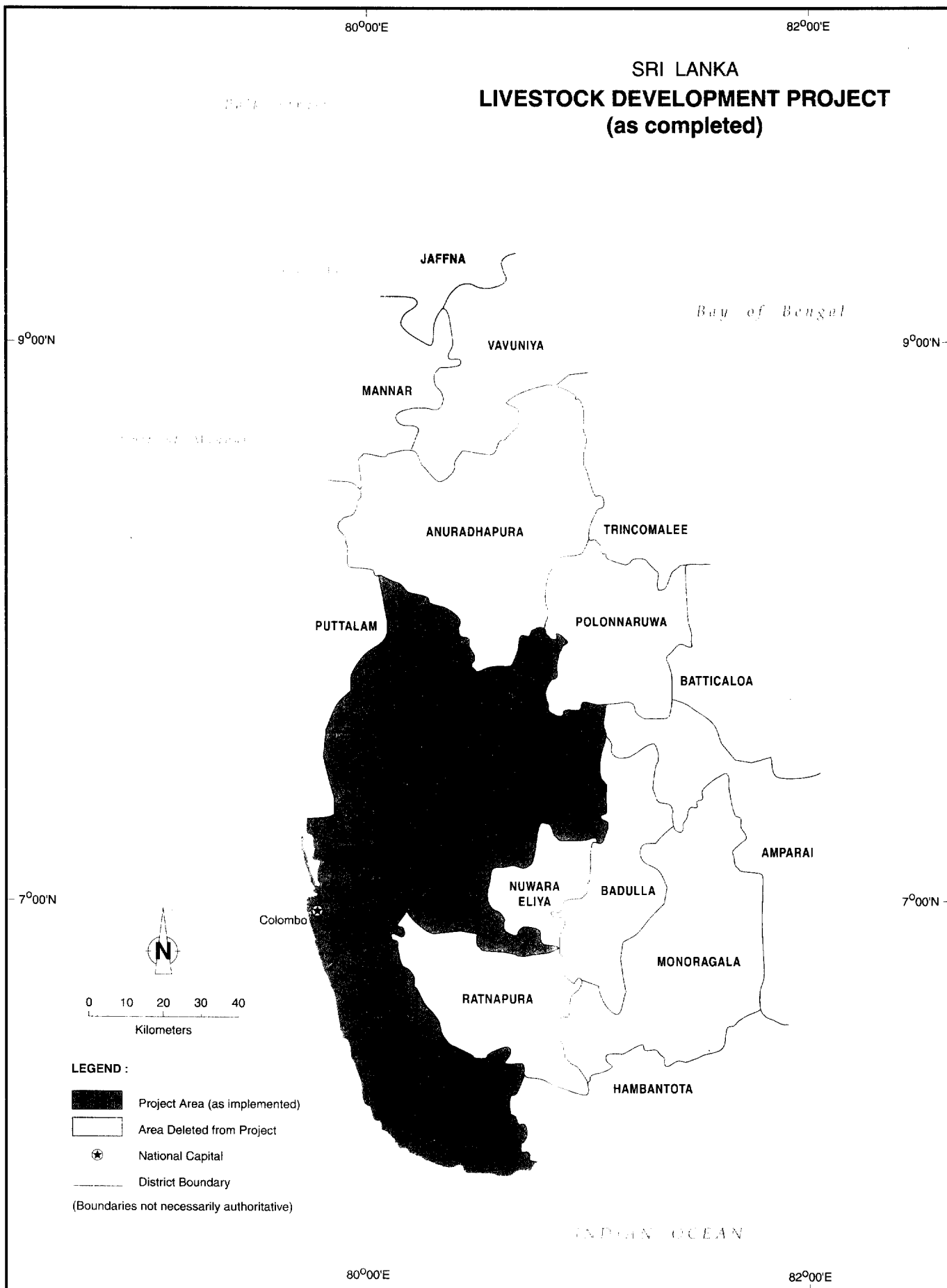
**MISSION DATA:**

Type of Mission	No. of Missions	Person-days
Fact-Finding	1	69
Inception	1	12
Appraisal	1	95
Project Administration		
- Review	7	127
- Special Loan Administration	3	26
- Project Completion	1	59
Postevaluation	1	16

<sup>1</sup> Includes \$1.63 million reallocated to the rehabilitation of rural agrarian centers damaged by the civil unrest. This amount has not been included in the Project cost.

<sup>2</sup> Gross margins calculated (see Appendix 5).

<sup>3</sup> Gross margins calculated (see Appendix 4).



## I. HIGHLIGHTS

1. **Objectives and Scope.** The Project was designed to improve smallholder dairy, pig, and poultry production so as to increase food supply and improve rural incomes and employment. Dairy production from cattle was the major Project focus. A range of components provided for the genetic upgrading of livestock; improvements in stockfeed supply and marketing, including the formation of cooperative societies; additional credit funds for livestock production and marketing; and, the expansion of services for animal health, extension, supply of fodder planting material, farmer training and continuing education of technicians. The Project was to be implemented in ten districts in the north and west of the country.
2. **Cost, Financing, and Schedule.** Compared with an expected cost of \$20.72 million, the actual cost of the Project was \$16.67 million. The Bank disbursed \$12.52 million out of the approved loan of \$15.20 million for the Project. A further \$1.63 million of the loan amount was allocated for the repair of damaged agrarian centers. The Project was completed in 1991 after an implementation period of almost nine years, about two and a half years longer than originally expected.
3. **Implementation.** All the subcomponents for the northern areas as well as some of the components for improving marketing and stockfeed supply were not implemented because of the civil unrest and changing conditions in the country. Instead, 23 small subcomponents were added. The revised components were implemented satisfactorily except for the imported Sahiwal herd, which contained many inferior animals; the credit component, which was little utilized; and the cooperative societies, which have not improved farm prices.
4. **Institutional Aspects.** Thirty-three cooperative societies were formed, but only one quarter appear financially viable. However, many of the remaining societies could be strengthened. Generally, the societies are weak and vulnerable to manipulation, the majority of members are not committed to the principles of the cooperative movement. The Government's livestock services have been expanded as a result of the infrastructure developed under the Project and the additional recruitment and training of staff. However, adequate programs and systems to utilize the new animal health facilities have not been established yet. The Government's recruitment of private inseminators and the introduction of an incentive scheme for all inseminators contributed significantly to the achievement of benefits by the Project from the crossbreeding of dairy cattle.
5. **Environmental Aspects.** Many pig and poultry production units are located in semiurbanized areas and are creating effluent and dust problems. Recent legislation provides a mechanism for pollution control, but the effectiveness of its implementation has yet to be established. Overgrazing, a risk identified at appraisal, has not occurred.
6. **Cost/Benefit Assessment.** The economic internal rate of return (EIRR) was recalculated to be 6.7 percent, which was significantly lower than the 40 percent expected at the time of appraisal because the number of improved quality animals was lower and the benefits were delayed. Sensitivity tests show that if the economic price for milk is higher than estimated and equivalent to the financial price of SLRs9.50/liter, the EIRR would increase to 7.9 percent, while a decline by 20 percent in the insemination service from 1996 onwards would lower the EIRR to 6.2 percent.

7. **Overall Performance and Sustainability.** The genetic upgrading components are expected to result in higher livestock productivity as planned although the benefits have been delayed. The training and education components have also been beneficial, but the cooperative societies, the other marketing interventions, and the improvements for stockfeeds and animal health services, which formed a large part of the Project, have had little impact on livestock production. The environmental, social, and institutional impacts were generally positive, although not of major consequence. The EIRR for the Project was recalculated to be only 6.7 percent and the Project was rated as partly successful.

8. **Feedback.** The Project demonstrates that crossbreeding to improve dairy and pig production is beneficial and that artificial insemination is a viable mechanism for increasing production in cattle, particularly if private inseminators are involved and financial incentives are provided to the inseminators. The Project also demonstrates that the promotion of successful cooperative societies is a long process and may not be achieved in the timeframe of a single project; the importation of livestock is an expensive and risky undertaking; the improvement in livestock services infrastructure requires similar improvements in operational systems to enable its effective utilization; and the Bank may need to give special attention during the early stages of project implementation to ensure the data collection is adequate for monitoring and evaluation.

## II. BACKGROUND

### A. Rationale

9. By improving livestock productivity within the smallholder sector, the Project aimed to increase the national supply of food, reduce the expenditure on imported products, raise smallholder incomes, and generate additional rural employment. Increased food supply was particularly important at the time of Project preparation as the per capita availability of livestock products had been declining. Also, at that time, the smallholder sector, particularly dairy, was considered to have a comparative advantage against imports. The Project was the first major public investment in the sector. It formed part of the Government's efforts to accelerate livestock development embodied in the Animal Husbandry Master Plan (1979-1983).

