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Agriculture Operations Division

STAFF APPRAISAL REPORT

SRI LANKA

NATIONAL IRRIGATION REHABILITATION PROJECT

MAY 9, 1991

Agriculture Operations Division
Country Department I
Asia Region

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CURRENCY EQUIVALENTS

(December 1990)

Currency Unit	=	Sri Lanka Rupee (SL Rs)
SL Rs 1	=	US\$ 0.0248
US\$1.00	=	SL Rs 40.3

WEIGHTS AND MEASURES

1 hectare (ha)	=	2.47 acres (ac)
1 kilometer (km)	=	0.62 mile (mi)
1 metric ton (mt)	=	2,205 pounds (lbs)

ABBREVIATIONS

ADB	-	Asian Development Bank
APT	-	Agricultural Planning Team
ASC	-	Agrarian Services Center
CIDA	-	Canadian International Development Agency
CMC	-	Central Management Cell
DAS	-	Department of Agrarian Services
EEC	-	European Economic Community
ERR	-	Economic Rate of Return
FO	-	Farmer Organization
GOSL	-	Government of Sri Lanka
ICB	-	International Competitive Bidding
ID	-	Irrigation Department
IDA	-	International Development Association
IIMI	-	International Irrigation Management Institute
IMD	-	Irrigation Management Division
IMPASA	-	Irrigation Management Policy Support Activity
INMAS	-	Integrated Management of Major Irrigation Schemes
IO	-	Institutional Organizer
IRDP	-	Integrated Rural Development Project
ITI	-	Irrigation Training Institute
LCB	-	Local Competitive Bidding
MASL	-	Mahaweli Authority of Sri Lanka
MIRP	-	Major Irrigation Rehabilitation Project
MLIMD	-	Ministry of Lands, Irrigation, and Mahaweli Development
NIRP	-	National Irrigation Rehabilitation Project
O&M	-	Operation and Maintenance
PCC	-	Project Coordination Committee
RST	-	Regional Support Team
SCF	-	Standard Conversion Factor
SDC	-	Swiss Development Cooperation
SOE	-	Statement of Expenditure
TIMP	-	Tank Irrigation Modernization Project
USAID	-	United States Agency for International Development
VIRP	-	Village Irrigation Rehabilitation Project

GLOSSARY

anicut	-	diversion structure
Maha	-	northeast monsoon season (October to February)
paddy	-	unhusked rice
tank	-	impounding reservoir
Yala	-	southwest monsoon season (April to September)

FISCAL YEAR

January 1 - December 31

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SRI LANKA

NATIONAL IRRIGATION REHABILITATION PROJECT

Credit and Project Summary

Borrower: Democratic Socialist Republic of Sri Lanka

Amount: SDR 21.9 million (US\$29.6 million equivalent)

Terms: Standard IDA terms with a maturity of 40 years

Cofinancier: The European Economic Community (EEC) will provide a grant of ECU 3.34 million (US\$4.0 million equivalent)

Project Objectives: The main objectives of the project are to protect and increase agricultural production and incomes and to raise the standard of living of the beneficiaries through rehabilitation and improved operation and maintenance (O&M) of existing irrigation schemes. Subsidiary objectives are to: (a) upgrade the skills of staff of implementing agencies and the farmers; and (b) establish viable farmer organizations (FO) for managing the rehabilitation schemes.

Description: The proposed seven-year project (1991-97) would be nationwide in scope and include: (a) rehabilitation and improvement of about 1,000 minor and 60 medium/major irrigation schemes covering about 37,500 ha; (b) establishment of FOs and introduction of improved O&M practices in all rehabilitation schemes; (c) training of staff of implementing agencies and farmers; (d) execution of environmental protection works and studies; (e) establishment of three new support units in the Irrigation Department (ID) and execution of hydrological and socio-economic studies; (f) provision of consultants' services for project planning, implementation, and impact assessment; and (g) procurement of vehicles and equipment.

Benefits and Risks:

As a result of the project, the average incomes of some 100,000 farm families would increase by about 15% to 55% over present levels due to higher crop production after rehabilitation and improvement of the schemes and introduction of better O&M practices. At the same time, their current incomes would be better protected against losses arising from deterioration of scheme facilities. The project would also generate an additional annual labor demand for farm activities of about 2,000 person-years, largely hired labor. Temporary off-farm employment created during project implementation is estimated at about 7,000 person-years which would primarily benefit the landless. Less than adequate staffing of the new provincial administrations and a slower than expected pace of establishing FOs may delay the implementation of the project. Therefore, a Central Management Cell would be established at ID, and consultants employed, to assist the provincial administrations with project planning and implementation. When necessary, key implementation tasks would be transferred from the provinces to the central ID. Institutional organizers would be employed temporarily in all rehabilitation schemes to assist the process of formation of FOs and minimize the risk of implementation delays.

Estimated Project Cost:

	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
	- - -	- - - US\$ million - - -	- - -
Rehabilitation and Improvement Works:			
Surveys and Investigations	0.4	-	0.4
Civil Works	15.8	3.0	18.8
Engineering and Administration	<u>2.2</u>	<u>-</u>	<u>2.2</u>
Subtotal	18.4	3.0	21.4
Farmer Organizations	1.9	-	1.9
Training	0.8	1.2	2.0
Environmental Protection	0.7	-	0.7
Institutional Support and Studies	2.1	0.9	3.0
Technical Assistance	3.1	0.6	3.7
Vehicles and Equipment	<u>1.6</u>	<u>1.7</u>	<u>3.3</u>
Base Cost	28.6	7.4	36.0
Physical Contingencies	0.9	0.2	1.1
Price Contingencies	<u>11.7</u>	<u>1.0</u>	<u>12.7</u>
Total Cost <u>a/</u>	<u>41.2</u>	<u>8.6</u>	<u>49.8</u>

a/ Including taxes and duties of US\$2.3 million

Financing Plan:

	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
	----- US\$ million -----		
Government	16.2	-	16.2
EEC	-	4.0	4.0
IDA	25.0	4.6	29.6
Total	<u>41.2</u>	<u>8.6</u>	<u>49.8</u>

Estimated Disbursement of IDA Credit:

FY	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>
	-----US\$ million-----						
Annual	2.0	1.9	5.5	5.6	5.6	5.0	4.0
Cumulative	2.0	3.9	9.4	15.0	20.6	25.6	29.6

Economic Rate of Return: 31%

Map: IBRD 22876

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NATIONAL IRRIGATION REHABILITATION PROJECT

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This report is based on the findings of an IDA appraisal mission which visited Sri Lanka in November/December 1990. The mission comprised Messrs. H. van Voorthuizen, C. Maguire, T. Abeysekera (IDA), G. Schokman, Y.K. Murthy, and P. Senerath (Consultants). Mr. J. Prunzel (IDA) also contributed to the report. The peer reviewers were Messrs. J. Srivastava (overall project content and technical aspects), J. Berkoff (overall project content and institutional aspects), and J. Bredie (training component). The report was endorsed by Messrs. S. Asanuma (Director, Country Department 1, Asia Region), and C. Helman (Chief, Agriculture Operations Division).

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SRI LANKA

NATIONAL IRRIGATION REHABILITATION PROJECT

I. SECTOR AND PROJECT BACKGROUND

A. The Agriculture Sector

1.01 Sri Lanka is commonly divided into three agro-ecological zones based on climate, soils and vegetation -- the dry, intermediate and wet zones. Annual rainfall, at 75% probability levels, varies from about 600-900 mm in the dry zone, to about 1,200-1,500 mm in the intermediate zone, and over 2,000 mm in the wet zone. The most drought-prone districts experience drought once every three or four years during the Yala (southwest monsoon) crop season and once every five to seven years during the Maha (northeast monsoon) season. The frequency of the dry spells causes wide year-to-year variations in crop areas and yields. Food crops dominate farming in the dry and intermediate zones -- paddy is grown in the bottom lands, and other food crops are cultivated under rainfed conditions on the better-drained lands and upper slopes. Tree crops are grown at higher elevations and paddy is cultivated in the valley bottoms and plains of the wet zone. Sri Lanka has a total land area of about 6.5 million ha, of which about 1.6 ha million is cultivated permanently; shifting cultivation is practiced on about 1.1 million ha. Tree crops account for about 900,000 ha of the cultivated land, highland annual crops for about 100,000 ha, and paddy for about 600,000 ha. About 80% of all paddy land is under the command of irrigation systems.

1.02 At present, the agriculture sector contributes about one quarter of GDP and is the main source of employment for more than 2.2 million persons (about 45% of the active labor force). With three-quarters of the population living in rural areas, agriculture is the single most important source of livelihood for these people. About 33% of the country's exports were derived from agriculture in 1989. These exports came primarily from tree crops: tea, rubber, and coconut. Overall agricultural performance during the last decade has been mixed. The sector achieved a 4% annual growth rate between 1978 and 1986, but experienced almost no growth from 1987 to 1989. Tree crop production has stagnated or declined during much of the decade, underlining the need for major restructuring of the sector. Paddy production increased to near self-sufficiency levels in the early 1980s, but despite continuing expansion of irrigated areas (para 1.03), production has stagnated during the last five years, mainly due to a string of below-average rainfall years and civil disturbances in many parts of the country. The Government of Sri Lanka (GOSL) is currently reconsidering its long-standing policy goal of attaining self-sufficiency in paddy production, often at the expense of other crops. GOSL now also emphasizes the preservation and improvement of existing irrigation schemes on which most of the production of paddy depends.

B. The Irrigation Subsector

Past Developments

1.03 Irrigation has been practiced in Sri Lanka since ancient times and is almost exclusively used for the cultivation of paddy. Schemes in the dry zone have storage reservoirs which assure supplemental irrigation during dry spells in the Maha season and, to some extent, also make it possible to cultivate crops during the Yala season. Diversion (anicut) schemes on perennial streams in the intermediate and wet zones assure supplemental irrigation during both crop seasons. Irrigation has been a major focus of development since the country gained its independence in 1948. Reducing unemployment through settlement of the dry zone, achieving self-sufficiency in food production, and development of hydropower, have been major policy goals of successive governments, particularly after 1977. Since 1970, the total area under irrigation has expanded by at least 200,000 ha, and in 1990 it reached about 550,000 ha. The multi-purpose Mahaweli Development Program was the government's single largest investment scheme during the late 1970s and 1980s, accounting in its peak year (1984) for 39% of total public capital investments and 92% of all investments in the irrigation sector.

1.04 To date, some 255,000 ha of irrigated land is served by about 75 major schemes (over 600 ha), including 45,000 ha under the Mahaweli Program. An additional 45,000 ha is irrigated by medium schemes (80 - 600 ha). Most of the medium and major schemes are located in the dry zone and were built or restored by GOSL over the last 40 years. GOSL also retained the responsibility for operation and maintenance (O&M) of these schemes. Some 235,000 ha is served by about 22,000 minor schemes (less than 80 ha). About 65% of the land under minor schemes is located in the dry zone and is irrigated from tanks; the remaining 35% is supplied by anicuts. Typically, the minor schemes are operated and maintained by the farmers themselves. However, over the years government agencies have provided assistance for the construction or rehabilitation of structures such as tank bunds, spillways, outlet sluices, diversion weirs, and some distributory canals and turnouts.

Institutions

1.05 Over the last two decades there has been a proliferation of government departments and agencies serving the irrigation sector. The recent transfer of authority from the central government to the provincial councils has added to the complexity of the situation. Due to inefficiencies in the use of staff and other resources, the current level of services to the irrigation sector is less than optimal.

1.06 The Irrigation Department (ID) is the oldest among the irrigation sector institutions. Until the advent of the provincial administrations, ID was fully responsible for managing construction and O&M activities in medium/major schemes, with the exceptions noted in paras 1.07 and 1.08 below. In addition, ID executes externally financed rehabilitation works in minor schemes, e.g. under the IDA-financed Village Irrigation Rehabilitation Project (VIRP, Cr. 1160-CE, now closed) and several ongoing or completed Integrated Rural Development Projects (IRDP). ID operates in the field through range

offices and irrigation divisions. Until recently ID had a staff of about 6,800 persons, including about 400 engineers.

1.07 The Mahaweli Authority of Sri Lanka (MASL) since the early 1970s has been responsible for the planning, implementation and O&M of the Mahaweli Development Program. MASL operates through several work organizations, of which the Mahaweli Engineering and Construction Agency and the Mahaweli Economic Agency are the two largest. Over the years GOSL has received considerable financial support for the Mahaweli Development Program from all major donors, including IDA. In addition to the Mahaweli schemes, MASL manages one other major irrigation project.

1.08 The Irrigation Management Division (IMD) of the Ministry of Lands, Irrigation, and Mahaweli Development (MLIMD) since 1984 has been responsible for managing about 35 major irrigation schemes, each exceeding 800 ha. IMD launched a Program for Integrated Management of Major Irrigation Schemes (INMAS), designed as an interdisciplinary approach to increase agricultural productivity. The program is administered through national, district, and project level committees and farmer organizations (FO). IMD operates in the schemes through project managers who coordinate the functions of all line agencies. Budgets for O&M are allocated and controlled by IMD headquarters in Colombo. The ID handles all technical matters related to rehabilitation and O&M of major IMD-managed schemes. IMD is the implementing agency for the Major Irrigation Rehabilitation Project (MIRP, Cr. 1537-CE) financed by IDA, the Canadian International Development Agency (CIDA) and the Swiss Development Cooperation (SDC), and the Irrigation Systems Management Project financed by the United States Agency for International Development (USAID).

1.09 The Department of Agrarian Services (DAS) is since 1957 responsible for a wide range of activities in the agricultural sector, including technical and institutional advisory services for minor irrigation schemes. DAS operates through a network of agrarian services centers (ASC). Agricultural planning teams (APT) are functioning at the ASCs to support minor irrigation schemes. The APTs consist of a divisional officer, a technical officer and an agricultural instructor, supported by district-level specialists in these fields. The APTs advise farmers on scheme improvements, better water management and cropping practices, and formation of FOs. DAS allocates and controls a GOSL-financed budget for repair works in minor schemes (Rs 43.0 million in 1991). DAS also implemented a scheme modernization program under the IDA-financed VIRP (Cr. 1160-CE).

1.10 In accordance with the 13th Amendment of the Constitution, the provincial councils recently took over the responsibility from the central GOSL agencies for providing services (construction, O&M of major schemes, technical advice) in all irrigation schemes located on provincial rivers. Following a decision by the Minister of MLIMD, the provincial councils also assumed responsibility for all schemes under 400 ha which are located on interprovincial rivers. Since 1990 the provincial councils have responsibility for all minor schemes and about 40% of the area under medium/major schemes in seven provinces. Transfer arrangements in the Northern and Eastern Provinces have not been completed due to the civil conflict in the area. During 1990 the seven provinces organized themselves to

execute their new responsibilities. Four provinces established a major engineering and construction agency with separate wings for irrigation, roads, and buildings. The remaining three provinces established independent departments for these three types of work. Some 1,725 staff, including about 90 engineers, were transferred from the central ID to the new provincial irrigation units. A decision by GOSL to also transfer DAS field staff to the provincial administrations was reversed in early 1991. GOSL funds for O&M of provincial medium/major schemes are now being transferred directly from the center to the provinces. Similarly, in 1990 funds for repair of minor schemes were also transferred from the center to the provinces. However, in 1991 the GOSL budget for minor schemes has again been brought under the control of DAS. Overall, relations between the central government and the provincial councils have not stabilized as yet and, no doubt, further administrative changes will be introduced over the next few years. At present, the technical and institutional capability of the new provincial administrations remains an area of concern.

1.11 Options for streamlining central and provincial government services (including for the irrigation sector) are being explored under several studies. Supported by IDA, GOSL has commissioned studies of all central government departments and provincial administrations. Draft reports by consultants were circulated in late 1990 and were reviewed by the concerned departments and provinces at the time of appraisal. The ID will probably be restructured in order to achieve a better organizational balance between its two main tasks -- construction of new systems and management of existing schemes. Proposals for reorganizing DAS are based on the vision that it will act as GOSL's principal agency for providing institutional support to farmer organizations. The provincial administrations, including their engineering services, will probably be organized along more rational and uniform lines across provinces. Ways need to be found to attract sufficient numbers of qualified, experienced and motivated staff to the provincial administrations. In the meantime, the provinces will have to rely on central government departments (supported by consultants, where necessary) to undertake tasks for which their implementing capacity is still inadequate. Future management of the irrigation sector is the focus of separate studies currently being conducted under the Irrigation Management Policy Support Activity project (IMPISA), financed by USAID. The studies cover a broad range of topics, including the future role and organization of public institutions for the irrigation sector at both the central and provincial levels. A draft working paper, circulated in December 1990, correctly recommends that the evolution of a single agency for irrigation management should be the long-term goal for the country. The studies are scheduled to be completed by the end of 1991 (see also para 4.08).

Performance of Existing Schemes

1.12 The performance of existing schemes has been less than expected, mainly due to inadequate allocation, or sub-optimal use, of resources by government agencies and the beneficiaries of the schemes. Maintenance is not done regularly, causing deterioration of facilities, and scarce water is often wasted, resulting in loss of production. As a rule, standards of O&M in minor schemes depend on the farmers' efforts. Farmers usually clean the canals at regular intervals and agree among themselves on the cultivation schedules. However, they rarely maintain or repair headworks, and water distribution practices often result in wastage at the heads of the canals and shortages at the tail ends. Over the years DAS has assisted the farmers with these tasks using its small budget and by providing advisory services but this assistance has been limited primarily to schemes where rehabilitation or repair works were undertaken under externally financed projects such as VIRP and the IRDPs. As a result, irrigation facilities in most of the 22,000 minor schemes have been allowed to deteriorate to the point where full-fledged rehabilitation works now are necessary. Recent estimates compiled by DAS field staff indicate that some 10,000 minor schemes covering about 110,000 ha require rehabilitation works, at an estimated cost of about Rs 2.2 billion (US\$55.0 million).

1.13 The ID, and now also the provincial irrigation units, are responsible for O&M of medium and major schemes. However, funds allocated in the Revenue Budget for this purpose (Rs 84 million in 1990) meet less than half of estimated requirements, and most of the funds are spent on staff and other overhead costs. Since 1984 farmers in major schemes are legally obligated to pay water charges covering the O&M costs of their schemes. During 1985 recoveries reached about 50% of the amounts due, but during 1989 payments ceased almost completely. The disturbed conditions in much of the country, initial weaknesses in the legal provisions (since corrected), and alleged inability of the farmers to pay (due to low incomes and low yields or drought-related crop failures) are the most frequently cited reasons for the poor collection performance. Although several rehabilitation projects have been taken up during the last decade, recent estimates by ID indicate that still some 190 medium/major schemes covering about 50,000 ha require rehabilitation works, at an estimated cost of about Rs 1.1 billion (US\$27.5 million).

