

Project Performance Audit Report

PPA: SRI 24120
(Final)

North Western Province Water Resources Development Project In Sri Lanka (Loan 1166-SRI[SF])

December 2004

Operations Evaluation Department
Asian Development Bank

CURRENCY EQUIVALENT

Currency Unit – Sri Lanka Rupee/s (SLRe/SLRs)

		At Appraisal (30 April 1992)	At Project Completion (23 March 2001)	At Operations Evaluation (15 September 2004)
SLRe100	=	\$2.364	\$1.157	\$0.971
\$1.00	=	SLRs42.3	SLRs86.4	SLRs102.9

ABBREVIATIONS

ADB	–	Asian Development Bank
ARPA	–	agricultural research and production assistant
BME	–	benefit monitoring and evaluation
DAS	–	Department of Agrarian Services
EA	–	executing agency
EIRR	–	economic internal rate of return
FO	–	farmer organization
IA	–	implementing agency
ID	–	Irrigation Department (national)
IMD	–	Irrigation Management Division
IPM	–	integrated pest management
JFPR	–	Japan Fund for Poverty Reduction
MTR	–	midterm review
NGO	–	nongovernment organization
NWP	–	North Western Province
O&M	–	operation and maintenance
OEM	–	Operations Evaluation Mission
OFC	–	other field crop
PCR	–	project completion report
PDOA	–	Provincial Department of Agriculture
PED	–	Provincial Engineering Department
PS	–	pradeshiya sabha
TA	–	technical assistance

WEIGHTS AND MEASURES

ha	–	hectare
kg	–	kilogram
km	–	kilometer
m ³	–	cubic meter
t	–	metric ton

GLOSSARY

Classes of rural roads

Class D road: A carriageway of about 3.5 meters (m) wide (usually tarred).

Class E road: A carriageway of about 3.5 m wide, graveled.

Other rural road: Graveled with a carriageway of 3.5 m wide or less. There are no definite technical standards for this category of road.

Dugwell

A well used for irrigation, typically 5 m in diameter, 6 m deep, and

Irrigation works financed under the Project	with a daily yield of about 13 cubic meters. Improvement: Works costing up to SLRs6,000 per hectare (ha). Rehabilitation: Works costing up to SLRs44,000/ha. Restoration: Fixing of abandoned tanks, with a ceiling of SLRs66,000 investment/ha. Extension: Expansion of existing schemes.
Local government areas	Division: Administrative unit comprising about 5,000 to 18,000 households. There are about 45 divisions in North Western Province.
Types of irrigation schemes	Minor schemes have a command area of less than 80 ha. Medium schemes have a command area of between 80 ha to 600 ha. Major schemes have a command area of more than 600 ha.

Local terms

<i>Bethma</i>	A practice that temporarily redistributes plots of land among stakeholders (being rice field landowners) in part of the command area of a tank during drought periods. It is practiced when there is not enough water available to cultivate the entire command area or <i>purana wela</i> (oldest part used as command area, usually located close to the bund).
<i>Chena</i>	Slash and burn agriculture.
<i>Kanna meeting</i>	Crop planning meeting held before each cropping season.
<i>Maha</i>	October to March wet season, dominated by the northeast monsoon.
<i>Pradeshiya sabha</i>	Elected local government administrative unit covering a few villages.
<i>Samurdhi</i>	Welfare.
<i>Vel vidane</i>	Village headman and irrigation manager.
<i>Yala</i>	April to September dry season, dominated by the southwest monsoon.

NOTES

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

Director General, Operations Evaluation Department	:	Bruce Murray
Director, Operations Evaluation Division 1	:	Graham Walter
Evaluation Team Leader	:	Toshio Kondo

Operations Evaluation Department, PE-658

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Toshio Kondo, senior evaluation specialist (team leader), was responsible for the preparation of this report; led an Operations Evaluation Mission to Sri Lanka; conducted document reviews, and key informant interviews; and guided the fieldwork undertaken by Jonathan Cook, international consultant (water resource management specialist) and Karunatissa Athukorala, domestic consultant (rural development specialist). Henry Tucker, senior portfolio evaluation specialist, assisted the mission. Additional research assistance was provided by Agnes Anabo, senior evaluation officer.

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Attachment: Management Response on the Project Performance Audit Report on the North Western Province Water Resources Development Project (Loan 1166-SRI[SFI]) in Sri Lanka.

BASIC DATA

Loan 1166-SRI(SF): North Western Province Water Resources Development Project

PROJECT PREPARATION/INSTITUTION BUILDING

TA No.	TA Project Name	Type	Person-Months	Amount	Approval Date
1387	North Western Province Water Resources Development Project	PPTA	26	400,000	11 Oct 1990
1719	Institutional Strengthening of the North Western Provincial Council	ADTA	36	400,000	25 Jun 1992

As per ADB Loan

KEY PROJECT DATA (\$ million)	Documents	Actual
Total Project Cost	40.0	22.4
Foreign Exchange Cost	11.9	6.8
Local Currency Cost	28.1	15.6
ADB Loan Amount/Utilization ¹	30.0	17.3
ADB Loan Amount/Cancellation ¹		12.2

KEY DATES

	Expected	Actual
Appraisal		29 Jan–14 Feb 1992
Loan Negotiations		18–21 May 1992
Board Approval		25 Jun 1992
Loan Agreement		24 Jul 1992
Loan Effectiveness	24 Oct 1992	10 Sep 1992
Project Completion	31 Dec 1998	30 Sep 2000
Loan Closing	31 Dec 1999	23 Mar 2001
Months (effectiveness to completion)	74	97

ECONOMIC INTERNAL RATES OF RETURN (%)

Appraisal	PCR	PPAR
16.7 ²	13.7	11.4

BORROWER

Democratic Socialist Republic of Sri Lanka

EXECUTING AGENCY

Ministry of Lands, Irrigation, and Mahaweli Development³

MISSION DATA

Type of Mission	No. of Missions	Person-Days
Fact Finding	1	30
Appraisal	1	119
Inception	1	18
Project Administration		
Review	6	134
Special Project Administration	3	9
Midterm Review	1	82
Project Completion	1	60
Operations Evaluation	1	32

ADB = Asian Development Bank, ADTA = advisory technical assistance, PCR = project completion report, PPAR = project performance audit report, TA = technical assistance, PPTA = project preparatory technical assistance.

¹ At approval, the loan was equivalent to SDR21,526,000. At closing, the loan was equivalent to SDR12,441,275.81.

² With ancillary costs. If the ancillary costs are excluded, the economic internal rate of return increases to 25%.

³ In 1994, the Ministry of Lands, Irrigation, and Mahaweli Development was renamed the Ministry of Irrigation and Power, and in 2001 the Ministry of Irrigation and Water Management.

EXECUTIVE SUMMARY

Making better use of underutilized ancient irrigation systems in North Western Province (NWP)¹ was a development opportunity in Sri Lanka. Many schemes were operating considerably below their potential due to inadequate maintenance and the deteriorating condition of the roads leading to these irrigation systems. Small entrepreneurs had limited access to credit, which curtailed the potential for microenterprise development in the project area. The Government's strategy for NWP aimed at making better use of existing assets in the water resources sector, supporting better market opportunities through an improved rural road network, increasing rice production, diversifying cropping, and creating jobs through microenterprises.

Project formulation was supported by a technical assistance grant.² The objective of the Project was to improve the economic, social, and nutritional well being of the people living in the rural areas of NWP.³ The Project had three components: (i) rural infrastructure development to improve, rehabilitate, or extend irrigation systems involving a total area of 26,940 hectares (ha) and to rehabilitate about 740 kilometers (km) of roads; (ii) credit lines to finance about 1,500 dugwells, 250 lift pumps, and 1,000 businesses of rural women entrepreneurs; and (iii) institutional support in the form of facilities, equipment, training, consultants, and monitoring of project implementation, benefits, and environmental impacts.

The total project cost was estimated at \$40.0 million equivalent, \$11.9 million of which was the foreign exchange cost. The Asian Development Bank (ADB) was to finance the entire foreign exchange cost plus \$18.1 million equivalent of the local currency cost, for a total of \$30.0 million equivalent (or 75% of the total project cost). The loan was approved in 1992. The Ministry of Lands, Irrigation, and Mahaweli Development⁴ was to act as the executing agency at the national level, with overall responsibility for coordination and supervision of the Project. At the provincial level, the North Western Provincial Council was to be the executing agency.⁵

In total, 697 irrigation systems were upgraded under the Project, with a total area of 28,700 ha, or about 1,800 ha more than estimated at appraisal. Upgrading of most schemes involved improvements to tank bunds, spillways, and offtakes, and to the main canals on minor schemes and to the main and branch canals on medium (up to 600 ha) and major schemes. A total of 988 km of existing rural roads were rehabilitated and upgraded, 33.5% more than the planned 740 km. After a slow start, the credit component picked up momentum. A total of 4,255 households received loans. The total number of beneficiaries was 55% higher than planned due to the large increase in microenterprise loans. While the credit component was intended as a poverty reduction mechanism, in practice, the large loan amounts and the need for equity contributions and security reduced their relevance to the poor.

A key objective of the Project related to the institutional strengthening of farmer organizations (FOs). At project inception, only about 15% of minor schemes had effective FOs.

¹ 3-hour drive from Colombo and away from the conflict area.

² TA 1387-SRI: *North Western Province Water Resources Development Project*, for \$400,000, approved on 11 October 1990.

³ At the time of appraisal, NWP was one of the least developed areas in the country with respect to irrigation. Poverty was widespread. About half of the farm population engaged in field crop cultivation lived below the poverty line.

⁴ In 1994, the Ministry of Lands, Irrigation, and Mahaweli Development was renamed the Ministry of Irrigation and Power, and in 2001 the Ministry of Irrigation and Water Management.

⁵ However, because of the victory of the opposition party, the 1993 elections led to the transfer of responsibility from the North Western Provincial Council to the central Government.

By the end of the Project, almost all schemes had operational FOs, although of widely varying effectiveness. Problems remaining include lack of ownership and inability to take full responsibility for scheme operation and maintenance (O&M). This has resulted from the approach to FO formation adopted nationally and from the general agriculture sector policy framework. Establishing strong community-based organizations requires the close involvement of all stakeholders, the encouragement of a sense of ownership, and the provision of long-term support.

Many FOs find it difficult to manage their schemes due to inability to control infractions, such as damage by livestock, problems of tenant farming, overuse of water, damage to structures, nonparticipation in meetings, and nonpayment of FO and O&M fees. There is little sense of ownership among the beneficiaries of rehabilitated water resources schemes. FOs do what they are prescribed to do by the authorities. Nominally they own the systems, but in practice many decisions are taken by the authorities. The legal framework needed for FOs to undertake activities necessary for O&M of their schemes has not yet been developed. Some FOs do not practice continuous record keeping, and records are sometimes not handed over to new committee members. As the FOs handle quite large amounts of money, they need to be legally accountable, to demonstrate good governance, and to be fully transparent. Otherwise, FOs lose the confidence of their members.

The Project is assessed as relevant. Irrigation infrastructure had deteriorated following the abandoning of the traditional system in the late 1950s. Rehabilitation was essential to increase farm productivity and reduce poverty. It is consistent with the current Government's far-reaching reform agenda, which focuses on promoting the private sector and balanced regional development, and with ADB's ongoing assistance in environment and natural resources management, which focuses on promoting rural development and enhancing rural incomes in several subsectors.⁶ The Project is judged less efficacious because (i) the "full level of performance" projected for the rehabilitated irrigation schemes by 2005 is no longer realistic, largely due to the high proportion of marginally effective FOs; (ii) the majority of the rehabilitated irrigation schemes are not being maintained as planned; (iii) most roads were not rehabilitated to an appropriate standard and are not being maintained; and (iv) around 30% of microenterprises established with project credit have not been sustained. Despite these problems, the Project made significant contributions to the national irrigation and road programs and also contributed to the objectives of employment generation and poverty reduction in NWP. If more project resources had been used to develop the FOs, and to increase the quality of the infrastructure rehabilitation works, then the efficacy rating could have been higher.

Although it is close to the borderline for a rating of less efficient, the Project is assessed as efficient. The Project demonstrated limited efficiency during its first few years. However, the introduction of new implementation systems, involving the use of private contractors for design, assessment, and construction supervision allowed most targets to be met or exceeded with relatively little time overrun.

Sustainability is assessed as "less likely," primarily due to the poor standard of maintenance of the irrigation and road investments, and the relatively weak condition of many FOs. The ongoing Japan Fund for Poverty Reduction (JFPR) project was developed to address some of the Project's shortcomings by assisting in establishing sustainable approaches to

⁶ The ADB Sri Lanka country strategy and program (2004–2008) states that, in supporting poverty reduction through broad-based growth, ADB expects to support agriculture and rural development, transport (roads and ports), energy (including rural electricity), financial sector and small and medium enterprises, education (especially skills and vocational training), and water supply and sanitation.

irrigation system and road maintenance. However, problems are being experienced getting legislative backing for its proposed sustainable development funds. JFPR project resources are limited when compared with the extensive support required by most FOs.

While the institutional structure of the loan Project was appropriate for the investments made, in practice, it was complex and difficult to manage. The Project did assist all institutions through training, contributions to budgets, and the provision of equipment and buildings. However, the overall institutional impact was moderate. The Project had little positive or negative environmental impact.

Overall, the Project is rated as partly successful. While it failed to meet its crop diversification targets, it did contribute significantly to increased rice production, and through its credit component, to upland crop production and women's employment. Improvements to the schemes were useful and reflected farmers' priorities. Against these plusses must be set the poor caliber of maintenance and the generally poor performance of the FOs. There is little of effective farmer management of most schemes.

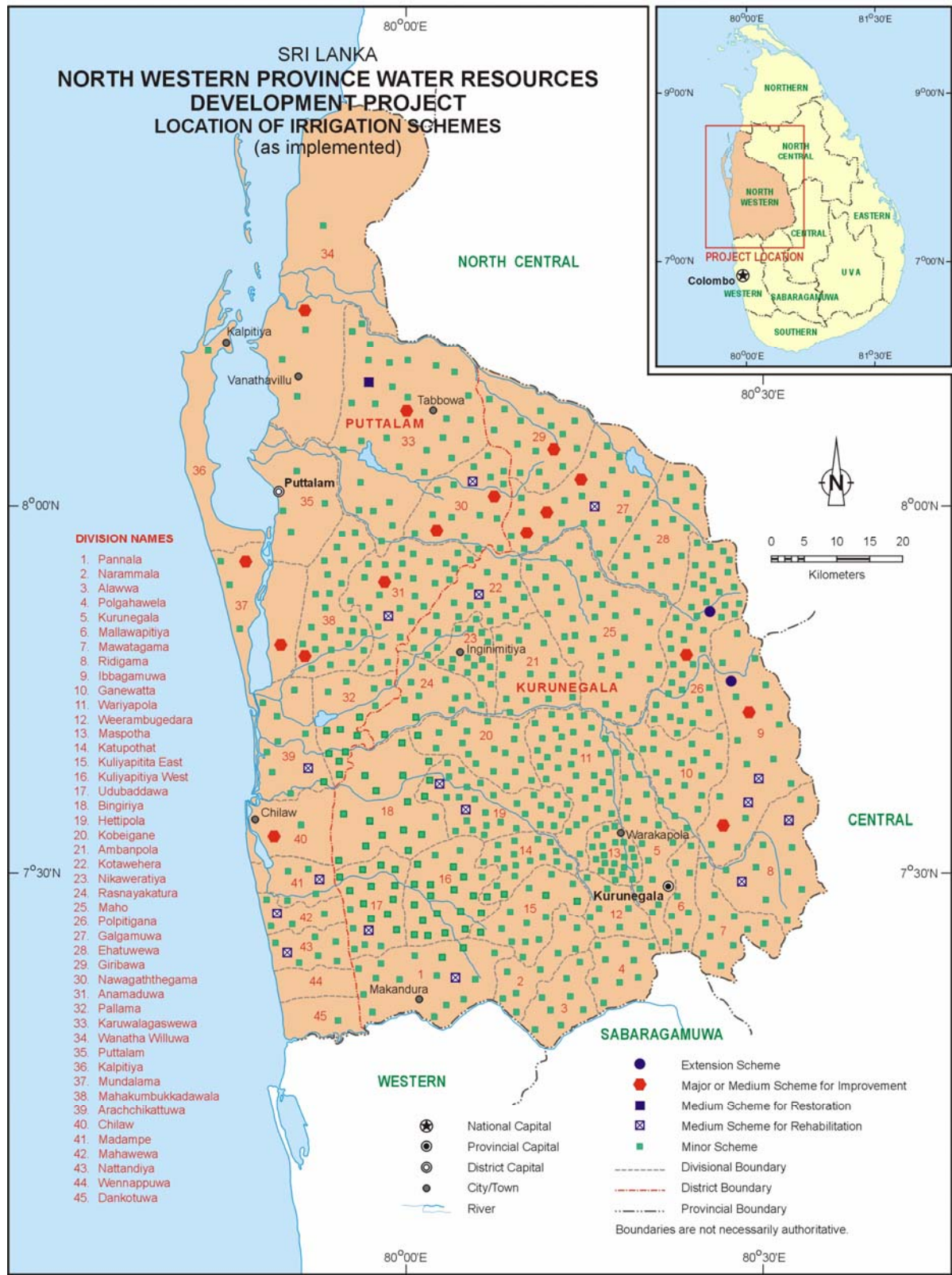
Key issues for the future include the need to (i) improve farmer ownership and scheme O&M; (ii) make project records more secure, transparent, and accessible; and (iii) further enhance the institutional and policy framework.

It has been difficult to develop FOs that are capable of effectively managing and maintaining irrigation schemes. To support the further development of Sri Lanka's FOs, the Government should establish a clearly defined policy framework within which they can operate. The creation of a highly participatory environment and a strong sense of ownership among the FO membership is paramount. Clear guidelines with regard to the imposition of service fees and sanctions are also essential.

The agricultural and irrigation sector policy environment is not well defined, in part due to changes in government. Clearly defined and well-publicized policies are needed in areas such as water use, irrigation scheme management, FO organization and operation, catchment management, tank desilting, agricultural marketing, and service supply. The policies will need to emphasize FO self-reliance and private sector support to compensate for the public sector's inability to provide adequate services to the industry.

The establishment of effective and self-reliant FOs is difficult. Critical success factors include (i) freedom from political interference; (ii) the provision of appropriate and prolonged support through extension and training; (iii) a strong sense ownership among the FO membership, engendered by high participation levels in decisions affecting the scheme; (iv) the establishment of tailored articles, regulations, O&M service fees, and penalties; (v) effective management to ensure that rules are followed; and (vi) equitable sharing of benefits.