### B. Formulation

10. In response to the Government's request for assistance to develop the livestock sector, the Bank provided technical assistance (TA)<sup>1</sup> to formulate a comprehensive investment project during 1981. Following lengthy discussions to resolve potential conflicts concerning the organization of dairy producers for milk marketing purposes and duplication of the coverage with a country-wide dairy project prepared at the same time by the World Bank, the Project was appraised by the Bank in the second half of 1982.

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<sup>1</sup>

TA No. 371-SRI, for \$200,000, approved on 3 November 1980.

### C. Objectives and Scope at Appraisal

11. To increase the quality and productivity of smallholder livestock, the Project as designed covered five main areas: (i) improvement of livestock genetic quality; (ii) development of stockfeeds; (iii) institutional and physical development to improve marketing; (iv) provision of production and marketing credit; and, (v) upgrading and expansion of the Government's support services for disease control, extension, production of fodder planting materials, farmer training, and continuing education of its staff. To improve the livestock genetic quality, frozen cattle semen as well as improved cattle, buffalo, pigs, and ducks were to be imported for multiplication and distribution to smallholders, and the Government's semen production center, artificial insemination facilities and several breeding farms were to be upgraded. Three fodder resource centers and a feed mill were to form the core of the stockfeeds development program. The marketing improvements included the construction of a terminal livestock market near Colombo, and the establishment of milk, egg, and other marketing facilities to be operated by cooperative societies, also to be formed under the Project. Credit funds were to be made available for smallholders to set-up or expand production units and to fund the facilities of the societies. As part of the program for strengthening the Government's support services, new rural veterinary centers and veterinary (disease) investigation centers were to be constructed and others upgraded, support was to be provided to the Veterinary Research Institute for disease investigation and vaccine production, and to four farmer and technical staff training facilities and, at the Peradeniya University, an Institute of Continuing Education, was to be constructed. The Project also provided general implementation support in the form of consultant services and facilities for a Project Management Office (PMO) and a Project Monitoring Cell.

12. The Project was to be implemented in ten districts in the northern and western parts of the country where a relatively large proportion of the nation's livestock and people were concentrated. Cattle and buffalo, mainly for dairy, but also for draft and beef production, and pigs and poultry were to be developed. The Project formed the first comprehensive development of the sector undertaken by the Government.

### D. Financing Arrangements

13. At appraisal, the cost of the Project was estimated at \$20.72 million, of which \$12.00 million was the foreign exchange component. On 7 December 1982, the Bank approved a loan of \$15.20 million from the Asian Development Fund to finance the entire foreign exchange costs and part of the local costs. The balance, equivalent to 27 percent of the total cost was to be financed by the Government (\$5.11 million) and subborrowers under the credit component (\$0.41 million). The Borrower was the Democratic Socialist Republic of Sri Lanka, and the main Executing Agencies were the Department of Animal Production and Health (DAPH),<sup>1</sup> the Bank of Ceylon, and the People's Bank.<sup>2</sup>

<sup>1</sup> For part of the implementation period, the PMO was transferred from the DAPH to the National Livestock Development Board, but later reverted back. Towards the end of the Project, the DAPH was transferred from the Ministry of Agriculture to the Ministry of Livestock Development and Rural Industries when the latter was formed.

<sup>2</sup> The Regional Rural Development Bank was added as an Executing Agency for credit in 1987.



## E. Project Completion

14. The Project was completed in December 1991 and the Bank loan was closed in March 1992. A Project Completion Report (PCR) was prepared in August 1992 by the Bank's Agriculture Department. The PCR provides a detailed outline of the design, scope, and implementation of the Project as well as relevant comments on various operational aspects. The PCR concluded that the Project was successful, but it did not quantify the effects of the Project on farm level production and the economic impact of the Project was not assessed.

## F. Postevaluation

15. The Project Performance Audit Report (PPAR) is based on a review of the PCR, the Appraisal Report (AR), material in the Bank's files and records of the Executing Agencies, and on discussions with staff members of the Bank, the Executing Agencies, and other concerned Government agencies of the Borrower, livestock owners, traders, and other nongovernmental entities. The PPAR focuses on pertinent aspects of the Project and presents the findings of the Postevaluation Mission (PEM), which visited the Project area during January 1995. Copies of the draft PPAR were provided to the Borrower, the Executing Agency, and Bank staff concerned for review and comments. The comments received were taken into consideration in finalizing the report.

# III. IMPLEMENTATION PERFORMANCE

## A. Design

16. During the course of implementation, many changes were introduced into the Project. The more significant changes included: narrowing the focus of the cattle and buffalo component to just dairy production rather than both dairy and draft production because of the growth in farm mechanization; replacing the pilot duck component with one for chicken because of the start-up of a similar component under another project; deleting the milk chilling centers because the dairy societies became suppliers for the existing chilling facilities operated by the two main milk processors; deleting the terminal livestock market because of the changes in livestock marketing arrangements and the slowdown in livestock movements caused by the peace and order problems, and replacing it with a pork processing facility; and deleting the feedmill. In addition, those parts of the remaining components for implementation in the Jaffna area were not implemented because of the civil disturbances in the area. In their place, 23 new subcomponents, all consistent with the original scope of the Project, were added. Except for the inclusion of the pork processing facility (see para. 19), the changes were appropriate.

17. The major part of the Project focused on smallholder dairy production. This emphasis at the time arose from the perception that the smallholder dairy sector had a comparative advantage relative to imported products.<sup>1</sup> The dairy components of the Project

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<sup>1</sup> As part of the postevaluation, the benefits from dairy production were quantified using gross margins. Milk was valued in terms of the cost of imported milk powder. The positive results for most of the production models evaluated indicate that a competitive advantage may continue to exist, although a more detailed analysis would be required to confirm this and to assess the comparative advantage of domestic dairy production (see also para. 53).

were designed to address, as main issues, the low genetic capability of the animals and milk marketing problems. Livestock nutrition, animal health, and credit were of secondary importance. In concept, this approach proved to be sound. However, the view that cooperative societies could be formed quickly, and that they could solve the marketing problems was not realistic. Additional TA or consultant support in forming cooperative societies and developing markets would have been beneficial in view of the lack of expertise within the Executing Agency in these areas. In addition, more studies of the milk market in Sri Lanka should have been undertaken to provide a stronger framework for the formulation of the business plans of the societies (see also para. 52).

18. In retrospect, given the low level of expertise in livestock management on the part of the beneficiaries, the Project did not give enough attention to livestock production extension. In addition, the livestock field services have continued to be strongly oriented towards animal health rather than livestock production. A reorientation of the services, perhaps including reorganization and additional staff training, may have improved the extension efforts.

19. The pork processing facility was expected to be operated by the pig producers societies through their formation into a federation. Inadequate attention was given to assessing the capability of the societies or the federation to undertake this task and the facility was never operated by them.<sup>1</sup> In addition, the facility has a capacity of eight head per day which may be too small to enable it to be operated profitably.

## **B. Contracting, Construction, and Commissioning**

20. Except for the Sahiwal breeding stock, all items supplied and all construction works were completed satisfactorily. Production records for the 290 Sahiwal breeders (253 females, 37 bulls) indicate that even though nutrition and management are adequate, a significant number have milk production capabilities well below the breed norm and also below outputs already achieved by many smallholders in Sri Lanka. Some stock have physical disorders, but the main cause of under performance is low genetic quality that makes them unsuitable for the upgrading of local milk producing cattle.

## **C. Organization and Management**

21. The PMO and the Project Coordination Committee (PCC) were established as intended. The PMO, which was under the DAPH, encountered problems early because of the inadequate Government salary levels and the shortage of skilled manpower, particularly in administration, finance, and engineering. This problem, common throughout the Government service, was solved by transferring the PMO to the relatively autonomous National Livestock Development Board (NLDB). However, this did not solve all the procurement problems. In addition, the transfer brought about changes in personnel and responsibilities which caused implementation delays, and resulted in the loss of some records. The PCC was active and addressed the issues related to the Project, including milk pricing for which it initiated cost of production studies and submitted requests for price increases to the Government.