New Approaches

1.14 Several attempts have been made in recent years to address the unsatisfactory O&M situation. IMD, through its INMAS program, has made major efforts to involve farmers in the management and O&M of their schemes. Institutional organizers (IO) have been employed to encourage the formation of farmer organizations (FO) and project committees for scheme management. In several schemes the maintenance of field and distributory canals has been transferred to the project committees. The activities of IMD have been most successful when combined with rehabilitation and system improvement works in externally financed projects such as MIRP. Experience also indicates that close involvement of the beneficiaries in the planning and implementation of rehabilitation and improvement works is an important requirement for success.

DAS has made significant efforts to improve operational practices in minor schemes through its agricultural planning team (APT) approach. DAS also has, on a pilot basis, successfully employed IOs in several schemes in Anuradhapura District. Much emphasis has been given under VIRP to training of APTs for their tasks. As in the case of the INMAS program, the APT approach has been most successful when combined with rehabilitation or modernization works. A few non-governmental organizations also have made serious efforts to improve maintenance and management practices in existing irrigation schemes. The Sri Lanka Field Office of the International Irrigation Management Institute (IIMI) is conducting field research in a number of schemes in order to identify and disseminate successful experiences in this important area.

1.15 The encouraging results of programs to involve farmers in the management of their schemes and the failure to make headway in the collection of water charges for major irrigation projects prompted GOSL in 1988 to adopt a new management policy for the irrigation sector. The new policy is designed to increase the participation and responsibilities of the farmers and reduce the role of the public sector. Where possible, schemes are to be fully managed by the farmers themselves. This already is the common practice in most minor and some medium schemes. Major schemes in the future are to be managed jointly by the farmers and government agencies. This concept already is being applied in several major schemes where O&M of the distributory canals has been taken over by FOs and project committees. In the long term, the role of the public sector would be limited to providing technical and institutional advice to FOs, and O&M of major facilities such as headworks and main canals. Eventually, the FOs would assume the full O&M cost of the schemes, beginning with the parts of the systems managed by them, and the farmer-members of the FOs would contribute their fair share in the form of labor and/or cash payments. Modalities for implementing these concepts are being studied in several projects, including the ongoing IMPSA project referred to in para 1.11. By the end of 1991 the IMPSA project is expected to result in detailed policy statements and draft legislation to implement GOSL's new policy direction.

1.16 Meanwhile, recent positive experience has demonstrated the need to establish more formal FOs. Past efforts have been directed at informal groups of farmers or influential farmer leaders. However, as farmers take on more responsibility for managing their irrigation schemes, the need for formal organizations with well-defined rights and obligations will grow as well. These changes apply not only to the distribution of water and maintenance of schemes, but also to other vital functions such as the supply of inputs, provision of credit, and marketing of produce. Anticipating these needs, GOSL has taken steps to amend existing legislation. The Agrarian Services Act of 1979 was amended in February 1991, to empower DAS to legally register and recognize the FOs in irrigation schemes and elsewhere. The Irrigation Ordinance of 1968 also is being amended to: (a) empower the FOs to collect irrigation charges after they have taken over O&M responsibilities for the field and distributory canals; and (b) specify the legal powers of the management committees for major irrigation projects.

Summary of Government Strategy

1.17 Agricultural performance, particularly the production of paddy and other food crops, depends heavily on irrigation. Much of this is in older schemes of which many are not functioning properly due to deterioration of facilities leading to loss of production. Priority has been given during the last four decades to a rapid expansion of the country's irrigation systems, but emphasis is now shifting towards rehabilitation, improved maintenance, and more efficient use of capacity in existing schemes. GOSL, assisted by the donor community, already has begun to correct the balance between the construction of new projects and rehabilitation and O&M of existing schemes. The Mahaweli Development Program is winding down and several rehabilitation projects have been taken up over the last ten years, including the IDA-financed VIRP and MIRP. However, there still exists a large need for rehabilitation works (paras 1.12 and 1.13). Budgetary constraints and continuing uncertainty over the prospects for peace and development in the northeast reinforce the need to preserve and make optimal use of existing irrigation infrastructure in the short and medium term. Encouraging the farmers to assume full responsibility for O&M of their schemes is a key element of this strategy. IDA endorses this strategy.

C. Project Background

Experience under Earlier Rehabilitation Projects

1.18 The National Irrigation Rehabilitation Project (NIRP) was first proposed in 1987 as a way to continue rehabilitation and modernization of minor schemes started under VIRP. Implementation of VIRP had been adversely affected from 1985 by security problems in seven north-eastern districts and in 1986 all works in the seven districts were suspended. Implementation continued after 1986 in eleven districts but disturbances in many other parts of the country caused further work interruptions in 1988 and 1989. The IDA Credit was extended four times (from end 1986 to end 1990). By the end of 1990 the ID had rehabilitated about 1,075 schemes covering about 30,500 ha (95% of the appraisal estimate), and DAS had modernized about 600 schemes covering about 13,500 ha (120% of appraisal estimate). Some 90 schemes covering about 2,600 ha were at various stages of completion at the end of 1990. All remaining works are scheduled to be fully completed in the course of 1991, using retroactive financing under NIRP.

1.19 A study team of the faculty of Agriculture from Peradeniya University has conducted a series of benchmark and evaluation studies in a sample of 144 VIRP schemes in six districts. Results from the baseline study and one follow-up survey are available for the entire sample but a second follow-up survey was conducted in only part of the sample schemes due to the 1988-89 disturbances. An in-depth study of 14 schemes (all included in the original sample) was conducted by the Peradeniya University team from 1988 through 1990. A third survey covering about 150 schemes (of which 30 are to be covered in-depth) is scheduled to start shortly with assistance and supervision from IIMI. Data available at this time on the impact of VIRP are fragmentary and have to be treated with caution. Nevertheless, several important conclusions are emerging. First, most schemes appear to have been

successful, but the few that failed completely did so either because farmer interest had not been properly ascertained in advance or because the executed works did not respond to farmer requirements. Second, farmers often complained about the poor quality of rehabilitation works. Third, cropping intensity during the Yala season increased substantially in some of the schemes after rehabilitation and modernization but changed little in most. Fourth, in most of the sample schemes farmers took full control over the distribution of water after rehabilitation.

1.20 During preparation and appraisal of VIRP, and also of the earlier Tank Irrigation Modernization Project (TIMP, Cr. 666-CE, see Project Completion Report - No. 5986 of December 23, 1985) and the subsequent MIRP, it had been assumed that crop production would increase substantially as a result of the rehabilitation and improvement works. Available evidence suggests that these expectations have not materialized as only modest increases in cropping intensities and/or yields have been recorded in most of the schemes covered by the three projects. It appears that stabilization of existing production has been the main source of benefits. Increases in production over pre-project levels due to: (a) repair of deteriorated facilities which already had caused loss of production; and (b) improvement and/or modernization of facilities, together with the introduction of improved water management practices, contributed to a lesser extent to the projects' benefits.

1.21 The Project Completion Report for TIMP stressed the need for: (a) carrying out surveys and detailed designs well in advance to avoid implementation delays; (b) allowing sufficient time for construction in view of the limited time canals can be closed; (c) preventing indiscriminate land and water use in the catchment area as it reduces inflow to the tanks and increases erosion; and (d) building confidence among the farmers that water will arrive on time and will be distributed equitably. Relevant findings and lessons of the earlier projects have been taken into account in the design of the NIRP.

Project Preparation

1.22 Early on in preparing the NIRP it was agreed to expand its scope to include rehabilitation works in medium and major schemes. The coverage of other rehabilitation projects (either ongoing or proposed) was considered insufficient to meet the requirements, particularly for medium-sized schemes. In order to avoid concentrating available funds in only a few major schemes, and to facilitate preparation and approval of rehabilitation proposals during project implementation, it was further agreed to limit the coverage of NIRP to schemes costing US\$1.0 million or less. The project has been prepared during 1989-90 by a Project Preparation Cell comprised of ID and DAS staff, assisted by consultants. Full feasibility studies have been prepared for a first group of 17 representative schemes (11 minor and 6 medium/major), of which 6 schemes (4 minor and 2 medium/major) were selected for in-depth appraisal.

II. PROJECT OBJECTIVES AND DESCRIPTION

A. Rationale for IDA Involvement

2.01 GOSL's current strategy for the irrigation subsector emphasizes completing ongoing projects, and preserving and improving the performance of existing schemes in order to stabilize and increase the production of paddy and other food crops (para 1.17). IDA supports this strategy and has already financed rehabilitation and improvement of minor schemes under VIRP (Cr. 1160-CE), closed in December 1990, and that of major schemes under the ongoing MIRP (Cr. 1537-CE). Although several other donors also have financed such works, minor schemes covering at least 45% of the command area under such schemes and medium/major schemes for about 15% of their command area still require rehabilitation. The proposed project is a national program which would support GOSL's strategy, build on experience gained under VIRP and similar recent projects, and assist provincial administrations in executing their new responsibilities. IDA support is justified as it would: (a) improve the capacity and efficiency of public irrigation services at the center and in the provinces; and (b) promote increased participation in system management by farmer organizations (FO).

B. Project Objectives

2.02 The project's main objectives are to stabilize and increase agricultural production and incomes and to raise the standards of living; through rehabilitation and improved O&M of existing irrigation schemes. Subsidiary objectives include: (a) upgrading the skills of farmers and staff of the implementing agencies; and (b) creating viable FOs for managing the rehabilitation schemes.

C. Project Components

2.03 The project includes the following components:

- (a) rehabilitation and improvement of about 1,000 minor and 60 medium/major irrigation schemes covering about 37,500 ha;
- (b) establishment of FOs and introduction of improved O&M practices in all rehabilitation schemes;
- (c) training of farmers and staff of the implementing agencies;
- (d) environmental protection studies and works;
- (e) establishment of three new support units in ID and execution of socio-economic and hydrological studies;
- (f) consultant services for project planning, implementation, and impact assessment; and

(g) procurement of vehicles and equipment.

D. Detailed Features

Rehabilitation and Improvement Works (Base Cost US\$21.4 million)

2.04 The project would rehabilitate about 1,000 minor schemes covering some 25,000 ha and about 60 medium/major schemes covering about 12,500 ha throughout the country. The project would also complete ongoing rehabilitation works in about 90 minor schemes started under VIRP (para 1.18). The project would cover about 25% of the estimated rehabilitation requirements. However, in view of the unsatisfactory maintenance of existing schemes, requirements for such works are likely to increase in the near future. Other donors, including the European Economic Community (EEC) and the Asian Development Bank (ADB), have also agreed, or are planning, to finance rehabilitation works in some provinces.

2.05 In order to qualify for financing under the project, schemes would have to meet selection criteria that emphasize technical and economic viability, and ensure the involvement of beneficiaries (Annex 1). FOs would be established for all schemes at the rehabilitation planning stage. They would be required to contribute at least 10% of the construction cost and maintain the schemes at their cost in accordance with an agreed plan. A draft model contract between GOSL and the FOs, reflecting the obligations of both parties, was reviewed during negotiations. Types and quantities of works would be determined in close consultation between the implementing agencies and the FOs and would be kept at the minimum necessary to ensure the effective operation of the schemes. For minor schemes the cost of rehabilitation and improvement would not exceed the equivalent of US\$ 750 per ha and for medium/major schemes the economic rate of return would be at least 15%. During negotiations agreements were obtained from GOSL that: (a) schemes would be selected in accordance with the criteria specified in Annex 1; and (b) a plan for periodic safety inspections of dams constructed or rehabilitated under the project would be sent to IDA for review by December 31, 1992.

2.06 Rehabilitation schemes would be selected on a year-to-year basis as implementation proceeds. Existing operational schemes throughout the country would qualify for consideration under the project. Tentative lists of identified schemes are given in Annex 1. Actual selection of schemes would depend on factors such as: (a) overall requirements for rehabilitation by province and district; (b) financing available from other donors; and (c) implementation capacity. The estimates include an indicative provision for the Northern and Eastern Provinces, representing about 10% of total investment cost, in order to facilitate the early start-up of rehabilitation works in the two provinces once security is restored. Completion of on-site appraisal of selected schemes to the satisfaction of IDA and review of implementation arrangements by IDA would be a condition of disbursement against expenditures in the Northern and Eastern Provinces.

Formation of Farmer Organizations and Improved Operation and Maintenance (Base Cost US\$1.9 million)

2.07 The project would enable farmers to maximize their returns from the rehabilitated schemes and assume responsibility for O&M of scheme facilities. The project would therefore support: (a) formation of FOs and employment of institutional organizers (IO); (b) preparation and introduction of improved scheme maintenance and water distribution plans; (c) demonstration of improved cropping practices; and (d) logistical support to staff of the implementing agencies. The process of organizing farmers into FOs would start at the turn-out level. Most minor schemes would be served by a single FO but for medium/major schemes two- or three-tier organizations would be formed. Office bearers would be elected, or selected by consensus, and working committees formed to undertake specific tasks. Legal recognition would be obtained from the Commissioner of Agrarian Services in accordance with the Agrarian Services Act, as amended in 1991. The FOs would reach binding agreements with the implementing agencies, specifying mutual responsibilities for rehabilitation works and O&M activities. The project would provide the FOs with office space and basic furniture.

2.08 Experience gained over recent years has demonstrated the need for special assistance to involve farmers in the management of their schemes. The project would therefore support temporary employment of IOs for all rehabilitation schemes. The IOs would: (a) assess the communities' needs and resources; (b) plan and implement strategies for organizing the farmers; and (c) facilitate and enhance the FOs' capabilities to plan and manage all scheme-related activities. Throughout the process the IOs would closely coordinate their activities with staff of the technical agencies. One IO would serve two adjacent minor schemes for about two years. For medium/major schemes one IO would be employed for about 300 families during the first two years, and one for about 1,000 families during the third and the fourth year. Twenty four IOs have already been posted in the first group of 17 schemes for which feasibility studies were completed during the preparation of the project.

2.09 Preparation of a plan of operation would be an integral part of the feasibility planning for all schemes. The plans would comprise detailed schedules for maintenance and operation of the schemes. The maintenance schedule would specify the preventive maintenance works to be executed continuously, and the periodic maintenance works to be undertaken between cropping seasons. The operational schedule would include an issue tree describing the distributory system, and the rotational systems to be adopted for each of the crop seasons in order to optimize the use of water, especially during periods of drought. The plans of operation would also specify the composition and responsibilities of project level farmer organizations and management committees for all O&M activities from the headworks down to the field level. Farmers would be consulted during preconstruction meetings and their views would be fully reflected in the plans. The IOs and the agricultural planning teams (APT) would participate in the preparation of the plans of operation and advise the FOs during implementation.

2.10 The project would provide support in selected rehabilitation schemes (about 10% of all schemes) for a special program of agricultural extension activities which meets specific requirements expressed by the farmers. The special program would supplement the Department of Agriculture's country-wide extension services, which would be strengthened under the proposed Integrated Agricultural Support Services Project. The special program would emphasize activities for demonstrating the cultivation of high-value field crops and improving home gardening. Agricultural instructors would prepare and execute the special programs in close cooperation with the FOs. Project support would be used for procurement of inputs and payment of travel allowances to the agricultural instructors.

2.11 The project would provide logistical support to district and divisional level staff of the provincial support agencies, including the members of the APTC and work supervisors of ID. Further details on the formation of FOs and improved O&M are given in Annex 2.

Training (Base Cost US\$1.9 million)

2.12 The project would: (a) upgrade the skills of existing staff of the implementing agencies; (b) train new IOs; (c) train leaders and members of the FOs; (d) provide technical assistance to enhance project management's capacity to manage the training program; and (e) increase the capacity of existing training centers. The training program would provide staff with limited overseas training opportunities, including three masters level degrees and 6-12 week short courses for about 100 staff at training institutions in Southeast Asian countries. The in-country staff training program would include short courses at selected in-service training institutes, on-the-job training, and study visits. Selection and training of about 500 IOs would be a key element of the training program. The project would also provide preconstruction, construction, O&M, and refresher training for over 5,000 elected officials of the FOs and arrange for multiple one-day training sessions for about 37,500 farmers. Designated trainers would participate in short training-of-trainers courses. Special emphasis would be given to raising the level of environmental awareness of both project staff and farmers. All trainers would be adequately prepared to cover environmental issues. Assistance would also be provided for expansion and upgrading of four in-service training institutes and for procurement of teaching equipment and supplies. Further details on the training component are given in Annex 3.

Environmental Protection (Base Cost US\$0.7 million)

2.13 The project would minimize environmentally harmful activities and, where feasible, alleviate existing problems. For all selected rehabilitation schemes the environmental impact of the proposed works would be reviewed and remedies against any adverse consequences prepared, as specified in the terms of reference for the feasibility studies. In addition to environmental awareness training of project staff and farmers (para 2.12), the project would support the following activities: (a) minimizing damage to the ecosystem during construction; (b) alleviating existing environmental problems; and (c) studying environmental problems at the watershed level.

2.14 Excavations and destruction of vegetation are potentially harmful activities during construction. Contract specifications would reflect existing GOSL regulations in this regard and include clauses obliging contractors to: (a) consult with beneficiaries on the selection of borrow pits; (b) strip and replace the topsoil and level off the borrow pits under a gradient which permits unimpeded drainage; and (c) strip, and after resectioning, replace the topsoil on the tank embankments before turfing. In addition, the project would provide for planting of trees in borrow areas and canal reservations. Strict supervision by project staff and consultants would ensure that the specifications mentioned above are adhered to. The beneficiaries would be encouraged to monitor implementation of the civil works.

2.15 Erosion and drainage problems at the reservoir and headworks of tank schemes would be corrected during rehabilitation. Periodic maintenance by the FOs after rehabilitation would minimize the risk of recurrence. Siltation of reservoirs and canals due to erosion in the catchment areas is a potential threat to irrigation and irrigation management. However, reliable information on this issue is not available in Sri Lanka. The project would therefore provide for a monitoring program for silt build-up in a selected sample of 50 minor and 5 medium/major tank schemes. The program would be managed by the Research Management Unit to be established at ID (para 2.17). Fragmentation of holdings and reduction of plot sizes due to population pressure is a serious issue which interferes with the adoption of sound water management practices. The project would provide for a study in three minor schemes in Anuradhapura District to examine the technical possibility of, and farmers' interest in, land consolidation, or other ways to overcome this problem. If successful, the study would be followed by a pilot land consolidation or land pooling project. This study would also be managed by ID's new Research Management Unit.