Bruce Murray
Director General
Operations Evaluation Department



I. INTRODUCTION AND BACKGROUND

A. Rationale

1. In 1991, 43% of the active labor force in Sri Lanka depended on agriculture for their livelihood. A Base Line Socioeconomic Survey¹ carried out during the preparation of the North Western Province Water Resources Development Project (the Project) in 1991 covered a sample of 160 farming households (0.04% of all households in the project area). It was found that about 50% of these households had income below the poverty line. Making better use of underutilized ancient irrigation systems in North Western Province² (NWP) was a development opportunity. Many irrigation schemes were operating considerably below their potential due to inadequate maintenance and the deteriorating condition of the roads leading to them. The country was importing substantial amounts of food crops that could potentially be grown within the deteriorating irrigation schemes. Also, jobs, particularly for women, were scarce, and small entrepreneurs had limited access to credit, which curtailed the potential for microenterprise development. Given this context, the Government's strategy for the NWP aimed at making better use of existing assets in the water resources sector, supporting better market opportunities through an improved rural road network, increasing rice production, diversifying cropping, and creating jobs through microenterprises. On 25 June 1992, the Asian Development Bank (ADB) approved a \$30 million loan from its Special Funds resources to finance the Project. The loan was accompanied by an advisory technical assistance (TA) grant³ for institutional strengthening of the North Western Provincial Council.

B. Formulation

2. In 1990, ADB approve TA⁴ to prepare a feasibility study for the Project. The feasibility report, plus the findings of ADB fact-finding and appraisal missions, formed the basis of the Project. The Project Completion Report (PCR) found the feasibility study as to be generally satisfactory, as it provided a detailed analysis of the infrastructure development component, which constituted the core of the Project. However, the study provided too little diagnostic analysis of the causes of institutional performance gaps.

C. Purpose and Outputs

3. The objective of the Project was to improve the economic, social, and nutritional well-being of the people living in the rural areas of the NWP.⁵ This was to be achieved through (i) increased agricultural production of about 13,000 metric tons (t) of rice and 19,600 t of other food crops (OFCs), and an average annual increase in income of about \$123 per household for about 70,000 farm households; (ii) diversified cropping covering about 4,000 hectares (ha) during the *yala* (dry) season; (iii) generation of about 3,100 sustained jobs and about 12,000 person-years of employment during construction for the unemployed and underemployed, including women; and (iv) institutional support for (a) project management, (b) strengthening of

¹ Agriteams. 1991. Base Line Socioeconomic Survey, North Western Province Water Resources Development Project. Report submitted to AgriSwiss.

² 3-hour drive from Colombo, and away from the conflict area.

³ TA 1719-SRI: Institutional Strengthening of the North Western Provincial Council, for \$400,000, approved on 25 June 1992.

⁴ TA 1387-SRI: *North Western Province Water Resources Development Project*, for \$400,000, approved on 11 October 1990.

⁵ At the time of appraisal, NWP was one of the least developed areas in the country with respect to irrigation. Poverty was widespread. At least 50% of the farm population engaged in field crop cultivation lived on incomes below the poverty line.

agricultural extension services, (c) formation of effective farmer organizations (FOs) in the irrigation schemes, and (d) sustained maintenance of the Project.

4. The Project had three components: (i) rural infrastructure development to improve, rehabilitate, or extend irrigation systems involving a total of 26,940 ha and to rehabilitate 740 kilometers (km) of roads; (ii) credit lines to finance 1,500 dugwells, 250 lift pumps, and 1,000 businesses of rural women entrepreneurs; and (iii) institutional support in the form of facilities, equipment, training, consultants, and monitoring of project implementation, benefits, and environmental impacts.

5. During implementation, there were changes from the feasibility assessment, including (i) upgrading of 200 irrigation schemes from the improvement category to rehabilitation,⁶ and (ii) addition of 23 minor schemes for rehabilitation. The latter were added in line with the aim of balanced development support among the divisions in NWP.

D. Cost, Financing, and Executing Arrangements

6. Total project cost was estimated at \$40.0 million equivalent, \$11.9 million of which was foreign exchange cost. ADB was to finance the entire foreign exchange cost plus \$18.1 million equivalent of the local currency costs, for a total of \$30.0 million equivalent or 75% of the total project cost. The Government was to fund \$8.2 million equivalent, and the farmers/subborrowers, \$1.8 million equivalent. The Ministry of Lands, Irrigation, and Mahaweli Development⁷ was to be the executing agency (EA) at the national level, with overall responsibility for coordination and supervision of the Project. At the provincial level, the North Western Provincial Council was to be the EA. Because of the victory of the opposition party, the 1993 elections led to the transfer of responsibility from the North Western Provincial Council to the central Government.

E. Completion and Self-Evaluation

7. The Project was completed in late 2000, and the loan was closed in March 2001, 12 months behind schedule. An ADB Project Completion Review Mission visited Sri Lanka in May 2002 and prepared a report that contains useful analysis and sound recommendations. The PCR concluded that the Project was successful, based on the Government's PCR, field visits, and consultation with the implementing agencies (IAs).

F. Operations Evaluation

8. This report presents the findings of the Operations Evaluation Mission (OEM) that visited Sri Lanka in September 2004. It assesses the Project's effectiveness in achieving its objectives and generating sustainable benefits. It is based on a review of the PCR, the appraisal report, the impact assessment report, and material in ADB files; discussions with farmers and farmer leaders; and discussions with the IAs, ADB staff, and concerned government agencies in NWP and Colombo. Comments from concerned departments and offices of ADB and from the IAs were taken into consideration in finalizing this report.

⁶ Schemes for rehabilitation included those that had not had any remedial work since their original construction, and were in varying stages of deterioration. Schemes for improvement were to be provided with adequate water control structures in the irrigation distribution system to facilitate better water management.

⁷ In 1994, the Ministry of Lands, Irrigation, and Mahaweli Development was renamed the Ministry of Irrigation and Power, and in 2001 the Ministry of Irrigation and Water Management.

II. PLANNING AND IMPLEMENTATION PERFORMANCE

A. Formulation and Design

9. The formulation and design of the Project followed a normal path. A project preparatory TA was implemented in 1991. Its report was detailed and technically sound. However, it lacked sufficient analysis of the constraints to crop diversification. It correctly assessed the need to institutionalize farmer participation, but underestimated the difficulty of, and resources required for, this task. ADB's appraisal was detailed and relevant. Project design followed earlier ADB projects including the Walawe Irrigation Improvement Project and built on previous experience. However, insufficient attention was paid to mechanisms for promoting farmer management of schemes in response to government legislation in 1991, which passed responsibility for all minor schemes to the farmers and established FOs in schemes of all sizes.⁸ This experience could have been further built on, particularly in relation to the need for strong support to participatory irrigation management and the FOs. Overall, however, the design was relevant to both ADB's and the Government's prevailing policies.

10. Initial implementation arrangements proved to be unsatisfactory. Provincial departments lacked the necessary implementation capacity, suggesting that additional institutional analysis during design would have been desirable. Following the midterm review (MTR), a change in approach to involve private contractors in the design and implementation of subprojects resulted in a marked acceleration of implementation and allowed most targets to be exceeded by project completion.

11. Project design included a substantial component relating to environmental monitoring, including international and domestic consulting inputs and provision of equipment, mainly for water quality monitoring. In practice, no significant adverse environmental impacts were found, and the resources devoted to this area could have been better allocated to other areas, such as community development and FO support. Farmer leaders were involved in the detailed design of minor scheme improvements, and all FO members were invited to attend the ratification meetings held for each scheme. Farmers were not much involved in the planning of large- and medium-scheme improvements.

12. Significant external factors affecting project performance include a decline in rice prices, which decreased by an average of 3% per year over 1980–2000 (though more slowly over the past second decade), resulting in a reduction in the profitability of rice. However, the change in relative prices was not sufficient to promote a switch to OFCs in the project areas, as discussed in para. 31. and in the PCR (see Appendix 3 of this report). Rice pest outbreaks in 1996 and 2000 and a drought in 2003–2004 also had significant adverse impacts. Because of these adverse trends, households increasingly relied on off-farm employment and income for part of their livelihood.

B. Achievement of Outputs

13. **Irrigation.** In total, 697 irrigation systems were upgraded under the Project, covering a total area of 28,700 ha, which was 1,800 ha more than estimated at appraisal. Improvements were completed on five major schemes with a total area of 7,830 ha, 29 medium schemes covering 6,441 ha, and 663 minor schemes covering 14,415 ha. Upgrading of most schemes

⁸ In Walawe, rehabilitation was required within 10 years of scheme completion (partly because of underinvestment in water control in the original scheme). Further cycle of rehabilitation appeared inevitable due mainly to the modification by farmers of control and diversion structures in the rehabilitated scheme.

involved improvements to tank bunds, spillways, and offtakes, and to the main canals on minor schemes and main and branch canals on medium (up to 600 ha) and major schemes. Water control structures were improved to allow better water management. The average cost was (i) for improvement, SLRs5,600/ha on 14,132 ha (equivalent to about \$82/ha);⁹ (ii) for rehabilitation, SLRs29,400/ha on 13,535 ha (\$430/ha); (iii) for restoration, SLRs66,500/ha on 945 ha (\$970/ha); and (iv) for extension, SLRs52,600/ha on 745 ha (\$769/ha). Although these cost levels are reasonable, some needed works were not carried out due largely to farmers' unwillingness to meet the required 10% contribution as well as seasonal constraints. A number of schemes have not been completed. Farmer leaders participated in needs definition and priority setting on the minor schemes. There was limited participation by FOs in the design of medium and major schemes. Project irrigation achievements are listed in Appendix 1, Tables A1.1 and A1.2.

14. The Provincial Department of Agriculture (PDOA) was responsible for the demonstration plot program and extension. In total, 600 farm demonstrations were conducted, of which 30% were for rice and 70% were for OFCs. The rice demonstrations were generally successful, often yielding more than 7 t/ha. Farmers interviewed by the OEM recalled the demonstration plots and integrated pest management (IPM) training run by the Project. Aspects of IPM continue to be applied in some schemes, providing cost savings and environmental benefits. According to the PCR (Appendix 3), a high proportion of OFC demonstrations were in upland areas and used manual spray irrigation. Many were unsuccessful and irrelevant to local agricultural systems.

15. **Roads.** A total of 988 km of rural roads were rehabilitated and upgraded under the Project, 33.5% more than the planned 740 km. The roads included 415 km of class D and E roads and 573 km of rural roads. The Provincial Engineering Department (PED) reports that good quality gravel was generally used, and was applied at the specified thickness of 120–150 millimeters. Sub-base compaction was reportedly not done on some roads. The camber on most roads appears inadequate for surface drainage, which is a common fault of many of Sri Lanka's rural roads. The culverts observed by the OEM appeared adequate, and some reduction of road-induced flooding was reported. Total road expenditure was around \$2.5 million equivalent or 63% of the budget allocation. The project expenditure limit of SLRs300,000/km (about \$4,000/km at the average exchange rate) was low, though not always strictly applied.

16. **Credit.** After a slow start, the credit component picked up momentum, largely as a result of changes made following the MTR. A total of 4,255 households were provided with loans, including 918 loans for agricultural wells (61% of the original target of 1,500), 148 loans for lift irrigation systems (59% of the target of 250), and 3,201 loans to women for microenterprise development (320% of the target of 1,000). The total number of beneficiaries was 55% higher than planned due to the large increase in microenterprise loans. At the start of the Project, the credit program was implemented only by the Wayamba and Hatton National banks. The addition of two credit institutions (People's Bank and Bank of Ceylon) late in the Project contributed greatly to the high lending rate achieved. While the credit component was intended as a poverty reduction mechanism, in practice, the large loan amounts and the need for equity contributions and security reduced their relevance to the poor.

17. None of the banks has maintained readily accessible information on the project credit lines, and information additional to that provided by the PCR is not available. The Bank of Ceylon reports almost full recovery of loans under the Project, apart from a significant failure

⁹ Since precise information on the completion dates of schemes is not available, SLRs values have been converted at the average 1998 exchange rate of SLRs88.3/\$.

rate in Puttalam, where 20% of the 30 loans made in Anamaduwa were written off. The general repayment rate reported by the banks of around 92–94% is barely sufficient to meet the banks' repayment obligations to the Central Bank, based on an interest spread of 6.5% and a lending rate of 14.5%.

18. The quality of work on the few dugwells inspected by the OEM was high, though the drought and a decline in the water table were limiting use during the dry (*yala*) season of 2004. In normal seasons, most wells have achieved or exceeded their irrigation target of 0.4 ha. In common with almost all wells in Sri Lanka, for both drinking and agricultural purposes, the wells have no security, and very basic and widely spaced steps.¹⁰ While the dugwells and lift schemes did contribute to OFC production, the component was a largely unnecessary add-on to the Project, distracting management and complicating implementation. According to the final impact evaluation, the performance of the lift irrigation systems was relatively poor, with about half of those surveyed indicating satisfaction with their investments. Of the microenterprise owners financed, 56% rated their enterprises as successful and 14% as partly successful. The proportion of women with family incomes over SLRs5,000/month increased from 20% before the Project to 53% after investing in their enterprises.

19. **Institutional Strengthening.** As reported by the PCR (para. 13), most construction targets were achieved, apart from the 71 PDOA extensions to agrarian service centers.¹¹ PDOA lacked the capacity to implement the intended level of farmer training, with achievement estimated by the PCR at 40% of the target. Despite the major efforts made by the Project and the IAs, farmer training was limited. Apart from the 1 or 2-day courses at the commencement of each subproject, little training was carried out. However, farmers interviewed particularly valued the construction training that was provided. Within the IAs, it would have been useful if training had been extended to lower levels in the organizations and, for example, workshops had been conducted to present the results of the study tours to a wider audience. The provision of vehicles was useful to the IAs, and the Irrigation Department (ID) continues to use them. The project construction equipment was given to the Provincial Machinery and Equipment Authority, from which ID now has to rent it.¹²

20. A key aspect of the Project related to the institutional strengthening of the FOs. At project inception, only about 15% of the minor schemes had effective FOs. By the end of the Project, almost all schemes had operational FOs, although of widely varying effectiveness. Many FOs lack a sense of ownership and the ability to take full responsibility for scheme operation and maintenance (O&M). This has resulted from the approach adopted nationally for FO formation and the general agriculture sector policy framework (see Appendix 2 which discusses the history and status of FOs). Establishment of a strong community-based organization requires the close involvement of all stakeholders, the encouragement of the sense of ownership, and the provision of long-term support. Many FOs require follow-up training in O&M, while newly elected leaders require training so that they will understand their rights and responsibilities. Apart from significant strengthening FOs, the Project had limited institutional impact, at least compared with the \$6.5 million cost. The limited institutional development

¹⁰ This would not be acceptable in developed countries due to the risk of children falling in and drowning.

¹¹ This problem arose because the Department of Agrarian Services was not prepared to release land that the PDOA considered appropriate to construct the centers. Such problems highlight the difficulties that can result from multiple IAs, even when they are within the same ministry.

¹² During the project period, rental covered operating costs. However, subsequently, hire charges have included full cost recovery and profit, meaning that ID cannot afford to use the equipment, which is used mainly for other provincial government activities. This has limited the maintenance and development work that ID can accomplish. Equipment management was a significant issue for the Project, and in retrospect, greater care was needed in the design of this component.

despite the expenditure of funds highlights the difficulty that ADB often experiences in effecting institutional change.

C. Cost and Scheduling

21. The actual project implementation period, including a 12-month extension of the loan closing date, ran from September 1992 to March 2001. According to the PCR, project cost totaled \$22.4 million, or 56% of the budgeted cost of \$40 million. Only \$17.3 million, or 57.7% of the \$30 million loan, was actually disbursed (see Basic Data). The savings resulted from the (i) low unit costs of construction for both roads and irrigation systems; (ii) low level of credit disbursement for irrigation systems; (iii) reduced training and institutional strengthening activities; (iv) less-than-expected need for contingencies; and (v) devaluation of the Sri Lankan rupee from about SLRs42 to the dollar at project appraisal in February 1992 to about SLRs86 at loan closing in March 2001, which significantly reduced the dollar equivalent of expenditures. Despite the substantial cost savings, physical targets were substantially exceeded. Increased expenditure on some irrigation schemes and roads would probably have improved project outcomes, through extending irrigation benefits to more farmers and reducing road maintenance needs in the medium term.

22. Implementation was slow during the early years of the Project due to complex implementation arrangements and the limited capacity in some of the IAs. The MTR was effective in resolving some of the problems. Following the MTR in late 1995, changes were made to implementation processes, mainly through outsourcing survey, design, and construction supervision to the private sector. More detailed institutional analysis during project preparation might have identified the problems likely to be faced by the IAs, and thus would have included approaches to speed up early implementation. The credit program accelerated greatly after the MTR. While credit repayment rates were high by Sri Lankan standards, available data suggest that a significant proportion of the microenterprise and lift irrigation subprojects failed or underperformed, with repayment made from other sources of capital or income.

D. Procurement and Construction

23. The OEM did not note any particular issues relating to procurement. Consultant recruitment was timely, assisted by advance procurement action. The rehabilitation works for minor irrigation schemes consisted primarily of improvements to headworks and canals, including limited check structures and turnouts. According to the PCR (para. 19), more than 85% of earthworks were contracted to FOs, which also undertook minor concrete construction, under the supervision of PED or external engineers.¹³ This contributed to their ownership of the schemes and to financial autonomy (through a 5% management levy). However, both ownership and the financial status of many FOs remain weak. Limited work was sought by farmers or undertaken on drainage or system remodeling, which limited the potential to expand OFC production. Works such as sluices, spillways, and concrete canal sections and viaducts inspected by the OEM on the major and medium schemes were satisfactory. One significant problem was observed at Kimbulwana, where one of the three extension areas was not fully developed due to the deep cuts needed for the distributary canal in an unstable soil environment. Stabilization work on the banks has not been undertaken, making the system

¹³ While the works were generally sound, problems arose in a few schemes, such as one where the supervisor found a concrete structure to be badly built and refused to authorize payment. The OEM believes that the structure is probably sufficient. Failure to pay based on faulty judgment had an adverse financial impact on the community land organization.

unusable. In the same scheme, there is a shortage of check structures so that sandbags and earthworks are required to divert water. Due to water distribution problems, the farmers have widened some structures. However, this does not appear to be a general problem, compared with some schemes such as Walawe.

E. Organization and Management

24. Delays were caused by the complex implementation arrangements. However, given the structure and function of the departments responsible for irrigation development and support, such arrangements were necessary. Overall, the IAs performed acceptably and made efforts to achieve the Project's physical targets. PDOA, however, faced difficulties in meeting its commitment to provide extension support and demonstrations to schemes, in large part because it had inadequate capacity to implement the four major projects for which it was responsible in NWP at the time. This situation should have been anticipated and addressed during project preparation. In addition, some PED engineers lacked the necessary experience to meet the professional standards required by the Project. Their designs and estimates needed reworking to meet project needs. The Department of Agrarian Services (DAS) generally met its training obligations and ensured that FOs were at least established and operating in all project schemes. The provincial Agricultural Development Authority did useful work with the dugwells and lift pump borrowers, while the banks (apart from Hatton National) made substantial efforts to provide loans under the credit component.