22. In retrospect, the staff of the DAPH lacked the necessary expertise to form strong cooperative societies and the arrangement whereby the Ministry of Cooperatives was to provide expert support was inadequate. Initially, the societies were defined and managed

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<sup>1</sup> In 1990, the facility was taken over and operated by the National Livestock Development Board.

completely by the DAPH staff. Efforts to build up the capability of the members to control the societies were inadequate. The Government's commitment to the societies also changed abruptly in 1989 and resulted in the unplanned withdrawal of the DAPH managers, which weakened many of the societies. A program to build up the members' ability to take over the responsibility for the societies was lacking.

#### **D. Actual Cost and Financing**

23. The actual cost of the Project amounted to \$16.67 million, about 20 percent less than expected (see Appendix 1). Of the approved loan amount of \$15.20 million, an amount of \$14.15 million was disbursed, which includes \$1.63 million utilized for the rehabilitation of agrarian centers damaged by the civil unrest.<sup>1</sup> A major cause of the cost underrun was the low utilization of the production and marketing credit funds provided under the Project.

#### **E. Implementation Schedule**

24. The closing date of the loan was extended twice. The Project was deemed to have been completed in December 1991 after an implementation period of almost nine years, about two and a half years longer than expected. Most of the delay was due to civil unrest, which occurred during the early implementation period of the Project, and again in 1988 and 1989, and was beyond the control of the Executing Agencies. Changes to the organizational structure for the Project (see para. 21) as well as uncertainty concerning the implementation of the World Bank-funded Dairy Development Project II<sup>2</sup> in 1983/84 also contributed to the delays.

#### **F. Technical Assistance**

25. The feasibility study report for the Project, prepared under TA No. 371-SRI (see para. 10), was comprehensive and covered all the topics in a normal livestock project. However, there is no evidence of significant beneficiary participation in the design of the Project. The consultants appear to have underestimated the efforts required in forming cooperative societies and in establishing a cooperative based marketing system and overestimated the need for on-farm pasture development. The milk marketing system appears more complex than the model on which the design of the Project was based.

#### **G. Compliance With Loan Covenants**

26. Overall, the loan covenants were reasonably complied with although delays in compliance, as noted in the PCR, occurred in the staffing of the PMO in the release of local counterpart funds, in making the cooperative societies self-sufficient and independent, and in the submission of audited accounts.<sup>3</sup> Given the importance of milk price as an incentive to production, one covenant required the Government to review milk prices every six months, and to establish a price that was in conformity with prevailing free market prices and attractive to producers. Milk prices were to be set through Milco, the Government-owned milk processor that had the responsibility for collecting the milk produced under the Project. While the milk

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<sup>1</sup> At the request of the Government, the Bank approved a reallocation of loan proceeds under which \$2 10 million was provided to the Department of Agrarian Services to undertake rehabilitation activities in 1988.

<sup>2</sup> Eventually, this project was not implemented.

<sup>3</sup> Refer to Appendix 5 of the PCR for a list of the main covenants and an assessment of their compliance.

prices were not reviewed as frequently as required, the prices of Milco were comparable with those in the free market. A more contentious point, however, is the relative nature of adequate prices, that is, a low price may be adequate to induce production at low levels of productivity, but inadequate if higher levels of output are targeted. Given that dairy producers are giving their animals small amounts of feed concentrates, that is, they are providing more than the minimum level of husbandry, and by doing this are achieving the output levels targeted at appraisal, the price may be considered as adequate from the perspective of the Project (see also para. 51).<sup>1</sup> Apart from not reviewing prices as frequently as required, the covenant on milk price was complied with.

#### IV. PROJECT RESULTS

##### A. Operational Performance

##### 1. Improvements in Livestock Production

27. The Project will contribute to higher levels of milk and meat production from cattle and buffalo because of the rapid increase in the number of crossbred dairy animals than otherwise would have occurred. Depending upon the level of upgrading achieved, milk yields in crossbred cattle and buffalo are from 500 to 1,500 liters per lactation higher than for unimproved stock. The improved animals also have higher body weights than the unimproved ones and this is the major cause of the increase in meat production. Although the Project was in operation earlier, it only began to have an effect on the rate of crossbreeding in 1992 after the civil disturbances had subsided and output from the Kundasari semen production center began to increase (see Appendix 2). At the end of 1994, the incremental number of improved female dairy animals is estimated to be about 2,800 head, and this number is expected to increase over time. The first incremental output should occur in 1996 when the first of these additional crossbred animals reaches productive age. In year 2000, the annual incremental milk output should be about 6 million liters from about 10,000 cows. In comparison, in 1994, total domestic milk production in Sri Lanka amounted to 343 million liters.

28. The main contributory factors to the increase in production under the Project were the improvements in the artificial insemination (AI) service for cattle resulting from the expansion of the AI facilities (semen production, distribution, and delivery); the introduction of high quality semen production bulls; and the distribution of improved buffalo bulls from the Nili-Ravi herd that was established at the Nikaweratiya farm. However, the Project was not the only reason for the improvement in the rate of crossbreeding. The engagement of private inseminators and the introduction of an incentive scheme for inseminators were also important complementary factors.

29. Although buffalo bulls were procured and stationed at the Kundasari semen production center, AI is not performed on significant numbers of buffalo yet and the effect of the AI program is limited to cattle. A Sahiwal herd was established at the Nikaweratiya farm and some bulls produced by this herd have been distributed. However, the ability of these bulls to upgrade the local animals is limited because their mothers show wide genetic variability and many demonstrate substandard milking performance, as shown by the farm records, even

<sup>1</sup> Current productivity targets are higher than those set for the Project, and the Government has assessed that the current prices are not sufficient to encourage producers to achieve these new targets.

though nutrition and management has been adequate for higher production. As a consequence, little reliance can be placed on the breeding value of their offspring.

30. Semen produced at Kundasari also is distributed outside the area covered by the Project. The production costs per unit of semen at Kundasari are less than alternative imported semen and the Project also is contributing to the development activities in other areas by reducing the cost of semen.

31. The improvement of the Wellisera Farm under the Project enabled the distribution of upgraded breeder pigs and the replacement of unimproved stock (see Appendix 2). Although low levels of management on smallholder farms is a constraint to the full realization of the high levels of genetic capability of the improved stock, herds based on these animals generally are more productive than those having unimproved animals as a result of more frequent and larger litters, higher weight gains, and improved carcass quality. By the end of 1994, a total of 6,655 breeder pigs, equivalent to 4 percent of the national pig herd, had been distributed.

32. The Project provided support to the Merisawatta farm to enable it to change production from day-old egg layer chicks to day-old broiler chicks with a resultant increase in the national production of broiler meat (see Appendix 2). However, at the time of the PEM, egg layer chicks were in shorter supply than broiler chicks.

## **2. Stockfeeds**

33. The fodder resource centers, the only stockfeeds development component implemented, did not generate the benefits as expected because a shortage of feed for dairy cattle is not an important constraint yet. If productivity levels are to increase beyond those currently achieved and expected under the Project, the situation would be different and good quality grasses and legumes would be required. A small number of farmers near the centers received grass cuttings and seeds. Part of the work undertaken at the centers was an unnecessary repetition of basic research.

## **3. Producer Societies and Marketing**

34. At the time of postevaluation, about 30 percent of the 10 dairy producer societies and 19 poultry producer societies formed under the Project appeared to be financially viable,<sup>1</sup> and a further 40 percent were functioning, although struggling financially. The balance were not viable, while the four pig producer societies as well as the pig and poultry producer federations had ceased operations. The dairy cooperative societies market most of the milk output of their members, but the average farm gate prices are no different than those received by nonmembers using alternative marketing channels. The poultry societies market a small proportion of the egg and broiler output of members at higher prices, but do not handle enough of each farmer's production to have an appreciable general impact on farm prices. Most of the societies supply production inputs to members at slightly lower prices than alternative sources. Overall, the impact of the societies on producer profit margins has been small and their operation does not appear to have induced any additional production. In retrospect, it appears that the cooperative societies may not have been the best approach to improve farm prices

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<sup>1</sup> Dividends were being paid and they were building significant bank deposits that could finance the replacement of assets.

and that a greater understanding of the marketing of livestock products may have led to a different design (see also paras. 17 and 52). A major factor contributing to the failure of the societies was the insufficient effort in building the organizational skills and cooperative spirit among the members so that the cooperatives could function independently. The viable societies have strong, honest managers and board members who compensate for the deficiencies among the members.