2.16 Minor tank schemes in the dry zone are typically part of a larger system, called a cascade, and are hydrologically interdependent. Feasibility studies would take into account all schemes which are part of a cascade to ensure that the planning and design of rehabilitation works recognizes their interdependence. Specific measures would be proposed and implemented to optimize the performance of individual schemes. Further details on environmental protection are given in Annex 4.

Institutional Support for Irrigation Department and Studies (Base Cost US\$3.0 million)

2.17 Irrigation Research Management Unit. Over the years it has become apparent that actual benefits achieved in irrigation projects are not commensurate with the investments made, mainly due to: (a) poor O&M of the schemes; (b) use of questionable hydrological planning parameters for determining available water resources; and (c) mono cropping of paddy in both cultivation seasons. In order to coordinate research on these issues, the project would support the establishment of an Irrigation Research Management Unit in ID. Technical assistance for the Unit would be provided by the Sri Lanka Field Operations Unit of IMII. The Research Management Unit would identify research needs, carry out or contract for research, evaluate the

findings, and disseminate the results. Support under the project would cover a four-year period (1992-95) and would include internationally and locally recruited expertise, equipment, vehicles, and research activities.

2.18 Dam Safety Unit. Following the recent failure of the dam at the Kantalai scheme, GOSL has commissioned a comprehensive study by consultants to review the effectiveness of the existing dam safety program and to prepare recommendations for a workable and effective system. The project would support the establishment of a Dam Safety Unit within ID by providing equipment, vehicles, training, advice by experts, and fund to cover the operating cost of the Unit.

2.19 Quality Control Unit. Ineffective supervision and inadequate testing of construction materials frequently result in substandard quality of works in irrigation projects in Sri Lanka and elsewhere. The project would enhance the capacity of ID's existing Quality Control Unit and would support the establishment of nine regional field laboratories. The facilities would serve the ID ranges and the provincial irrigation units. The project would provide for equipment, vehicles, the renovation of existing buildings or construction of new ones, and the cost of operating the Unit.

2.20 Hydrological and Water Management Study. Plans to optimize the use of available water resources through better water management must be based on reliable estimates of such resources. VIRP supported a physical resource evaluation of a sample of tank schemes in the dry zone which was conducted by the Land and Water Use Division of the Department of Agriculture. The final report will be submitted shortly and the findings would be used to improve water management planning under NIRP. The project would support, over five years (1991-95), a similar study in a sample of three diversion schemes in the intermediate and wet zones. The three schemes would also be included in the sample for the socio-economic study (para 2.21).

2.21 Socio-economic Study. The project would support a socio-economic study of a sample of ten rehabilitation schemes located in the Central and North-West provinces. The objective of the study would be in-depth monitoring and analysis of changes due to the project. In addition to collecting general information on scheme beneficiaries, physical facilities, and supporting services, the team would study changes in farm production and incomes, irrigation practices, and the effectiveness of institutional arrangements for rehabilitation and O&M in the sample schemes. Research assistants would be posted in the schemes to collect data for the duration of the study (1992-97). Further details on institutional support for ID and related studies are given in Annex 5.

Technical Assistance for Project Planning, Implementation and Impact Assessment (Base Cost US\$3.7 million)

2.22 In addition to capacity building technical assistance for training and irrigation research management (paras 2.12 and 2.17, respectively), the project would provide consulting services to support: (a) effective planning and implementation of rehabilitation and improvement works, and introduction of improved O&M practices in all rehabilitated schemes; and (b) execution of

impact assessment studies in a representative sample of schemes. The expertise required would be provided under two separate contracts. The scope of consulting services for project planning and implementation would include: (a) screening of all schemes proposed for rehabilitation; (b) preparation of feasibility studies for medium/major schemes, and review of the feasibility studies for minor schemes prepared by the implementing agencies; (c) construction monitoring and quality control for all schemes; (d) technical support for improved O&M, and institutional support to the FOs; and (e) management support for the Central Management Cell (CMC) to be established at ID (para 4.04). Consulting requirements have been estimated at 50 staff months of internationally recruited specialists, 1,020 staff months of locally recruited professional staff, and 1,080 staff months of locally recruited mid-level staff. During negotiations agreement was obtained from GOSL that consultants for project planning and implementation would be appointed by December 31, 1991 under terms of reference satisfactory to IDA.

2.23 One benchmark and two evaluation studies would be conducted in a sample of 30 minor and 15 medium/major schemes in order to assess the project's impact and to draw lessons for similar future operations. The benchmark studies would be conducted before rehabilitation. The two evaluation studies would be conducted about one year and three or four years, respectively, after completion of the works. The studies would cover the engineering, agricultural, environmental, socio-economic, and institutional aspects of the sample schemes, and would be conducted by a local research institute or a firm of consultants. Staff requirements are estimated at 190 staff months for senior professional staff and 168 staff months for junior professional staff. Further details on technical assistance for project planning and implementation, and impact assessment studies are given in Annex 6.

Procurement of Vehicles and Equipment (Base Cost US\$3.3 million)

2.24 The project would provide 75 vehicles, 87 motorcycles, 300 bicycles, and various other types of equipment, as specified in Annex 10, Schedule 2. Contractors would provide their own construction equipment.

III. PROJECT COST AND FINANCING

A. Project Cost

3.01 The total project cost is estimated at Rs 2,009 million (US\$49.8 million equivalent), with a foreign exchange component of US\$8.6 million or 17% of total cost (Table 3.1 and Annex 8). The cost estimates have been based on early 1991 prices. Estimates of quantities for the rehabilitation and improvement works are based on the feasibility studies for the first group of 17 schemes. The project cost includes Rs 92 million (US\$2.3 million equivalent) in taxes and duties. Physical contingencies for civil works have been estimated at 5%. Price contingencies and foreign exchange rates have been estimated on the basis of expected rates of local and foreign inflation as follows: local price contingencies: 11.5% for 1991, 7.7% for 1992, 6.0% for 1993-94, 5.0% for 1995, and 3.4% for 1996-97; and foreign price contingencies: 3.4% for all years.

Table 3.1: Project Cost Estimates

	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Foreign</u>
	-----Rs million-----			-----US\$ million-----			<u>Exchange</u>
							<u>%</u>
Rehabilitation and Improvement Works:							
Surveys and Investigations	14.5	-	14.5	0.4	-	0.4	-
Civil Works	639.1	120.4	759.5	15.8	3.0	18.8	17
Engineering and Administration	<u>89.3</u>	<u>-</u>	<u>89.3</u>	<u>2.2</u>	<u>-</u>	<u>2.2</u>	-
Subtotal	742.9	120.4	863.3	18.4	3.0	21.4	15
Farmer Organizations	78.0	0.5	78.5	1.9	-	1.9	-
Training	30.8	46.8	77.6	0.8	1.2	2.0	60
Environmental Protection	28.0	-	28.0	0.7	-	0.7	-
Institutional Support and Studies	84.9	36.8	121.7	2.1	0.9	3.0	36
Technical Assistance	125.7	25.0	150.7	3.1	0.6	3.7	17
Vehicles and Equipment	<u>65.9</u>	<u>69.5</u>	<u>135.4</u>	<u>1.6</u>	<u>1.7</u>	<u>3.3</u>	50
Base Cost	1,156.2	299.0	1,455.2	28.6	7.4	36.0	21
Physical Contingencies	35.9	5.8	41.7	0.9	0.2	1.1	15
Price Contingencies	<u>472.1</u>	<u>40.5</u>	<u>512.6</u>	<u>11.7</u>	<u>1.0</u>	<u>12.7</u>	8
Total Cost	1,664.2	345.3	2,009.5	41.2	8.6	49.8	17

B. Project Financing

3.02 The project would be financed by IDA, EEC and GOSL. The IDA Credit of SDR 21.9 million (US\$29.6 million equivalent) would be on standard IDA terms with a maturity of 40 years and would cover about 62% of the total project cost, excluding taxes and duties. IDA would finance the cost of rehabilitation and improvement works, formation of farmer organizations, introduction of improved O&M practices, agricultural demonstrations, procurement of a portion of vehicles and equipment, and VIRP carry-over works and studies. In order to facilitate the early start-up of the project and to complete the VIRP carry-over works and studies, expenditures of up to US\$1.2 million incurred after December 31, 1990, would be considered for retroactive financing. An EEC grant of ECU 3.34 million (US\$4.0 million equivalent) would cover about 8% of project cost, excluding taxes and duties. EEC would finance the foreign cost of training, institutional support for ID, and technical assistance for project planning and implementation. Signing of the cofinancing agreement between GOSL and EEC would be a condition of effectiveness for the IDA Credit. GOSL would finance the remaining project cost, i.e. US\$16.2 million. This includes US\$9.1 million equivalent of EEC Food-aid counterpart funds to finance the local cost of training, environmental protection works, institutional support for ID, studies, and technical assistance. It also includes US\$2.7 million equivalent to be contributed in labor, or other acceptable form, by the beneficiaries of the rehabilitation and improvement works. All such works to be financed under the project would be conditional upon a firm commitment by the farmer organizations to contribute at least 10% of the cost of the works (paras 2.05 and 2.07 and Annex 1, para 1). The balance of GOSL's contribution, including US\$2.3 million in taxes and duties, would be made available through annual budget appropriations in conformance with the project implementation schedule. Table 3.2 summarizes the project financing plan. Further details are given in Annex 9.

Table 3.2: Financing Plan
(US\$ million)

	<u>IDA</u>	<u>EEC</u>	<u>GOSL</u>	<u>Total</u>
Surveys and Investigations	0.5	-	-	0.5
Civil Works	23.5	-	3.9	27.4
Engineering and Administration	1.7	-	1.7	3.4
Farmer Organizations	2.7	-	-	2.7
Training	-	1.3	1.0	2.3
Environmental Protection	-	-	1.0	1.0
Institutional Support and Studies	0.1	1.0	2.7	3.8
Technical Assistance	-	0.7	4.4	5.1
Vehicles and Equipment	<u>1.1</u>	<u>1.0</u>	<u>1.5</u>	<u>3.6</u>
Total Financing Required	29.6	4.0	16.2	49.8

C. Procurement

3.03 Civil Works (US\$26.7 million, excluding taxes and duties) are relatively small, labor-intensive, and geographically dispersed in areas with difficult access. These works are not expected to attract international bidding and would therefore be carried out, either under contract through local competitive bidding (LCB) procedures acceptable to IDA, or on force account by the FOs at the engineer's estimated cost. Current GOSL regulations permit registered FOs to carry out small civil works contracts outside normal tender procedures, provided that: (a) the value of each contract does not exceed Rs 250,000 (US\$6,250); (b) the total value of all contracts held by the FO at any one time does not exceed Rs 750,000 (US\$18,750); (c) the Ministry concerned is satisfied that the FO has the capacity to carry out the works; and (d) the works are located within the scheme managed by the FO. It is estimated that about 20% of the civil works, particularly those involving excavation works, would be offered to the FOs. The aggregate value of civil works to be carried out on force account would not exceed US\$5.5 million. Vehicles and Equipment (US\$1.1 million) would be procured through international competitive bidding (ICB) or prudent shopping. Contracts costing US\$20,000 or more each would be procured through ICB procedures in accordance with IDA guidelines. Local suppliers competing under ICB would be granted a price preference of 15% of the CIF price of the goods or the customs duties, whichever is less. Small off-the-shelf items costing less than US\$20,000 each, would be procured on the basis of quotations from at least three independent suppliers in accordance with GOSL procedures which are acceptable to IDA. Such purchases would not exceed the equivalent of US\$500,000 in the aggregate. Surveys and Investigations (US\$0.5 million) would be carried out by ID on force account or under contract through LCB. Consultants' Services for studies (US\$0.1 million) would be contracted in accordance with IDA guidelines for the use of consultants.

3.04 Bid documents for all civil works contracts over US\$150,000 and all contracts for vehicles and equipment over US\$100,000 would be submitted to IDA for prior review, and IDA's concurrence would be sought before the contracts are awarded. This procedure would apply to about 5% of the estimated total cost of civil works and about 70% of the estimated cost of vehicles and equipment to be procured through ICB. For other contracts GOSL would use standard bidding documents approved by IDA. Goods and services to be financed by EEC (para 3.02) would be procured in accordance with EEC's own procedures. The methods of procurement for all project components are given in Table 3.3.

Table 3.3: Methods of Procurement /a
(US\$ million)

<u>Project Element</u>	<u>ICB</u>	<u>LCB</u>	<u>Other</u>	<u>N.A b/</u>	<u>Total</u>
Surveys and Investigations	-	0.2 (0.2)	0.3 (0.3)	-	0.5 (0.5)
Civil Works	-	21.9 (18.8)	5.5 (4.7)	-	27.4 (23.5)
Engineering and Administration	-	-	-	3.4 (1.7)	3.4 (1.7)
Farmer Organizations	-	-	-	2.7 (2.7)	2.7 (2.7)
Training <u>c/</u>	-	-	-	2.3	2.3
Environmental Protection <u>c/</u>	-	-	-	1.0	1.0
Institutional Support and Studies <u>d/</u>	-	-	0.1 (0.1)	3.7	3.8 (0.1)
Technical Assistance <u>c/</u>	-	-	-	5.1	5.1
Vehicles and Equipment <u>e/</u>	2.6 (0.8)	-	1.0 (0.3)	-	3.6 (1.1)
Total	2.6 (0.8)	22.1 (19.0)	6.9 (5.4)	18.2 (4.4)	49.8 (29.6)

a/ Figures in parenthesis are the amounts to be financed by IDA and include contingencies

b/ Not applicable.

c/ To be financed fully by EEC and EEC Food-aid counterpart funds.

d/ To be financed partially by EEC and EEC Food-aid counterpart funds.

e/ To be financed partially by EEC.

D. Disbursements

3.05 Disbursements of the IDA Credit would extend over seven years (1991-98) and would cover:

- (a) 95% of expenditures on civil works, including construction materials, but excluding contributions by FOs (para 2.05);
- (b) 100% of expenditures on surveys and investigations, support of farmer organizations, and consultants' services;

- (c) 50% of expenditures on engineering and administration; and
- (d) 100% of foreign expenditures if imported, or 100% of local expenditures if manufactured locally, or 70% of local expenditures if procured locally, on vehicles and equipment.

3.06 Full documentation would be sent to IDA in support of withdrawal applications, except for item (c) above, for works executed under force account, and for small local contracts individually costing less than the equivalent of US\$100,000. For these items applications would be supported by statements of expenditure (SOE) certified by the Project Director and Accountant of the Central Management Cell. The relevant documentation would be retained by ID at a central location and should be made available to IDA representatives on request. This documentation also would be subject to audit. All documents sent to IDA in support of withdrawal applications for civil works, including SOEs, would have been checked and certified by the project consultants.

3.07 GOSL would open and thereafter maintain a Special Account in US dollars with the Central Bank in Colombo. The authorized allocation for the Special Account would be US\$1.5 million equivalent. This allocation represents an estimated four months of IDA-financed expenditures. The Special Account would be replenished through periodic reimbursement, either monthly or whenever the balance of the authorized allocation falls below 40%, whichever occurs first, and would be used exclusively for IDA's share of financing. The proposed closing date of the IDA Credit is June 30, 1998.

E. Accounts and Audits

3.08 The Central Management Cell at ID would establish and maintain a separate project account. Funds would be provided in the budget of ID, the lead agency for the project. Adequate records would be maintained by all implementing agencies to identify physical progress and financial transactions relating to the project. Individually identifiable accounts would also be kept for all expenditures for which withdrawals are made on the basis of SOEs, and for the flow of funds from the Special Account. A senior accountant (consultant) would be employed in the Central Management Cell to guide and supervise staff responsible for keeping the project accounts. The project accounts, including SOEs and the Special Account, would be audited annually by independent auditors acceptable to IDA. Audited accounts, together with auditors' comments, would be sent to IDA within nine months of the close of each financial year. At present the accounts of ID and the other participating agencies are audited by the Auditor-General's Department. This arrangement is satisfactory to IDA. An action plan is in place for submission of audit reports under ongoing projects in the irrigation sector.

IV. PROJECT IMPLEMENTATION

A. Implementation Schedule

4.01 Feasibility studies for 17 schemes and detailed proposals for the project's training program and improved O&M activities were prepared in 1989-90. During 1991 ongoing preconstruction activities for the 17 schemes would be completed, including: (a) topographical surveys; (b) preparation of detailed engineering documents; (c) selection and training of IOs; (d) formation of FOs; (e) formalizing agreements with the FOs on their contribution to the rehabilitation works; (f) preparation of preliminary proposals for the second group of rehabilitation schemes; and (g) preparation of designs and contract documents for improvement and expansion of in-service training centers. VIRP carry-over works would also be completed in 1991. Construction works for the first group of rehabilitation schemes would start in 1992 while, at the same time, feasibility studies and other pre-construction activities for the second group of schemes would commence. The total project period would be seven years, starting in January 1991 and ending in December 1997. The implementation schedule is given in Annex 7.

B. Organization and Management

Introduction

4.02 The project would be implemented by ID, DAS, the provincial councils, and the FOs. A Central Management Cell (CMC), headed by a Project Director under the Director of Irrigation, has been established in ID. The CMC would direct all project activities under the guidance and supervision of a Project Coordination Committee (PCC).

Project Coordination Committee

4.03 The PCC would have overall responsibility for the implementation of the project. The Secretary of MLIMD would chair the PCC and the Project Director would function as its Secretary. Permanent members would include the Director of ID, the Commissioner of DAS, the Director of IMD, and the chief secretaries of the provincial councils. Representatives of other concerned departments may be invited to participate in the deliberations of the PCC. These departments include the Land Commissioner's Department, the Department of National Planning, the Department of Agriculture, and the Survey Department. Specific responsibilities of the PCC would include: (a) policy guidance and decision making; (b) approval of annual work programs and budgets; (c) periodic review of work progress; and (d) resolution of problems which may arise during implementation. The PCC would meet at least once every six months.

Central Management Cell

4.04 The CMC would direct and coordinate all project components and activities. Its major responsibilities would include:

- (a) preparation of annual work plans and budgets;
- (b) screening and approval of all rehabilitation proposals to ensure that selection criteria are being adhered to;
- (c) promoting the establishment of viable FOs for all rehabilitation schemes;
- (d) preparation of feasibility studies and designs for medium/major schemes;
- (e) technical review and approval of feasibility studies and designs prepared by the provincial irrigation units;
- (f) monitoring of construction progress and quality for all schemes;
- (g) preparation and monitoring of project-related training programs;
- (h) guiding and monitoring of improved O&M activities;
- (i) coordination and monitoring of studies by other agencies;
- (j) procurement of vehicles and equipment;
- (k) financial control, including maintaining separate project accounts, preparation of disbursement applications, management of the Special Account, preparation of project accounts for audit, etc.; and
- (l) preparation of project progress reports.