25. Support to irrigation schemes was provided through the irrigation systems management and improvement cells established under the Project. They worked well until they were disbanded as scheduled in 1999. The Project then employed irrigation technical assistants and private sector experts to provide technical advice to FOs on a private consultancy basis. This proved effective for the last 2 years of implementation. However, it was not sustained, and the irrigation schemes have received little extension support since project completion. Overall, the development "software" was less well implemented than the "hardware." It has proven difficult to establish viable and self-reliant FOs. As a result, required maintenance has not been carried out, leading to the need for subsequent assistance that is addressing these issues.¹⁴

26. The Government was committed to the Project and made adequate counterpart funds available on a timely basis. The Ministry of Lands, Irrigation, and Mahaweli Development¹⁵ took an active interest in the Project, the minister making several visits to the project area. While there was room for better coordination among concerned offices, all loan covenants were substantially complied with.

27. Consultant inputs were generally appropriate and effective. Local staff reported that the international consultants performed well and made a useful contribution to the Project and to capacity building. The international consultant engineer developed the systems that were put into effect and helped the Project to identify and prioritize investments. Among the domestic consultants recruited under the loan, the engineers performed well. However, some of the other specialists lacked a practical approach and in some cases spent too little time in the field to gain full appreciation of the Project and the issues it faced.

¹⁴ Infrastructure Maintenance to Reduce Rural Poverty funded by a Japan Fund for Poverty Reduction (JFPR) TA 9025-SRI, for \$900,000, approved on 16 October 2002. JFPR has been used to further assist in sustaining the maintenance of loan project-related activities.

¹⁵ This ministry combined with the Ministry of Agriculture in 2004 to become the Ministry of Agriculture, Livestock, Lands, and Irrigation.

28. The main components of the benefit monitoring and evaluation (BME) system were a baseline survey in 1991, and an impact survey conducted by domestic consultants in 2000. While the baseline survey provided substantial useful information, the final impact evaluation report contains few hard data and presents its results as simple percentages. This problem should have been identified by the Project and ADB, and the consultants should have been required to provide more useful data. The Planning Division (PD) of the Provincial Council was responsible for routine BME during the project implementation period. However, it was unable to meet its monitoring responsibilities for a number of reasons discussed in the PCR (para. 28).

III. ACHIEVEMENT OF PROJECT PURPOSES

A. Operational Performance

1. Irrigation Schemes

29. Based on interviews conducted by the OEM in 12 villages, the operational performance of each class of irrigation scheme improved. Farmers and irrigation engineers report that irrigation practices continue much as before, and that the main benefit resulting from the Project is the increased security of the water supply. However, this has not translated into increased area or production of OFCs. This is reflected in the overall crop statistics for NWP, reported in Appendixes 3 and 4, which suggest a steady decline in the area planted to OFCs by an average of 6.3% per year for both *maha* and *yala* crops. Since the Project accounted for around 40% of the irrigated land in NWP, it is likely that OFCs also declined in project schemes, though perhaps to a lesser degree than elsewhere. This is highlighted in the Figure which shows an upward trend for both *maha* and *yala* rice as a percentage of cropped area. While detailed information is not available on incremental rice production under the Project, the estimate in the PCR of incremental paddy production of around 34,000 t/year appears realistic, based on average gains in production of around 500 kilograms (kg)/ha/crop for improvement and rehabilitation and 3,900 kg/ha for restoration and extension schemes. Incremental production of OFCs is close to zero on the lowland irrigation areas, but is significant for the 1,054 dugwells and lift irrigation systems.

30. Overall, operational performance of the irrigation systems has been less than expected for a number of reasons:

- (i) In some cases, rehabilitation was too limited to have any noticeable impact. For example in the 3,000-ha Batalagoda scheme, rehabilitation expenditure was SLRs10 million or SLRs3,300/ha (\$50/ha), significantly below the limit of SLRs6,000/ha for improvement. ID has costed full rehabilitation of the scheme at around SLRs80,000/ha.
- (ii) Many FOs have not managed their irrigation schemes effectively, and maintenance has been neglected.
- (iii) Some schemes, particularly the larger schemes in the south of Kurunegala District, have a high proportion of tenant farming. Tenants tend not to maintain the schemes at the same level as do owners.
- (iv) The increasing cost of inputs combined with relatively stable product prices have reduced incentives to increase production.

- (v) Farmers in NWP are conservative and risk averse, which, when combined with a shortage of capital, prevents investment in high-return but risky and capital-intensive OFCs.
- (vi) Drought in 2003-2004 limited cropping intensity and production; most dry zone and some intermediate zone minor schemes missed three consecutive cropping seasons from 2003 *yala* to 2004 *yala*, resulting in increased reliance on off-farm income.

31. One of the Project's objectives was to increase the production of OFCs. With the benefit of hindsight, this objective was unlikely to have been realized in the lowland schemes due to several factors:

- (i) Almost all areas are laid out for rice with a cascade irrigation system, making it difficult for one farmer to grow OFCs unless all farmers along the same tertiary or field canal do the same.
- (ii) Drainage is poor in most schemes, meaning that heavy rains that can occur even during *yala* can cause local flooding and damage to OFCs.
- (iii) Only 10–15% of an average scheme has sandy soils potentially suitable for OFCs.
- (iv) Poor in-field leveling means that the lower parts must be overwatered to ensure that sufficient water is applied to the higher areas.
- (v) Rehabilitation was limited to the headworks and main canals and did not address the issues that prevent upland crops from being grown in lowland areas.
- (vi) OFC cultivation requires more labor than irrigated rice to control weeds in the absence of inundation.
- (vii) Many demonstration plots failed or achieved low yields achieved during the first year or two after scheme construction.
- (viii) The market for rice is well established, widely known, and stable, and the Government sets a minimum price for institutional buyers, tending to underpin the market.
- (ix) The market for OFCs is volatile, with the risks of overproduction, low prices, and the possibility of not being able to sell the output at harvest time.
- (x) Farmers are conservative and risk averse by nature.
- (xi) Agriculture as a primary income source has been declining, reducing both interest in agriculture and the time available for labor-intensive activities such as OFC production.

In the OEM's view, the Project's objective to significantly increase OFC production was unrealistic and did not reflect good analysis during project preparation.

32. Maintenance of all irrigation schemes has been limited. On major and medium schemes, ID staff estimate that only around 20% of the needed annual maintenance budget is provided, resulting in an increasing backlog of maintenance, and ultimately in a need for full re-

rehabilitation. Maintenance activities are limited mainly to weed cleaning of the bunds and canals prior to each cropping season. Little attention has been paid to spillways, sluices, depth gauges, diversion or drop structures, and canal sections. The lack of maintenance is jeopardizing the irrigation efficiency gains made possible by the Project. The problems of FO operation and O&M of schemes and roads became apparent during the implementation period, leading to the decision to further support the FOs. The Japan Fund for Poverty Reduction (JFPR)-funded project was designed to address these issues and is currently being implemented. Its objectives are summarized in Appendix 5. The decision to process the JFPR project to improve project sustainability was sound.

2. Rural Roads

33. The rural roads upgraded under the Project are of variable utility. Although most have light traffic loads, they are generally well regarded by the people using them. According to the impact evaluation study, 33% of respondents considered that the time to travel to town had been much reduced, and a further 53% considered it somewhat reduced. Rural roads require regular maintenance, including the filling of potholes and regravelling for unsealed roads and retarring for Class D roads. The current situation is more or less the same as that given in the PCR, with only 30% of the roads receiving routine maintenance. Conditions are declining on many of the other roads because of a lack of maintenance. PED is responsible for maintaining approximately 200 km of the 415 km of class D and E roads. The remaining class D and E roads, and 573 km of other rural roads either are the responsibility of the local councils (*pradeshiya sabha*) or have not been assigned to any organization and are expected to be maintained by the local villagers. Roads that are highly valued tend to be maintained, and one project road inspected by the OEM in Kimbulwana (right bank area) had been regularly and recently maintained by the FO.¹⁶ Not surprisingly, virtually no maintenance is undertaken on many roads that have not yet been assigned to a specific agency. The few roads inspected by the OEM are still usable, although their utility will decrease at an accelerating rate unless adequate maintenance is undertaken. On sections of several roads inspected, the gravel layer had been displaced and the road surface had collapsed. This problem was exacerbated by lack of camber, which results in accelerating deterioration as water soaks in to the road base, and traffic worsens potholes.

34. The limited participation of the intended beneficiaries in the selection, planning, design, and construction of the roads has reduced ownership. This is a general problem in Sri Lanka, where villagers have come to believe that the Government is responsible for maintaining rural infrastructure. The JFPR project will address the road maintenance issue by appointing village road caretakers, each responsible for 1 km of road, who will be paid from the planned sustainable maintenance funds to be established in each village.

35. When asked by the OEM, project staff and FOs found it difficult to identify specific project roads in the field. The fact that several recent and ongoing projects in NWP have road rehabilitation components compounds the problem of identifying those provided by each project. This points to the need for a simple geographic information system database including global positioning system (GPS) information for all project infrastructure and activities. It is recommended that this be undertaken by the JFPR project.

¹⁶ The standard of canal maintenance by this FO was also exceptional and a model for other FOs.

B. Performance of Operating Entities

36. Several operating entities are relevant to project performance. Of greatest relevance are the FOs. Some FOs are doing well within the confines of their limited autonomy, while the majority of FOs are weak, a situation common throughout Sri Lanka, as discussed in Appendix 2. In Kimbulwana, a group interview with eight FO chairmen indicated that their FOs had substantial bank balances (averaging around SLRs20,000) and were undertaking satisfactory irrigation maintenance, particularly in the long-established right bank areas. Their average tenure as chairmen was around 5 years, indicating a lack of political pressure that some FOs face. At Gal Ambagas Wewa, the FO is well organized, has its own building and shop, and has recently constructed a crop drying plant to produce high-value products such as jackfruit chips. Savings increased by 400% over the project period. While the JFPR project will assist the small and medium irrigation scheme FOs supported under the loan Project, more is required, particularly to establish the policy framework needed to give the FOs real power, and to generate sufficient revenue for effective O&M of their schemes.

37. The need for improving FOs is a nationwide problem and requires further attention by the Government, which relates to enhancing the sense of ownership among FOs, which should be responsible for the proper management of water resources. FOs in larger irrigation schemes appear to be operating more effectively, on average, than those in minor schemes. In part, this is due to the presence of an ID scheme manager, who can assist in settling disputes and ensuring that scheme management is effective and as equitable as possible. The appointment of 1,370 agricultural research and production assistants (ARPAs) is a positive step. They are A-level school graduates who work for both DAS and PDOA to provide agricultural advice and support to farmers. Many have the potential to make a useful contribution to agricultural development and to the FOs in their villages, but will need further support and training.

38. Other operating entities include the Provincial Council, which is responsible for maintaining project roads (through PED), and the *pradeshiya sabhas*, which are responsible in principle for maintaining some of the Class E and other rural roads. Some FOs are maintaining their roads, at least by using soil to fill potholes in gravel roads. All agencies have problems in meeting their maintenance responsibilities, a situation that has been exacerbated by the lack of clarity over who is responsible for many of the roads. In retrospect, the Project should not have commenced design work on any road until a formal agreement was reached for its maintenance.

C. Economic Reevaluation

39. Economic reevaluation was carried out using PCR methodology, which in turn fairly closely reflected the appraisal methodology (Appendix 6). The PCR to some degree underestimated the restoration and extension areas. However, in some other regards, the OEM is more pessimistic than the PCR, for example in the number of people benefiting from road improvements. Overall, the PCR economic analysis is of a high standard. In one area, however (in adding farm-to-market transport cost to the economic value of rice), the PCR is considered to be incorrect, with a consequent reduction in the price of rice (by SLRs900/t), which reduces the economic internal rate of return (EIRR). In aggregate, the changes made reduced the EIRR from 13.7% to 11.4%, an acceptable level for a rural development project, particularly given the high proportion of institutional development costs. Labor in the project area was shadow priced at appraisal and in the PCR, at a rate of 0.8, in conformity with general practice in the early 1990s. However, by the time of the OEM, the situation had changed, with high levels of off-farm earnings by most farm families. In this situation, the market wage had risen, and labor was no

longer considered to be in short supply. Valuing labor at its market rate would reduce the EIRR to 10.4%.

D. Sustainability

40. Project outcomes are unlikely to be sustainable. Maintenance of minor irrigation schemes has often been poor, exacerbated by the crop disease problems and droughts experienced since 1996. Road maintenance has been limited since completion, resulting in deterioration of the sections of many roads. Both problems are being addressed by the JFPR project. Major and medium schemes have fared better due to the involvement of ID and the Irrigation Management Division (IMD) in their management. The irrigation structures built or upgraded under the Project are generally sound, and should contribute to improved operations for many years. However, canal management is less sound, with few minor schemes able to maintain the desirable canal section due to siltation and plowing too close to the outside canal wall. Sustainability is also limited by siltation in many tanks, particularly in the intermediate zone. Agricultural and other activities in the catchments above the tanks are increasing erosion, silt deposition in the tanks, and consequent loss of water storage capacity. While desilting is uneconomic at a cost of SLRs300–600/cubic meter (m³) (equivalent to SLRs3-6 million for 10,000 m³ of storage, which can provide 1 meter of water to 1 ha), it is widely sought by farmers. A return to the former traditional system, wherein each household was responsible for removing a set volume of silt from the tank and adding it to the bund each year, is envisaged under the new 10,000 tanks program. The JFPR project will assist in promoting sustainability.

E. Technical Assistance

41. TA with the objective of enhancing the planning and monitoring capabilities of NWP Provincial Council (NWPC) is rated partly successful. The limited planning capacity of the provincial councils was not fully addressed due to the lack of proper coordination between the PD of NWPC and the EA of the TA. The TA was implemented separately from the loan and lacked a specific supervision mechanism. The PD of NWPC benefited from the TA in terms of collected planning data and improved competency, which were relevant to the Project's goal of balanced regional development. However PD did not sustain the approach and use of the planning formats. This lack of coordination with the loan with which the TA was attached reduced its impact.

IV. OTHER DEVELOPMENT IMPACTS

A. Socioeconomic Impacts

42. One of the main project activities was to upgrade the irrigation systems of the project area to improve livelihoods in the farming communities. It was expected to increase rice and OFC production and to increase income by about \$124 (28%) each for about 70,000 farm families. Project records indicate that a total of 39,000 farm families benefited from minor scheme upgrading. A further 29,000 farmers own and/or operate farms on medium and major schemes, but only a portion of these benefited from the Project. Over 4,000 agricultural and microenterprises were provided with credit. The total number of irrigator beneficiaries was around 52,000 lower than the appraisal estimate due to differences with the appraisal estimates, chiefly the larger farm size and the lack of full rehabilitation on major and medium schemes. The road component targeted farm families around the upgraded tanks. The benefits after road rehabilitation were shared by the communities living along the road and were not beneficiary specific.

43. Little data are available to define the impact of the Project on farm performance. The farmers in minor schemes interviewed by the OEM reported variable impacts, ranging from zero to 50% increase in rice production; the average increase was 34%. In relation to farm income, the impact evaluation survey of 13 medium/major and 100 minor schemes indicated farm household incomes (in 2000) of around SLRs26,000, comprising rice, SLRs24,400; OFCs, SLRs1,200; and livestock, SLRs500. This was more than double the level in 1991, though in real terms the increase was 15%. Incomes on the medium and major schemes would have been higher, due to larger farm areas (averaging 0.52 ha compared with the 0.37-ha average area of minor scheme farms) and higher average yields. In the major schemes, few farmers live in the vicinity of the scheme, with their land either tenanted or farmed only on a seasonal basis. The Project has also been highly contributory to poverty reduction. A recent study assessed the economic value of the 429 tanks in the Kala Oya basin for cultivation, aquatic resources, water supply, commerce, and fisheries. It indicated an average benefit of \$425/household, and that the tanks are of great importance to poorer households. It also demonstrated that without rehabilitation of the tanks, any solution to loss of water storage would be short term and would yield lower total economic benefits.

44. Off-farm income has become more significant over the project period, accounting for 64% of household income for the 417 farmers surveyed during impact evaluation. Rice contributed 34% of income (cash and subsistence), and OFCs, 2%. In the farmer groups interviewed by the OEM, all households had some off-farm income from relatives working abroad, business operation, or working as laborers or tradespeople. It would have been difficult for many families to survive without such income, for example in case of drought. While farming will recover, it will not regain its former dominance as the main contributor to family income.

45. The OEM conducted a mail survey of dugwell loan recipients. The cultivated area ranged between 0.2 and 0.4 ha during the *yala* season. Net income from farm production was SLRs20,000–30,000/year. Based on the OEM survey, the annual increase in household income was SLRs15,000–25,000.

46. According to the 2002 household income and expenditure surveys, average annual household incomes in Kurunegala and Puttalam districts were SLRs129,300 (\$1,440) and SLRs134,700 (\$1,500), respectively. About a quarter of the households in Puttalam, the fifth poorest district of the country, and one fifth of the households in Kurunegala had incomes below the official poverty line in 2002. Although *samurdhi* (government welfare payments) data are not a reliable indicator of poverty, time series data show that the level of poverty decreased slightly between 1997 and 2001 (Table A.1.3, Appendix 1).

B. Environmental Impact

47. Overall, the Project had only minor impacts on the environment. Positive impacts included (i) improved water management in many rehabilitated irrigation schemes, (ii) the successful promotion of IPM among some FOs, (iii) a marginal increase in groundwater recharge in the vicinity of some rehabilitated tanks, and (iv) a marginal increase in tank wetland habitat for much of the year. Negative impacts included (i) a marginal increase in the use of agricultural chemicals in some irrigation schemes; and (ii) a minor increase in groundwater extraction from the dugwells, and a slight increase in water extraction from rivers for pump irrigation. The Project's environmental monitoring component operated for 3 years, assisting the Central Environmental Authority to undertake water quality testing. No significant problems were found. It had been planned to develop a number of integrated catchment management plans to assist in reducing erosion and tank siltation, but only the two pilot schemes were implemented.

This is regrettable, since tank siltation is a problem in many intermediate and some dry zone schemes.

C. Impact on Institutions and Policy

48. **Farmer Organizations.** The impact of the Project on FOs in the project area has been high. A survey by Kurunegala DAS in 2002 found that of 2,052 FOs, 1,823 or 89% were registered. This makes them legal entities that can undertake water management, input distribution, O&M, and contracts for upgrading infrastructure. The OEM observed that many FOs are functioning well and meeting the needs of their members. Most of the FOs studied became effective as a result of the Project. Project data indicate that the savings of the FOs increased substantially from preproject levels, from an average of SLRs5,000 to SLRs26,700. However, few FOs were able to reinvest their savings productively due to their lack of managerial skills. The savings have allowed some FOs to provide agricultural input credit for their members and to make urgent repairs. Several FOs have developed into strong and sustainable organizations that meet many of the demands of their farming communities.