#### **4. Credit**

35. Only \$401,000 out of the \$1.39 million allocated for production credit was used, while none of the credit line for marketing was disbursed. The loan recovery rate for both the Bank of Ceylon and the People's Bank for the funds disbursed under the Project is about 70 percent, which is similar to rates achieved under other credit programs. The low credit utilization reflects the delays in finalizing the lending modalities by the central bank; the linking of loans to membership in the societies; the delays in the formation of the societies; the lack of awareness of the credit line by livestock owners; and, in the case of the marketing credit, the cancellation of the main items to be established with credit, i.e. the milk chilling centers (see para. 16).

#### **5. Livestock Support Services**

36. The support provided under the Project for animal health services has expanded the Government's facilities, but these do not appear to have had an appreciable impact on production.<sup>1</sup> Although the available data is limited, it does not indicate any reduction in livestock mortality from the major diseases,<sup>2</sup> or a generally improved animal health position (see Appendix 3). This is partly due to the concentration of investments into infrastructure revolving around curative services, which can be accessed only by a small number of livestock owners; partly due to the significant advances that already had been gained in the early 1980s with the mass vaccination programs for livestock, and partly due to inadequate systems for the effective utilization of the facilities provided under the Project. As an example of the latter, the Disease Investigation Centers supported by the Project are mainly used for the analysis of fecal samples, the results of which can be predicted without analysis. The Centers are not used very much in the diagnosis of infectious disease which is an area where their contribution would have more value. Similarly, the Veterinary Research Institute now has an improved capacity for vaccine production as a result of the Project. However, the increased production capacity for haemorrhagic septicemia vaccine is not utilized very much, while the increased production of Newcastle Disease vaccine is largely wasted because of the inappropriate size and frequent breakage of the vaccine packages.

37. The livestock extension services were also supported under the Project, but they also have had limited impact as shown by the generally low level of animal husbandry practiced by farmers. The training facilities established under the Project have operated well and a significant number of farmers and technical personnel have been trained in various aspects of livestock husbandry. The effectiveness of this program could be increased further by improving the overall livestock extension program. This in itself may require fundamental changes to the structure of the livestock services which, at present, is dominated by staff oriented more towards animal health rather than animal production.

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<sup>1</sup> This assessment is disputed by Government.

<sup>2</sup> Haemorrhagic septicemia in cattle and buffalo, and Newcastle Disease in poultry.

## B. Institutional Development

38. The original intention of forming producer societies was to improve the efficiency of the marketing system. While this does not appear to have been realized (see para. 34), the dairy and poultry societies do provide a range of services to their members. The viability of these societies appears dependent upon having strong and honest managers and directors, and capacities to competitively provide services needed by the members. At present, the majority of members do not have a strong cooperative spirit or contribute to the management of their society.<sup>1</sup> The long-term viability of the societies will depend upon continued training of members and establishing a cooperative spirit.

39. The Government livestock services have evolved since the beginning of the Project. A major change, not part of the Project, was the separation of the livestock services from those for general agriculture by the formation of a separate livestock ministry. The added importance given to livestock as a result of this separation has been beneficial in terms of the development of sector policies, such as those for breeding and the use of private inseminators. The Project may have contributed to this evolutionary process through the assistance provided to expand the livestock service support facilities.

## C. Financial Performance

40. The upgrading of cattle, buffalo, and pigs is financially attractive to smallholders (see Appendix 4). Depending on the degree of crossbreeding achieved in cattle and buffalo, the use of improved breeding generates more than a fivefold increase in return per breeding female. The returns to breeding for a five sow pig unit are four times more than those from a herd of unimproved animals. Poultry production is also profitable, although at the time of postevaluation the returns from broiler production had declined to below those for egg production. A small number of the producer societies are financially viable, generate annual dividends, and have substantial bank deposits that will cover the replacement of their fixed assets.<sup>2</sup>

## D. Economic Reevaluation

41. The EIRR for the Project was reestimated using the same general methodology as used at appraisal (see Appendix 5).<sup>3</sup> The recalculated EIRR was 6.7 percent, substantially lower than the 40 percent estimated at appraisal. Compared with the appraisal estimate, the lower postevaluation result is due mainly to the smaller number of improved animals and the delay in the realization of benefits. The EIRR is sensitive to the price adopted for milk. The economic farm gate price used in the postevaluation analysis, i.e. SLRs7.29/liter, was derived from the international price for whole milk powder. This is lower than the financial price of about SLRs9.50/liter (\$0.19/liter). The higher financial price is the result of tariffs on milk powder imports, and the subsidies paid on milk powder produced from locally procured milk (see paras. 8 to 10 of Appendix 5). Given the lack of information concerning the milk market in Sri Lanka and the true cost of milk processing (see paras. 51 and 52), the economic price may

<sup>1</sup> This lack of concern by the general membership allowed a few unscrupulous members to gain power and to dissipate the assets of some of the societies.

<sup>2</sup> The main assets are vehicles (for transporting milk [in cans] and bagged feedstuffs), refrigerators, and office equipment.

<sup>3</sup> The EIRR was not recalculated in the Project Completion Report

be higher than that calculated as part of the reevaluation. If it is equal to the financial price, the EIRR would be 7.9 percent. Because the benefits of the Project will occur in the future from the offspring of the cattle crossbreeding program, the recalculated EIRR is also dependent upon the level of achievement of the projected artificial insemination targets (see Appendix 2). The sensitivity of the Project to this factor was tested by recalculating the EIRR assuming that the growth in insemination from 1996 onwards would be only 80 percent of the projected growth. Under this assumption, the EIRR would decrease to 6.2 percent.

#### **E. Socioeconomic and Sociocultural Results**

42. Many livestock owners assisted under the Project are from the lower income groups and the Project will have positive effects in contributing towards a more equitable distribution of income in the country. The pig production units have the capacity to generate relatively large net incomes for the operators. However, it appears that the pig units, as well as those for poultry, established under the Project were done so by families who, while not being rich, were not in the lowest economic groups and could afford to raise capital and to establish such basic facilities as housing for pigs and poultry by themselves. The situation is different for dairy producers, many of whom are landless.

#### **F. Women in Development**

43. Looking after dairy livestock and small-scale pig and poultry units is generally the task of women. They sell the produce and receive the income. Thus, the Project has contributed towards improving the socioeconomic position of women. Many women are also employed as veterinary officers and in other positions within the Government livestock service, which was expanded under the Project. Women also received approximately half the training provided to technical staff under the Project.

#### **G. Environmental Impacts and Control**

44. Effluent runoff and dust from the pig and poultry production units are becoming problems because most of these enterprises are located in, or are adjacent to, urbanized areas. Recently introduced regulations require new pig and poultry units to incorporate measures to prevent such problems. The regulations also enable action to be taken against existing units, if there are complaints. However, the effectiveness of the measures and their implementation has not been demonstrated yet. The effluent from the pork processing unit discharges into a swamp after passing through septic tanks. Data on the quality of this discharge was not available and the situation should be monitored by Government. Apart from these possible problems, the Project has not had any major deleterious environmental effects. Overgrazing, which was considered a risk at appraisal has not occurred, primarily because dairy production favors stall feeding rather than grazing.

#### **H. Gestation and Sustainability**

45. In cattle and buffalo crossbreeding programs, the gestation period before benefits are realized is quite long. At the time of postevaluation, the benefits from crossbreeding were still anticipated. The greatest risk to the realization of these future benefits is the continued ability of the Government to provide good quality semen and to maintain a large number of motivated inseminators. The issues for the semen supply are related to both



the supply activity itself and the quality of the semen supplied, i.e., its ability to produce offspring of high milk producing capability. Provided the Government allocates sufficient budgetary support for the AI program, enough semen should be available. The second aspect is more complex and concerns the Government's ability to import semen, or to obtain adequate quality bulls for semen production (see para. 47). Provided these risks can be overcome, the dairy benefits, even under the prevailing low levels of feed technology and animal management, are sustainable.

46. The situation for pigs is different; the gestation period is shorter, while the benefits will be sustained only if in-breeding in the production herds is prevented by regular replacement of the breeding boars. This will require either a program to develop specialized private sector breeders or to continue the operation of the Wellisera Farm, but with periodic changes of its breeding stock. At present, the stock on the Wellisera Farm need to be changed, but the NLDB does not have a firm program for this (see para. 58).