4.05 The CMC would operate as a task force for planning and implementation of the project. It would be composed of experienced GOSL staff and consultants. The CMC was established, and the Project Director appointed, prior to negotiations for the IDA Credit. CMC staff would be drawn from ID, DAS and IMD. The CMC would have work units for institutional development, operation and maintenance, training (all to be staffed by GOSL employees and consultants), designs, progress monitoring, procurement, accounts, and administration (to be staffed by GOSL employees only). The consultants would be fully responsible for feasibility planning of all medium/major schemes.

4.06 Regional Support Teams (RST) of the CMC, to be staffed by consultants, would be established in the provinces. The RSTs would discharge the CMC's responsibilities at the local level, including: (a) screening of preliminary rehabilitation proposals; (b) technical review of plans and designs for minor schemes; (c) monitoring of progress and quality control of all civil works, including certification of disbursement applications; and (d) providing institutional support to the FOs. Each RST would include a construction engineer, an institutional development officer, and a technical officer. Full details on the consultants' responsibilities are given in Annex 6.

Irrigation Department

4.07 The ID through its range offices would procure and implement the project works in all the medium/major schemes remaining under the management of ID. Specifically, the range offices would be responsible for: (a) conducting surveys and investigations; (b) managing construction works; and (c) introducing improved O&M practices in the schemes under their control. The range offices would select, and ID would employ, IOs for the schemes concerned (in consultation with the RSTs, which would clear the appointments). ID range offices are headed by deputy-directors who would delegate responsibility for implementing the project works to divisional irrigation engineers. The technical assistants of the irrigation divisions would function as scheme managers and would coordinate all project activities with the FOs, the scheme project committees, and the agricultural support services in the scheme area. The IOs would work under their direct supervision. The RSTs would monitor the progress and quality of construction work and provide technical and institutional guidance to the scheme.

4.08 Where necessary, ID and its range offices would assist the provincial administrations with the implementation of project works in schemes under provincial management. The need for such assistance would be determined on a year-to-year basis and may vary from one province to another (para 4.12). Several reviews of GOSL's organizational arrangements for serving the irrigation sector are being carried out (para 1.11). These reviews cover both the central and provincial administrations and, by the end of 1991, are expected to result by the end of 1991 in detailed proposals for streamlining GOSL's services to the irrigation sector. During negotiations agreements were obtained from GOSL that proposals for the future organizational arrangements of public services to the irrigation sector would be sent to IDA for review and comment by June 30, 1992, and that GOSL would submit, by December 31, 1992, a timetable for implementing agreed recommendations.

Department of Agrarian Services

4.09 The Commissioner of Agrarian Services would register FOs for all schemes to be covered by the project in accordance with the provisions of the Agrarian Services Act. The district assistant commissioners would select, and DAS would employ, IOs for all rehabilitation schemes under provincial management, after obtaining clearance from the RSTs. The district assistant commissioners and provincial deputy commissioners would screen all identification reports for repair and rehabilitation of minor schemes and decide which schemes would be repaired with local funding and which would be considered for financing under the project.

Provincial Councils

4.10 The provincial councils would be responsible for implementing the project in all minor and medium/major schemes under provincial management. Provincial project coordination committees would be established in all provinces to coordinate project activities. The committees would approve the annual work programs, review project progress, and resolve any problems which may arise. The chief secretaries of the provincial councils would chair the

committees, and the secretaries of the provincial ministries and heads of departments involved in implementing the project would be the members.

4.11 The provincial irrigation units (in some provinces a separate unit within a major engineering and construction agency, in others an independent department) would undertake a substantial number of tasks under the project, including:

- (a) preparation of feasibility studies (including O&M plans) for all minor schemes;
- (b) surveys and investigations for all schemes under provincial management;
- (c) preparation of designs for minor schemes;
- (d) procurement and management of construction works for all schemes under provincial control;
- (e) introduction of improved O&M practices in medium/major schemes under provincial management; and
- (f) provision of technical support services for all schemes, where needed.

4.12 The provincial irrigation units were established only recently and most are short of experienced staff. Therefore, the CMC each year would review the implementation capacity and workloads of the provincial irrigation units in order to determine their capacity for undertaking the tasks assigned to them under the project. After consultations with the chief secretaries, the ID would assume responsibility for executing all tasks found to be beyond the capacity of the provincial irrigation units. The first such review was conducted during the appraisal of the project in December 1990. At that time it was decided to assign the responsibility for preparing detailed designs for the first group of minor schemes in 1991 to the Designs Branch of ID instead of the provincial irrigation units. Similar reviews would be conducted during the months April - June of each project year. During negotiations agreement was obtained from GOSL that draft annual project work programs, budgets and staff requirements for the central and provincial implementing agencies, together with the actual staff positions of the agencies and the recommended division of responsibilities, would be sent to IDA for review and comment before June 30 of the year preceding the project year concerned. Submission of the draft work program, budget, staff requirements and actual positions for 1992, together with the recommended division of responsibilities between the center and the provinces, would be a condition of effectiveness of the IDA Credit.

4.13 The agricultural planning teams (APT), one of which exists in each administrative division, would undertake several key tasks at the field level. These tasks include: (a) preparing identification reports for the rehabilitation and improvement of minor schemes; (b) together with the IOs, promoting the formation of FOs in all schemes to be covered by the project;

(c) assisting the provincial irrigation units during the preparation of improved O&M plans; and (d) advising the farmers in all schemes on the introduction of the improved O&M plans and better cropping practices. The APTs would be guided by district and provincial level specialists and the RSTs.

Farmer Organizations

4.14 The FOs, as the clients of the rehabilitation and improvement works, would participate as full partners in the entire cycle from preconstruction activities through O&M. During the preconstruction stage the FOs would discuss and approve the preliminary and final plans for the rehabilitation and improvement works. These plans would include an contribution of at least 10% of the cost of the works by the farmers themselves. During preconstruction the FOs would also adopt a plan for improved O&M. During the construction stage the FOs would execute their contribution to the rehabilitation works and any additional works they may have contracted for. During the O&M phase the FOs would operate and maintain the schemes in accordance with an agreed plan.

Management of the Training Program

4.15 The CMC would have overall responsibility for planning and implementing the training and staff development program. Because of the scope and volume of training envisaged, the CMC would be assisted in this task by an internationally recruited training management specialist and a locally recruited farmer training specialist. At least one counterpart would be assigned to each consultant to sustain management of the training program after completion of the project. The consultants and their counterparts would initially prepare, and thereafter annually revise, detailed plans and budgets for implementation of the training program during the entire project period, based on updated training needs. They would also supervise program implementation in the field and evaluate the impact of all training activities. The curricula for all relevant existing training programs would be reviewed and adapted, as necessary, to meet the needs of the project. The most qualified persons from training institutes and agency staff would be selected to serve as trainers. The communications skills of those selected would be raised through training-of-trainers' programs. Existing in-service training institutes would be used as venues for in-service training of existing agency staff and for induction courses for IOs. The training of FO representatives and farmers would be conducted as close as possible to the project sites.

C. Reporting Requirements

4.16 The following reports would be sent regularly to IDA:

- (a) quarterly project progress reports, including summary statements on the contributions made by the FOs towards the implementation of rehabilitation and improvement works, within one month of the close of each quarter;

V. PROJECT JUSTIFICATION AND RISKS

A. Agricultural Production

General

5.01 The primary benefits of the project would arise from sustaining the current levels of agricultural production through rehabilitation of existing irrigation facilities. Improvement works and introduction of better O&M practices would result in additional benefits. Also, improvements in the conveyance system and control of water deliveries would facilitate the introduction of other field crops to the cropping system, until now dominated by paddy. The project would improve the living standards of farm families operating in the schemes, most of whom rely completely on irrigated agriculture. Estimates of total project benefits have been based on a detailed appraisal of a sample of six schemes, representing agro-climatic and farm production conditions prevailing in the dry and wet zones. Two of the sample schemes apply to medium/major systems and four apply to minor schemes.

5.02 Compared with present levels, production from all schemes to be rehabilitated under the project would increase by about 20,000 mt of paddy and about 5,700 mt of other field crops, valued at about US\$4.0 million per year at full development. The project would also stabilize the production of about 100,000 mt of paddy from these schemes, valued at about US\$15.0 million, which would otherwise be lost through further deterioration of the schemes. The income from increased crop production and stabilization of existing production would directly benefit about 100,000 farm families in the project area. The increased production would generate an additional annual labor demand for farm activities of about 2,000 person-years, largely hired labor. The reduction in employment resulting from reduced production without the project would be about 8,000 person-years. Temporary off-farm employment created during project implementation is estimated at about 7,000 person-years; this employment would primarily benefit the landless.

Crop Yields and Production

5.03 Increases in crop areas would range between 0% and 20%, and increases in paddy yields between 5% and 10%. Most of the expected gains would come from farmers cultivating the tail-end lands of the schemes, as these farmers generally experience difficulties in receiving water. The project would permit modest levels of crop diversification during the dry season in schemes in the dry zone. Table 5.1 summarizes the projected changes in the cropping intensities and the production of rice and other field crops in the six appraised schemes. Details are given in Annex 11, Tables 1-6.

Table 5.1: Cropping Intensities and Crop Production of Appraised Schemes a/

<u>Area (ha)</u>	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>
Net Irrigable Area	819	195	17	32	39	22
Cultivated Area P <u>b/</u>	1,638	205	34	32	39	24
Cultivated Area W/O <u>c/</u>	1,310	150	24	25	25	17
Cultivated Area W <u>d/</u>	1,638	223	34	38	47	28
<u>Cropping Intensity (%)</u>						
P	200	105	200	100	100	109
W/O	160	77	141	78	64	77
W	200	114	200	118	121	117
Reduction W O Project	40	28	59	22	36	32
Increase W Project	-	9	-	18	21	8
Total Increment	40	37	59	40	57	40
<u>Crop Production (mt)</u>						
Maha Season Rice	P 3,194	761	39	128	156	79
	W/O 1,769	315	24	78	113	46
	W 3,440	800	43	141	180	88
Yala Season Rice	P 3,112	37	36	-	-	6
	W/O 1,703	-	22	-	-	-
	W 3,276	78	33	-	-	10
Other Field Crops <u>e/</u>	P -	-	-	-	-	-
	W/O -	-	-	-	-	-
	W 24	9	2	6	8	3
Total	P 6,306	798	75	128	156	85
	W/O 3,472	315	46	78	113	46
	W 6,740	887	78	147	188	101
Reduction W/O Project	2,834	483	29	50	43	39
Increase W Project	<u>434</u>	<u>89</u>	<u>3</u>	<u>19</u>	<u>32</u>	<u>16</u>
Total Increment	3,268	572	32	69	75	55

a/ I Kaltota; II Mahagal Wewa; III Dorakada Liyadde; IV Kobeigane, V Mahakiri Ibbewa; VI Nittewa.

b/ Present, c/ Without Project, d/ With Project.

e/ Includes crops such as chillies, onions, pulses and vegetables.

B. Marketing and Prices

5.04 Sri Lanka is a net importer of rice. In the 1980s, annual rice imports averaged about 10% of domestic consumption. The country also imports wheat flour and wheat grain, averaging about 500,000 mt per year. Despite GOSL's desire to attain self-sufficiency in rice production, the goal has remained elusive. Available evidence suggests that full self-sufficiency would not be reached in the next ten years or so. The incremental production of rice and other food crops resulting from the project therefore would be consumed domestically, mostly within the areas of production.

5.05 The procurement of food crops and supply of production inputs in all schemes is handled by private traders. GOSL's interventions in these activities are minimal. The subsidy on fertilizer was removed in 1989 and all inputs now are available to farmers at competitive prices. No major problems of produce disposal or input supply are envisaged in the future.

C. Farm Incomes

5.06 In order to assess the impact of the project, a detailed analysis of farm incomes was conducted and farm budgets were prepared for each of the six sample schemes. The analysis was based on owner-operated farms since about 85% of the land is cultivated by owners. The average farm size in the schemes ranged from a low of 0.2 ha in Dorakada Liyadde to a high of 1.4 ha in Mahagal Wewa. The farm models were designed on the basis of present and estimated future cropping patterns and cultivation practices. Gross incomes and costs of production were estimated using actual December 1990 market prices. Production costs include the schemes' O&M costs to be met by the farmers, at an estimated average rate of Rs 670 per ha for tank schemes and Rs 600 per ha for diversion schemes. Table 5.2 presents a summary of the average farm incomes indicating conditions and conditions with and without the project. Details are given in Annex 11, Tables 7-12.

Table 5.2: Summary of Farm Incomes a/

<u>Scheme</u>	<u>Farm Size (ha)</u>	<u>Farm Income (Rs)</u>				
		<u>Present</u>	<u>Without Project</u>	<u>With Project</u>	<u>Incremental</u>	
					<u>I b/</u>	<u>II c/</u>
Kaltota	0.4	11,217	4,244	17,298	6,081	13,054
Mahagal Wewa	1.1	19,666	8,643	24,256	4,596	15,613
Dorakada Liyadde	0.2	2,320	1,274	2,996	676	1,722
Kobeigane	0.2	3,174	1,710	3,768	594	2,050
Mahakiri Ibbewa	0.35	5,247	2,194	6,215	968	4,021
Nittewa	0.6	8,913	4,982	10,432	1,519	5,450

a/ Annual gross production value minus cash production cost

b/ Difference between with project and present income

c/ Difference between with project and without project income

5.07 Incremental incomes in the six sample schemes are estimated to range between 15% and 55% over present levels, and between 100% and 300% over levels without the project. The distribution of incremental incomes from the project, according to farm sizes and land tenancy arrangements, is not expected to differ significantly from the present situation. Sharecropping is practiced on about 15% of the land. In most such cases, the sharecropper pays for all inputs and retains 50% of the produce.

D. Economic Analysis

5.08 The overall economic rate of return (ERR) for the project is estimated at 31% and the NPV at about US\$58.0 million. The main assumptions underlying the analysis and the methodology followed are described below.

- (a) Agricultural Production. Estimates for the entire project are based on production and cost data from the six representative sample schemes. The key variables affecting crop production are: crop yields, cropping pattern, and cultivation intensity. Estimates of these variables with and without the project were based on estimates of the remaining life span of all existing scheme facilities and detailed discussions with scheme officials and farmers. Details of production-related variables are given in Annex 11, Tables 1-6.
- (b) Input-Output Prices. The projected prices for tradeable goods used in the analysis were based on the Bank's December 1990 price forecasts, wherever applicable. For other goods, domestic financial prices were converted to economic prices using a standard conversion factor (SCF) of 0.85. Unskilled labor costs were adjusted by a conversion factor of 0.9. A summary of financial and economic prices is given in Annex 12, Tables 1 and 2.
- (c) Project Execution. Preconstruction activities commenced in early 1991. Construction would begin in early 1992 and would be completed in 1997. The implementation schedule is given in Annex 7. The analysis has been based on a project investment life span of 25 years.
- (d) Investment Costs. The analysis was based on project costs directly associated with the schemes. It excludes taxes, other transfer payments and price contingencies. The local costs were adjusted by a SCF of 0.85.
- (e) Operation and Maintenance Costs. Estimates of incremental O&M costs were made for each sample scheme and were adjusted by a SCF of 0.85.

E. Sensitivity Analysis, Special Emphasis, and Risks

5.09 Sensitivity Analysis. The project's viability under adverse conditions was tested using sensitivity analysis. The results of the tests are summarized in Table 5.3. The switching values indicate the percentage change in each of the variable streams required to reduce the ERR to 10% (assumed opportunity cost of capital). The test results show that relatively large changes would be required to reduce the project's economic viability to below acceptable levels.

Table 5.3: Sensitivity Analysis

<u>Variable Tested</u>	<u>Switching Value (percentage change)</u>
Increase in rehabilitation costs	292
Decrease in crop revenue in Maha season	-76
Decrease in crop revenue in Yala season	-129
Increase in cost of farm inputs in Maha season	260
Increase in cost of farm inputs in Yala season	317
Lag in benefits (in years)	6

5.10 Special Operational Emphasis. Rehabilitation and improvement of existing irrigation schemes, of which many were constructed centuries ago, would benefit entire local communities in Sri Lanka. Additional employment opportunities would be created, especially for the landless, both off-farm during construction and on-farm during planting and harvesting seasons. Sri Lankan men and women have equal access to economic opportunities and social facilities. Many of the farmers are women, and women are active participants in community activities, including the farmer organizations now being established in the irrigation schemes. Therefore, women and men are expected to benefit equally from the project.

5.11 Project Risks. The project faces two main risks. First, inadequate staffing of the new provincial administrations could cause implementation delays or sub-standard quality of works. To minimize this risk, a Central Management Cell would be established in the Irrigation Department and consultants would be employed to assist the provincial administrations with project planning and implementation and to monitor the quality of works. The capacity of the provincial administrations would be reviewed each year and, if necessary, tasks beyond their capacity would be assigned to the Irrigation Department. Second, the establishment of farmer organizations could proceed at a slower pace than expected, causing delays in project implementation. Institutional organizers would be employed in all schemes to assist with the formation of farmer organizations and to minimize the risk of delays.

VI. AGREEMENTS REACHED AND RECOMMENDATION

6.01 Agreements have been obtained from GOSL that:

- (a) schemes would be selected in accordance with criteria specified in Annex 1 (para 2.05);
- (b) a plan for periodic safety inspection of dams constructed or rehabilitated under the project would be sent to IDA for review by December 31, 1992 (para 2.05);
- (c) consultants for project planning and implementation would be appointed by December 31, 1991 (para 2.22);
- (d) proposals for the future organizational arrangements of public services to the irrigation sector would be sent to IDA for review and comment by June 30, 1992, and a timetable for implementing agreed recommendations would be submitted to IDA by December 31, 1992 (para 4.08); and
- (e) draft annual project work programs, budgets, and staff requirements for the central and provincial implementing agencies, together with the actual staff positions of the agencies and the recommended division of responsibilities, would be sent to IDA for review and comment before June 30 of each year (para 4.12).

6.02 Conditions of effectiveness would be:

- (a) signing of the cofinancing agreement between GOSL and EEC (para 3.02); and
- (b) submission to IDA of the draft work program, budget, staff requirements, and actual staff positions for 1992, together with the recommended division of responsibilities between the center and the provinces (para 4.12).

6.03 Disbursements against expenditures in the Northern and Eastern Provinces would be conditional upon completion of on-site appraisal of selected schemes and review of implementation arrangements to the satisfaction of IDA (para 2.06).