49. Difficulties still exist in managing their schemes due to inability to control infractions, such as damage by livestock, problems of tenant farming, overuse of water, damage to structures, nonparticipation in meetings, and nonpayment of FO and O&M fees. About one fourth of FOs now can manage O&M funds by themselves. But there is little sense of ownership of most of the irrigation systems. FOs do what they are prescribed to do by the authorities. Nominally they own the systems, but in practice many decisions are taken by government officials (e.g., preparation of contracts for undertaking repairs). In some cases money collected by the FOs cannot be spent without the approval of DAS. The legal framework has not yet been developed that would allow FOs to fully manage, operate, and maintain their schemes. FOs seldom maintain good records, and records are not handed over to new committee members. As the FOs handle quite large amounts of money, they need to be legally accountable and fully transparent. Otherwise, they can lose the confidence of their members. There may be a perception that FO committee members use the funds to benefit themselves. If there is a perception of corruption among the beneficiaries, the credibility and effectiveness of the FOs will be undermined.

50. The IAs were strengthened by the Project, though to a limited degree. DAS's relationship with the FOs improved due to interaction with the Project, though DAS requires capacity building and equipment to monitor and support the FOs. Both the provincial and national irrigation departments, responsible for minor and medium/major tanks, respectively, have improved their interaction with the farming community as a result of the Project and national policy. The semiparticipatory approach to scheme design was positive for PED. ID (and IMD) have close interaction with the FOs on the major and medium schemes, a role that was enhanced by the Project. The partial empowerment of the FOs made them more valid partners for the IAs. PDOA remains weak, with limited capacity to provide support and extension to farmers. However, the ARPAs have the potential to become valuable extension agents in relation to both FOs and agricultural production. The Project had little institutional impact on the banks other than causing a flurry of activity in agricultural and microenterprise lending for a short period. While the Project made substantial efforts to strengthen the state agencies involved in implementation, ultimately it had to rely on private sector engineers and consultants, and on part-time government employees on a contract basis to meet its construction and extension targets. The large number of IAs complicated management and made the achievement of institutional strengthening objectives more difficult.

V. OVERALL ASSESSMENT

A. Relevance

51. At the time of appraisal in 1992, half of all households were below the poverty line. Irrigation infrastructure had deteriorated following the abandoning of the traditional royal system in the late 1950s. Rehabilitation was essential to increase farm productivity and reduce poverty. The Government consequently accorded high priority to development in the province, which had received relatively limited assistance compared with other irrigated areas such as the eastern provinces, which are irrigated largely from the Mahaweli scheme, and the southern area, where ADB had supported large irrigation projects in Kirindi Oya and Walawe. The current Government's far-reaching reform agenda focuses on promoting the private sector and balanced regional development and is rated as relevant.

B. Efficacy

52. Although the Project's physical targets were largely met as reported in the PCR, the OEM observed that the expectations for continuing improvements expressed in the PCR had not materialized. Specifically, (i) the "full level of performance" projected for the rehabilitated irrigation schemes by 2005 is no longer realistic; (ii) the majority of the rehabilitated irrigation schemes are not being maintained as planned; (iii) most roads were not rehabilitated to an appropriate standard and are not being maintained; and (iv) around 30% of the microenterprises established with project credit were not sustainable. The project rating is assessed to be less efficacious. Nonetheless, the Project has made significant contributions to national irrigation and road programs, and has contributed to the objectives of employment generation and poverty reduction in NWP. If more project resources had been utilized to further develop the FOs, and to increase the quality of the infrastructure rehabilitation works, instead of canceling 42% of the loan, then the efficacy rating could have been higher.

C. Efficiency

53. The Project is assessed as being efficient, although it is close to the borderline for a rating of less efficient. It demonstrated limited efficiency for its first few years of implementation. However, the introduction of new implementation systems, involving the use of private contractors for design, assessment, and construction supervision, allowed most targets to be met or exceeded with relatively little time overrun. While the OEM is more pessimistic than the PCR with regard to project economic outcomes, the revised EIRR of 11.4% being below both the appraisal estimate of 16.7% and the PCR estimate of 13.7%, it still is considered reasonable for an agriculture sector project.

D. Sustainability

54. The ongoing JFPR project was developed to address some of the loan Project's shortcomings by assisting in establishing sustainable approaches to irrigation system and road maintenance. JFPR project resources, which will not address the root cause of the sustainability problem, are also limited when compared with the extensive support required by most FOs. Sustainability is assessed as less likely.

E. Institutional Development and Other Impacts

55. The best among the FOs, which could be considered about one fourth of their total number, including several visited by the OEM, are models that other FOs can emulate. The institutional structure of the Project was appropriate for the investments made but in practice was complex and difficult to manage. Some institutions performed better than others. DAS and the Agricultural Development Authority provided useful support to the FOs and the credit components, respectively. BME was weak. The Project did assist all institutions through training, contribution to budget, and the provision of equipment and buildings. However, the overall institutional impact was moderate. The Project had little positive or negative environmental impact. Three years of monitoring under the Project's environmental monitoring component did not identify any adverse trends in water quality. The Project was unable to build on its catchment management pilot subprojects, thus missing an opportunity to make a positive impact on environmental management in Sri Lanka.

F. Overall Project Rating

56. The Project is rated partly successful. It failed to meet its crop diversification targets. However, in practice this goal was not achievable under the conditions prevailing in the project area irrigation schemes and with the nature of system improvement undertaken. The Project did contribute significantly to increased rice production, and through its credit component, to upland crop production and women's employment. Improvements to the schemes were useful and reflected farmers' priorities. Against these plusses must be set the poor maintenance and the lack of institutionalization of effective farmer management of most schemes. These weaknesses will likely result in a situation wherein the project benefits are not sustainable. These problems are not unique to the Project and are in fact widespread in Sri Lankan irrigated agriculture. Establishing a dynamic and viable small-scale irrigated agriculture sector is a major challenge for farmers, institutions, and aid partners.

G. Assessment of ADB and Borrower Performance

57. Overall, ADB's performance is assessed as satisfactory. Through good project supervision, ADB made substantial efforts to improve project implementation, which resulted in the Project meeting its physical targets. The review missions, particularly the MTR, were effective. The Government's performance was also satisfactory. The Government ensured that counterpart funds were made available on a timely basis, and endeavored to provide sufficient staff resources in a time of strict staffing restrictions and cuts that had commenced in 1990. The failure of the provincial government to meet its commitments to the Project was largely the result of its overcommitment to other projects, which could perhaps have been avoided or mitigated if there had been better institutional assessment during project preparation.

VI. ISSUES, LESSONS, AND FOLLOW-UP ACTIONS

A. Key Issues for the Future

1. Farmer Ownership and Scheme O&M Need To Be Improved

58. It has been difficult to develop FOs that are capable of effectively managing and maintaining their irrigation schemes. The problem has been studied extensively in Sri Lanka and elsewhere, and there are numerous examples of successful FOs whose experience can be applied. To support the further development of Sri Lanka's FOs, the Government should

establish a clearly defined policy framework within which they can operate. The creation of a highly participatory environment and a strong sense of ownership among FO membership are essential. Clear guidelines are needed with regard to the imposition of service fees and sanctions. Considering that the O&M issue has been the central concern of all water resources development projects, further examination on related matters before project planning and formulation would be critical. For the newly planned water resources development project, intensive examination of the readiness of FOs would be very important during the project planning stage to examine its rationale for intervention.

59. While the FOs have improved their water management, in part due to the Project, there is a need to increase irrigation efficiency. This can be achieved through improved management of sluices and diversions, the construction of improved diversion structures, and improved scheme layout and field leveling. Improved irrigation efficiency is particularly important in the dry zone and in dry years in the intermediate zone. Ultimately, O&M fees should be systematically determined to provide incentives to increase efficiency, requiring measurement of water releases to the distributary canals. Initially, this will be more relevant on major and medium schemes, and could be tried, perhaps as part of ID's Deduru Oya catchment management program.

60. Until the late 1950s, farmers were fully responsible for the O&M of their irrigation systems. Traditionally, irrigation had been managed by the *vel vidane*, a representative of the king. Over time and through successive policy changes, the self-reliance of farmers has been eroded. While it is not possible or desirable to return to the old state, there are valuable concepts from the past that merit reexamination, modification, and extension. Examples include (i) the *bethma* system for sharing land near the head-end of the scheme during the *yala* season, so that tailend or landless farmers can produce crops; (ii) work sharing for land preparation and maintenance; (iii) strong delegated management; and (iv) tank desilting. Other traditional practices such as slash-and-burn (*chena*) farming need to be prevented in tank catchments. Experience in other Asian countries (such as the Lao People's Democratic Republic and Viet Nam) suggests that strong FOs and support programs and legislation can make major inroads into the slash-and-burn problem.

61. The improved performance of medium schemes compared with minor schemes suggests that the appointment of an independent manager, appointed by ID in the case of medium schemes, has advantages. Small schemes could develop a similar mechanism, for example, by four or five schemes appointing a manager with similar powers to those of an ID manager of a medium scheme. In principle, the appointment should be made by the apex association of the schemes, but in practice, at least initially, perhaps ID could employ the manager.

2. Agronomic Problems in the Project Area Need to be Addressed

62. Two schemes of the 12 evaluated by the OEM had low rice yields due to soil problems. This may indicate a serious issue in the project area and one that needs further study. If the problem is widespread, it warrants urgent attention by government agencies to analyze the causes and develop appropriate solutions. These may include improved flushing and drainage, and the planting of salt-tolerant rice varieties, supported by necessary extension.

3. Project Records Need To Be Made More Secure and Accessible

63. Many of project records and reports that should have been readily available from the IAs were either lost or otherwise unavailable. Given the ease with which information can now be stored in soft format, there is no longer any reason why project data, reports, and other important records cannot be maintained long after implementation has finished. Ongoing and future projects should be required to maintain a simple geographical information system database that includes the coordinates of all project infrastructure. This would facilitate locating project sites in the field, and also make it possible to view how the geographical coverage of various projects and activities overlaps. Having accurate records of where project facilities are constructed is essential for good project administration and to ensure that corruption does not result in expenditures for “ghost” projects.

64. Provided FOs can see some benefit (for example, in the timely feedback of comparative data) they will often be prepared to undertake participatory monitoring (e.g., of cropping patterns and yields). Many of these data could be recorded at the *kanna* (crop-planning) meeting for the subsequent crop. The ARPAs could be given responsibility for this task.

4. The Institutional and Policy Framework Needs To Be Improved

65. Complex institutional structures caused problems during project implementation. While the project design included a multiplicity of agencies for sound reasons, it may be timely to review the appropriateness of this situation. For example, it might now be more efficient and effective to merge IMD with ID, and possibly DAS with PDOA.

66. The agricultural and irrigation sector policy environment is not well defined, in part due to changing priorities of successive governments. Clearly defined and well-publicized policies are needed in areas such as water use, irrigation scheme management, FO organization and operation, catchment management, tank desilting, agricultural marketing, and service supply. The policies will need to emphasize FO self-reliance and private sector support to compensate for the public sector’s inability to provide adequate services to the industry.

B. Lessons Identified

67. The establishment of effective and self-reliant FOs is difficult in Sri Lanka as elsewhere. Critical success factors include (i) freedom from interference from locally elected political representatives and concerned officials; (ii) the provision of appropriate and prolonged support through extension and training; (iii) a strong sense ownership among the FO membership, engendered by high participation levels in decisions affecting the scheme; (iv) the establishment of tailored articles, regulations, O&M service fees, and penalties; (v) effective management to ensure that rules are followed; and (vi) equitable sharing of benefits.

68. Other lessons from the project experience include the following:

- (i) In part because initial implementation was slow, many schemes were completed late in the project period. This left little time to consolidate the FOs and ensure that O&M was effective, leading to the need for a successor project. Project designs should allow for a period following subproject completion when ongoing support can be provided.

- (ii) Adequate institutional analysis during project design is essential to ensure that each IA has the capacity to fulfill its functions effectively, or to define other methods of conducting project activities (such as contracting in services).
- (iii) The responsibility for O&M of rehabilitated roads must be clearly defined when each road is selected. The completed road must be formally handed over to the agency concerned when works have been completed.
- (iv) The Project did well to exceed most of its targets. However, in practice it may have been preferable to rehabilitate a smaller number of irrigation schemes and roads to a higher standard, given the accumulating maintenance deficit. These matters could have been more adequately examined during project formulation with particular emphasis on the readiness of FOs in terms of O&M-related matters.
- (v) Road rehabilitation needs to be of a higher standard than normal if follow-up maintenance is to be low (e.g., in terms of compaction, drainage, and gravel thickness).
- (vi) Assumptions about farmers' response to recommendations for changing behavior (e.g., to grow more OFCs) should be made only after detailed assessment of the agronomic and social factors that dictate current practice, ideally tested in a pilot project.
- (vii) Equitable sharing of project benefits in a water-constrained situation requires adoption of a land-sharing system (called *bethma* in Sinhala). Such systems are practiced in some schemes and could be more widely promoted to support the often poor tailend farmers and the landless.
- (viii) Agricultural activities generally have little impact on water quality. IPM and more careful use of agrochemicals are desirable. In the case of the Project, greater benefits would have been gained had scarce TA resources been more closely aligned with project objectives, such as community mobilization and FO support.

C. Follow-Up Actions

69. A number of the issues raised require follow-up action by the Government. Some require changes in institutional culture and incentive structures. The actions in the table should be considered to promote the further achievement of project benefits and their sustainability. The follow-up function of the JFPR project⁸ would assist an effective long-term solution of the O&M issues for both rural roads and water resources management.

⁸ Agriculture, Environment, and Natural Resources Division, South Asia Department, which is responsible for administering JFPR, in consultation with Sri Lanka Resident Mission, confirmed the follow-up actions.

Follow-Up Actions

Action	Institutions responsible	Suggested timing	Monitoring
i. Assess the agronomic problems in project and other schemes; provide soil testing and extension to assist in mitigation.	JFPR project PDOA, NDA	2004/05	SLRM
ii. Introduce participatory monitoring by FOs, with information recorded on a seasonal basis (crop areas, yields, water levels), collected by ARPAs and processed by DAS through training on repairing and implementing seasonal O&M plans to be supported by as a part of the JFPR project.	DAS, JFPR project	End 2005	SLRM
iii. Require FOs to maintain books for a minimum period and to ensure that the books are passed to new secretaries and treasurers.	DAS	End 2005	SLRM
iv. Expand ongoing and refresher training for FO staff, particularly following elections where new staff are taken on; provide training in participation to IA officers.	DAS	End 2005	MALLI
v. Conduct workshops to present results of project performance audit report to IAs.	MALLI	March 2005	SLRM
vi. Define methods for increasing FO revenues to allow improved O&M and payment of honoraria to senior FO staff.	DAS, IMD, ID	End 2005	SLRM
vii. Review all project roads to define ownership and maintenance responsibilities, and assign responsibilities; increase the proportion formally accepted by institutions including the PSs.	JFPR project	End 2005	SLRM
viii. Pilot test the feasibility of developing a geographic information system/global positioning system database of project roads (start and finish) and irrigation schemes (main sluice).	JFPR project	End 2005	SLRM

ARPA = agricultural research and production assistants, DAS = Department of Agrarian Services, FO = farmer organization, IA = implementing agency, ID = Irrigation Department, IMD = Irrigation Management Division, JFPR = Japan Fund for Poverty Reduction, MALLI = Ministry of Agriculture Livestock Lands and Irrigation, NDA = National Department of Agriculture, O&M = operation and maintenance, PDOA = Provincial Department of Agriculture, SLRM = Sri Lanka Resident Mission.

PROJECT-RELATED STATISTICS

Table A1.1: Cost Breakdown by Project Component (\$ million)

Component	Appraisal Estimate			Actual		
	Foreign	Local	Total	Foreign	Local	Total
Rural Infrastructure						
Irrigation and Drainage	3.5	8.6	12.1	2.6	8.4	11.0
Rural Roads	1.2	2.8	4.0	0.9	1.6	2.5
Subtotal	4.7	11.4	16.1	3.5	10.0	13.5
Credit						
Dugwell	0.5	1.9	2.4	0.0	0.5	0.5
Lift Irrigation	0.1	0.1	0.2	0.0	0.0	0.0
Women Microenterprises	0.0	0.2	0.2	0.0	1.3	1.3
Subtotal	0.6	2.2	2.8	0.0	1.8	1.8
Institutional Development	3.0	5.6	8.6	2.7	3.8	6.5
Total Base Cost	8.3	19.2	27.5	6.2	15.6	21.8
Physical Contingencies	0.8	1.7	2.5	0.0	0.0	0.0
Price Contingencies	1.7	7.2	8.9	0.0	0.0	0.0
Service Charge	0.9	0.0	0.9	0.5	0.0	0.5
Technical Assistance Recovery	0.2	0.0	0.2	0.1	0.0	0.1
Total Project Cost	11.9	28.1	40.0	6.8	15.6	22.4

Source: Project completion report.

Table A1.2: Water Resources Outputs

Component	Appraisal Target		Achieved		Total Cost (SLRs'000)	Average Cost (SLRs/ha)	Average Cost (\$/ha)
	Number	Area (ha)	Number	Area (ha)			
Irrigation Improvement							
Major Schemes	5		5	7830	34700	4432	65
Medium Schemes	17		10	3170	15000	4732	69
Minor Schemes	300		100	3132	29000	9259	136
Total Improvement	322	18,600	115	14132	78700	5569	82
Rehabilitation							
Medium Schemes	9		16	3079	42200	13706	201
Minor Schemes	300		523	10456	355600	34009	498
Total Rehabilitation	309	6300	539	13535	397800	29390	430
Restoration							
Medium Schemes	1		1	120	7700	64167	939
Minor Schemes	30		40	825	55100	66788	978
Total Restoration	31	800	41	945	62800	66455	973
Extension Medium Schemes	4	270	3	704	37000	52557	769
Total Irrigation	666	25,970	697	28,686	576300	20090	294

ha = hectare.

Average exchange rate 1998 SLRs/\$ = 68.3

Table A1.3: Number of Recipients of Samurdhi Program Support

Year	SLRs1000	SLRs500	SLRs250	SLRs200	SLRs100	Total
1997	1,729	121,077	36,332	42,057	24,445	225,640
1998	1,729	121,077	36,332	42,057	24,445	225,640
1999	1,425	121,562	35,661	41,700	25,369	225,717
2000	1,121	118,047	33,543	45,916	26,008	224,635
2001	1,032	118,047	33,543	45,916	26,008	224,546

Source: Samurdhi Secretariat, North Western Province, May 2002, reported by PCR.

Table A1.4: Road Performance

Village/ Work undertaken	Class	Width (m)	Cost SLRs'000	Length (km)	Families	Benefits
Ihala Pudiyankulama – Nawaththegama culverts, gravel, grains	D	3.6	1460	13.8	800	Travel time much reduced (33%). Prices up from low cost part of road Maintenance by PED
Galgamuwa – Palukandawela culverts, gravel, drains	D	3.0	1784	5.0	200	Time improved Prices improved Maintenance poor, road deteriorating, no one responsible
Nawadankulama – Periyakadawala tarring of road	D	4.0	715	4.1	600	Time much reduced (50%) Much improved visits by officers Prices improved (67%) Maintenance satisfactory by PED
Hunupola – Makul Wewa culvert, drains, gravelling	Ag	4.0	358	3.4	2,000	Motorability good No change in Ag visits or prices Maintained by ID
Thabbowa LB Canal gravelling	Canal	3.0	540	9.0	1,200	Time somewhat reduced Visits improved (50%) Price improve (67%) Maintained by ID
Hulugalla RB formation and gravelling	Ag	2.5	497	1.5	probably few – est. 200	Time to town somewhat reduced Maintained by farmers, gravel washed off one section
Total			5354	36.8	5,000	

Ag = agriculture, est. = estimate, ID = irrigation Department, PED = Provincial Engineering Department.