## V. KEY ISSUES FOR THE FUTURE

### 1. Semen Supply for the Artificial Insemination Program

47. AI is expected to form an important part in the Ministry of Livestock Development and Rural Industries' development strategy for cattle. Given the long-term nature of cattle upgrading programs, it is advisable to use semen of bulls with proven, good genetic characteristics even though smallholder animal management is not of a sufficiently high level at present to fully exploit the genetic potential conferred. At issue is the mechanism for procuring semen of adequate genetic quality for use in the program. Frozen semen from high quality, proven dairy animals could be imported. However, the Ministry prefers to operate the Kundasari semen production unit to produce semen locally because this insulates the program from the difficulties of securing foreign exchange each year to import semen. The locally produced semen is also cheaper than imported semen. However, operation of the center poses the problem of how to periodically obtain high quality bulls for semen production. The nucleus herds on the NLDB farms, which are currently viewed as a source of such bulls are small, and the farms are inappropriately managed (see para. 48). As a result, any bull selected from these herds is unlikely to have proven genetic capability. The importation of bulls (or importation of semen) would overcome this problem. The issue requires a review and formulation of an appropriate action plan.

### 2. NLDB Farms

48. The NLDB maintains many livestock farms, the operations of which are subsidized by cropping activities. The main purpose of these farms is to produce breeding animals for distribution to smallholders and, in the case of cattle and buffalo, to produce bulls for use in semen production. For pigs and poultry, the private sector has the capacity to supply breeders and further support for private farms and hatcheries would appear preferable to the subsidized operation of the NLDB farms. In the case of cattle and buffalo, similar private units do not exist and the cattle and buffalo farms may be necessary. However, the number of these farms is more than needed, and some of the cattle are of questionable genetic quality (see para. 29). Furthermore, the general level of farm management is poor. One reason for the poor management is the confusion concerning the objectives of the farms

and the management strategies. The farms are required to be high performance units and sources of highly productive breeding animals. This suggests that the individual animal productivity and the culling rates should be high. However, the operations are geared towards maximizing output by maximizing animal numbers, as high total output is incorrectly taken as a measure of productivity. This results in inefficiencies and a lowering of animal performance levels, but with high animal numbers the gross output of each farm remains high. In view of these issues, it would be appropriate to complete a detailed review of the purpose of the NLDB livestock farms, and compare the farms with alternative measures to achieve the same purposes. For those farms that are deemed necessary, clear operating policies and appropriate stocking and management systems need to be introduced.

### **3. Pork Processing**

49. The NLDB should consider divesting itself of the pork processing unit at the Wellisera farm. The industry does appear to be becoming dominated by a single large processor, and it is advisable to encourage the establishment of other private pig processors to create a more competitive market structure for the industry. One such entrepreneur may be a potential operator of the pork processing unit. However, the unit may be too small for profitable operation.

### **4. Government Livestock Services**

50. The Government's animal health services are directed mainly towards high cost, curative activities that are provided more cheaply and efficiently by the private sector. It would be more cost-effective if the Government supports private veterinarians to provide these services as is being done with private inseminators for the AI program, and focuses its attention on regulatory, disease prevention, and extension services. The large private companies involved in pig and milk processing, poultry hatchery, and feedmilling should also be encouraged to support extension activities because they generally have a strong interest in promoting livestock development.

### **5. Milk Pricing**

51. Attempts have been made to address the milk price issue at all stages of the Project. This is a clear recognition of the importance of price as a basic production incentive. Although to a large degree, milk output is a function of the genetic capability of the dairy animals, farmers can change their output, particularly of improved animals by changing the nutrition and management of their livestock. With a higher price, they generally are encouraged to use more high quality feeds instead of lower quality ones. As a consequence, the maintenance by Government of an adequately attractive price for milk procured under the Project was the subject of a loan covenant (see para. 26). In practice, rural milk prices, including those for milk produced under the Project, are determined by the two major milk processors, Nestlé and Milco, which purchase most of the milk collected in the country. These prices strongly reflect imported milk powder prices because part of the milk collected is processed into milk powder for local sale in competition with imported powders. Imported milk prices are low and the resultant current rural milk prices are attractive only at relatively low levels of animal nutrition, management, and output. While these output levels are comparable with those expected under the Project, the improved animals have the potential to produce more with better nutrition and management.

52. The Government would like to increase dairy animal productivity further to capitalize on the high genetic potential of the growing number of improved dairy cattle and buffalo, but it is reluctant to impose additional import tariffs and to provide producer subsidies as means to improve farm level prices. Partly, this is a reflection of the Government's policy to maintain low consumer prices as well as its policy favoring free trade. Several other ways of improving prices are available, however. First, a greater understanding of the dairy market is required. Much of the discussion of the dairy industry in Sri Lanka focuses on sales of milk in processed liquid milk form, but this accounts for only 5 percent of the national consumption of dairy products.<sup>1</sup> Much more milk is consumed in either unprocessed form (which does not pass through the formal milk marketing system and accounts for 39 percent of dairy consumption) or in nonliquid milk forms, mainly powdered milk, yogurt, and curd. Forty-eight percent of consumed dairy products comes from imported milk powders. On the basis of more information about the market, it may be possible to allow processors to increase the prices for some "luxury" products without affecting consumption of the lower income groups. Secondly, while the producer societies failed to generate higher farm gate prices because they sell almost all their collected milk to Nestlé or Milco, greater efforts could be made to link the societies with other small processors of yogurt and curd who may be willing to pay higher prices than the two large processors. Third, the efficiencies of the processors could be investigated. As price setters, they can pass on inefficiencies to the producer. In this respect, it was noted that only one of the five main milk processing plants in Sri Lanka has a utilization rate of more than 35 percent. Rationalization of processing may be a key to higher farm prices and increased milk output.

## 6. Comparative Advantage in Dairy Production

53. An issue associated with milk price is comparative advantage. A comparative advantage in production should form one of the reasons, along with concerns such as food security and income distribution that govern the degree to which Government supports the industry. At present, the major production input in dairy production is grass which is valued in terms of the cost of the unskilled labor used for its collection. As the milk price rises and production increases with the use of expensive concentrates in place of the cheaper grass, as well as other inputs (e.g., veterinary products), the economic cost of production will change. At present, there are no comprehensive studies of comparative advantage or detailed production models that would indicate whether the increase in economic cost would be more or less than the increase in the value of the output, i.e., whether the comparative advantage would increase or decrease. Studies along these lines should be done as a prerequisite for further support to the industry.

## VI. CONCLUSIONS

### A. Overall Assessment

54. The Project is expected to generate benefits in terms of improved quality and increased output of dairy cattle and buffalo, pigs and poultry in line with its intended major objective. Such benefits are being achieved largely as a result of the genetic upgrading component of the Project, with relatively small complementary effects contributed by its marketing, credit, animal health and extension components. However, the realization of

<sup>1</sup> With all dairy products expressed in terms of their equivalents in liquid milk.

benefits was substantially delayed and the level of benefits achieved did not measure up to expectations because the number of improved quality animals was lower than the original estimate. As a consequence, the EIRR for the Project was reestimated at only 6.7 percent, which was much below the 40 percent expected at the time of appraisal. Nevertheless, the Project has had positive social and institutional impacts. Viewed overall, the Project was rated partly successful.

## **B. Lessons Learned**

55. The Project demonstrated the following lessons.

- (i) Crossbreeding to upgrade the productivity of dairy cattle and buffalo is beneficial in Sri Lanka. AI is acceptable to livestock owners and provides a viable mechanism for introducing exotic genetic material.
- (ii) The importation of live animals to establish breeding herds for production of improved animals for distribution is expensive and risky, particularly in the case of the Sahiwal, where the sources and number of stock for making a selection are limited. The importation of semen or small numbers of bulls appears preferable.
- (iii) Although not envisaged under the Project, the use of private inseminators and financial incentives for inseminators in the area covered by the Project demonstrates that these measures can increase significantly the effectiveness of the AI field services.
- (iv) The promotion of successful cooperative societies is a lengthy process, requiring a comprehensive, well-executed development program, and may not be achieved within the timeframe of a project. This is evident by the lack of cooperative spirit and inability of many of the societies to prevent mismanagement of their business.
- (v) The concentration on infrastructure to improve Government support services, such as those for animal health, without commensurate efforts to upgrade the operating systems may not generate the expected benefits.
- (vi) The inclusion of an office within the management structure for the Project to collect data for monitoring and evaluation does not guarantee that useful information will be collected. It may be necessary for the Bank to give specific support to ensuring that the office has expertise in developing appropriate data collection and monitoring systems. The need for this assistance should be assessed at an early stage of implementation in order that data collection activities are planned, funded, and conducted.

## **C. Follow-Up Actions**

56. The alternative methods for securing semen for use in the AI program should be studied and a decision made about the most effective method that should be adopted. As an adjunct to this exercise, it would be useful to determine the role of the NLDB livestock farms in national livestock development. For those farms whose operations need to be continued, the operating objectives should be clearly defined and appropriate management systems should be introduced.