6.04 With the above conditions and agreements, the project would be suitable for an IDA Credit of SDR 21.9 million (US\$29.6 million equivalent) on standard IDA terms with a maturity of 40 years. The Borrower would be the Democratic Socialist Republic of Sri Lanka.

SRI LANKA

NATIONAL IRRIGATION REHABILITATION PROJECT

Rehabilitation and Improvement Works

A. Criteria for Selection of Schemes

1. Existing operational medium/major and minor schemes, listed in the inventories of ID and DAS, respectively, would qualify for rehabilitation and improvement under the project. In order to be selected, proposed schemes must satisfy the following criteria:

- (a) a farmer organization (FO) would be established and registered at the preconstruction phase in accordance with the Agrarian Services Act of 1979, as amended in 1991;
- (b) the FO would agree: (i) to contribute at least 10% of the cost of rehabilitation and improvement in the form of free labor, or any other acceptable form; and (ii) to operate and maintain the scheme in accordance with an agreed plan;
- (c) for minor schemes (less than 80 ha) the FO would bear the full cost of O&M after completion of rehabilitation and improvement;
- (d) for medium/major schemes (80 ha and over) the FO would: (i) bear the full cost of O&M of distributory and field canals after completion of rehabilitation and improvement; and (ii) bear the cost of O&M of headworks and main canals starting two years after completion of rehabilitation and improvement (initially, payments would not exceed Rs 500 per ha in 1991 prices; this amount would be adjusted annually, taking into account inflation during the previous year and the need to achieve full O&M cost recovery for all rehabilitated schemes within a reasonable time period);
- (e) the command area would not be less than 4 ha and the number of benefitting families not less than 10;
- (f) the investment cost would not exceed Rs 40.0 million (US\$1.0 million equivalent) in 1991 prices;
- (g) for medium/major schemes the economic rate of return of rehabilitation and improvement works would be at least 15%; and
- (h) for minor schemes (less than 80 ha) the cost of rehabilitation and improvement works would not exceed a base cost of Rs 30,000 (US\$750 equivalent) per ha in 1991 prices.

B. Guidelines for Preparation of Minor Schemes

Introduction

2. Standard proforma would be used for assembling all technical information required for the preparation of identification and feasibility reports. Minor and medium/major schemes would have different standards for acceptance into the project. The proforma for the identification report would be the same for all schemes but separate proforma would be used for the feasibility reports for minor schemes and medium/major schemes, respectively. This section provides guidance for field staff for the preparation of identification and feasibility reports for minor schemes. Feasibility studies for medium/major schemes would be prepared by consultants (see Annex 6 for a description of consultant's terms of reference).

Proforma for Identification Reports for Minor Schemes

3. The proforma for identification reports for minor schemes would have the following parts:

I. Name of Scheme and Location. Province, district, division, and a brief description of means of access.

II. Description of Scheme and its Condition. A brief description of the scheme, including: type of scheme; data for headworks and canal system; condition of infrastructure; rehabilitation works undertaken during the last five years; reasons for deterioration; and safety of infrastructure. In addition, details on: the socio-economic situation (population, farm families, occupation, and incomes); agriculture (farming practices and yields); farmers' participation in the identification process; their interest in forming a FO, contributing a part of the capital cost, and taking over the full responsibility for O&M of scheme. Also to be included: comments on present and expected future effects of the deteriorated scheme condition on the socio-economic situation of the farmers and, specifically, on the security of the scheme, in case deterioration is allowed to continue.

III. Proposals. To be included: details and costs of necessary rehabilitation works to restore the scheme to design parameters. Desirable improvement works may be suggested but costs need not be estimated at this stage.

Proforma for Feasibility Reports for Minor Schemes

2.03 The proforma for feasibility reports for minor schemes would have the following parts:

I. Name of Scheme and Location. Province, district, division, coordinates, and a brief description of access.

II. Description of Scheme and its Condition. Data required include:

- (a) Engineering: type of scheme; brief description of the system, including data on irrigable command area, headworks, and canal system; condition of infrastructure and reasons for deterioration; comments on the safety of the system; description of the operational plan (preventive and periodic maintenance, operation of the headworks, and rotational water distribution system) and its effectiveness; repair and rehabilitation works carried out over the last five years, and amounts and sources of financing for these works (including farmers' contributions in the form of cash or labor);
- (b) Socio-economic: population, number of farm families, occupation, and incomes;
- (c) Agricultural: soils, farming practices, cropping patterns, and crop yields;
- (d) Institutional: support services of GOSL (ID, DAS, Department of Agriculture, and agrarian services centers); banking facilities; processing and storage; transport and marketing (public or private);
- (e) Management: scheme management; effectiveness of the system; FOs (if any) and their effectiveness; responsibilities of GOSL agencies and FOs for O&M of headworks and canal system, including operation of a rotational water distribution system, if any; and
- (f) Environment: catchment degradation (deforestation and cultivation); tank bed cultivation; silting of tanks; seepage at tank bunds and waterlogging downstream of tank bunds; waterlogging in the irrigable area due to poor drainage conditions (flood backwater, silting, man-made obstructions along natural drains, borrow pits); agro-chemical and industrial pollutants and effects on domestic water supplies; health hazards due to polluted water and insects.

III. Hydrology

Tank Schemes. Data required include: (a) agro-ecological zone; (b) catchment area; (c) condition of terrain; (d) number of operating schemes and proposed development in the catchment; (e) monthly rainfall data with a probability factor of 75%; (f) seasonal specific yields; (g) utilizable yield assumed at 70% of the seasonal yield less water used by the upstream and downstream users; and (h) flood runoff based on the rational formula.

Diversion Schemes. Most diversion works are located across minor streams with perennial flow. The irrigable area during the wet season is limited by land availability and during the dry season by the minimum flow. The hydrological analysis would determine the minimum dry-season flow and the maximum flood runoff during the wet season. As discharge data are not available to determine these parameters, the following methodology is suggested:

- (a) during the identification and feasibility phase (about 18 months), flow measurements (current metering or float method) would be conducted during two dry seasons and one wet season. In addition, discharge data at upstream diversion works would be collected. On this basis irrigable command area for the Maha and Yala seasons for these flows would be determined; and
- (b) catchment area conditions, rainfall and stream capacity would be analyzed. This would include the following steps:
 - (i) determine catchment area and agro-ecological region;
 - (ii) determine the 75% monthly rainfall and the monthly yield for the catchment area using long term daily rainfall data from the nearest representative rainfall station;
 - (iii) compute maximum stream capacity, adjust 75% probability yield for maximum stream capacity, and on a pro-rata basis compute the weekly rainfall;
 - (iv) compute weekly crop water requirements for the irrigable area;
 - (v) compare available water, as at para (b) (iii), with water requirement, as at para (b) (iv), and estimate the weekly success rate. Success rates should not be less than 100% and 70% for the Maha and Yala seasons, respectively. Compare these areas with those obtained under para (a) above.

IV. Proposals

- (a) Rehabilitation and Improvements. Details would be given for headworks and canal system. Rehabilitation would cover works to restore the scheme to design parameters, including repairs and replacement of structures. Improvements would cover new works, such as additional sluices, protection works, lining of canals, additional canals and control arrangements, improved or new drainage canals;
- (b) Operation and Maintenance. Preventive and periodic maintenance works (including frequency) would be described separately for headworks and the canal system. This would include:
 - (i) headworks: preventive maintenance of the tank bund and access roads; spillway approach and tail canals; sluices, including control arrangements and clearing of debris at intakes; upstream and downstream protection works; filter toe and lead away drains; diversion headworks and clearing of the main diversion stream; and periodic maintenance of spillways; protection works for embankment and sluices; filters; toe and

lead away drains; diversion works; and replacement of stop logs; and

(ii) canal system; preventive maintenance of the main, distributory, and field canal bunds and roads; backfilling of slips or undermined foundations at structures; minor repairs and greasing of control arrangements of turnouts; repairs to protection works at drop structures; and periodic maintenance for desilting of main, distributory, and field canals; clearing of drainage canals; major repairs to canal structures; repair or replacement of control arrangements.

(c) Management. A brief description of the proposed management structure (organization, activities, and responsibilities of FOs); the roles of central government and provincial agencies; and suggestions for resolving problems of processing and storage, transport and marketing, and supply of farm inputs; and

(d) Environment. Description of measures to eliminate or minimize adverse effects of environmental problems and participation of the FOs in implementing the measures.

V. Estimated Cost. A proforma for the estimate is given below:

	Unit	Quantity	Rate	Amount	Foreign % of Amount	Tax Rate
<u>Headworks</u>						
Rehabilitation						
Improvement						
<u>Downstream Development</u>						
Rehabilitation						
Improvement						
<u>Environmental Protection Works</u>						
Reforestation						
Subtotal Base Cost						
<u>General</u>						
Engineering and Administration (12% of base cost)						
Physical Contingencies (5% of base cost)						
Price Contingencies (10% of base cost)						
Subtotal General						
Total Cost						

VI. Benefits and Justification. This would include: crop areas, yields and production with and without the project and the benefit/cost ratio. Cost would include investment and O&M costs. Benefits would be net of farm production cost.

VII. Compliance with Selection Criteria

VIII. Attachments. This would include:

- (a) location map;
- (b) scheme plan to a suitable scale showing the headworks, and downstream development area;
- (c) sketch plan of the command area, showing the canal system including drainage canals and plots;
- (e) rotational system (frequency and quantity of water), referenced to the notations for turnouts and plots shown in the sketch plan;
- (f) longitudinal sections and cross-sections of embankments and streams, and site surveys of headworks structures such as spillways sluices, and diversion works;
- (g) quantity sheets;
- (h) minutes of meetings with the FO; and
- (i) documents confirming the legal status of the FO, and the FO's agreement: (i) to contribute at least 10% of the cost of civil works; and (ii) to operate and maintain the scheme in accordance with an agreed plan and to assume the cost of O&M as specified in para 1.

SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT
Appraised and Prepared Schemes

<u>Scheme</u>	<u>Province</u>	<u>District</u>	<u>Irrigable Command Area (ha)</u>	<u>Farm Families (No.)</u>	<u>Estimated Cost (Rs M)</u>	<u>Management ID/Province</u>
Appraised Schemes:						
Medium/Major						
1. Kaitota Diversion	Sabaragamuwa	Ratnapura	820	1,800	16.0	ID
2. Maha Galwewa - Meegahajandura Tank	Southern	Hambantota	195	1,000	9.2	Province
Minor						
3. Dorakada Liyadde Diversion	Western	Kalutara	16	450	0.4	Province
4. Maha Kiri Ibbewa Tank	North Central	Anuradhapura	41	1,500	1.0	Province
5. Kobeigane Tank	North Western	Kurunegala	34	550	0.9	Province
6. Nittewa Tank	North Central	Anuradhapura	<u>22</u>	400	<u>0.9</u>	Province
Total Appraised Schemes			1,128		28.4	
Prepared Schemes:						
Medium/Major						
7. Buttala Amuna Diversion	Uva	Monaragala	650	884	13.1	ID
8. Gampola Wela Raja Ela Diversion	Central	Kandy	160	500	4.5	Province
9. Udugodu Bandara Ela Diversion	Central	Kandy	117	500	3.5	Province
10. Wennaru Wewa Tank	North Western	Kurunegala	188	425	3.7	Province
Minor						
11. Ulugala Amuna Diversion	Sabaragamuwa	Ratnapura	15	75	0.5	Province
12. Beramada Maha Ela Diversion	Uva	Badulla	17	60	0.5	Province
13. Moragaswewa Tank	North Central	Polonnaruwa	19	90	0.9	Province
14. Pitaha Maha Ela Diversion	Central	Nuwara Eliya	19	45	0.3	Province
15. Nelugolakada Maha Wewa Tank	North Central	Anuradhapura	57	60	1.1	Province
16. Pethyannekada Wewa Tank	North Central	Anuradhapura	80	170	2.7	Province
17. Karawdeniya Mahawewa Tank	North Central	Anuradhapura	<u>12</u>	24	<u>0.6</u>	Province
Total Prepared Schemes			1,334		31.4	

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NATIONAL IRRIGATION REHABILITATION PROJECT
Identified Medium/Major Tank Schemes

<u>Scheme</u>	<u>District</u>	<u>Irrigable Command Area (ha)</u>	<u>Estimated Cost (Rs M)</u>
<u>North Eastern Province</u>			
1. Namal Oya <u>a/</u>	Ampara	950	13.5
2. Pallang Oya	"	1,312	18.0
3. Tempitiya	"	174	4.0
4. Sevakapattu	Batticaloa	122	2.5
5. Visvamadu	Mullaitivu	327	3.7
6. Ethun Bendiwewa	Trincomalee	129	1.5
7. Maruthamadw Tank	Vavuniya	177	4.9
8. Adampan Kulam	Mannar	<u>162</u>	<u>2.5</u>
Subtotal		3,353	50.6
<u>North Central Province</u>			
1. Ambagaha Wewa	Anuradhapura	122	3.4
2. Ittikulama Wewa	"	211	3.2
3. Kalanchiya Wewa	"	243	5.8
4. Kapirigama Wewa	"	113	3.1
5. Labunoruwa Wewa	"	283	7.0
6. Manankatiya Wewa <u>a/</u>	"	607	14.0
7. Manewa Wewa	"	81	2.5
8. Puwarasankulama <u>a/</u>	"	100	3.1
9. Ralapanawa Wewa	"	122	1.8
10. Rampathwila Wewa	"	105	2.5
11. Sangili Kanadarawa	"	340	7.6
12. Usgal Siyambalangamuwa <u>a/</u>	"	643	11.0
13. Wahalkada <u>a/</u>	"	810	25.0
14. Bebiyawa Wewa	Polonnaruwa	94	3.1
15. Erige Oya	"	<u>107</u>	<u>1.8</u>
Subtotal		3,981	94.9

<u>Scheme</u>	<u>District</u>	<u>Irrigable Command Area (ha)</u>	<u>Estimated Cost (Rs M)</u>
<u>North Western Province</u>			
1. Pahariya	Puttalam	146	4.9
<u>Central Province</u>			
1. Dewa Huwa	Matale	946	14.0
<u>Western Province</u>			
1. Uyanwatta Wewa	Kalutura	142	2.5
<u>Southern Province</u>			
1. Deegoda Wewa	Galle	81	2.5
2. Badagiriya Wewa a/	Hambantota	850	5.0
3. Pahala Andera Wewa	"	93	2.5
4. Muruthuwela Tank	"	1,609	36.6
5. Pallemattala Tank	"	134	2.9
6. Pattiyapola Maha Wewa	"	182	8.0
7. Ranmudu Wewa	"	81	2.6
8. Denagama Wewa	Matara	343	4.1
9. Ellawala Tank	"	542	6.1
10. Kekanadura Tank	"	<u>447</u>	<u>11.1</u>
Subtotal		4,362	81.4
<u>Uva Province</u>			
1. Ambewela Tank a/	Badulla	403	9.0
2. Kande Ela Tank a/	"	645	8.1
3. Balaharuwa Tank	Monaragala	85	3.1
4. Ethimole Wewa a/	"	405	9.6
5. Maha Wewa	"	101	2.5
6. Monarawana Tank	"	94	3.6
7. Sudupanwela Tank	"	<u>243</u>	<u>6.4</u>
Subtotal		<u>1,976</u>	<u>42.3</u>
Total - 43 Schemes		14,906	290.6

a/ Schemes under ID management; the balance are under provincial management.

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NATIONAL IRRIGATION REHABILITATION PROJECT

Identified Medium/Major Diversion Schemes

<u>Scheme</u>	<u>District</u>	<u>Irrigable Command Area (ha)</u>	<u>Estimated Cost (Rs M)</u>
<u>North Central Province</u>			
1. Attaragallewa Anicut a/	Polonnaruwa	330	4.3
2. Gal Amuna a/	"	1,620	8.4
3. Kambiliya Oya a/	"	196	3.1
4. Kotikapitiya a/	"	<u>142</u>	<u>2.5</u>
Subtotal		2,291	18.3
<u>North Western Province</u>			
1. Irudeniya	Kurunagala	101	4.0
2. Moragoda Amuna	"	112	3.7
3. Wattakandal Anicut	Puttalam	<u>203</u>	<u>6.5</u>
Subtotal		416	14.2
<u>Central Province</u>			
1. Gurukele Galpihilla Amuna	Kandy	120	5.5
2. Hattota Amuna	Matale	204	3.7
3. Lamasooriya Diversion	Nuwara Eliya	<u>142</u>	<u>3.4</u>
Subtotal		466	12.6
<u>Western Province</u>			
1. Ketewala Diversion	Gampaha	634	12.2
2. Kotugoda Bolanda	"	89	1.8
3. Morena	"	454	9.2
4. Panugala	"	<u>269</u>	<u>9.8</u>
Subtotal		1,446	33.0
<u>Southern Province</u>			
1. Aluth Pahala Kepu-Ela	Galle	97	1.6
2. Dorape Ela Amuna 1 & 2	"	105	1.8
3. Hathagala Udu Amuna	Hambantota	101	3.2
4. Karagas Aru Amuna	"	<u>101</u>	<u>2.5</u>
Subtotal		404	9.1
<u>Sabaragamuwa Province</u>			
1. Damme Ela	Ratnapura	103	3.7
2. Hulanda Oya	"	81	3.1
3. Wallalgoda	"	182	3.1
4. Wellawa	"	<u>215</u>	<u>2.5</u>
Subtotal		581	12.4
<u>Uva Province</u>			
1. Debara Aru	Monaragala	97	9.6
2. Horabokka	"	101	2.5
3. Hulandawa Oya Anicut	"	103	2.5
4. Maha Thotilla Ela	Badulla	<u>284</u>	<u>5.0</u>
Subtotal		<u>585</u>	<u>19.6</u>
Total - 26 Schemes		6,189	119.2

a/ Schemes under ID management; the balance are under provincial management.