Source: Northern Province reports.

FARMER ORGANIZATIONS

A. Introduction

1. The hydraulic civilization of the dry zone of Sri Lanka dates back several centuries. The water supply for crop cultivation is based on a technically sound network of irrigation schemes (major, medium, and minor). The water is not to be controlled by individual farmers, as it is a common resource. Furthermore, unlike in rain-fed farming, irrigation structures need regular maintenance to stay in good condition, requiring both human and monetary resources. The collection of fees from water users and the contribution of labor are essential to maintain the system. Also farmers have to take collective action to use water efficiently and effectively. A number of agencies including the Irrigation Department (ID), the Irrigation Management Division (IMD), and the Department of Agrarian Services (DAS) are making efforts to achieve efficient water management and effective and sustainable operation and maintenance (O&M). However, this has yet to be realized in most schemes. Work by projects and the authorities is not yet sufficient to make this a reality. This annex provides some information on the farmer organizations (FOs) in the project area.

B. Historical Overview

2. The ancient irrigation system was managed under a system of benevolent dictatorship. The king owned all natural resources – land, water, and forest—and gave land to farmers for cultivation. The method of water use and the cultivation calendar were prepared in consultation between the farmer and the king's representative, later called the *vel vidane*, who collected fees for water, depending on the area of irrigated land owned. The *vel vidane* required the farmers to undertake O&M and desilting every *yala* (dry) season, when water levels in the tank were low. This was called *katti kepeema*, removing of soil from the tank bed. The volume to be removed by each farmer was determined by the farmer's area of irrigated rice land. The *vel vidane* marked the size of the pile for each farmer, was responsible for managing water, and had the authority to take action against those who violated the rules and regulations. In addition to this, the *vel vidane* distributed the fish catch from the tank each year with the participation of the farmers.¹

3. In some systems, farmers had two plots of lands, one at the head and the other at the tail. This prevented overuse of water by head-end farmers. This technosocial model was very effective, and to some degree all the stakeholders participated in the irrigation management system. However, this system was destroyed by internal and external political struggles. Dry zone agriculture was badly neglected during the British rule.

4. After Independence, the Government focused on restoration of dry zone irrigation schemes. This was mainly to utilize the the rich lands in the dry zone and to settle people from the wet zone in the dry zone. The population in many large and medium irrigation schemes comprises settlers from various part of the country, while the majority of the people under small-scale tanks have been living in their traditional villages for many generations. Social organization in the settlement schemes and traditional villages has thus evolved differently.

¹ Elderly farmers remember that the distribution of fish was based on the principles of religion, equity, and land ownership. Of the fish catch, 1/3 was for the temple, 1/3 for pregnant and lactating women and widows, and 1/3 for the farmers, distributed by the *vel vidane* according to the size of the land owned.

C. FO and State Management

5. The management of irrigation systems was seen as the purview of technical personnel.² The farmer as the end user had little voice in water distribution especially in the major and medium-scale irrigation systems, until the mid-1980s; as yet this problem has not been fully resolved. The overall responsibility for agricultural aspects rested with the Department of Agriculture.³ Until the provincial council system was introduced, the departments of the central Government handled all activities in irrigation settlements. Technical responsibility for major and medium tanks is now under ID and the Mahaweli Development Authority. Responsibility for minor tanks is with the provincial irrigation department and the Agrarian Services Department. Meanwhile, IMD was set up in the mid-1980s to take responsibility for farmer organization, as ID alone was unable to solve the problems of the farming community. IMD, now a division under the Ministry of Agriculture, assigned a project manager to look into the problems of the farming community in major and medium-level irrigation systems. Another recent development in the last few years has been the appointment of agricultural research and production assistants (ARPAs). This was a political move to utilize unemployed youths who were unable to enter university. On appointment, most lacked basic knowledge of agriculture and irrigated farming. They work 3 days/week for the Provincial Department of Agriculture and 2 days/week for DAS, providing a link between the farming community and the authorities. Many have been able to develop rapport with farmers and have the potential to provide a valuable service. Substantial further training and ongoing support will be needed.

D. State Intervention to Get FO Participation

6. Irrigation settlement schemes in the dry zone encountered technical deficiencies and incompatibilities with the social system. These could be solved only by organizing the farmer community. The state attempted to provide ways to organize farmers by introducing various formal state-sponsored organizations, like *paladawardena sahba* (production committees). However, these did not lead to increased farmer participation in decision-making processes. In the 1980s, experimentation in participatory water management was carried out in different parts of the dry zone, especially after the establishment of IMD. The growing international trend towards participatory management in the 1990s prompted government officers to attempt to enlist the participation of farmers in development initiatives. Attention was paid to the possibility of establishing a network of water user organizations at the secondary (distributary canal) and tertiary (field canal) levels in the major and medium-level schemes. Models were tested in Minipe, Tambuttegama, and Kimbulwana. One of the best-known experiments in participatory water management is Gal Oya, where the setting up of a FO was facilitated by state-sponsored catalysts.

7. The systematic sharing of information and experience among technocrats, academics, policymakers and bureaucrats was lacking until the 1980s. The introduction of IMD and the contribution made by the Irrigation and Water Management Institute (based in Colombo) at the academic and policy levels brought the subject into the open. This resulted in paying more attention to irrigation systems and farmers' problems. Therefore, over time, several irrigation

² The government took over responsibility for the management of major and medium irrigation schemes after rehabilitation (by ID), of new schemes (by the Mahaweli Development Authority), and of minor schemes (by DAS).

³ To provide extension services, agricultural extension officers were attached to the Department of Agriculture until the 1980s. This system was abandoned, as the Government was unable to continue with this free service. The agricultural extension officers were given the post of *grama niladhari*.

rehabilitation projects⁴ promoted farmer participation in construction, O&M, and water management.

8. The level of farmer participation in the above-mentioned projects was passive or marginal, varying in degree from project to project. Under the North Western Province Water Resource Development Project, compared with all the other irrigation projects, farmers have been given substantial responsibilities for construction and O&M. All contracts relating to minor tanks were given to FOs. The Project has been able to get the farmers' participation (although passive) from needs assessment to construction. The farmer community is happy, because they were trusted and were handed over the financial responsibility for upgrading their systems although they are not satisfied with the volume of work carried out under the Project.⁵ IMD in Pimburettawa and Nagadeepa tested similar systems between 1986 and 1988 through a nongovernment organization. However the system established was not sustained due to problems inherited by the implementing agency.⁶

E. Brief Assessment of FOs under WRDP-NWP

9. Examination of the project achievements demonstrates that upgrading irrigation physical infrastructure can be done with farmer participation. Quality of output can be assured by providing farmers with simple construction know-how. If the funds generated by FOs through their involvement in the construction activities of a project are properly invested, the FOs can be more self-sufficient and undertake responsibility for O&M, water management, crop production, and input supply.

10. Information from over 300 tanks indicates that the average savings of FOs were SLRs4,950 before and SLRs26,650 after the Project, differing from FO to FO depending on management and leadership capacities. Of the 10 tanks visited by the Operations Evaluation Mission (OEM), the majority of the FOs were active. About 25% of the FOs have used funds generated from construction work very effectively. Some FOs were created by or revitalized under the Project and have subsequently sustained their activities.

11. Some FOs such as the Ekamuthu Govi Sanvidanaya in the Gal Ambalgas Wewa scheme in Mahawa were established under the project and managed to save a sum of money to invest in various farmer-centered profit-making activities. This was due mainly to proper management of resources and the committed leadership of the FO. This FO has the characteristics of a small company, meeting many of its members' requirements (credit, social, and cultural activities), and has more than SLRs2 million worth of assets (Table A2.1). But many FOs that undertook project contracts have not been able to use the funds collected effectively. Many are waiting for another project to carry out the balance of work.⁷

⁴ The Tank Irrigation Management Project, Major Irrigation Rehabilitation Project, Village Irrigation Rehabilitation Project, Gal Oya Rehabilitation Project, Irrigation Systems Management Project, National Irrigation rehabilitation Project, and Dry Zone Participatory Development Project.

⁵ The farmers' expectations have been hardly met by the Project, as the farmers' concern about desilting of tanks was not addressed by the Project.

⁶ The reason was that the NGO from the very beginning tried to give all the responsibilities to the FOs and the role played by the technocrats and bureaucrats was not been paid any attention. This one-sided approach cannot always not yield the desired results.

⁷ Japan Fund for Poverty Reduction project is planning to carry out work in half of the tanks already upgraded, indicating that O&M work was not properly attended to by the FOs after the loan Project.

Table A2.1: Assets of Ekamuthu FO in Mahawa, Kurunegala

Item	Source	SLRs'000
Building (FO office and sales center)	Land free, construction labor free, cost of materials by the FO	1,000
Agrochemicals, fertilizer, etc.	FO	100
Furniture (chairs, cupboard, etc.)	FO	150
Dryer	Gift	110
2-wheel tractors (2)	FO through a loan	500
Threshing machine	DAS	80
Welfare Fund	FO	90
Total		2,030

DAS = Department of Agrarian Services, FO = farmer organization.
Source: Ekamuthu FO.

12. Based on discussions and observations, the changes in the FOs in relation to construction work under the Project could be divided into three classes: (i) FOs that were functional were strengthened through assistance from the Project; (ii) FOs that were dysfunctional became functional with project support, although some became nonfunctional after the Project; and (iii) some FOs were formed just to get contracts for the personal benefit of their leaders, who had direct or indirect contacts with the implementing agencies.

13. Kurunegala DAS indicated 2,258 FOs in the district in 2004 of which 1,988 were registered (Table A2.2). Membership totaled 140,500 (33,000 women and 107,500 men). Average savings were Rs 33,100 per FO and Rs 530 per member, sufficient (potentially) to undertake basic O&M.

Table A2.2: Financial Status of FOs in Kurunegala District, 2004

Item	Quantity
Total number of FOs	2,258
Number of FOs registered under DAS	1,988
Number of meetings held (Mahasaba)	2,267
Average attendance	23
Number of Committee meetings held	2,170
Average attendance	6
Average membership fee per member	42
Average fixed deposit per FO	2,600
Average current account per FO	7,900
Average savings account balance per FO	19,200
Cash in hand per FO	,830
Per FO (total)	33,100
Per member	530

DAS = Department of Agrarian Services, FO = farmer organization.
Source: Kurunegala Department of Agrarian Services.

F. Issues

14. Several issues have not yet been properly addressed either by the project or by other institutions:

15. **Leadership** is one of the main factors in the sustainability of FOs. In many FOs the leadership is not strong. In some cases, the key officers do not want to continue with the voluntary job due to the high opportunity cost. Some say that however much they work, they are always blamed, but no one is prepared to take over the leadership role. They engaged in FO work to assist their communities. However, many farmers are not willing to pay honoraria to the FO leaders, even though some work on a full-time basis.

16. **Participation rates and farmer contributions** are relatively low. Many FOs cannot control damage by livestock, illegal use of water, and nonpayment of membership and O&M fees due to lack of formal rules and regulations. FOs cannot take effective action against members as they have not been provided with the necessary legal framework.

17. **FOs handle large amounts of money for construction** work without formal legal cover (but given authority by a circular of the DAS. Now they, together with the implementing authorities, control the money. However, FOs need formal legal and financial recognition free of outside control if they are to be accountable for money and all financial transactions. Otherwise they can lose the confidence of their members, and the members cannot take any action against a leader for misuse of funds.

18. **Ownership of the system** (land, water, money and other resources) is another unsolved problem. The Provincial Engineering Department says that farmers own the minor irrigation systems. Some knowledgeable farmers think it belongs to them, but the majority of farmers think that the schemes belong to the Government. Hence, they believe that the Government should undertake the improvement of physical infrastructure. This dependency increased soon after the Government took over O&M activities in the medium and major schemes. Later on, many irrigation development projects were implemented without the participation and consent of the farmer community. This dependency has had long-term impact on irrigation structures. The lands of the major and medium schemes belong to ID, and the lands in minor irrigation schemes belong to farmers. The major decisions are taken by authorities; legal power lies with the authorities; money can be used only with the approval of the authorities; improvements and structural modifications are always done by the authorities. Thus the farmers lack a sense of ownership of the system. Nominally, the FOs own the systems, but in practice the authorities take many decisions. For example, the authorities prepare the contracts for undertaking repairs to the systems, and money collected by the FOs cannot be spent without the approval of DAS. Some authorities emphasize farmer ownership only when they want the FOs to undertake some labor-intensive work. Thus FOs are seen as the easy implementation arm by many authorities. Unless programs are introduced to increase the sense of ownership and to decrease the control of the authorities, the responsibility for O&M of the schemes will not be accepted by the FOs.

19. **Collective action:** FOs in major and medium schemes often experience difficulties in organizing farmers for collective action due to the absence of the owners. The real owners of the land are engaged in income-earning activities outside the community and therefore cannot participate in scheme activities and O&M. As farming is not their main income source, they rent their land to tenant farmers. The cultivator's income is limited, since part of the crop is shared

with the owner. They are therefore seldom interested in maintaining the system. The tenant farmers in some FOs of major and medium schemes are not members of the FOs.

20. **Proper and continuous record keeping and bookkeeping** are two inherited problems of FOs. Records are kept while the responsible officer is in power. If new members are elected for key positions, the books and records may not be handed over to the newcomer. This is worse if the newcomers are chosen after competition between different social or political factions. This aspect needs strengthening to empower the membership.

21. **DAS monitoring of FOs:** By a circular in December 2003 from the Commissioner General of Agrarian Services, ARPAs have been assigned to collect data on every FO. FOs are classified into five classes, with 'A' being excellent and 'E' being nonfunctional. The following factors are assessed: (i) structure of the FO (maximum marks 80), (ii) meetings held (110), (iii) bookkeeping (90), (iv) fund raising (60), (v) permanent assets (70), (vi) variable assets (80), (vii) sales of agriculture inputs (80), (viii) responsibilities (40), (ix) implementing special projects (160), (x) banking activities (180), and (xi) managerial and collective work (60).

22. Under this method of evaluation, no FO can reach Level A due to the strictness of the methodology, a classification more relevant to commercial businesses, with high cut-off points between classes. This appears to be another top-down nonparticipatory initiative of an authority. Of the FOs observed by the OEM, at least one should have been classified under A and several under B in a realistic classification system. All the FOs observed were functioning at some level. However, according to the assessment of 2003 by DAS using the above assessment method, 95% of FOs were in category E and the rest in C and D. Simple but comprehensive participatory methodologies to assess community-based organizations are available and should be adopted in order to define the level of support needed by individual FOs.

Case Study of Lenawa FO in the Intermediate Zone

This FO was registered in 1992 prior to the project intervention. In 1994, DAS requested the FO leaders to organize a meeting and advised them about the Project. The problems experienced by the farmers, especially physical systems, were discussed at this meeting. An upgrading plan came from the project office later. Some of the requests of the farmers were addressed in the plan, but the farmers wanted a bank to protect the dam, plus a washing place, which was thought essential, as people were damaging the bank in many places. The cost was estimated at SLRs10,000. However apart from this and desilting, the Project met about 75% of their expectations.

In the upgrading of the tank, farmers built up the dam, cleaned the sluice, and removed the water hyacinth. About 100 labor-days had been offered by the community to meet the required 10% of project cost. The main benefit from the Project is increased water security, and no increase in cropping or command area was achieved. None of the present FO leaders received training under the Project, and they now seek training in maintenance, bookkeeping, and accounting. The FO obtains inputs from DAS on credit. Farmers pay for transport plus 2% margin to the FO. Farmers are happy about this arrangement. The FO bank account is now SLRs60,000, mainly from the margin on chemicals and seed.

For O&M work, each person gives 2 or 3 days (free) for cleaning the bunds and canal. The monthly fee is SLRs5; only about half the membership pay the fee regularly. Due to drought over the last 18 months, farmers have not attended to O&M work. The *vel vidane* system still functions. Most farmers the pay *vel vidane* in rice according to the size of their land.

Relating to payment of caretakers for O&M work under the Japan Fund for Poverty Reduction (JFPR) project, there are many gray areas. SLRs500 was to be paid to one poor farmer, selected at a meeting, close to tank. However, the farmers did not agree with the payment. They feel they can clean the tank adequately. This suggests that the JFPR project may not have done sufficient mobilization. The FO could become much more self-reliant, e.g., in making improvements, scheduling maintenance, and obtaining and extending technology such as salt-tolerant rice with some further support by an authority.

The annual bank balance of SLRs58,000 shows that the Project had a significant impact on the FO and its sustainability, after a more-or-less steady rise since 1993.

Land size is small, with 5.5 hectares divided among 40 farmers. They cultivate rice in *maha* (wet) season, and a few cultivate chillies and onion in *yala* (dry) season. If water is available, the majority prefer to cultivate rice.

IRRIGATION DEPARTMENT DATA ON CROPPING INTENSITY

1. The Irrigation Department records crop area and yield in the major and medium schemes in North Western Province. It provided data for the period 1979/80–2002/03 for the schemes listed in Table A3.1.