57. The Sahiwal herd procured under the Project needs to be culled of those animals with inadequate physical and genetic value. The culled animals should be sold for slaughter.

58. If the operation of the Wellisera pig farm is to continue as a source of improved genetic material for smallholder pig producers, its breeding herd needs to be upgraded. Part of the future benefits from the Project is expected from such an upgrading. If the farm ceases its operation, the private sector should be encouraged to take over completely the role of supplier of upgraded genetic stock, and should be provided with assistance in importing base breeding material. The Government should establish its policy and formulate an action plan in this regard as soon as possible.

59. A study should be undertaken to determine whether NLDB should continue to operate the pork processing facility. In this study, consideration should be given to the possibility that the continued operation of the facility by the NLDB could act as a disincentive that would prevent the entry of private entities into processing.

60. It is necessary to undertake a comprehensive review of the cooperative societies to assess what further support is required to build a cooperative spirit among the members.

**APPENDIXES**

<b>Number</b>	<b>Title</b>	<b>Page</b>	<b>Cited On (page,para.)</b>
1	Appraisal and Actual Project Cost	18	6,23
2	Main Quantifiable Project Outputs	19	7,27
3	Animal Health Statistics for Project Area	20	9,36
4	Production Models for Cattle, Buffalo, Pigs, Broilers, and Egg Layers	21	10,40
5	Reevaluation of the Economic Internal Rate of Return	26	10,41

## APPRAISAL AND ACTUAL PROJECT COST

	Appraisal Estimate <sup>a</sup>				Actual		
	LC Financed By			Total	FX + Local Cost Financed		
	FX	Bank	Govt. <sup>b</sup>		by Bank	Govt.	Total
<b>Part A</b>							
(I) Production/breeding including SC 1, 3, 4, 5, 6 & 20	2,057	137	49	2,243	3,248.6	948.7	4,197.3
(II) Pasture/fodder development including SC 8	452	82	54	588	672.3	200.1	872.4
(III) Education & training including SC 9, 10, 11, 12 & 23	682	396	160	1,238	1,738.3	306.6	2,044.9
(IV) Field veterinary extension services including SC 13, 14, 15, 18 & 27	1,141	326	55	1,522	3,193.5	1,092.9	4,286.4
(V) Market support facilities including terminal market and SC 21, 23 & 29	2,016	327	66	2,408	856.2	270.5	1,126.7
(VI) Support facilities & services including SC 24, 25 & 26	523	576	472	1,571	1,517.8	995.9	2,513.7
(VII) Consultant services including SC 13, 14, 15, 18, 21, 1 & 8	540	60	108	708	484.6	14.0	498.6
(VIII) Fellowship including SC 1, 4, 8, 10, 14, 15 & 18 & 29	516	--	--	516	712.1	20.6	732.7
Duty	--	--	476	476	--	--	--
Base Cost	7,926	1,904	1,440	11,270	12,423.4	3,849.3	16,272.7
Contingency							
Physical (15%)	1,189	286	216	1,691	--	--	--
Price Escalation	2,885	980	135	4,000	--	--	--
Subtotal	12,000	3,170	1,791	16,961	12,423.4	3,849.3	16,272.7
<b>Part B</b>							
Credit Funds							
Production	--	--	1,390	1,390	--	401.0	401.0
Marketing	--	--	641	641	--	--	--
Subborrower Equity	--	--	251	251	--	--	--
Base Cost	--	--	2,282	2,282	--	401.0	401.0
Contingency							
Physical (15%)	--	--	342	342	--	--	--
Price Escalation	--	--	1,256	1,256	--	--	--
Subtotal	--	--	3,760	3,760	--	401	401.0
<b>Total</b>	<b>12,000</b>	<b>3,170</b>	<b>5,551 <sup>c</sup></b>	<b>20,722</b>	<b>12,423 <sup>d</sup></b>	<b>4,250.3</b>	<b>16,673.7</b>

Discrepancy in additions as per Appraisal Report.

Including subborrowers.

Although the total Bank financing was estimated at \$15.17 million at appraisal, the approved loan amount was \$15.20 million.

Therefore, the corresponding amount for Government and subborrowers estimated at appraisal would be \$5.52 million rather than \$5.55 million.

Excluding \$1.63 million used for the rehabilitation of rural agrarian centers damaged by the civil unrest and included on a Project cost in the PCR.

Note: SC = Subcomponent and refers to the subcomponents introduced during 1987 to 1989.

A list is given in Appendix 1 of the PCR.

Source: PCR Appendix 3.

## MAIN QUANTIFIABLE PROJECT OUTPUTS

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Inseminations Performed in Project Area (000) <sup>a</sup>																								
With Project	19.7	20.2	22.7	22.2	22.4	24.1	22.0	18.1	19.7	23.4	25.2	31.8	34.1	37.0	39.9	42.8	45.7	48.6	51.5	54.4	57.3	60.2	63.1	66.0
Without Project	19.7	20.2	22.7	22.2	22.4	24.1	22.0	18.1	19.7	23.4	25.2	25.8	26.3	26.9	27.4	28.0	28.5	29.1	29.6	30.2	30.7	31.3	31.8	32.4
Increment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	7.8	10.1	12.5	14.8	17.2	19.5	21.9	24.2	26.6	28.9	31.3	33.6
Semen Produced at Kundasari (000 doses) <sup>b</sup>																								
With Project	97	106	12	109	110	72	66	103	94	103	128	118	167	170	182	195	210	225	241	259	278	298	320	343
Without Project	97	106	12	109	110	72	66	103	94	103	110	110	110	110	110	110	110	110	110	110	110	110	110	110
Increment	0	0	0	0	0	0	0	0	0	0	18	8	57	60	72	85	100	115	131	149	168	188	210	233
Bulls Distributed (number) <sup>c</sup>																								
Cattle											38	58	63	40	45	45	45	45	45	45	45	45	45	45
Buffalo													21	0										
Breeder Pigs Distributed <sup>d</sup>																								
(number)								758	930	961	1135	840	901	1130	1150	1200	1250	1300	1350	1400	1450	1500	1550	1600
Day old Chicks Distributed (000 head) <sup>e</sup>																								
With Project																								
- Broiler																								
- Layer (females)	20	20	20	20	20	20	20	20	68	260	368	619	645	764	800	800	800	800	800	800	800	800	800	800
Without Project									0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Broiler																								
- Layer (females)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Increment																								
- Broiler																								
- Layer (females)									68	260	368	619	645	764	800	800	800	800	800	800	800	800	800	800
									-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20

Source: Ministry of Livestock and Rural Industries and the National Livestock Development Board for data up to 1993, and mission estimates for subsequent years.

<sup>a</sup> Up to 1990 the majority of inseminations were with chilled semen. Subsequently a mixture of chilled and frozen semen was used. Small quantities of imported frozen semen were used from 1987.

<sup>b</sup> From 1991 a mixture of frozen and chilled semen was produced. Prior to this all semen was chilled.

<sup>c</sup> Prior to 1991 non-dairy bulls were distributed.

<sup>d</sup> Combined issue from Wellisera Farm and the private breeders which received stock from Wellisera Farm. Wellisera Farm also produces pigs for slaughter.

<sup>e</sup> From Meriswatta Farm.



# ANIMAL HEALTH STATISTICS FOR PROJECT AREA

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
<b>Vaccine Production (million doses)</b>											
Haemorrhagic septicaemia	0.5	1.2	0.7	1.0	1.0	1.1	1.0	1.0	0.8	1.1	1.3
Foot & Mouth Disease	0.7	0.6	0.6	0.7	0.4	1.1	0.0	0.1	0.1	0.3	0.4
Newcastle Disease	11.3	12.8	13.8	8.0	9.0	7.1	14.0	10.8	17.3	24.9	14.5
Fowl Pox	4.6	4.5	4.5	6.2	4.2	3.5	6.5	8.1	4.4	4.7	6.5
<b>Veterinary Samples Analysed ('000)</b>											
Bacteriology			2.0	3.1		1.1	1.0	1.9	2.8	0.7	0.8
Virology			0.0	0.0		0.1	0.1	0.0	0.1	0.1	0.0
Serology										8.0	7.8
Histopathology							0.1	0.1		0.0	
Parasitology			3.2	2.9		0.6	2.8	3.4	4.4	4.8	4.7
Post Mortem			1.6	2.2		3.2	1.0	1.8	2.5	2.4	3.2
<b>Haemorrhagic septicaemia Data</b>											
Vaccinations done ('000)	112	699	563	748	806	426	577	830	450	984	991
Outbreaks (No.)	39	40	24	15	31	12	53	35	23	46	48
Reported deaths (No.)	292	224	383	125	480	105	409	269	379	161	

Source: Ministry of Livestock and Rural Industries

Note: Blanks indicate no data available.