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SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT
Identified Minor Schemes

Province and District	Tank Schemes					Area under NIRP (ha)	Diversion Schemes					Area under NIRP (ha)
	Total Inventory		Requiring Rehabilitation				Total Inventory		Requiring Rehabilitation			
	No.	Area (ha)	No.	Area (ha)	Cost (Rs M)		No.	Area (ha)	No.	Area (ha)	Cost (Rs M)	
North Eastern												
Jeffna	727	7,679	213	3,215	85.5	-	-	-	-	-	-	
Mullaitiu	173	4,516	92	3,107	80.0	-	-	-	-	-	-	
Killinochi	190	3,896	102	2,917	76.0	-	-	-	-	-	-	
Vavuniya	520	9,275	210	5,105	145.0	-	-	-	-	-	-	
Mannar	181	2,818	83	1,019	29.0	-	-	-	-	-	-	
Trincomalee	218	1,923	154	1,200	29.5	-	-	-	-	-	-	
Batticaloa	293	9,652	113	7,144	192.0	-	-	-	-	-	-	
Ampara	96	2,517	51	7,144	32.7	-	-	-	-	-	-	
Subtotal	2,398	42,276	1,018	24,907	669.7	1,700	-	-	-	-	-	
North Central												
Anuradhapura	2,549	49,247	1,020	19,640	49.2	-	-	-	-	-	-	
Polonnaruwa	200	4,400	120	2,620	66.0	18	448	20	437	11.0	-	
Subtotal	2,749	53,647	1,140	22,260	115.2	5,500	18	448	20	437	11.0	
North Western												
Puttalam	858	10,594	436	4,930	14.5	-	-	-	-	-	-	
Kurumegala	5,384	39,426	2,915	21,306	507.0	-	-	-	-	-	-	
Subtotal	6,242	50,020	3,351	26,236	521.5	1,500	55	402	30	218	5.0	
Western												
Gampaha	-	-	-	-	-	-	649	5,855	127	1,111	22.5	-
Colombo	-	-	-	-	-	-	228	2,831	56	699	18.6	-
Kalutara	-	-	-	-	-	-	362	5,754	105	1,711	37.2	-
Subtotal	-	-	-	-	-	-	1,239	1,440	288	3,521	78.3	1,000

Province and District	Tank Schemes					Area under NIRP (ha)	Diversion Schemes					Area under NIRP (ha)
	Total Inventory		Requiring Rehabilitation				Total Inventory		Requiring Rehabilitation			
	No.	Area (ha)	No.	Area (ha)	Cost (Rs M)		No.	Area (ha)	No.	Area (ha)	Cost (Rs M)	
Central												
Matale	-	-	-	-	-	-	1,070	8,924	627	4,824	112.3	-
Kandy	-	-	-	-	-	-	1,608	10,309	885	5,164	142.0	-
Nuwara Eliya	-	-	-	-	-	-	<u>1,053</u>	<u>7,892</u>	<u>646</u>	<u>4,635</u>	<u>107.5</u>	-
Subtotal	-	-	-	-	-	-	3,731	27,125	2,158	14,623	361.8	3,500
Uva												
Badulla	722	3,301	427	1,590	43.1	-	700	3,205	413	1,543	41.9	-
Moneragala	<u>446</u>	<u>4,657</u>	<u>298</u>	<u>2,800</u>	<u>77.0</u>	-	<u>191</u>	<u>1,995</u>	<u>128</u>	<u>1,200</u>	<u>33.0</u>	-
Subtotal	1,168	7,958	725	4,390	120.1	1,500	891	5,200	541	2,743	74.9	700
Sabaragamuwa												
Ratnapura	-	-	-	-	-	-	904	7,813	372	3,165	81.0	-
Kegalle	-	-	-	-	-	-	<u>856</u>	<u>3,426</u>	<u>377</u>	<u>1,060</u>	<u>32.0</u>	-
Subtotal	-	-	-	-	-	-	1,760	11,239	749	4,225	113.0	2,000
Southern												
Galle	298	5,228	82	1,198	31.9	-	-	-	-	-	-	-
Matara	739	11,103	298	4,113	109.4	-	-	-	-	-	-	-
Hambantota	<u>681</u>	<u>9,134</u>	<u>229</u>	<u>2,652</u>	<u>70.5</u>	-	-	-	-	-	-	-
Subtotal	<u>1,718</u>	<u>25,465</u>	<u>609</u>	<u>7,963</u>	<u>211.8</u>	<u>7,300</u>	-	-	-	-	-	-
Total	14,275	179,366	6,843	85,756	1,638.8	17,500	7,694	58,854	3,786	25,767	644.0	7,500

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NATIONAL IRRIGATION REHABILITATION PROJECT

Formation of Farmer Organizations and Improved Operation and Maintenance

Introduction

1. The project would encourage the farmers to maximize returns from all rehabilitated schemes and would therefore support actions in the following areas:

- (a) formation of farmer organizations (FO);
- (b) employment of institutional organizers (IO);
- (c) planning and implementation of improved operation and maintenance (O&M) practices;
- (d) demonstration of improved cropping practices; and
- (e) logistical support to staff of the technical implementing agencies;

The project would also support an extensive training program for staff of the implementing agencies and farmers (Annex 3).

Farmer Organizations

2. Adoption of improved O&M practices by the farmers requires major changes in their attitudes and behavior. Instead of relying on GOSL agencies to undertake maintenance and repair works and organize the distribution of water in an efficient and equitable manner, farmers should be motivated to organize themselves for undertaking these tasks. In view of the positive experience gained in several earlier irrigation rehabilitation projects, it is envisaged that FOs would be established for all schemes to be rehabilitated under this project. Most minor schemes would be served by a single FO but for medium/major schemes two- or three-tier organizations would be required. For all schemes the process of organizing the farmers would start at the turn-out or field canal level. Once operative, the lower-level FOs would be combined to form higher level organizations for management of the scheme. IOs would be employed under the project to facilitate the organizing process, and also for some time thereafter to enable the new FOs to stabilize and operate on a sustainable basis (paras 5 - 11). The IOs would be guided in their work by institutional development officers (consultants) to be based in the Regional Support Teams (RST), and an institutional specialist at the project's Central Management Cell (CMC).

3. Organizing Process. The process of organizing the farmers involves a series of actions, including the following:

- (a) identify and delineate the lowest-level area units, based upon hydrological boundaries, with a common water outlet (for most minor schemes this will include the entire command area of the scheme);
- (b) prepare accurate lists of irrigation users in each unit and identify potential farmer representatives based upon criteria, primarily relating to capabilities and character;
- (c) motivate the identified leaders and develop their capability through training;
- (d) organize working committees to handle preconstruction needs (generally for subjects such as: membership; by-laws; survey and design; manpower inventory; etc.);
- (e) initiate meetings of the working committees and assist the members in planning their tasks;
- (f) organize election, or selection by consensus, of office-bearers after the by-laws have been ratified by the majority of the farmers (IOs to act as facilitators during the proceedings);
- (g) assist the FOs in obtaining legal recognition from the Commissioner of Agrarian Services;
- (h) specify the mutual responsibilities of technical agencies and the FOs with regard to subjects such as: procedures for survey and design; methods of construction and quality control; manpower recruitment and placement; cost recording and reconciliation; O&M procedures and guidelines; limits of responsibilities of the FOs and the technical agencies; and
- (i) assist FOs in larger schemes to federate in multi-tier organizations and committees for management of the schemes.

4. Project Support. In addition to institutional expertise, the project would provide the newly established FOs with office space (rented space for minor schemes, and new or renovated buildings for medium/major schemes). The project would also provide basic furniture for the FO offices.

Institutional Organizers

5. Experience gained over recent years in several major and minor irrigation schemes has clearly demonstrated the need for special assistance (in addition to GOSL's permanent technical support services) to bring about desirable changes in attitudes and behavior of the farmers. The project would therefore support the temporary employment of IOs for all rehabilitation schemes.

6. Role. After taking up their posts in the schemes, the IOs would first assess the communities' needs and resources and thereafter plan and

implement strategies for organizing the farmers (see para 3). Subsequently, they would facilitate and enhance the FOs' capability to plan and manage all scheme related activities. They would continuously monitor the progress and effectiveness of the new FOs. Throughout the process the IOs would closely coordinate with staff of the technical support agencies.

7. During the preconstruction stage the IOs, in close consultation with staff of the technical support agencies, would:

- (a) ensure that farmers' needs are identified correctly;
- (b) enlist the farmers' cooperation for the necessary surveys and investigations;
- (c) discuss the preliminary and final plans for rehabilitation and improvement works with the FOs to ensure that farmers' views are fully taken into account;
- (d) discuss various options for the FOs to contribute 10% of the rehabilitation and improvement works and secure its formal commitment to the preferred option;
- (e) explore the possibilities for the FOs to execute part of the works on force account and make appropriate arrangements to that effect; and
- (f) discuss all details of the proposed O&M plan with the farmers, seek their agreement to the proposals, ensure that all obligations are fully understood, and arrange for formal adoption of the plan by the FOs.

8. During the construction stage the IOs would:

- (a) arrange for coordination between the FOs, implementing agencies and the contractors to ensure that all works are executed in accordance with agreed plans and quality standards;
- (b) provide all assistance needed by the FOs for the execution of their 10% contribution to the works, and any additional works the FOs may have contracted for, including the keeping of accurate records; and
- (c) help resolve any problems which may arise.

9. During the O&M stage the IOs would:

- (a) ensure coordination between the FOs and staff of the agricultural support services, particularly the members of the agricultural planning teams (i.e. divisional officer for institutional subjects, technical officer for technical matters, and agricultural instructor for agricultural activities), and also institutions and agencies,

such as banks, input suppliers, and crop insurance agencies, concerned with providing facilities and services to the farmers;

- (b) assist the FOs with the implementation of seasonal water management programs and rotational irrigation schedules (in close cooperation with the members of the agricultural planning teams);
- (c) assist the FOs with implementation of maintenance schedules;
- (d) identify training needs and make arrangements for farmer training classes;
- (e) help resolve any disputes among the farmers and, if unsuccessful, alert the competent authorities; and
- (f) assist the FOs in any other possible way to ensure the efficient operation of the scheme.

10. Qualifications and Duration of Employment. The minimum qualification for IOs would be an O-level certificate. They would be employed under a contract, either by DAS (for the devolved schemes) or by ID (for non-devolved schemes). The RSTs would participate in the selection process of all IOs, clear their appointments, and guide them in their work. Good character and proven ability to communicate with the farmers would be key requirements for the IOs. Currently, ID has a surplus of work supervisors. Those who fit the profile for IOs would be encouraged to apply for the position.

11. The duration of employment of IOs for minor schemes would be two years. One IO would serve two adjacent schemes. In medium/major schemes on average one IO would be employed for about 300 families during the first two years and about 1,000 families during the third and fourth years.

Improved Operation and Maintenance

12. Government Involvement. At present, the range offices of ID and the irrigation units of the provincial councils are responsible for O&M of the non-devolved and devolved medium/major schemes, respectively. Previously, their responsibilities included all activities up to the field channel turnouts. In compliance with the recent directive from GOSL, FOs are now taking over all O&M activities at the distributory level. With regard to minor schemes, farmers have always been responsible for all O&M activities, with advice provided by DAS. Repairs of headworks in these schemes were financed and implemented by DAS, depending on availability of funds. In keeping with the GOSL's final objective of handing over all O&M activities to the FOs, support by the project would be limited to technical and managerial guidance. However, repair of major damage caused by floods, or from any other cause, would continue to be financed by GOSL. Due to the complexity of some of the medium/major schemes, it may not be possible for the FOs to execute all repair works and operational tasks, particularly for the headworks of tank schemes. In such cases the central or provincial irrigation units would execute these works against payment by the farmers (see Annex 1, para 1).

13. Reasons for Under-performance. The deterioration and under-performance of most irrigation schemes can be attributed to: (a) inadequate budget allocations for medium/major schemes operated and maintained by GOSL; (b) ineffective use of available funds in order to meet excessive operational overheads; (c) over-dependence of farmers on GOSL agencies to undertake maintenance and rehabilitation works; (d) insufficient participation and lack of management skills of the farmers in system maintenance; and (e) operational constraints due to inadequate, or non-existing water management plans, or due to the deteriorated condition of the schemes and ineffective control arrangements at the turnouts.

14. Proposed Plan of Operation. At the feasibility stage a plan of operation would be prepared for each scheme. The plan would comprise maintenance and operation schedules. Farmers' views would be ascertained during the preconstruction meetings and reflected in the plan. In order to ensure satisfactory maintenance and optimal use of water, project staff would provide continuous technical guidance for updating the plan. The command areas in diversion schemes would be based on the lowest discharge during the period for which data are available, or, in the absence of such data, the measured discharge during the preparation phase. On the basis of these data, realistic cropping patterns and rotational systems would be determined during the feasibility study. In tank schemes, the cropping patterns and rotational systems would depend on the remaining storage after the Maha season and only limited cultivation, or none at all, would be possible during the Yala season. The maintenance schedule would be divided in two categories, i.e preventive and periodic maintenance. The operation schedule would comprise activities to be performed at the headworks and the downstream levels. A description of activities follows below:

- (a) preventive maintenance would be executed continuously and includes:
 - (i) slashing of the reservoir and canal bund slopes to remove any unwanted vegetation;
 - (ii) filling of runnels in the reservoir bund slopes, and potholes on the bund roads;
 - (iii) filling of minor slips and turfing of exposed sections;
 - (iv) clearing of shrubs in the intake and outfall spillway canals;
 - (v) filling of scours at headworks and canal structures, including compaction;
 - (vi) clearing of debris at sluice intakes and cleaning of trash racks;
 - (vii) greasing of lifting mechanisms of sluices and turnouts;
 - (viii) cleaning of toe and lead away drains of downstream filters in tank schemes;
 - (ix) preventing cattle damage by erecting and maintaining fences;
 - (x) clearing of debris and man-made obstacles, such as fish fences, in the drainage canals; and
 - (xi) maintaining reservations along tank and canal bunds;

- (b) periodic maintenance would be executed during the close seasons. The plan of operation would specify the frequency of activities, depending on the type of scheme (tank or diversion), activity, terrain, and infrastructure. The activities would include: (i) maintaining the design profile of tank and canal bunds; (ii) repair of downstream protection works of spillways, sluices, drop structures, and turnouts; (iii) repair of downstream filters in tank

schemes; (iv) desilting of main, distributory, and field canals; (v) painting of gates in sluices, weirs, and turnouts; and (vi) repair or replacement of locking arrangements of turnouts; and

- (c) operational activities would be executed continuously, except during the close season when periodic maintenance works would be done. The operation schedule would include: (i) a management chart detailing the composition and responsibilities of project committees for operational activities from the headworks down to the field level; (ii) an issue tree describing in a diagrammatic form the distributory system, together with a scheme plan showing canal layouts and farm holdings; (iii) the rotational systems to be adopted for each of the two crop seasons in order to optimize the use of water, especially during periods of droughts. The rotational system would specify discharges in liters/second, as well as the duration of supplies from the headworks and from each turnout of the main, distributory, and field canals.

15. Execution of O&M. The FOs would be fully responsible for all O&M activities up to the distributory canal level and jointly with central and provincial irrigation agencies manage the upstream portions of medium/major schemes. The Distributory Channel Organisation (DCO), comprising separate farmer groups for each distributory and its field channels, would organize and execute the activities below the distributory head. The responsibilities of the different entities are described below.

- (a) The Field Channel Organisation (FCO), comprising all the farmers benefitting from a turnout on the distributory, would be responsible for the distribution of water among the farmers and maintenance of the channel. The FCO would have a representative on the DCO who would also be responsible for water distribution. Any FCOs receiving water directly from the main canal would be attached to the nearest DCO.
- (b) The DCO would be the main functional committee and comprise representatives of the FCOs. DCOs would be registered under the Agrarian Services Act and would have responsibility for operation and maintenance of the entire distributory channel and its field channels. Each DCO would prepare a detailed O&M plan and execute it through the combined efforts of the FCOs.
- (c) The Project Management Committee (PMC) would include representatives of the DCOs, government support services, and lending banks. The PMC would be responsible for planning of O&M of the entire scheme, and its implementation by DCOs, including the O&M activities for the headworks and main canal. Depending on the complexity and safety requirements of medium/major schemes, ID and the provincial irrigation units may decide to retain the O&M responsibilities for the headworks and the main canal until the PMC and DCOs become strong enough to handle the O&M of the entire scheme. In those cases, the PMC would arrange with the DCOs to provide labor and pay

for other cash expenditures incurred by ID or the provincial irrigation units, in accordance with arrangements referred to in Annex 1, para 1.

Agricultural Demonstrations

16. GOSL would continue to promote improvements in cropping practices by the farmers through national agricultural support programs directed by the Department of Agriculture and implemented through the provincial administrations. Irrigation schemes would particularly benefit from extension programs aimed at increasing the efficiency in the use of available water (rainfall and irrigation) through the cultivation of high-value field crops other than rice, and timely planting of crops. Other important extension activities include: (a) increasing labor efficiency by promoting the use of simple hand-operated implements for seeding, transplanting and weeding; (b) protection of the environment through judicious use of organic and inorganic fertilizers, and adoption of integrated pest management practices; and (c) increasing incomes through the adoption of improvements in post-harvest operations.

17. Specific support would be provided under the project in selected rehabilitation schemes to complement GOSL's country wide extension programs. The agricultural instructor for each selected scheme, in close consultation with the FO, would prepare a special program of extension activities which meets the specific requirements expressed by the farmers. Priority would be given to the cultivation of high-value field crops and home gardening. The agricultural instructors would manage the execution of the scheme-specific extension programs supported by the project. Available project funds, estimated at Rs 5,000 (1991 prices) per selected scheme per year, would be used for procurement of inputs for demonstration plots (about Rs 3,800) and payment of travel allowances (maximum Rs 100 per month) to the agricultural instructors.

Logistical Support

18. The project would provide for travel and subsistence allowances and for vehicle operating costs for district and divisional level staff of the provincial support agencies, including the members of the APTs and work supervisors of ID.

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NATIONAL IRRIGATION REHABILITATION PROJECT

Training and Staff Development

A. Objectives

1. The proposed training program would ensure that management, technical and support staff of concerned national agencies and provincial administrations possessed the knowledge and skills required to motivate and assist farm families in project supported irrigation schemes to rehabilitate, operate and maintain their schemes and by the application of improved water management practices, maintain or improve their standards of living. The training program would have five sub-objectives:
 - (a) provision of a comprehensive program of local and overseas staff in-service training;
 - (b) recruitment, training and support of institutional organizers (IOs) who would motivate and guide farmers in each scheme to form farmer organizations (FOs);
 - (c) implementation of an intensive training program for elected leaders of the FOs and FO members;
 - (d) provision of limited technical assistance to support and increase project management's capacity to manage training and staff development; and
 - (e) support for the expansion and improvement of four training institutes; procurement of teaching and demonstration equipment; and purchase of vehicles for the transportation of trainers to and from field training locations.