Table A3.1: Major and Medium Schemes Recorded by the Irrigation Department

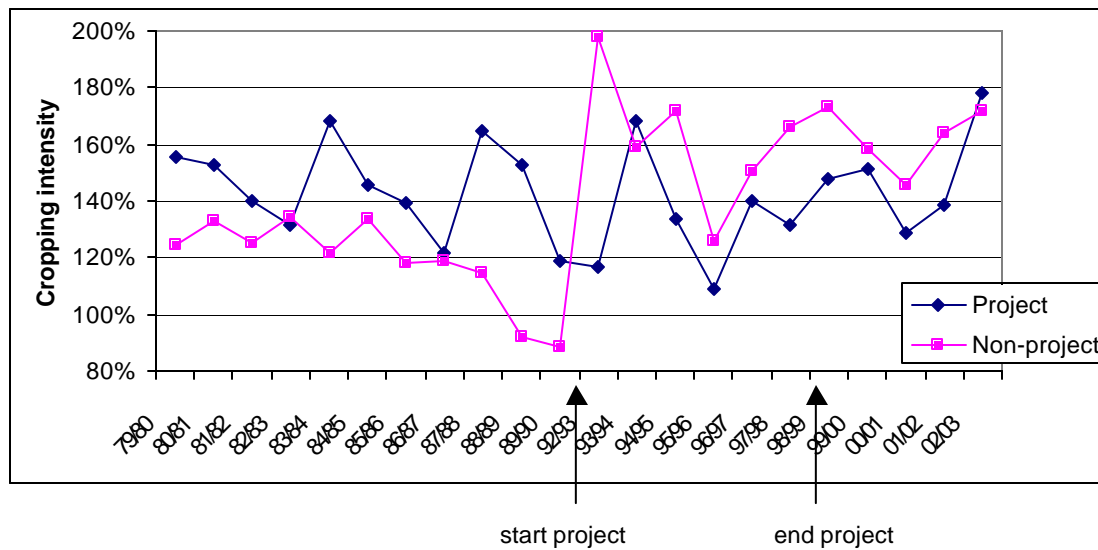
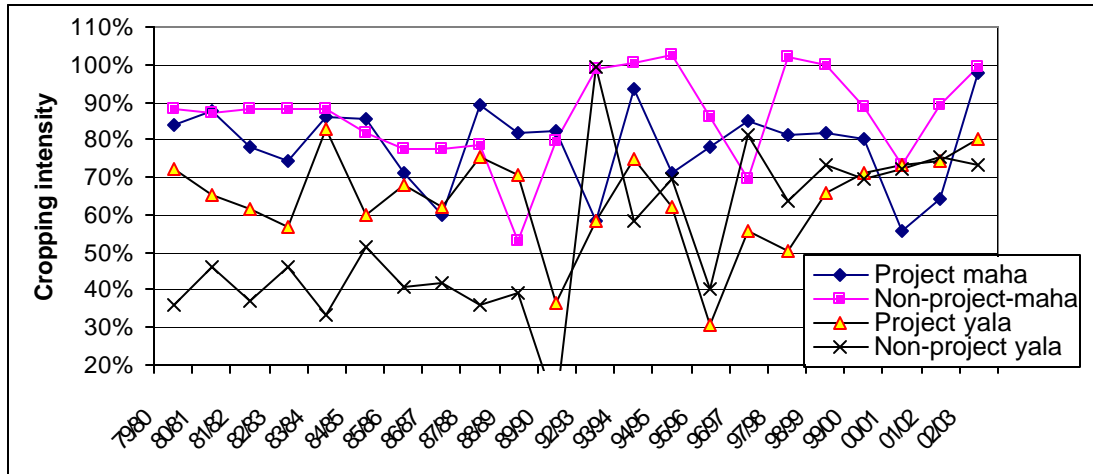
Project	Area (ha)	Nonproject	Area (ha)
Abakolawewa	340	Diyature	231
Attaragalla	419	Magalla	2,428
Bathalagoda	3,089	Maha Nanneriya	162
Hakwatunaoya	2,578	Mediyawa	486
Hulugalla	97	Moragoda	228
Kimbulwana Oya	842	Morathi Oya	101
Kospothu Oya	116	Usgala Siyambalangamuwa	850
Madulla	140	Wennaruwewa	166
Maha Siyambalangamuwa	168		
Makandura	304		
Meddeketiya	98		
Nikapitiya	91		
Palukadawala	820		
Welikumbura	115		
Total	9,217		5,137
Average area	658		571

ha = hectare.

Source: Irrigation Department, Kurunegala.

2. The results are surprising—aggregate cropping intensity in the nonproject schemes was almost always below that in the project schemes up to 1992/93, but since then it has been ahead of the Project in all years except two. While the results are not definitive, they give the impression that the Project had little aggregate effect on cropping intensity in the medium and major schemes. This conclusion is supported by field interviews during the Operations Evaluation Mission in two major schemes (Bathalagoda and Kimbulwana Oya), in both of which the works were not of a nature that cropping intensity would increase. The first part of the figure , the first shows cropping intensity by season, while the second part gives the aggregate cropping intensity per year.

Cropping Intensity - Major and Medium Schemes 1979/80 to 2002/03



Note: 1990/91 and 1991/92 omitted as few data are available.

Source: Irrigation Department, Kurunegala.

3. The Irrigation Department also records crop type and yield on the major and minor schemes. While time series data are not available information was provided to the Operations Evaluation Mission on 2001 *yala* cropping in 23 schemes (Table A3.2).

Table A3.2: Proportion of Other Field Crops during 2001 Yala

Item	Unit	Project	Non-project	Total
Schemes		14	9	23
Area				
Rice area	ha	7,587	3,114	10,701
OFC area	ha	83	514	597
Total area	ha	8,986	4,847	13,834
Cropping Intensity				
Rice	%	84%	64%	77%
OFCs	%	1%	17%	4%
Total	%	86%	81%	100%

ha = hectare, OFC = other field crop.

Source: Irrigation Department.

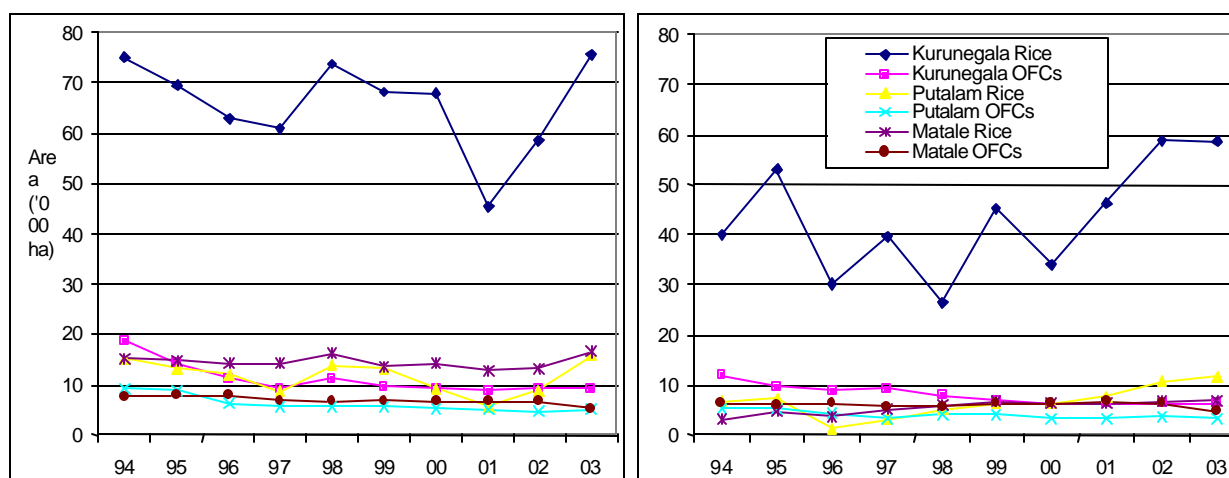
4. Again the results are surprising, indicating almost no other field crop (OFC) production in the project schemes in that year. One season is insufficient for firm judgments to be made, but the figures do indicate low production of OFCs generally, and particularly in project major and medium schemes. While further research would be required, at present it appears that the results in the medium and major schemes show that the Project has not yet made much if any impact on OFC production.

CROP AREA, PRODUCTION, AND YIELD

1. Crop area, production, and yield for rice and all other crops combined are summarized in the following figures. Data are for Kurunegala, Puttalam, and Matale districts, with the last selected as a control, since it received no major projects during the project period. However, Matale is not entirely satisfactory as a control, even for Kurunegala, as Matale is more hilly and somewhat higher in average rainfall. The total district data are also not fully representative of the Project, since the Project worked with only around 45% of the total cropped area of the province. However, since project benefit monitoring and evaluation did not provide much useful data to assess impacts, the production statistics are the best available source of information on trends, which were at least partly caused by the Project.

2. Figure A4.1 summarizes crop area data. The dominance of Kurunegala rice during the wet season (*maha*) is apparent in the left side. Rice remained dominant during *yala* (right side), though the areas were lower. No trends are obvious from the graphs. However analysis of the data using a logarithmic function to smooth trends (Table A4.1) suggests that the *maha* trend is downwards in all districts and for all crop groups. In *yala*, the trend of rice area is upwards, particularly in Puttalam and Matale, with other field crops (OFCs) trending downwards

Figure A4.1: Crop Area: Kurunegala, Puttalam, and Matale, 1994–2003
Maha ('000 ha) *Yala* ('000 ha)



ha = hectare.

Source: Hector Kobbekaduwa Agrarian Research and Training Institute database.

Table A4.1: Trends in Area in Kurunegala, Puttalam, and Matale, 1994–2003

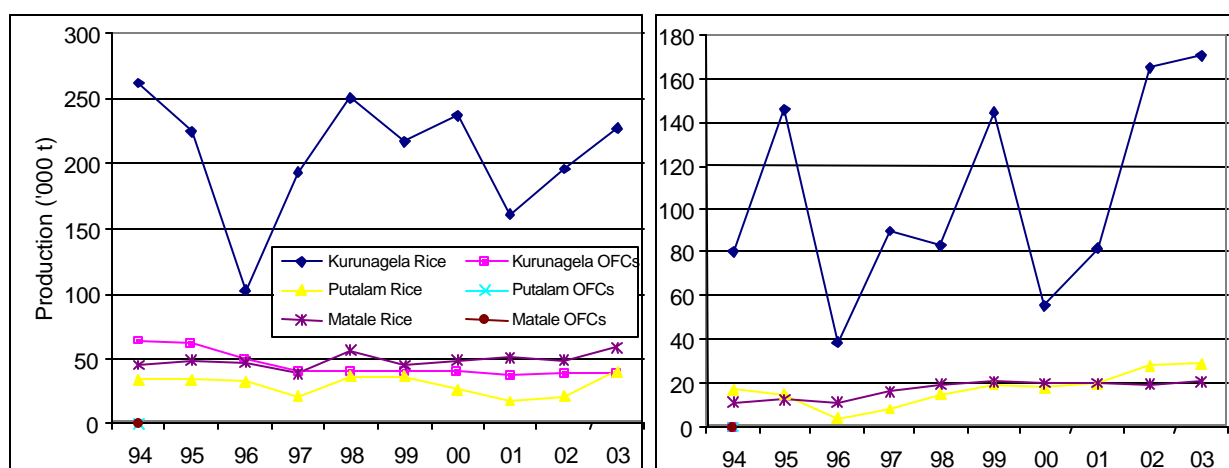
Season	Kurunegala		Puttalam		Matale	
	Rice	OFCs	Rice	OFCs	Rice	OFCs
<i>Maha</i>	-1.5%	-6.3%	-3.4%	-6.6%	-0.5%	-3.5%
<i>Yala</i>	4.0%	-7.0%	11.9%	-4.7%	8.2%	-0.9%

OFC = other field crop.

Source: Trends calculated from Hector Kobbekaduwa Agrarian Research and Training Institute data in Excel using Logest-1.

3. Figure A4.2 summarizes crop production data. The high variability of Kurunagela rice during both seasons, but particularly *yala*, is notable. Problems in 1996 related to an outbreak of brown planthopper. Pest problems also caused the low production in 2001. Production levels of rice in the other two districts and of other crops in all districts were relatively stable, though OFCs have been trending downwards quite rapidly in Kurunagela and Puttalam (Table A4.2). No significant trend is evident in Matale. Given the emphasis placed by the Project and the Government on increasing production levels of OFCs, the downwards trend is notable. Various reasons could be put forward for the trend: (i) increasing population, and thus demand for rice, the main staple food; and (ii) poor seasons (with low rainfall in the 2000s).

Figure A4.2: Crop Production in Kurunegala, Putalam, and Matale, 1994–2003
Maha ('000 t) *Yala* ('000 t)



t = metric ton.

Source: Hector Kobbekaduwa Agrarian Research and Training Institute database.

Table A4.2: Trends in Crop Production in Kurunegala, Putalam, and Matale, 1994–2003

Season	Kurunegala		Putallam		Matale	
	Rice	OFCs	Rice	OFCs	Rice	OFCs
<i>Maha</i>	0.3%	-5.4%	-2.7%	-9.0%	1.9%	-0.3%
<i>Yala</i>	6.6%	-4.3%	12.8%	-5.5%	7.7%	0.9%

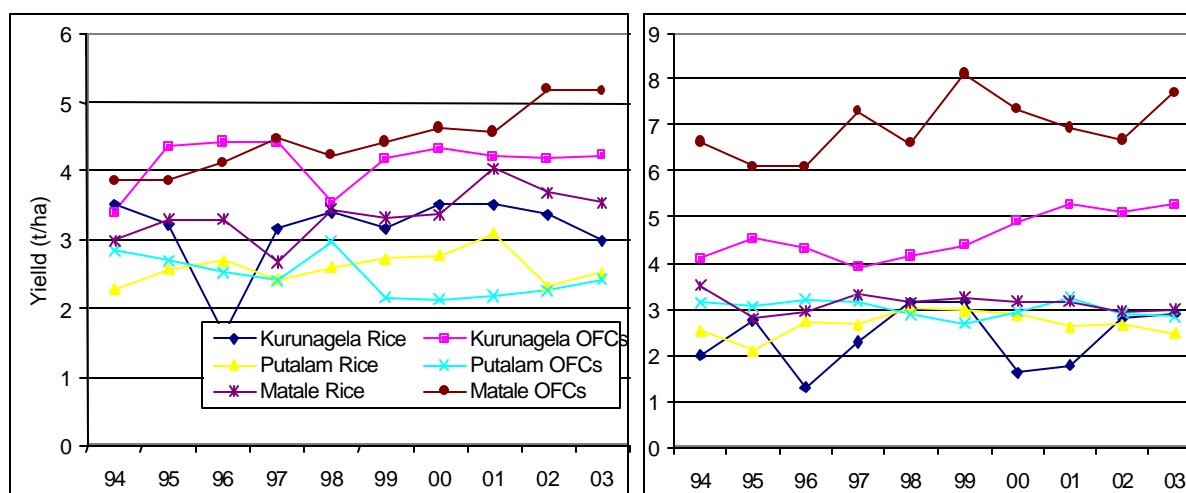
OFC = other field crop.

Source: Trends calculated from Hector Kobbekaduwa Agrarian Research and Training Institute data in Excel using Logest-1.

4. Figure A4.3 summarizes crop yield data. Rice yield has trended upwards by around 2%/year in Kurunegala and 0.8%/year in Puttalam. The yield of OFCs in both Matale and Kurunagela is high due to the dominance of a number of root and melon-like vegetables. OFC yield trended upwards in Kurunagela and Matale but declined in Puttalam. It is not really valid to estimate yield for a range of crops, since their characteristics are different. Some villagers interviewed reported declining yields caused by increasing cost and reduced usage of fertilizers

and chemicals, combined with quality problems for seed and fertilizer. However, such factors are not reflected in production trends and yields.

Figure A4.3: Crop Yield in Kurunegala, Putalam and Matale, 1994–2003
Maha (t/ha) Yala (t/ha)



ha = hectare, t = metric ton.

Source: Hector Kobbekaduwa Agrarian Research and Training Institute database.

Table A4.3: Trends in Yield in Kurunegala, Putalam and Matale, 1994–2003

Season	Kurunegala		Putallam		Matale	
	Rice	OFCs	Rice	OFCs	Rice	OFCs
Maha	1.8%	0.8%	0.8%	-2.3%	2.4%	2.2%
Yala	2.5%	2.0%	0.8%	-1.2%	-0.5%	1.6%

OFC = other field crop.

Source: Hector Kobbekaduwa Agrarian Research and Training Institute data in Excel using Logest-1.

5. The area and production of crops in Kurunegala and Puttalam districts during 2003 are summarized in Table A4.4. Rice was grown on 87% of cropped area. The next highest crop – manioc – occupied 2% of cropped area, and green gram, chili, and cowpea around 1% each. The remaining crops accounted for only 7% of cropped area. These ratios are similar, though more dominated by rice, to Sri Lanka's national cropping pattern, wherein 78% of cropped area is planted to rice, with manioc, maize and chilies exceeding 2% of total area, and green gram, cowpeas, and ash plantain exceeding 1%.

Table A4.4: Area and Production of Crops in Kurunegala and Puttalam Districts, 2003

Crop	Kurunagela				Puttalam				Total			
	Area (ha)		Production (t)		Area (ha)		Production (t)		Area (ha)	Prod'n (%)	Prod'n (t)	Yield (t/ha)
	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala				
Paddy	75721	58437	227000	170000	15945	11693	40000	29000	161796	87.38	466000	2.9
Manioc	1632	1596	14337	13505	495	400	2,382	2032	4123	2.2	32256	7.8
Green gram	1242	425	820	320	475	218	411	138	2360	1.3	1689	0.7
Chillies	734	423	1678	1052	644	410	1,947	1135	2211	1.2	3558	1.6
Cowpea	876	325	638	227	464	222	439	186	1887	1.0	1490	0.8
Ground nut	395	331	177	133	524	280	168	138	1530	0.8	663	0.4
Ash plantain	559	366	2848	2254	231	218	526	474	1374	0.7	5512	4.0
Maize	709	118	706	122	355	173	287	73	1355	0.7	1188	0.9
Sweet potato	421	543	2634	3112	72	61	313	221	1097	0.6	6280	5.7
Red onion	61	85	460	371	468	473	2,350	2374	1087	0.6	5555	5.1
Red pumpkin	362	297	3952	3043	140	125	715	632	924	0.5	12741	13.8
Gingelly	115	320	52	197	318	137	182	66	890	0.5	646	0.7
Brinjals	321	245	1991	1686	147	129	594	515	842	0.5	4786	5.7
Ladies fingers	273	223	1512	1068	121	104	440	370	721	0.4	3390	4.7
Kurakkan	359	45	328	25	125	59	68	32	588	0.3	453	0.8
Capsicum	193	191	806	959	89	36	313	127	509	0.3	2205	4.3
Cucumber	267	172	2242	1317	30	30	124	122	499	0.3	3805	7.6
Snake gourd	146	102	780	611	59	26	205	110	333	0.2	1706	5.1
Bitter gourd	124	112	608	457	32	51	124	196	319	0.2	1385	4.3
Black gram	95	34	56	32	66	21	44	18	216	0.1	150	0.7
Tomatoe	72	53	487	328	25	17	74	59	167	0.1	1296	7.4
Ash pumpkin	93	55	835	509		3		13	151	0.1	815	4.9
Big onion	27	49	136	274					76	0.0	1357	9.0
Other crops	60	83	579	1014	48	24	241	139	215	0.1	410	5.4
Total	84857	64630	265662	202616	20873	14910	51947	38170	185270	100	559336	

ha = hectare, t = metric ton.

Source: Hector Kobbekaduwa Agrarian Research and Training Institute database.

INFRASTRUCTURE MAINTENANCE TO REDUCE RURAL POVERTY

1. This project is funded by the Japan Fund for Poverty Reduction (JFPR) and is the successor project to the loan Project, assisting in the maintenance of the assets improved by the loan Project. This appendix provides some information on the JFPR project.