Table 1: Production Model for Cattle - Single Cow

	Unimproved	1/2 Cross	3/4 Cross
<b>Main Production Parameters</b>			
Age at first calving (yrs)	3.2	2.5	2.2
Intercalving interval (yrs)	1.3	1.2	1.2
Lactation			
length (days)	100	220	270
average yield (kg/day)	1	6	8
annual milk production (kg)	65	898	1550
Liveweights			
mature female	130	290	330
yearling	65	100	112
Adult lifetime (years)	10	8	8
Adult mortality (%)	0.05	0.01	0.01
Mortality up to 1 yr of age (%)	0.10	0.05	0.05
Concentrate fed (kg/yr)	0	220	405
<b>Enterprise Budget</b>			
Value of Outputs (SLRs)			
milk production	618	8531	14725
adult sales	252	740	888
yearling sales	675	1188	1330
Total	1545	10459	16943
Cash Costs (SLRs)			
concentrate feeds	0	880	1620
inseminations/bull service	0	83	83
animal health	100	200	200
Total	100	1163	1903
Labor Inputs (person-days)			
grass cutting	25.3	32.1	48.2
feeding & watering	10.1	11.2	12.8
milking	3.8	4.2	4.8
calf care & other	7.6	8.4	9.6
Total	46.8	55.9	75.4
Value of Production			
less: Cash Costs (SLRs)	1445	9296	15040
<b>Price assumptions:</b>			
Milk (SLRs/kg)	9.5		
Adult sales (SLRs/kg LW)	30		
Yearling sales (SLRs/kg LW)	15		
Feed (SLRs/kg)	4		
Insemination/bull service (SLRs/time)	40		
Animal health (SLRs/yr)	200	(Half for unimproved)	

Table 2: Production Model for Buffalo - Single Female

	Unimproved	1/2 Cross	3/4 Cross
<b>Main Production Parameters</b>			
Age at first calving (yrs)	4.5	4.0	4.0
Intercalving interval (yrs)	1.5	1.3	1.3
Lactation			
length (days)	120	225	270
average yield (kg/day)	1	5.5	7
annual milk production (kg)	70	900	1370
Liveweights			
mature female	300	400	420
yearling	100	135	145
Adult lifetime (years)	12	15	15
Adult mortality (%)	0.05	0.01	0.01
Mortality up to 1 yr of age (%)	0.10	0.10	0.10
Concentrate fed (kg/yr)	0	220	405
<b>Enterprise Budget</b>			
Value of Outputs (SLRs)			
milk production	805	10350	15755
adult sales	445	581	610
yearling sales	900	1458	1566
Total	2150	12389	17931
Cash Costs (SLRs)			
concentrate feeds	0	880	1620
inseminations/bull service	0	77	77
animal health	100	200	200
Total	100	1157	1897
Labor Inputs (person-days)			
grass cutting	30.4	40.6	45.6
feeding & watering	10.1	11.2	12.8
milking	3.8	4.2	4.8
calf care & other	7.6	8.4	9.6
Total	51.9	64.4	72.8
Value of Production			
less: Cash Costs (SLRs)	2050	11232	16034
<b>Price assumptions:</b>			
Milk (SLRs/kg)	11.5		
Adult sales (SLRs/kg LW)	30		
Yearling sales (SLRs/kg LW)	15		
Feed (SLRs/kg)	4		
Insemination/bull service (SLRs/time)	40		
Animal health (SLRs/yr)	200	(Half for unimproved)	

	Unimproved	Improved
<b>Main Production Parameters</b>		
Sow/boar ratio	5:1	5:1
No of litters/year	1.5	1.5
Litter Size (no. of piglets)	6	9
Weaning age (mo)	3	2
Mortality (%/yr)		
adult	20	5
juvenile	40	25
Adult culling rates (%)		
sows	25	33
boars	25	33
Age of fatteners at sale (mo)	12	12
Sale weights (kg liveweight)		
fattener	50	90
sows	60	90
boars	70	120
Disposal of Piglets		
total no. produced per year	45	68
annual mortality	18	17
no. for replacements each year	3	2
no. sold each year	24	48
<b>Enterprise Budget</b>		
Value of Production (SLRs)		
fatteners	66000	237600
adult culls	4163	8460
Total	70163	246060
Cash Costs (SLRs)		
purchased feed - adults	0	3063
purchased feed -growers	0	5388
swill collection costs	21900	21900
animal health	1275	3650
Total	23175	34001
Labor Inputs (person-days)	136	178
Value of Production		
less: Cash Costs (SLRs)	46988	212059

fattener sale price (SLRs/kg liveweight)	55
cull breeder sale price (SLRs/kg liveweight)	45
feed cost (SLRs/kg)	7.6
swill collection cost (SLRs/day)	60
animal health (SLRs/hd/yr) - unimproved	25
- improved	50
labor (SLRs/person-day)	51

Cost for the foundation herd of 5 improved sows and boar is SLRs 25050

**Table 4: Production Model for Broilers**

<b>Main Production Parameters</b>		
No. of birds per batch		500
No. of batches per year		4
Mortality (%)		7
Days of feeding per batch		42
Average weight at sale (kg liveweight/bird)		1.5
Average feed consumption (kg/bird)		
starter (over a period of 24 days)		1.00
finisher (over a period of 18 days)		2.00
Labor input (hr/day)		2
<b>Enterprise Budget (SLRs)</b>		
Value of output		
broilers		150660
used litter & manure		12500
Total		163160
Cash costs		
chicks		48000
feed		78752
litter		12500
brooder fuel, medications & other		1920
Total		141172
Value of output less cash costs		21988
Total labor input (person-days)		42
<b>Price Assumptions:</b>		
broiler output (SLRs/kg liveweight)	54.00	
chicks (SLRs/chick)	24.00	
starter feed (SLRs/kg)	14.54	
finisher feed (SLRs/kg)	13.90	

Table 5: Production Model for Egg Layers

<b>Main Production Parameters</b>	
No. of layers	200
Egg production (eggs/mature bird/year)	218
Egg breakage (%)	5
Growing period (days)	130
Production period (days)	290
Mortality - growing period (%)	7
Mortality - production period (%)	5
Labor input (hr/day)	1
<b>Enterprise Budget (SLRs)</b>	
Value of output	
eggs	80508
culled layers (@ 1.7 kg liveweight/bird)	13464
used litter & manure	5000
Total	98972
Cash costs	
chicks	5800
booster feed (10 days @ 0.025 kg/bird/day)	753
chick feed (35 days @ 0.050 kg/bird/day)	4326
grower feed (85 days @ 0.0294 kg/bird/day)	5132
layer feed (290 days @ 0.015 kg/bird/day)	8477
litter	5000
animal health & other	1354
Total	30842
Value of output less cash costs	68130
<b>Price Assumptions (financial):</b>	
eggs (SLRs/piece)	2.2
culled layers (SLRs/kg liveweight)	45
chicks (SLRs/chick)	29
booster feed (SLRs/kg)	15.05
chick feed (SLRs/kg)	12.36
grower feed (SLRs/kg)	11.04
layer feed (SLRs/kg)	10.52

### Reevaluation of the Economic Internal Rate of Return

1. This reevaluation focuses on the main benefits and costs of the Project. The methodology used and described below follows the same general approach adopted during appraisal. Four benefits were quantified as part of the reevaluation: (i) the increase in milk and meat output as a result of upgrading the genetic capability of existing cattle and buffalo as well as the small complimentary effects of other interventions under the Project such as the cooperative societies, livestock extension, and animal health; (ii) the increase in the output of pork as a result of replacing existing breeding pigs with improved stock coupled with small improvements in smallholder production techniques; (iii) the increase in output of broilers, offset partially by the reduction in egg and spent-layer output, by small farmers as a result of changes in the type of day-old chicks produced and in the capacity at the Merriswatta Farm and hatchery; and (iv) the reduction in the cost of production (relative to imports) of incremental semen produced at the Kundasari Semen Production Center and distributed to areas not covered by the Project. These reflect the main economic impacts of the Project.