B. Training Components

2. In-service Training for Project Staff. Approximately 1,700 management, technical and support staff posted in Colombo, ID ranges, and provincial administrations would be involved in the implementation of the project. Based on a detailed training needs analysis conducted as part of project preparation, the project training program would, inter alia, provide:

- (a) limited overseas training (three masters level degrees) and short (6-12 week) training programs for 96 technical and training specialist staff. It is envisioned that most of the short-term training would take place within the South East Asian countries; and

- (b) in-country training covering a range of topics (Table 1). It would be offered at Galgamua Irrigation Training Institute (ITI), in Colombo and, in some cases, on the job. The in-service training programs would also comprise carefully planned study tours to observe operation, maintenance and management of successful irrigation schemes. The study tour groups would include combinations of senior and junior staff of different disciplines (engineering, agriculture, institutional development) in order to obtain the synergy value of discussing problems and solutions together. This approach to study tours represents a departure from those conducted in previous projects wherein groups from each staff level would separately visit schemes without the benefit of interaction. Training would also be offered to increase the staff's levels of environmental awareness.

Training for Institutional Organizers

3. The IOs, a post introduced under the INMAS program, are expected to act as a catalyst in accelerating the establishment of FOs and to encourage FO members to participate collectively in irrigation scheme rehabilitation and O&M, practice improved water management, and assume leadership and decision-making roles.
4. Approximately 500 IOs would be recruited and trained under the project, the exact numbers dependent on the number of schemes entering the project year by year. Table 1 shows the projected levels of recruitment of IOs over the seven years of project implementation. The schedule assumes that some IOs trained during the early project years would roll over to new schemes during the later years.
5. IOs would be recruited from candidates who have attained GCE 'O' level (secondary) education, and would undergo a three-week induction training course at Galgamua ITI, or other suitable sites. On completion of the training program, the IOs would be posted to the field on the basis of one IO for every two minor schemes, except during the first year of effectiveness (1991) when one IO would be attached to each minor scheme. For major and medium schemes, an average of three to four IOs would be posted to each scheme during the first year of the schemes' enrollment in the project. After six months in the field, IOs would undergo a one-week refresher course during which experiences would be shared and solutions to operational problems discussed. A further one-week training session would be offered to IOs at the O&M stage of scheme rehabilitation. In designing the IO induction training course for NIRP, the Central Management Cell (CMC) would evaluate the IO training program already developed for the INMAS program and adapt it to the needs of the project. Trainers for the IO training programs would be selected from the best qualified and most effective available. A program of training

for institute staff and resource persons involved in IO training (engineers, range officers) would be conducted prior to the induction training for newly recruited IO candidates. A total of 26 persons (10 institute staff, 16 resource persons) would participate in this training-of-trainers course (Table 1).

Training for Elected Representatives of Farmer Organizations

6. In addition to the guidance and encouragement provided by the IOs, elected FO representatives (president, secretary, treasurer) would receive additional training in the areas of scheme specific rehabilitation objectives, O&M, leadership skills, and financial responsibilities. The first two-day training session for presidents and secretaries would be held at preconstruction stage; the second lasting three days would be for presidents, secretaries, and treasurers dealing with O&M and would also cover the treasurers' financial responsibilities. Two additional training sessions would be offered for presidents and secretaries during later stages of project implementation. Each training session would include discussions on environmental issues relating to scheme O&M, and to farming operations associated with the scheme. The estimated target group of FO elected representatives is 2,500. The training schedule for FO elected representatives is in Table 1.

Farmer Training

7. The project would organize four one-day training sessions for about 37,000 farmers at preconstruction, O&M, post-O&M and finally prior to project termination. The training sessions would provide information and knowledge about the scheme, crop water requirements, and environmental awareness. Trainers would include agricultural planning team (APT) members, i.e. development officers, agricultural instructors and technical officers. A special three-day training course would be offered to improve training techniques and communications skills for staff involved in farmer training. A total of 300 trainers would be trained in groups of 20. Estimates of farmer training for each year of project implementation are given in Table 1.

Equipment for Training and Demonstration

8. The project would provide for the purchase of training and demonstration equipment for the Galgamua ITI and for the three in-service training institutes at Anuradhapura, Banderawela and Galle.

Civil Works and Other Improvements

9. The Galgamua ITI is the principal in-service training institution serving the irrigation subsector. Capacity has been limited despite increasing demands for in-service training. If the volume of training generated by the project is to be completed in a timely manner, additional capacity is required. The project provides for a self-study center, a

computer center and library, a 30 place hostel, a kitchen and staff quarters, and a recreational facility. In addition, the project provides for improvements to a test and demonstration plot at Inginimitiya which would concentrate on activities relating to hydrology, soils, and land use. In-service training institutes operated by DAS at Bandarawela, Anuradhapura and Galle would also receive assistance. No civil works are required at Bandarawela as the facility is already completed but it requires furniture. The site for the Anuradhapura institute has already been selected and the design is being prepared. At Galle a site still has to be selected. The project provides for construction and furniture at both institutes.

Vehicles for Training

10. The project would procure four double-cab pickup trucks and two 15-seater minibuses for Galgamua ITI and three 26-seater minibuses for the three DAS in-service training institutes.

Technical Assistance

11. A total of 24 staff months of internationally recruited technical assistance for overall training program management would be provided to the CMC. An additional 48 staff months of locally recruited technical assistance to manage the farmer training component would also be provided. The internationally recruited expert would initially be posted to the CMC for 12 continuous months and, thereafter, for three months per year for four years. Terms of reference for the technical assistance appear in Attachment 1.

C. Management of Training Program

Implementation Plan

12. The CMC would have overall responsibility for planning and implementation of the training and staff development program. Given the scope and volume of training envisaged, the project provides for limited technical assistance to the CMC to support the preparation and timely delivery of a high quality program (para. 11). The CMC would assign at least one counterpart to the consultant for overall management of the training program, and one to the consultant for farmer training with a view to developing the capacity to sustain training and staff development program management after completion of the project. The first task for the consultants and their counterparts would be to develop a detailed plan for implementation, covering the entire project period. The implementation plan, to be based on the SAR training program description, would update the training needs determined at project preparation and appraisal, and outline an implementation plan for the entire program. The implementation plan would be updated annually to ensure that new or redundant training needs were identified and that training programs were updated to reflect evaluation findings from training activities implemented earlier.

Trainers and Training Resource Persons

13. Over the years, the irrigation sector has benefitted from considerable training support through IDA and bilateral projects. A reservoir of suitably qualified persons now exists which can be tapped to serve as a training resource. In managing and implementing the project's training program, the CMC would select the most qualified people from training institutes and agency staff to serve as trainers. The project provides for training-of-trainers' programs to raise the communications skills level of those selected.

Training Sites

14. Staff Training. The overseas training program, which includes three masters level degree courses and short courses for technical and training staff, would be implemented at regional and world-wide locations depending on the appropriateness of course design and cost. It is likely that a large proportion of the technical short courses would be conducted in South East Asian countries. The in-country program includes training activities which are institution based, on the job, and provided by external agencies. The program also includes study tours. The CMC would make use of the most appropriate in-service training institute for the training activity being offered. Galgamua ITI would be the venue for many of the five-day courses, especially for senior and middle level staff. However, arrangements may be made to utilize other institutes should space be unavailable at Galgamua ITI. Training for IOs would be held at Galgamua ITI, at least for the longer induction course. Follow-up courses would be offered at Galgamua ITI or other institutes. Training of FO representatives and farmer groups would be held as close as possible to the project sites.

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Draft Terms of Reference for Consultants

A. Training Program Management Specialist

Scope of the Assignment

1. Achievement of the project's objectives depends on the ability of Government agency staff to perform a variety of tasks to a high standard. In addition to technical, engineering, and water management activities, project staff are expected to help scheme farmers establish farmer organizations (FO) which would operate and maintain the schemes. The project supports a comprehensive training program which would require careful planning and management if it is to have the desired impact on staff and FO performance. The project would require the services of an experienced and energetic person to spearhead the management of the project training program. The total duration of the assignment is 24 months over a period of five years. The initial assignment would be for 12 months, with follow-up visits of three months per year during the succeeding four years.

Qualifications and Experience

2. The specialist would be recruited internationally. He/she would hold earned qualifications from a recognized institution and have a minimum of five years experience in the management of training programs in agriculture sector projects. The specialist would be fluent in English.

Major Responsibilities

3. The specialist would provide the guidance necessary for the smooth and timely implementation of the project training program. He/she would work closely with counterparts in the CMC and in-service training institutes and ensure that training program quality is of a high standard.

Main Tasks

4. The main tasks of the specialist are the following:

- (a) prepare with CMC counterparts annual staff in-service and IO training programs based on actual needs;
- (b) prepare with counterparts detailed plans for annual training program implementation, including the identification of trainers and training sites, preparation of teaching aids, and budgeting;

- (c) plan, monitor and evaluate training-of-trainers activities;
- (d) monitor staff and IO training program quality and, if necessary, make proposals for improvement;
- (e) advise CMC on placement of staff in short-term overseas technical and training courses;
- (f) prepare simple guidelines on training program management for use by CMC staff as project implementation proceeds;
- (g) describe work programs for the four three-month technical assistance visits which would follow the initial 12-month assignment; and
- (h) prepare an end-of-assignment report on the 12-month assignment.

B. Farmer Training Program Specialist

Scope of the Assignment

5. The project aims at increased farmer responsibility for the operation and maintenance of major, medium, and minor irrigation schemes. The involvement would be encouraged through the creation of farmer organizations (FO) and an intensive training program for FO representatives and farmers. The project would require the service of a qualified and experienced person to assist with the implementation of the farmer training program. The assignment would be for 48 months.

Qualifications and Experience

6. The specialist would be recruited locally. He/she would hold earned qualifications from a recognized institution and have a minimum of five years experience in the planning and implementation of farmers training activities on a large scale. The specialist would be fluent in English.

Major Responsibilities

7. The specialist would provide the advice and leadership required to guarantee the timely implementation of farmer and FO representatives training programs. He/she would work closely with counterparts in the CMC, training institutes, ID range offices, and provincial administrations and ensure that all training activities reach an acceptable level of quality.

Main Tasks

8. The main tasks of the specialist are the following:
- (a) prepare with assigned counterparts annual programs of FO representatives and farmer training based on the stage of scheme development and level of farmer participation;
 - (b) prepare with assigned counterparts detailed plans for annual training program implementation, including the identification of trainers and training sites, preparation of training aids, and budget estimation;
 - (c) plan, monitor and evaluate training of trainers activities for farmer training programs;
 - (d) monitor training programs and evaluate quality. If necessary make proposals for quality improvement;
 - (e) prepare simple guidelines for the implementation of farmer training programs;
 - (f) prepare semi-annual farmer training progress reports; and
 - (g) produce an end-of-assignment report.

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Training Program

Training Activity	Number	Unit Cost	Duration	PY1	PY2	PY3	PY4	PY5	PY6	PY7	Location
A. Overseas Training											
Masters Program	3	Rs 960,000	12 mo		1	1	1				Region/EEC
Short-term Technical	90	Rs 300,000	6 wks		18	18	18	18	18		Region
Short-term Trainers	6	Rs 600,000	12 wks			2	2	2			Region/EEC
B. In Country Training Staff (In-service)											
Benefit Cost Analysis	50	Rs 500/day	3 days		25	25					
Small Scale Irrigation Projects Rehabilitation Design	200	Rs 450/day	5 days		50	75	75				Provincial ID, Range
O&M Study Tour	240	Rs 450/day	5 days		60	60	60	60			Colombo
Production, Income Assessment	50	Rs 500/day	3 days		25	25					
Supervision & Quality Control	70	Rs 425/day	3 days			50	20				
Water Management (IE)	50	Rs 450/day	3 days		25	25					
Water Management (TA)	200	Rs 400/day	3 days		50	50	50	50			In-House
Computer Aided Design	40	Rs 500/day	5 days			20					
Computer Aided Design	40	Rs 400/day	5 days			20	20				
Accounting Management	25	Rs 400/day	5 days		25						
Institutional Management	50	Rs 450/day	5 days				25	25			
Mgt. & Communications	50	Rs 450/day	5 days				25	25			
On Farm Water Mgt.	150	Rs 350/day	5 days			30	30	60		30	
Environmental Awareness	120	Rs 400/day	2 days		30	30	30	30			In-House
C. Institutional Organizers (IO)											
Induction Training	490	Rs 250/day	21 days	24	95	190	165	16			
Refresher, after 6 months	490	Rs 250/day	7 days		119	190	165	16			
Refresher 0 and M	490	Rs 250/day	7 days			119	190	165	16		
Training of Trainers	26	Rs 400/day	5 days	10	16						
D. FD Elected Representatives /a											
Preconstruction	5,000	Rs 150/day	2 days	270	700	1,600	1,700	750			Local
O&M Training	7,500	Rs 150/day	3 days		400	1,050	2,400	2,550	1,104		
Refresher 1	5,000	Rs 150/day	2 days			270	700	1,600	1,700	750	
Refresher 2	4,250	Rs 150/day	2 days				270	700	1,600	1,700	Local
E. Farmer Training /b											
Preconstruction		Rs 50/day	1 day	130	350	800	850	368			Local
O&M		Rs 50/day	1 day		120	350	800	850	368		Local
Follow-up 1		Rs 50/day	1 day			130	350	800	850	368	Local
Follow-up 2		Rs 50/day	1 day			130	350	800	850	368	Local
Training of Trainers	300	Rs 400/day	3 days	40	120	120	20				In-service Training Institute

/a Number of representatives calculated on the basis of one FD for each minor irrigation scheme, 15 FDs per medium/major scheme and 5 D channel FDs per major/medium scheme. All 2 day training sessions would include FD presidents and secretaries while the 3 day session would also include FD treasurers. Annual numbers of FDs will depend on entry of schemes to the project.

/b Number of farmers groups per year calculated on the basis of 15 farmers per group. Minor schemes would have one group each, medium/major schemes would have on average 15 F channel groups and 5 D channel groups each. A maximum of 37,500 individual farmers would be trained in multiple sessions.

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NATIONAL IRRIGATION REHABILITATION PROJECT

Environmental Protection

Introduction.

1. In earlier irrigation rehabilitation projects it was generally assumed that the environmental effects were positive and other than the direct benefits of rehabilitation, few proposals were prepared relating to improvement of the environment. Under this project, however, environmental impact assessment of the appraised schemes was undertaken by the project preparation team. The recommendations have been included in the detailed terms of reference for feasibility studies for all schemes, including formulation of remedies against any adverse consequences the rehabilitation works may have. Recommendations from the Bank initiated Environmental Action Plan would be incorporated in these studies as they become available.

2. The project aims at minimizing environmentally harmful activities and would also attempt to alleviate existing problems. The activities proposed under the project include three categories: (a) minimizing damage to the eco-system during construction; (b) reducing existing environmental problems; and (c) considering environmental problems at the watershed level. The three categories of activities are discussed below.

Construction.

3. Potentially harmful activities during construction are excavations and destruction of vegetation. Borrow pits are often not levelled off upon completion of the civil works. Water collects in these pits which provide ideal breeding grounds for mosquitoes. Plants and trees are destroyed and usually not replaced. To avoid these problems, the contract specifications would reflect existing regulations and include clauses that would make it compulsory for the contractor to: (a) consult the beneficiaries in the selection of borrow pits; and (b) strip and replace the topsoil and level off the borrow pits under a gradient which permits unimpeded drainage. Beneficiaries would be encouraged to plant fast growing trees or other plants in the borrow areas. Trees would also be planted in the canal reservations of medium and major schemes. Tank embankments would be stripped and, after resectioning, the topsoil would be replaced before turfing. Strict supervision by project staff would ensure that the specifications mentioned above are adhered to. The beneficiaries would be encouraged to monitor the implementation of civil works.

Existing Environmental Problems.

4. The project would attempt to alleviate existing environmental problems in connection with: (a) the reservoir and headworks; (b) siltation; and (c) socio-economic issues.
5. The main environmental issues concerning the reservoir and headworks are: (a) erosion of the embankment and canal bunds; (b) drainage problems at the toe of the embankment; and (c) cultivation of the reservoir bed resulting in increased siltation in the canals and pollution of the reservoir by agro-chemicals. Erosion and drainage problems would be corrected by and controlled after rehabilitation through periodic maintenance. Beneficiary awareness for proper O&M is a key issue and would be an important part of the training program of GOSL staff and farmers alike. Although existing legislation prohibits the cultivation of the tank beds, it is difficult to control as farmers plant vegetables following the receding water line at the end of the monsoon. Farmer's awareness in the prudent use of agro-chemicals would be included in the training program.
6. Siltation of reservoirs and canals is caused by erosion in the catchment areas and is a threat to irrigation and irrigation management. It reduces the reservoir capacity and hence the area under irrigation. The project includes a monitoring program for silt build-up in a selected sample of reservoirs after rehabilitation, including about 50 minor and five medium/major tank schemes. The program would be implemented by the Research Management Unit to be established in ID with technical support by IIMI (Annex 5). The schemes would be selected from the first and second batch prepared for implementation. Taking the tank embankment as the base, spot-level surveys of the tank bed would be taken every two years towards the end of the Yala season. Rain gauges would be placed and rainfall monitored. A preliminary assessment of the catchment area conditions, including vegetation, soils and gradients would be made and subsequently monitored. Siltation problems would thus be identified at an early stage and appropriate measures would be undertaken to alleviate their effects.
7. The fragmentation of holdings and the reduction of plot size due to population pressure is an important socio-economic issue which interferes with the adoption of sound water management practices. The project would include a study to examine the technical possibility of, and farmers' interest in, land consolidation or other ways to overcome this problem. This study would also be conducted by the Research Management Unit. In co-operation with DAS, three schemes covering in total about 100 ha would be selected. The main selection criterion would be that farmers show great interest in improving farm management through reallocation or pooling of their landholdings. Key staff to execute the study would include a socio-economist, an irrigation engineer and a cadastral surveyor of the Survey Department. After discussions with the beneficiaries and agreeing on a course of action, a land consolidation or land pooling pilot project would be prepared. To this end, topographical, soils and cadastral surveys to a map scale of 1:2,000 would be executed. Subsequently, a new land plan and technical plan would be prepared and implemented as agreed with the beneficiaries. Preparatory works would take

about one year and the pilot schemes would be implemented during one dry season.

Sub-basin Approach.

8. Ideally the entire hydrological system of a basin or sub-basin should be studied whilst planning rehabilitation of irrigation projects. In the dry zone the small tanks are typically part of a larger system, called cascade, which are hydrologically interdependent. Three issues deserve special attention, i.e. scheme selection, reforestation, and watershed management. The project would consider all small tanks which are part of a cascade, and ensure that the planning and design of the rehabilitation works recognize their interdependence. In such cases also the watershed management would be given high priority and specific measures would be proposed and implemented which would optimize the performance of the individual schemes. However, the issue of reforestation of the catchment areas at a large scale is beyond the scope of this project.