A. Background

2. **Current Situation Regarding Maintenance.** The Government's arrangements for maintaining rural infrastructure have generally proven to be ineffective. Five government agencies are responsible for maintaining irrigation systems and rural roads, with overlapping responsibilities and limited commitment to maintenance. Each agency uses a different approach, with little involvement of local communities. No less important is the tendency among farmers and local communities to wait for government support to address maintenance requirements. Consultations with stakeholders showed that many farmer organizations (FOs) have substantial financial resources, but they are reluctant to use their funds for maintenance, because they are unsure of replenishment. In addition, knowledge is lacking on how to organize operation and maintenance in a systematic and sustainable manner. Experiences suggest that primary beneficiaries and users of rural infrastructure are motivated and are willing to participate in maintenance efforts and to contribute to maintenance in kind or with cash. However, lack of an organizational setup and procedures prevents participation and contributions. In addition the small amounts that are required initially to meet maintenance expenditures are affordable, but rapidly increase as deterioration progresses very quickly once it starts. If repair needs are not attended to on time, the required works rapidly exceed local capacities and budgets.

3. **Options for Decentralized Maintenance of Infrastructure.** Sri Lanka has a long history of maintaining large irrigation systems under the administration of FOs. This is well known. But the traditional maintenance system for small irrigation systems and rural infrastructure is less widely known. The ancient kings, colonial rulers, and the independent administration until the early 1970s used a traditional maintenance system that involved contracting caretakers under petty maintenance contracts. The system was effective but was abandoned because of political difficulties. However, this tradition gives many lessons that could be applied in today's context. Reviving the old system of maintenance by local caretaker families under modified institutional arrangements could be a viable option for routine and small maintenance works. However, lessons must be drawn from the past, and modified arrangements need to be developed and piloted. Alternative supervision, financing, and monitoring mechanisms need to be considered. To avoid the problem of political interference and to increase efficiency, public-private partnership arrangements are proposed. Under these arrangements, a supervisory board will be formed to review and approve budgets and semiannual plans, and generally to supervise, monitor, and control the proposed innovative maintenance system. In addition, a payment system based on the performance of service providers will be developed. Another option for infrastructure maintenance would be contracting larger packages of maintenance works to construction firms. This would complement the approach proposed under the JFPR project for larger and technically more challenging maintenance works. However, for larger maintenance works, providing employment to a large number of Samurdhi welfare recipients and reducing poverty directly through sustained employment generation might not be possible in the same way as for the small and more labor-intensive routine maintenance works targeted under the JFPR project.

4. **Piloting Innovative Arrangements for Infrastructure Maintenance.** The JFPR project is developing innovative institutional arrangements for maintenance on the basis of past

experiences. The important aspects of these arrangements will be (i) broad participation of the private sector and stakeholders; (ii) a cost-sharing, performance-based payment system; and (iii) accountability. The project will help FOs to maintain their irrigation systems, and pradeshiya sabhas (PSs) to maintain rural roads. The FOs and PSs will be supported and trained to administer maintenance caretaker contracts under a performance-based payment system. In addition, a community-based awareness process will lead to improved accountability, transparency, and responsiveness of infrastructure management. To launch such a process, the JFPR project will conduct campaigns to generate increased public awareness of the need for timely maintenance and public monitoring. Through policy dialogue, the foundation will be laid to widely replicate such an innovative pilot approach to poverty reduction through infrastructure maintenance. The proposed maintenance arrangements aim at poverty reduction. Sustainability of this approach is important. Therefore sustainable financing arrangements, cost-sharing, and substantial contributions by farmers who directly benefit are emphasized.

B. Objectives

5. The JFPR project's overall goal is to reduce poverty through job creation and better maintenance of rural infrastructure that is essential for the poor. The purpose is to pilot innovative management arrangements for maintaining rural infrastructure that is supervised and monitored by users including the poor. The maintenance system will impact on poverty by (i) creating jobs for the poor; (ii) sustaining use of infrastructure in the poorest areas; and (iii) allowing economic savings, as on-time rural infrastructure maintenance is cheaper. The project's policy agenda will promote investment of these savings to sustain and expand the approach. Sustaining the approach and institutional setting will not impose any additional economic cost or burden to the government budget.

C. Scope

6. Under the JFPR project, an innovative maintenance system will be developed and institutionalized. The system will use poor caretakers and petty contractors selected from among Samurdhi welfare recipients. They will maintain the rural roads, and the minor and medium irrigation systems that were constructed under the associated loan Project. The JFPR project will also lay the foundation for expanded and sustained application of the system to all suitable infrastructure in North Western Province and beyond.

7. The loan Project covers 663 minor irrigation schemes (15,000 hectares [ha]), 27 medium irrigation schemes (6,400 ha), and 988 kilometers (km) of rehabilitated rural roads. This infrastructure will be maintained under caretaker contract arrangements. The JFPR project will provide start-up support for maintaining rural infrastructure (rural roads and minor and medium irrigation systems) for a period of 3 years. After midterm, the scope will expand to include infrastructure rehabilitated under other projects in the province, thus reaching 30,000 ha and 2,000 km at project completion.

8. The loan Project has four components: (i) establishing a sustainable maintenance fund, (ii) building the capacity of poor caretakers and stakeholders, (iii) developing sector policies, and (iv) supporting project management. It will last for 3 years beginning in November 2002, and covers the area of the associated loan project (e.g., North Western Province).

ECONOMIC REEVALUATION

A. Introduction

1. Project economic performance was reestimated based on information contained in the Project Completion Report (PCR), the government's PCR, the impact evaluation and on Operations Evaluation Mission (OEM) interviews in the project area. The methodology used by the PCR was applied by the OEM through updating the PCR spreadsheets, which in turn followed the appraisal methodology reasonably closely.

2. The major benefits from the Project comprise an increase in crop production resulting from increased water availability and security on rehabilitated, restored, and extension areas. Road benefits relate to time, vehicle operating cost, and transport savings due to improved transit speeds and reduced damage to vehicles.

B. Assumptions

3. Assumptions are included in the Tables A6.4 through A6.10. The main changes to the PCR assumptions are discussed in the following subsections:

1. Rice Price

4. The milling cost assumed by the PCR at SLRs360/metric ton (t) is too low based on OEM interviews in the project area. Villagers report paying SLRs1.5-2/kilogram net of bran value (usually kept by the miller and worth perhaps SLRs1,000/t of rough rice). However, it is likely that a lower rate could be negotiated for large volumes, and a cost of SLRs1,200/t of milled rice is assumed (SLRs 816/t of rough rice).

5. Sri Lanka remains a net importer of rice, as shown in Table A6.1. It is therefore reasonable to continue to treat rice production in North Western Province (NWP) as an import substitute. If the country becomes self-sufficient in rice, an average of import and export parity should probably be used for assessment, with strong negative impact on the economic viability of rice-based irrigated agriculture. Imports over the past two (drought) years are likely to have increased from 2002 levels.

Table A6.1: Sri Lanka Rice Imports, 1997–2002

Item	1997	1998	1999	2000	2001	2002
Rice imports (SLRs million)	4,331	2,621	3,290	288	969	1,732
(\$ million)	73.4	40.7	46.6	3.7	10.8	18.1

Source: Asian Development Bank key Indicators of developing member countries.

2. Wage Cost

6. The Appraisal Report and the PCR both adopted a shadow wage rate of 80% of the market rate, to allow for underemployment of rural labor. In practice, underemployment is quite likely to be at least in part a sociocultural preference, with gainful employment opportunities only partly utilized. This is reflected in the high proportion of tenant farmers in much of the project area and also in difficulties in engaging poor rural people in food-for-work programs, due to lack

of time during key agricultural seasons in particular. A shadow wage rate of 90% would reduce the economic internal rate of return (EIRR) from the PCR estimate of 13.7% to 12.4%, while elimination of the shadow wage rate would further reduce the EIRR to 11.1% without other changes. The reason for this is the high usage of family and hired labor assumed in the crop budgets, costed at the 2001 market rate of SLRs200/day, which by 2004 had reached SLRs250-300/day.

3. Farm and Off-Farm Income

7. Farm income accounted for only 36% of household income on project irrigation schemes according to the project impact evaluation (Table A6.2). The data suggest that the average household was well above the poverty line, estimated at around SLRs36,000/year per family in 2004 or about half the average farm family income in 2001 in (2001 dollars). The data also suggest that a shadow wage rate of 0.8 is no longer justified, since off-farm income-earning activities are significant, accounting for 64% of household income in the survey.

Table A6.2: Average On-Farm and Off-Farm Incomes per Family, 2001
(SLRs)

Source of Income	Average Income	
	Amount	(%)
1. On-Farm activities		
Rice	24,416	34
Other field crops	1,170	2
Livestock	543	1
Total farm income	26,129	36
2. Off-Farm activities		
Employment	38,112	53
Rent, lease, and hiring of equipment	900	1
Foreign employment	2,412	3
Pensions and other allowances	4,284	6
Total off-farm income	45,708	64
Total income	71,837	100

Source: Socioeconomic survey on farmers of irrigation schemes, project impact evaluation.

4. Project Costs

8. Few data are readily available on project costs. The PCR analysis was therefore used as a base. The use by the PCR of a 2.5% per year deflator to increase costs to 2001 dollar values does not conform to normal postevaluation methodology which requires separate conversion of local costs using a local cost deflator, and conversion of foreign costs using the international manufacturing unit value index. Since accurate cost data are not available, and no definitive separation of local and foreign costs is possible, the PCR costings and approach have been used.

5. Farm Budgets

9. The PCR **cropping intensity** estimates indicate an average total cropping intensity of 163% (without project, 147%). Other field crops (OFC) *yala* (dry) season cropping intensity was assumed to rise to 14.7% (without project, 5.8%). There is little information available to revise these data, but both the impact evaluation and OEM village interviews suggest that the actual OFC cropping ratio is significantly lower. For example Table A6 in the impact evaluation provides information on income (including subsistence income) for a sample of 417 households in 113 schemes, indicating income from rice of SLRs21,416 and income from OFC of SLRs1,170, or 4.6% of total crop income. Since substantial proportions of OFCs are produced on upland areas, and in addition should be somewhat more profitable than rice (on average), it is unlikely that OFC cropping exceeded 2% of irrigated crop area, or perhaps 6% during the *yala* season (since OFCs cannot be grown in lowland areas during the *maha* [wet] season).

10. The appraisal report and PCR farm budgets included big onions, the latter with 580 hectares (ha) in Kurunegala District and 306 ha in Puttalam. Official statistics only record 76 ha in Kurunegala and none in Puttalam, making it a very minor crop. Red onions are more important, with 146 ha in Kurunegala and 940 ha in Puttalam. However, on balance, it was decided to omit onions from the lowland irrigated crop budgets. Since the other two crops budgeted, green gram and chili, are the other important irrigated crops in the province, the farm budgets are limited to these two crops. Removal of big onions actually increases the EIRR marginally.

11. **Crop yields** assumed by the PCR are appropriate – irrigated without the Project, 3.4 t/ha; irrigated with the Project – 3.9 t/ha; and rain-fed, 2.4 t/ha. OEM interviews in nine villages indicated an average increase in yield from 2.86 t/ha to 3.85 t/ha. However, this is substantially higher than achieved on the improved schemes, where few gains are possible. The with-project level of 3.9 t/ha is appropriate for restored and extension schemes, although it may take somewhat longer than expected to reach this target.

12. **Labor inputs** for irrigated rice are assumed to be 105 days/ha both with and without the Project. The improved water control possible after the Project should compensate for additional time needed for fertilizer application, threshing, and transport.

6. Project Area

13. According to the PCR and project records, the total area of irrigation improved or established was 28,686 ha including extension areas of 704 ha and restoration areas of 945 ha. However, the PCR's economic analysis was based on an area of 27,514 ha. OEM analysis increases the base area, but more or less retained the PCR's incremental command area and distribution of area between dry and intermediate zones on which improved information is not available.

7. Roads

14. Based on Tables 1-4 in Appendix 1 of the project impact evaluation, the average number of households served averaged about 136 per kilometer (km) of road constructed. This may be an overestimate, since 62% of the road length in the survey comprised Class D roads, whereas over the entire program, the length of Class D roads is likely to have been less than 40%. Use of the impact evaluation data result in a reduction in population served from 5,100 to 2,774. On its own, this factor would make the roads uneconomic, given the other assumptions used.

However, the average trip distance on the road appears to have been underestimated, and assumes that the population served is evenly distributed (on average) along the road. In practice, many of the users will live beyond the end of the road, and will thus use the entire road length. The average return trip length has therefore been increased from 1 km per km of road to 1.5 km. The road component under this assumption returns to economic viability, though still below the cutoff rate. Other key factors in the road analysis are the rate of repair assumed, which appear appropriate for a reasonably maintained road, and the road life. In the absence of adequate maintenance, annual economic benefits and road life will decline. A simulation of these factors (by halving maintenance cost, and reducing benefits to 50% over 10 years) has little effect on road EIRR. EIRRs for individual components are given in Table A6.3.¹

Table A6.3: Economic Internal Rate of Return

Item	Appraisal Estimate	PCR Estimate	OEM Estimate
Project EIRR	16.7	13.7	11.4
Gravity Irrigation	23.0	21.5	17.8
Dugwell and Lift Irrigation	40.0	42.5	47.1
Roads	13.3	12.0	8.5

15. The increase in dugwell and lift irrigation EIRR is due mainly to the exclusion of onions from the farm budgets, as they are less profitable than other upland crops. Reallocating onion land to the other upland crops therefore increases the return.

C. Results

16. The overall project EIRR is estimated at 11.4% as indicated in Table A6.3, below the appraisal (16.7%) and PCR (13.7%) levels, but satisfactory for a rural sector project.² It is also noted that the change to economic rice price estimates on their own reduces the PCR EIRR to 12.1%.

17. The EIRR is sensitive to a number of factors. If the shadow wage factor is increased from 80% to 90% of the market wage rate, the EIRR falls to 10.9%, and using the full market wage rate would generate an EIRR of 10.4%.

¹ The cash flows for the individual components include only the direct costs associated with those components. For the full Project, however, institutional strengthening costs are also included.

² The cutoff for economic efficiency of 12% suggested by the Asian Development Bank's project performance audit report guidelines is considered to be too high for most rural development projects, and any rate over 10% suggests reasonable efficiency. For infrastructure projects, which often include increasing levels of demand, as well as generating consumer surplus, 12% is more appropriate, though even here, public sector investments that generate higher rates of return than about 8% are considered acceptable in many developed countries, while those generating 15% or more may well be better undertaken by the private sector.

Table A6.4: Derivation of Economic Rice Price
(constant 2001 currencies)

Crop	Unit	Actual					Projected			
		1995	2000	2001	2002	2003	2004	2005	2010	2015
Indexes										
Exchange rate midyear SLRs/\$		51.3	77.0	89.4	95.7	96.5	102.8			
MUV index 1990=100		112.2	97.17	92.96	92.99	96.75	96.39	97.87	102.3	106.91
Sri Lanka GDP Deflator 1990=100		159.8	308.3	350.4	379.1	398.7				
Rice Paddy										
World Market Price FOB ^a	\$/t	239.9	202.4	172.8	191.9	199.0	202.0	205.0	220.0	230.0
Constant 1990 Dollars ^b	\$/t	269.2	208.0	182.9	198.9	205.7	209.6	209.5	215.1	215.1
Constant 2001 Dollars ^c	\$/t	250.2	193.4	170.0	184.9	191.2	194.8	194.8	200.0	200.0
Less Quality Adjustment ^c	20%	50.0	38.7	34.0	37.0	38.2	39.0	39.0	40.0	40.0
Quality Adjusted FOB	\$/t	200.2	154.7	136.0	147.9	153.0	155.9	155.8	160.0	160.0
International Freight	\$/t	42.0	42.0	42.0	42.0	43.0	44.0	42.0	42.0	43.0
Colombo CIF Price	\$/t	242.2	196.7	178.0	189.9	196.0	199.9	197.8	202.0	203.0
CIF Price in SLRs ^d	SLRs/t	21,648	17,580	15,912	16,975	17,517	17,865	17,680	18,052	18,142
Freight and Handling from Colombo	(SLRs)	(700)	(700)	(700)	(700)	(700)	(700)	(700)	(700)	(700)
Processing Rate ^c	%	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
Value of Rough Rice at Mill Door	SLRs/t	14,245	11,479	10,344	11,067	11,435	11,673	11,546	11,800	11,860
Processing Cost net of Bran Value	SLRs/t	(816)	(816)	(816)	(816)	(816)	(816)	(816)	(816)	(816)
Wholesale Rough Rice Value Local Market	SLRs/t	13,429	10,663	9,528	10,251	10,619	10,857	10,730	10,984	11,044
Freight from Farmgate	SLRs/t	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)
Farmgate Economic Price in 2001 SLRs	SLRs/t	13,329	10,563	9,428	10,151	10,519	10,757	10,630	10,884	10,944

CIF = cost, insurance and freight, FOB = free on board, GDP = gross domestic product, MUV = manufacturers' unit value.

^a Thai white, milled, 5% broken, FOB, Bangkok.

^b Constant 1990 prices are derived from World Bank Commodity Price Projections Oct.12, 2001.

^c Dlated by MUV index 1990 = 100, ie, by factor of .9639.

^d SLRs/\$ exchange rate at completion = 89.4.

Table A6.5: Derivation of Economic Prices of Fertilizers
(constant 2001 currencies)

Item	Unit	Actual					Projected			
		1995	2000	2001	2002	2003	2004	2005	2010	2015
Urea										
World Market Price FOB ^a										
Constant 1990 Dollars ^b	\$/t	177.4	115.1	113.3	97.8	134.4	132.8	129.5	122.2	121.6
Constant 2001 Dollars ^b	\$/t	164.9	107.0	105.3	90.9	124.9	123.5	120.4	113.6	113.0
International Freight	\$/t	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
Colombo CIF Price	\$/t	224.9	167.0	165.3	150.9	184.9	183.5	180.4	173.6	173.0
CIF Price in 2001 SLRs ^c	SLRs/t	20,103	14,927	14,777	13,489	16,530	16,397	16,123	15,517	15,467
Transport and Handling to Local Market	SLRs/t	700	700	700	700	700	700	700	700	700
Transport and Handling to Farmgate	SLRs/t	600	600	600	600	600	600	600	600	600
Farmgate Price	SLRs/t	21,403	16,227	16,077	14,789	17,830	17,697	17,423	16,817	16,767

CIF = cost, insurance, and freight, FOB = free on board.

^a Bagged, spot, FOB, East Europe.

^b Derived from World Bank Commodity Price Projections.

^c The March 2001 SLRs/\$ exchange rate prevailing at project completion was 86.35 SLRs per U.S. dollar.