2. The first three benefits were quantified on the basis of incremental gross margins (at economic prices) for representative farm models for cattle, buffalo, pig, broiler and egg-laying units, and the number of each unit, which was derived from Table 1. The economic gross margins were derived from the financial farm models in Appendix 4. It should be noted that Table 1 includes the projected outcome of the existing and future crossbreeding program, and is subject to the Government increasing its funding for cattle inseminators and maintaining the operation of the crossbreeding facilities at levels comparable with those existing at the time of the Postevaluation Mission. The economic gross margins are:

Cattle - unimproved	SLRs1,839/cow
- half cross	SLRs3,318/cow
- three quarter cross	SLRs6,389/cow
Buffalo- unimproved	SLRs1,800/cow
- half cross	SLRs5,597/cow
- three quarter cross	SLRs9,426/cow
Pig - unimproved	SLRs33,993/five sow unit
- improved	SLRs179,994/five sow unit
Broiler	SLRs33,027/500 hd batch unit
Egg-layer	SLRs57,351/200 hd unit

3. The financial models were adjusted to derive the economic gross margins by using the economic prices for milk and meat instead of financial prices, the cost of production of day-old chicks as their price, the inclusion of a value for labor at

SLRs61/person-day, which is the financial labor rate adjusted by a conversion factor of 0.72,<sup>1</sup> and by adjusting all the other prices by the standard conversion factor of 0.9.

4. The economic price for milk was derived from a combination of the border price equivalents (at the farm gate) for milk to be processed into powdered milk and for milk to be processed into pasteurized milk (see Table 2). Of the milk currently collected in Sri Lanka, about 65 percent is processed into nonliquid products, a majority of which is powdered milk, and 35 percent is sold in processed liquid form. This ratio of 65:35 was used in deriving the combined economic milk price. The basis of the border price in each case was the international price for imported whole milk powder. Most of the benefits will be realized in the future from the increases in milk production. It is probable that a larger proportion than 65 percent will be processed into powder. If this occurs, the derived economic price for milk will be overestimated. The economic price for meat was based on the World Bank commodity forecast price for frozen beef. A premium of 30 percent over the frozen meat price was imputed for fresh meat. The derived economic price was SLRs11.84/kg liveweight equivalent.

5. The benefit for the lower cost of incremental semen production from the Kundasari Semen Production Center in areas not covered by the Project was derived from the difference between the cost of imported frozen semen of \$1.00 per dose (i.e. SLRs49.50/dose) and the cost of production at Kundasari of SLRs16.06 per dose, net of adjustment by the standard conversion factor.

6. The costs for reevaluation include the investment in the Project and incremental farm investment in the form of improved breeder pigs and poultry facilities. It also included the operational costs at Wellisera for pigs, at Nikaweratiya for buffalo, and at Merriswatta for poultry. The production costs at these farms were assumed to be adequately represented by the prices of the animals issued, i.e. buffalo bulls, breeder pigs, and day-old chicks. Similarly, the operating cost of the Kundasari Semen Production Center was represented by the unit cost of the semen used in the farm models or distributed in the areas not covered by the Project. The insemination costs used in the farm models reflect the main component of the insemination delivery service. Not included in the analysis, because of lack of data, are the costs for supervising and general support for the artificial insemination service as well as the operational costs of the Government animal health and extension services. Because these costs were not included, the recalculated economic internal rate of return (EIRR) has been somewhat overestimated.

7. The recalculated EIRR is 6.7 percent as shown in Table 3. This result is optimistic because not all the costs were included (see the comment at the end of para. 6). If the economic price of milk was higher and as much as the financial price (see para. 10), the recalculated EIRR would be 7.9 percent. In view of the risk involved in the achievement of the projected number of crossbred animals, particularly cattle, the EIRR also was recalculated assuming achievement of only 80 percent of the expected

<sup>1</sup> See Cury S., Lucking R., and Adhikari R., 1991. Report on Shadow Prices for Sri Lanka. Development Planning Centre, Bradford University, UK. 1991.



number of crossbred cattle from 1996 onwards. On this basis, the result was 6.2 percent.

### **Milk Price**

8. The economic farm gate price for cow's milk is derived in Table 2, and varies from SLRs11.51 per liter for milk if it is made into pasteurized milk to SLRs5.01 per liter if it is made into powdered milk. The average, based on the current 65:35 ratio of nonliquid to liquid milk is SLRs7.29/liter. In comparison, the current financial farm gate price is SLRs9.50/liter. The derived economic farm gate price for buffalo milk was SLRs10.49/liter compared with the financial price of SLRs11.50/liter. The higher price for buffalo milk reflects a higher fat content (about 6 percent compared with about 4 percent for cow's milk).

9. The analysis indicates a price advantage for the production of liquid milk products from local milk, but not for the production of powder from local milk. However, the processors can produce powdered milk and compete against imports because of import tariffs and production subsidies. The import tariff of 20 percent would be equivalent to about SLRs2/liter of milk, while the subsidy would be equivalent to almost SLRs1/liter. The analysis suggests, however, that the processors also would have a 30 percent lower margin per kilogram of powder, equivalent to about SLRs1.50/liter of milk, compared with the importers of milk powder.

10. A significant factor in the derivation of the economic prices is the cost of processing the milk into powder or pasteurized milk. The processing costs used in the analysis were those currently being experienced in Sri Lanka and any inefficiencies in the processing are reflected in a low economic farm gate price for milk. Given the general low utilization of the milk processing plants in the country, inefficiencies probably exist.

Year	Incremental Number					Semen to Non-Project Areas ('000 doses)
	Crossbred Mature Cows (hd)		Crossbred Breeder Pigs (hd)	Broiler Chicks (hd)	Egg Layer Chicks (hd)	
	Half Cross	Cross				
1983	0	0	0	0	0	0
1984	0	0	0	0	0	0
1985	0	0	0	0	0	0
1986	0	0	0	0	0	0
1987	0	0	0	0	0	0
1988	0	0	758	0	0	0
1989	0	0	930	68000	-20000	0
1990	0	0	961	260000	-20000	0
1991	0	0	1135	368000	-20000	12
1992	0	0	840	619000	-20000	0
1993	0	0	901	645000	-20000	47
1994	0	0	1130	764000	-20000	48
1995	1116	0	1150	800000	-20000	57
1996	2556	0	1200	800000	-20000	68
1997	4409	0	1250	800000	-20000	81
1998	6284	406	1300	800000	-20000	93
1999	8446	930	1350	800000	-20000	107
2000	10877	1604	1400	800000	-20000	122
2001	12500	2433	1450	800000	-20000	139
2002	14079	3411	1500	800000	-20000	157
2003	15507	4540	1550	800000	-20000	176
2004	17174	5432	1600	800000	-20000	197
2005	18801	6362	1650	800000	-20000	217
2006	20429	7292	1700	800000	-20000	240
2007	22057	8223	1750	800000	-20000	265
2008	23705	9153	1800	800000	-20000	293
2009	25425	10084	1850	800000	-20000	323
2010	27238	11014	1900	800000	-20000	358
2011	29190	11952	1950	800000	-20000	395
2012	31280	12916	2000	800000	-20000	435
2013	33554	13914	2050	800000	-20000	480

Table 2: Derivation of Economic Farm Gate Milk Price

			Milk for Milk Powder	Milk for Pasteurized Milk
International Price of Whole Milk Powder	\$/ton		1650	1650
Ocean Freight	\$/ton		30	30
C&F Price, Colombo	\$/ton		1680	1680
C&F Price in local currency	SLRs/ton	a	83160	83160
Import & landing expenses	SLRs/ton	b	4160	4160
Wholesale procurement cost	SLRs/ton		87320	87320
Conversion to Liquid Milk Equivalent	SLRs/liter of milk	c	10.92	10.92
less processing, transport & collection costs	SLRs/liter of milk		5.94	5.83
Procurement price at chilling center	SLRs/liter of milk		4.98	5.09
Adjustment of price to equivalent for milk of 4% fat content	SLRs/liter of milk		5.69	5.82
less collection costs of societies or village collectors	SLRs/liter of milk	b	0.68	0.68
Border price at farm gate	SLRs/liter of milk		5.01	5.14
Combined economic price based on 65:35 ratio of "Milk for Milk Powder" & "Milk for Pasteurized Milk"	SLRs/liter of milk		5.06	

Source: Mission estimates.

a Exchange rate of SLRs49.50 = \$1.00

b Adjusted by SCF of 0.9

c Milk of 3.5 percent fat content

Note: Buffalo milk has 6 per cent fat content. Its economic farm gate price would be SLRs7.59/liter.

**Table 3: EIRR Recalculation**[illegible]