Table A6.6: Farm Model of Inputs per Hectare: Financial Costs
(Physical Inputs and Production Costs, Constant 2001 SLRs)

Without Project

Irrigated Areas (Without Project)		Rice			Chili			Big Onion			Green Gram		
Item	Unit	Quantity	Price	Total	Quantity	Price	Total	Quantity	Price	Total	Quantity	Price	Total
Seed	(kg)	120	17	2,040	2	1,120	2,520	7	582	4,307	20	62	1,240
Urea	(kg)	125	9	1,125	620	9	5,580	320	9	2,880	50	9	450
Other Fertilizer	(kg)	160	15	2,400	520	15	7,800	1,000	15	15,000	-	15	-
Pest/Weed Control	(SLRs)	1	3,000	3,000	1	26,000	26,000	1	20,500	20,500	1	2,000	2,000
Labor	(person-day)	105	200	21,000	500	200	100,000	400	200	80,000	70	200	14,000
Tractor	(SLRs)	1	5,440	5,440	1	5,300	5,300	1	6,900	6,900	1	5,400	5,400
Other Costs	(SLRs)	1	4,250	4,250	1	500	500	1	1,525	1,525	1	-	-
Total Cost				39,255			147,700			131,112			23,090
Rain-fed Areas (Without Project)													
Seed	(kg)	104	17	1,768	4	1,120	4,032	8	582	4,656	24	62	1,488
Urea	(kg)	67	9	603	390	9	3,510	160	9	1,440	-	9	-
Other Fertilizer	(kg)	100	15	1,500	265	15	3,975	500	15	7,500	-	15	-
Pesticide	(SLRs)	1	1,800	1,800	1	6,900	6,900	1	-	-	1	1,300	1,300
Labor	(person-day)	85	200	17,000	270	200	54,000	300	200	60,000	62	200	12,400
Tractor	(SLRs)	1	4,000	4,000	-	-	-	-	-	-	1	5,400	-
Other Cost	(SLRs)	1	2,400	2,400	1	175	175	1	1,000	1,000	1	-	-
Total Cost				29,071			72,592			74,596			15,188

With Project

Irrigated Areas (With Project)		Rice			Chili			Big Onion			Green Gram		
		Quantity	Price	Total	Quantity	Price	Total	Quantity	Price	Total	Quantity	Price	Total
Seed	(kg)	120	17	2,040	2	1,120	2,520	7	582	4,307	20	62	1,240
Urea	(kg)	150	9	1,350	650	9	5,850	320	9	2,880	60	9	540
Other Fertilizer	(kg)	180	15	2,700	530	15	7,950	1,100	15	16,500		15	-
Pest/Weed Control	(SLRs)	1	3,200	3,200	1	28,000	28,000	1	24,000	24,000	1	2,000	2,000
Labor	(person-day)	105	200	21,000	520	200	104,000	420	200	84,000	72	200	14,400
Tractor	(SLRs)	1	5,440	5,440	1	5,300	5,300	1	6,900	6,900	1	5,400	5,400
Other Costs	(SLRs)	1	4,750	4,750	1	500	500	1	1,525	1,525	1	-	-
Total Cost				40,480			154,120			140,112			23,580
Pump Cost (lift & dugwell)					1	18,000	18,000	1	18,000	18,000	1	8,000	8,000
Total for Lift & Dugwell							172,120			158,112			31,580

Data sources for quantities include field visits during the Project Completion Review Mission, the Final Impact Evaluation of the project prepared by TEAMS of Colombo and Department of Agriculture's Cost of Cultivation of Agricultural Crops, 2000/2001 for *maha* and *yala*. A middle range from these sources has been chosen.

Table A6.7: Crop Revenue per Hectare
(constant 2001 SLRs)

Financial Crop Revenue^a

Crop	Irrigated Without Project					Rainfed Without Project					Irrigated With Project				
	Yield	Price	Gross Revenue	Prod. Cost	Net Revenue	Yield	Price	Gross Revenue	Prod. Cost	Net Revenue	Yield	Price	Gross Revenue	Prod. Cost	Net Revenue
Paddy	3.4	11.0	37,400	39,255	(1,855)	2.4	11.0	26,400	29,071	(2,671)	3.9	11.0	42,900	40,480	2,420
Rice byproducts	2.7	1.0	2,720		2,720	1.9	1.0	1,920		1,920	3.1	1.0	3,120		3,120
Chili (gravity) (lift & well)	1.4	120.0	168,000	147,700	20,300	0.7	120.0	84,000	72,592	11,408	1.5	120.0	180,000	154,120	25,880
Green Gram (grav.) (lift & well)	0.8	51.0	40,800	23,090	17,710	0.4	51.0	20,400	15,188	5,212	1.7	120.0	204,000	172,120	31,880
Big Onion (gravity) (lift & well)	10.0	15.0	150,000	131,112	18,888	5.0	15.0	75,000	74,596	404	0.9	51.0	45,900	23,580	22,320
											1.2	51.0	61,200	31,580	29,620
											11.0	15.0	165,000	140,112	24,888
											12.5	15.0	187,500	158,112	29,388

Economic Crop Revenue

Crop	Irrigated Without Project					Rainfed Without Project					Irrigated With Project				
	Yield	Price	Gross Revenue	Prod. Cost	Net Revenue	Yield	Price	Gross Revenue	Prod. Cost	Net Revenue	Yield	Price	Gross Revenue	Prod. Cost	Net Revenue
Rice	3.4	10.8	36,572	35,983	590	2.4	10.8	25,816	26,081	(265)	3.9	10.8	41,950	37,517	4,434
Rice by products	2.7	0.9	2,448		2,448	1.9	0.9	1,728		1,728	3.1	0.9	2,808		2,808
Chili (gravity) (lift & well)	1.4	108.0	151,200	133,870	17,330	0.7	108.0	75,600	66,198	9,402	1.5	108.0	162,000	139,627	22,373
Green Gram (grav.) (lift & well)	0.8	45.9	36,720	19,847	16,873	-	-	-	-	-	1.7	108.0	183,600	155,827	27,773
Big Onion (gravity) (lift & well)	10.0	13.5	135,000	122,907	12,093	0.4	45.9	18,360	17,289	1,071	0.9	45.9	41,310	20,341	20,969
						-	-	-	-	-	1.2	45.9	55,080	27,541	27,539
						6.0	13.5	81,000	67,590	13,410	11.0	13.5	148,500	131,600	16,900
						-	-	-	-	-	12.5	13.5	168,750	147,800	20,950

^a Data sources for yields include field visits during the Project Completion Review Mission, the Final Impact Evaluation of the project prepared by TEAMS of Colombo and Department of Agriculture's Cost of Cultivation of Agricultural Crops, 2000/2001 for *maha* and *yala*.

Table A6.8: Financial Economic Revenue for 1-ha Gravity Scheme Farm
(constant 2004 SLRs)

Item	Amount per 1-ha Farm							
	Without Project			With Project			Increment	
	Area (ha)	Revenue per ha	Net Revenue	Area (ha)	Revenue per ha	Net Revenue	Area (ha)	Net Revenue
1. Financial Revenue								
Intermediate and Wet Zones								
Rice (<i>maha</i> irrigated)	0.92	865	794	1.00	5,540	5,540	0.08	4,746
Rice (<i>maha</i> rain-fed)	0.03	(751)	(23)	—	—	—	(0.03)	23
Rice (<i>yala</i> irrigated)	0.53	865	455	0.60	5,540	3,324	0.07	2,869
Chili (irrigated)	0.01	20,300	203	0.02	25,880	518	0.01	315
Green Gram (irrigated)	0.01	17,710	177	0.04	22,320	893	0.03	716
Chili (rain-fed)	0.01	11,408	114	—	—	—	(0.01)	(114)
Green Gram (rain-fed)	0.01	5,212	52	—	—	—	(0.01)	(52)
Total	1.51		1,773	1.66		10,274	0.15	8,502
Dry Zones								
	(Rs)							
Rice (<i>maha</i> irrigated)	0.74	865	641	0.80	5,540	4,432	0.06	3,791
Rice (<i>maha</i> rain-fed)	—	—	—	—	—	—	—	—
Rice (<i>yala</i> irrigated)	0.49	865	420	0.50	5,540	2,770	0.01	2,350
Chili (irrigated)	0.01	20,300	203	0.02	25,880	518	0.01	315
Green Gram (irrigated)	0.01	17,710	177	0.04	22,320	893	0.03	716
Chili (rain-fed)	0.01	11,408	114	—	—	—	(0.01)	(114)
Green Gram (rain-fed)	0.01	5,212	52	—	—	—	(0.01)	(52)
Total	1.27		1,607	1.36		8,612		7,005
Total Project								
Rice (<i>maha</i> irrigated)	0.86	865	741	0.93	5,540	5,157	0.07	4,416
Rice (<i>maha</i> rain-fed)	0.02	(751)	(15)	—	—	—	(0.02)	15
Rice (<i>yala</i> irrigated)	0.51	865	443	0.57	5,540	3,133	0.05	2,690
Chili (irrigated)	0.01	20,300	203	0.02	25,880	518	0.01	315
Green Gram (irrigated)	0.01	17,710	177	0.04	22,320	893	0.03	716
Chili (rain-fed)	0.01	11,408	114	—	—	—	(0.01)	(114)
Green Gram (rain-fed)	0.01	5,212	52	—	—	—	(0.01)	(52)
Total	1.43		1,715	1.56		9,700	0.13	7,985
2. Economic Revenue								
Intermediate/Wet Zones								
Rice (<i>maha</i> irrigated)	0.92	3,038	2,787	1.00	7,242	7,242	0.08	4,455
Rice (<i>maha</i> rain-fed)	0.03	1,463	44	—	—	—	(0.03)	(44)
Rice (<i>yala</i> irrigated)	0.53	3,038	1,599	0.60	7,242	4,345	0.07	2,746
Chili (irrigated)	0.01	17,330	173	0.02	27,773	555	0.01	382
Green Gram (irrigated)	0.01	16,873	169	0.04	20,969	839	0.03	670
Chili (rain-fed)	0.01	9,402	94	—	—	—	(0.01)	(94)
Green Gram (rain-fed)	0.01	1,071	11	—	—	—	(0.01)	(11)
Total	1.51		4,876	1.66		12,981	0.15	8,105
Dry Zone								
Rice (<i>maha</i> irrigated)	0.74	3,038	2,250	0.80	7,242	5,793	0.06	3,543
Rice (<i>maha</i> rain-fed)	—	1,463	—	—	—	—	—	—
Rice (<i>yala</i> irrigated)	0.49	3,038	1,475	0.50	7,242	3,621	0.01	2,146
Chili (irrigated)	0.01	17,330	173	0.02	27,773	555	0.01	382
Green Gram (irrigated)	0.01	16,873	169	0.04	20,969	839	0.03	670
Chili (rain-fed)	0.01	9,402	94	—	—	—	(0.01)	(94)
Green Gram (rain-fed)	0.01	1,071	11	—	—	—	(0.01)	(11)
Total	1.27		4,171	1.36		10,808		6,637
Total Project								
Rice (<i>maha</i> irrigated)	0.86	3,038	2,601	0.93	7,242	6,741	0.07	4,140
Rice (<i>maha</i> rain-fed)	0.02	1,463	29	—	—	—	(0.02)	(29)
Rice (<i>yala</i> irrigated)	0.51	3,038	1,556	0.57	7,242	4,095	0.05	2,539
Chili (irrigated)	0.01	17,330	173	0.02	27,773	555	0.01	382
Green Gram (irrigated)	0.01	16,873	169	0.04	20,969	839	0.03	670
Chili (rain-fed)	0.01	9,402	94	—	—	—	(0.01)	(94)
Green Gram (rain-fed)	0.01	1,071	11	—	—	—	(0.01)	(11)
Total	1.43		4,633	1.56		12,231	0.13	7,598

Table A6.9: Revenue and Cropping Patterns With and Without Dugwells and Lift Irrigation

	Cropping Pattern					
	Total Project Area (ha)			Area per 1-ha Farm		
	Without Project	With Project	Increment	Without Project	With Project	Increment
A. Area	868	868	-	1.00	1.00	-
Rice (<i>maha</i> irrigated)	-	-	-	-	-	-
Rice (<i>maha</i> rain-fed)	347	-	(347.2)	0.40	-	(0.40)
Rice (<i>yala</i> irrigated)	-	-	-	-	-	-
Chili (irrigated)	-	651	651.0	-	0.75	0.75
Green Gram (irrigated)	-	720	720.4	-	0.83	0.83
Big Onion (irrigated)	-	-	-	-	-	-
Chili (rain-fed)	174	-	(173.6)	0.20	-	(0.20)
Green Gram (rain-fed)	347	-	(347.2)	0.40	-	(0.40)
Big Onion (rain-fed)	-	-	-	-	-	-
Total	(Rs)	1,371	503	1.00	1.58	0.58

	Financial Revenue, 1-ha Farm							
	Without Project			With Project			Increment	
	Area ha	Net Revenue per ha	Net Revenue	Area ha	Net Revenue per ha	Net Revenue	Area ha	Net Revenue
B. Area	1.0			1.00				
Rice (<i>maha</i> irrigated)	-	-	-	-	-	-	-	-
Rice (<i>maha</i> rain-fed)	0.4	(751.0)	(300.4)	-	-	-	(0.40)	300
Rice (<i>yala</i> irrigated)	-	-	-	-	-	-	-	-
Chili (irrigated)	-	-	-	0.75	31,880.00	23,910	0.75	23,910
Green Gram (irrigated)	-	-	-	0.83	29,620.00	24,585	0.83	24,585
Big Onion (irrigated)	-	-	-	-	29,388.20	-	-	-
Chili (rain-fed)	0.2	11,408.0	2,281.6	-	-	-	(0.20)	(2,282)
Green Gram (rain-fed)	0.4	5,212.0	2,084.8	-	-	-	(0.40)	(2,085)
Big Onion (rain-fed)	-	404.0	-	-	-	-	-	-
Total	1.0		4,066	1.58		48,495	0.58	44,429

	Economic Revenue, 1-ha Farm							
	Without Project			With Project			Increment	
	Area ha	Net Revenue per ha	Net Revenue	Area ha	Net Revenue per ha	Net Revenue	Area ha	Net Revenue
C. Area	1.00			1.00				
Rice (<i>maha</i> irrigated)	-	-	-	-	-	-	-	-
Rice (<i>maha</i> rain-fed)	0.40	1,463	585.1	-	-	-	(0.40)	(585)
Rice (<i>yala</i> irrigated)	-	-	-	-	-	-	-	-
Chili (irrigated)	-	-	-	0.75	27,773	20,829	0.75	20,829
Green Gram (irrigated)	-	-	-	0.83	27,539	22,857	0.83	22,857
Big Onion (irrigated)	-	-	-	-	20,950	-	-	-
Chili (rain-fed)	0.20	9,402	1,880.3	-	-	-	(0.20)	(1,880)
Green Gram (rain-fed)	0.40	1,071	428.3	-	-	-	(0.40)	(428)
Big Onion (rain-fed)	-	13,410	-	-	-	-	-	-
Total	1.00		2,894	1.58		43,687	0.58	40,793

Cropping Intensity	100%	158%
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Table A6.10: Economic Cash Flow
(2004 dollars)

Year	Gravity Irrigation			Economic Cash Flow	Dugwell and Lift Irrigation			Economic Cash Flow	Roads			Economic Cash Flow	Total Project	
	Construction Cost	O&M	Incremental Benefits		Construction Cost	O&M	Incremental Benefits		Construction Cost	O&M	Incremental Benefits		Other Project Costs	Economic Cash Flow
1992	2	0		-2	0	0		0	1	0		-1	86	-88
1993	42	0		-42	0	0		0	9	0		-9	1369	-1420
1994	422	1	2	-420	41	0		-41	98	0	0	-98	630	-1188
1995	938	6	27	-917	127	1	8	-120	328	4	5	-327	816	-2180
1996	1639	18	103	-1554	126	5	39	-92	470	16	22	-463	1036	-3146
1997	2033	39	266	-1806	84	9	95	2	461	33	59	-435	676	-2916
1998	2098	66	538	-1626	112	12	166	41	833	58	114	-778	1755	-4117
1999	1585	93	921	-757	76	16	258	167	732	112	202	-642	144	-1375
2000	647	114	1366	606	110	18	357	230	233	161	316	-78	103	654
2001	0	122	1796	1674		18	453	435		193	426	234		2342
2002	0	122	2137	2015		18	525	507		252	518	265		2788
2003	0	122	2370	2248		18	581	563		264	590	326		3137
2004	197	122	2489	2170		18	616	598		267	629	362		3130
2005	193	122	2524	2210		18	637	619		235	639	403		3232
2006	225	122	2524	2177		18	637	619		238	639	401		3196
2007		122	2524	2402		18	637	619		250	639	388		3409
2008		122	2524	2402		18	637	619		230	639	409		3430
2009		122	2524	2402		18	637	619		206	639	432		3453
2010		122	2524	2402		17	599	582		289	639	349		3333
2011		122	2524	2402		13	479	466		293	639	346		3215
2012		122	2524	2402		9	360	351		216	639	423		3176
2013		122	2524	2402		6	281	275		193	639	446		3123
2014		122	2524	2402		2	175	172		252	639	386		2961
2015		122	2524	2402		0	103	103		264	639	375		2880
2016		122	2524	2402						267	639	371		2773
2017		122	2524	2402						235	639	403		2806
2018		122	2524	2402						238	639	401		2803
2019		121	2512	2391						250	637	387		2778
2020		116	2399	2283						226	617	391		2674
2021		104	2147	2044						191	551	360		2404
2022		82	1708	1625						256	456	200		1825
2023		56	1162	1106						234	363	129		1235
2024		29	599	570						104	195	91		661
2025		8	174	165						32	47	15		180
EIRR				17.8%				47.1%				8.5%		11.4%
ENPV				\$2573				\$1282				-\$433		-\$532

EIRR = economic internal rate of return, O&M = operations and maintenance.

**MANAGEMENT RESPONSE ON THE PROJECT PERFORMANCE AUDIT REPORT
ON THE NORTH WESTERN PROVINCE WATER RESOURCES DEVELOPMENT
IN SRI LANKA (Loan 1166-SRI[SF])**

On 2 March 2005, the Director General, Operations Evaluation Department, received the following response from the Managing Director General on behalf of Management:

1. Management understands that staff of OED and SARD consulted on the draft PPAR and basically agreed to the conclusions of the draft PPAR and appreciates OED mission's proactive consultation with the government agencies on key report contents. Management also understands that the downgrading of the overall rating from successful in the Project Completion Report to partly successful in PPAR was mainly due to the underachieved crop diversification target and uncertain sustainability of project impacts both physically and institutionally, as compared to the assessment made at the time of the Project Completion Review. Some specific comments are as follows.

2. With regard to the key issues, lessons, and follow-up actions in Chapter VI of the PPAR, Management in principle supports most of points and issues raised in the PPAR. It is essential that issues such as lack of a clearly defined policy framework, lack of farmer ownership of the irrigation systems, and insufficient resources of local governments to maintain rural roads, be addressed in future interventions in the sector. The follow-up actions recommended in para. 69 are also relevant to address the issues that are specifically related to the Project, and ADB will consider them in promoting further achievement of project benefits and their sustainability.

3. There are some concerns over certain actions recommended by the PPAR. For example, the action to "assess the agronomic problems in project and other schemes; provide soil testing and extension to assist in mitigation (Action i)" would require additional work for the national and provincial departments of agriculture. The PPAR also proposes that the JFPR project (JFPR 9025-SRI: Infrastructure Maintenance to Reduce Rural Poverty) should take responsibility for this action. However, this would be subject to the availability of the funds and the scope of the JFPR project. Overall, the commitment and capacity of the responsible government agencies will be essential in following up or monitoring the PPAR recommendations.