Training.

9. Environmental awareness training would be actively pursued throughout project implementation. Irrigation engineers would participate in an awareness raising course planned to be offered four times during project implementation. Environmental awareness would be included in the training program for IOs, FO representatives, and farmers, ensuring a broad coverage of the topic reaching into the farm families. Training-of-trainers courses would also include the topic and prepare trainers for the inclusion of environmental awareness in all formal courses.

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NATIONAL IRRIGATION REHABILITATION PROJECT

Institutional Support and Studies

A. Irrigation Research Management Unit

Introduction

1. Since the late seventies it has been recognized that the benefits of irrigation projects have not been proportional to the investments made due to: (a) unsatisfactory O&M resulting from inadequate participation by the farmers and lack of funding; (b) use of questionable hydrological planning parameters for determining available water resources; and (c) mono cropping of paddy in both the Maha and Yala seasons, without diversifying into other field crops, even when soil and drainage conditions are favorable. Research is an important means to address these issues. Therefore, the project would support, over four years (1992-95), the establishment of a Research Management Unit (RMU) in ID to manage and implement field-based research of relevant institutional, technical, and agricultural aspects of irrigation. Technical assistance would be provided by the Sri Lanka Field Operations Unit of the International Irrigation Management Institute (IIMI).

Objectives

2. The irrigation research management component of the project would:
- (a) assist ID to establish a RMU and foster its capacity to identify research needs, carry out or contract for research, evaluate results, and adopt them for implementation;
 - (b) support a research program which yields results of immediate interest to the irrigated agriculture sector and provides a training ground for RMU staff; and
 - (c) contribute to the quality of planning and implementation of NIRP.

Activities

3. All activities by RMU would be overseen by a Research Advisory Committee, to be chaired by the State Secretary of Irrigation. Members of the committee would include representatives from ID, IMD, DAS, Department of Agriculture, CMC, and IIMI. IIMI would appoint a Technical Adviser. Activities to be undertaken by RMU and IIMI are described below.

4. Institutional Support for RMU. In the first year of establishment of RMU, the following institutional requirements would be jointly developed by ID and IIMI: (a) RMU mandate and strategic plan; (b) organizational structure and staffing policy, followed by recruitment, orientation, and training of

personnel; (c) research procedures, policies, and plans; and (d) a work plan which includes a strong monitoring and evaluation component. RMU's activities would specifically be directed to generate innovations, identify research needs, and interpret and adapt research findings to improve the performance of Sri Lanka's irrigation systems. RMU would examine: (a) the institutional framework for irrigation; (b) procedures of water distribution for equity, efficiency, and productivity; and (c) prospects of new technologies for future investments. IIMI would provide support to RMU for conceptual, administrative, and research components. IIMI's role would be as a catalyst and guide. Decisions on RMU's future functions and operations would be made by ID.

5. Development and Implementation of a Research Program. Assisted by IIMI staff, RMU would:

- (a) undertake rapid assessments, particularly to obtain preliminary data for research selection and to train RMU staff;
- (b) carry out adaptive research to test institutional, technical, and institutional innovations. Field offices would be established to carry out this research, as required;
- (c) monitor and evaluate in a small sample of schemes, improvements implemented under NIRP to ascertain their acceptance, benefits and costs, and long-term sustainability;
- (d) measure the cost effectiveness of innovations identified in the research program, as required; and
- (e) record and analyze the lessons learned in establishing the RMU and its early operations.

IIMI, working together with RMU staff, would:

- (a) conduct a series of ten workshops to disseminate research findings and solicit inputs to the program; and
- (b) offer eight one-year research fellowships at IIMI.

6. Contribution to NIRP Planning and Implementation. The head of RMU and the IIMI Technical Adviser would attend key meetings of the PCC and the CMC to ensure that RMU and the research programs are well represented and coordinated. They would provide inputs to the project, based on in-country and international research findings of IIMI's worldwide program.

Outputs

7. It is expected that RMU would be well established at the end of the four-year period, and would be functioning as an initiator and evaluator of research which studies institutional development, water management, system management, water resources utilization, catchment hydrology and modelling,

siltation, land consolidation and crop diversification topics associated with irrigated agriculture. RMU staff would be able to undertake rapid appraisals, select sites and samples, structure research projects, undertake and supervise field work, and analyze and write up results. In the longer run, IIMI would share the lessons learned with the irrigation agencies of other countries.

Composition of IIMI Team and Logistical Support

8. IIMI would provide an internationally recruited Technical Adviser (39 staff months) with strong irrigation research credentials (an agricultural economist, an irrigation engineer, or a social/management scientist), and internationally recruited short term specialists (33 staff months) in the fields of irrigation engineering, social and/or management sciences, agricultural economics, agronomy, and agricultural engineering. Local staff would include one research associate and two research officers. The project would also provide for vehicles. The total cost is estimated at about US\$2.0 million, including IIMI's overhead costs (rent, utilities, management support).

Reporting and Evaluation

9. An annual report would be produced at the end of each of the first three years and the final report at the end of the fourth year. Publications would include country papers, technical papers, working papers, and training modules. The annual work plan and budget for the first year would be completed within the first two months of commencement. Subsequent annual work plans and budgets would be prepared before June 30 of the preceding year. External specialists would conduct a mid-term evaluation at the end of the second year and a final evaluation at the end of the fourth year.

B. Dam Safety Unit

Introduction

10. Regular inspections, surveillance monitoring, and preventive maintenance of storage dam infrastructure, are necessary to reduce the risk of failures. An analysis of past dam failures indicates that the risks are greater in dams over 50 years of age, particularly earth dams. In Sri Lanka the dam of the Kantalai scheme failed a few years ago, and signs of distress have been observed in other major dams. No records of failures have been kept for dams of minor schemes. However, analysis of failed dams indicates that the risks could have been reduced if stresses had been detected earlier and preventive measures taken. The failure of the Kantalai dam has increased public awareness of dam safety and has prompted GOSL to reactivate surveillance operations, and also to allocate more funds for strengthening of headworks. The measures taken to date by GOSL include: (a) establishment of an expert committee to carry out frequent inspections of major dams; (b) assignment of specific surveillance responsibilities to staff of ID's range and divisional offices; and (c) a comprehensive study by a Consultant to review the effectiveness of present dam safety procedures and to prepare recommendations for introducing a workable and effective system. To date, the

Consultant's recommendations have not been implemented, the expert committee has not functioned effectively, and irrigation field staff continue to operate without the required instruments, without an effective monitoring system, and without a program for preventive work.

11. The Ceylon Electricity Board is responsible for the safety of multipurpose dams and the Mahaweli Authority for dams in the Mahaweli projects. The ID is responsible for the safety of all other medium/major dams in Sri Lanka. In order to assist ID in this work, the project would support the establishment of a Dam Safety Unit (DSU).

Support by the Project

12. The DSU would be set up under the Engineering Materials Division of ID. The Unit would be headed by a Chief Engineer and staffed by two irrigation engineers (experienced in instrumentation and engineering materials, respectively), four research assistants, two technical assistants and one draughtsman. Specialist advice would be given by consultants of the CMC. The project would finance: (a) staff subsistence and travel allowances; (b) office and vehicle operation costs; and (c) procurement of surveillance equipment and vehicles.

Activities

13. The DSU would:

- (a) update the inventory of medium/major and minor dams maintained by the ID and the provincial irrigation units (or DAS), respectively, and evaluate the hazard ratings following guidelines given in the Consultant's report;
- (b) prepare a priority list of vulnerable schemes and obtain a condition report of these schemes from the ID range or provincial irrigation offices;
- (c) inspect the priority schemes, prepare a program of preventive works (including instrumentation), initiate implementation, and monitor progress;
- (d) review the recent guidelines for safety surveillance of reservoirs issued by ID and update or amend, as necessary, ID Circular no. 42 of 1978. Using these guidelines, prepare a program for surveillance of minor schemes;
- (e) monitor progress of the surveillance program and take corrective actions, when necessary, to ensure its effectiveness;
- (f) conduct regular visits to dams reported to be under stress, and check data collection and the effect of preventive works;

- (g) for dams under extensive stress conditions, implement a program of regular measurements. Process and interpret the observed data and propose remedial measures to minimize or eliminate stress, including improvements of design parameters, if appropriate and feasible;
- (h) review proposals for new dams for sufficiency of dam safety monitoring aids; and
- (i) establish a management information system and produce periodical reports for use by ID management.

Equipment and Vehicles.

14. The project would provide: (a) concrete equipment: a portable core drill, two calibrated crack monitors, two pulse velocity measurement meters, two multipurpose strain gauges, a detection cover meter for steel reinforcement, a crack detection microscope, a test hammer, and a portable compressor; (b) soils equipment: a lateral inclinometer for measuring lateral movement of earthworks and structures, a power auger and extension rods, a water level indicator to measure levels in bore holes; (c) inspection equipment: a trolley-mounted video camera with propulsion from suitable conveyor system for inspection of sluices; and (d) vehicles: a four-wheel drive vehicle and a double-cab pickup.

C. Quality Control Unit

Introduction

15. Ineffective supervision and inadequate testing of construction materials frequently results in substandard irrigation works in Sri Lanka and elsewhere. The available resources in ID are over-extended. Sufficient numbers of qualified technical staff are available to meet the needs of existing and future projects, but logistical support, such as field laboratories, testing equipment, and funds for operating expenses are inadequate, resulting in substandard work.

Support by the Project

16. The project would enhance the capacity of ID's existing Quality Control Unit and support the establishment of nine regional field laboratories. These would be located at Kurunegala, Kirindi Oya (Southern Province), Anuradhapura, Monaragala, Vavuniya, Kilinochchi, Ampara, Trincomalee, and Kandy. The laboratories in Vavuniya and Kilinochchi would be established after security has been restored in those districts. In addition to improvements to five existing units and construction of new buildings for four units, the project would finance operating expenses of quality control staff, and procure equipment and vehicles. Additional equipment would be provided for the central laboratory in Colombo which would also service schemes in Western Province. Engineers, research officers, and soil testers would be trained under the project's training program.

Activities

17. The Quality Control Unit would:
- (a) assisted by CMC, conduct a construction quality awareness program among technical assistants, work supervisors, and farmers;
 - (b) prepare guidelines on quality control for use by technical staff;
 - (c) assist in the identification of borrow areas and conduct field tests, including interpretation of test results;
 - (d) give technical guidance on quality control in a sample embankment section to be undertaken as a demonstration prior to the commencement of full scale construction of earth dams;
 - (e) advise on construction materials for concrete structures; and
 - (f) give directions on frequency and specifications for the collection of test samples, maintaining of field records, testing of samples, and follow-up of test results.

Equipment and Vehicles

18. The project would provide: (a) ten mechanical analysis stirrers; (b) a consolidation test apparatus; (c) an automatic mechanical soil compacter; (d) an air meter for measuring air content in concrete; (e) a penetration test machine; (f) ten compression testing machines; (g) 15 digital soil moisture meters; (h) two strata meters; (i) two ultrasonic concrete testers; (j) 15 electronic precision balances; (k) 15 moisture density gauges; (l) a vacuum pump; (m) accessories for the above items; and (n) 12 double-cab pickups, two four-wheel drive vehicles, and 36 motor-cycles.

D. Hydrological and Water Management Study

Introduction

19. The VIRP emphasized the introduction of effective water management systems. However, it was also recognized that efforts to optimize the use of available water resources depend not only on an effective water management plan but also on a proper evaluation of available water resources. In order to expand the physical resource data base, and to improve quality of planning parameters, VIRP supported a study of the hydrology of tank schemes in the dry zone. The study was designed to: (a) build up the data base for planning of tank schemes; (b) determine the hydrology of tank catchment and command areas and formulate cropping patterns to match the estimates of probable water availability; (c) plan for improved water management and agricultural production under a given water supply; (d) categorize tanks into broad groups according to productivity and reliability; and (e) modify criteria for selection of schemes where such changes were justified. The final report will be submitted shortly, and relevant recommendations reflected in the water

management plans to be prepared under NIRP. The project would support a similar study for diversion schemes.

Objectives

20. The objective of the study is to identify, through a diagnostic approach, the resources available and problems associated with diversion schemes. The study would include: (a) a physical resource evaluation; (b) development of a model to predict water availability; and (c) development of suitable cropping patterns for efficient use of available land and water resources.

Activities

21. A team led by an agronomist and supported by an engineer, a water management specialist, and a socio-economist, would undertake the activities described below.

- (a) Development of a Model to Predict Water Availability. The forecast of water availability from wet and dry season flows would help farmers and project staff prepare seasonal cultivation plans. Three representative diversion schemes would be selected for the study. Relief, rainfall, runoff, infiltration, and hydrological parameters would be monitored in each catchment area. Stream flow from each catchment would also be monitored. A model would be developed using these information to predict stream flow.
- (b) Development of Cropping Patterns. The traditional cropping patterns of paddy-paddy and paddy-fallow may be an inefficient use of utilization of land and water, particularly during the dry season, or in areas of well drained soils. It has also been observed that productivity and fertilizer response by paddy in the high, medium, and low areas in the mid-country are different, probably due to varying hydrological conditions. Under these conditions, suitable crop rotations could improve productivity. In addition, land productivity could be improved by introducing suitable cropping patterns to match water availability and land/soil types. Water availability and cultivable areas in the three sample schemes would be determined. Several cropping patterns, including high value crops, would be determined, using crop water requirements and water availability data. These cropping patterns would be evaluated in field tests for productivity per unit of land and for socio-economic factors.
- (c) Data Collection. The following data would be collected in the three sample schemes: (a) rainfall data from existing stations, or new stations if no station existed previously; (b) command area data to be determined from aerial photographs or topographical surveys, supplemented by information from the farmers; (c) soil types; (d) conveyance losses; (e) percolation and seepage losses; (f) evapo-

transpiration using climatic data; (g) water table behavior; and (h) runoff.

Reports

22. The study would commence in 1992 and continue to the end of 1996. The annual work program and budget for 1992 would be submitted before the end of 1991. Subsequent annual work programs and budgets would be submitted by June 30 of each preceding year. Bi-annual progress reports would include physical and financial progress, problems encountered, and suggestions to resolve them. An interim report would be submitted at the end of the third year and would include preliminary study findings. The final report would be submitted within three months of completion of the study.

E. Socio-economic Study

Introduction

23. In order to assess project impact and draw lessons for future operations, two different series of studies would be conducted over the seven-year project period. Firstly, benchmark and evaluation studies would be conducted in some 45 representative schemes located throughout the country. Information would be collected from statistical and other existing sources, and through interviews with community leaders and a representative sample of 50 farm households in each selected scheme. Draft terms of reference and the modalities for execution of one benchmark and two evaluation studies are described in Annex 6. Secondly, a continuous in-depth socio-economic study of a sample of ten schemes located in the Central and North-Western provinces would be conducted. Details on the second study are given below.

Objectives

24. The main objective of the socio-economic study is in-depth monitoring and analysis of changes due to the project. Specific subjects the study would cover include: (a) pre-rehabilitation status of the selected scheme, including condition of irrigation facilities and cropping systems, production and incomes; (b) changes due to the rehabilitation works and the adoption of improved water management and maintenance practices; (c) participation of the farmers in planning and execution of rehabilitation and maintenance works; (d) functioning of FOs and other village-level institutions; (e) effectiveness of GOSL and provincial support agencies; and (f) environmental effects of the project, both positive and negative.

Methodology

25. The study would start in three schemes in 1992 and would be expanded to six schemes in 1993 and ten schemes in 1994. Relevant data would be collected and continuously updated during successive crop seasons through field observations and visits to farmers. The data would cover four broad areas. General information would include, amongst others, data on population, land use, physical facilities, and supporting services operating in the

schemes. Farm production and incomes would cover crop areas and production, availability and use of inputs (farm labor, fertilizers, farm power, etc.), sales and home consumption of farm produce. Information on production and incomes from land outside the scheme and off-farm income would also be collected in order to facilitate the preparation of comprehensive farm household budgets. Irrigation data would cover availability of water, condition of supply and distribution facilities, on-farm water management, farmer participation in rehabilitation and maintenance works, problems perceived by the farmers and proposed solutions, etc. Institutional data would cover interaction of farmers with agricultural support agencies, participation in farmer organizations, sources and use of information on marketing and prices, etc.

26. Tables would be developed to illustrate various levels of resource use, cropping intensities, production, incomes, and cross linkages among different variables. Qualitative assessments would be made on the functioning of irrigation facilities, farmer participation in maintenance and management of the schemes, functioning of farmer organizations, effectiveness of agricultural support services, and the environmental aspects of the scheme.

27. Research assistants would be posted permanently in the schemes for the duration of the study (one research assistant would collect data for two schemes).

Reporting

28. The study team would prepare the following reports:

- (a) an inception report within two months after the start of the study which would include the proposed work plan, staffing of the team, and proposed formats of reports to be submitted;
- (b) quarterly progress reports;
- (c) annual reports which would include preliminary findings and conclusions and an updated work plan;
- (d) occasional working papers;
- (e) a draft final report two months before the end of the study period; and
- (f) a final report at the end of the study period.

SRI LANKA

NATIONAL IRRIGATION REHABILITATION PROJECT

Technical Assistance for Project Implementation and Evaluation

This Annex provides draft Terms of Reference for consultants services to: (a) assist the implementing agencies with planning and implementation of rehabilitation and improvement works, and improved operation and maintenance practices in about 1,000 minor and about 60 medium/major schemes, covering about 37,500 ha (Section I); and (b) conduct benchmark and evaluation studies in a representative sample of about 30 minor and 15 medium/major schemes (Section II).

I. Project Planning and Implementation

A. Scope of Consultant Services

- 1.01 The consultants services would cover the following:
- (a) screening of all schemes proposed for rehabilitation;
 - (b) preparation of feasibility studies for medium/major schemes;
 - (c) technical review of feasibility studies for minor schemes;
 - (d) monitoring of preparation of detailed engineering documents for all schemes;
 - (e) construction monitoring and quality control for all schemes;
 - (f) assistance to the Dam Safety Unit to be established in the Irrigation Department (ID);
 - (g) technical support for improved O&M for all schemes;
 - (h) institutional support to the farmer organizations (FO);
 - (i) management support to the Central Management Cell (CMC); and
 - (j) preparation of guidelines for various project activities.

B. Responsibilities of the Consultant

Screening

1.02 The Consultant would review all identification reports prepared by the ID's range offices (for schemes remaining under central government management) and the provincial councils (for devolved schemes) in order to

assess whether the proposals are technically sound and in compliance with the scheme selection criteria. The Consultant would particularly:

- (a) carry out spot checks, especially for tank schemes, to determine the accuracy of limited topographical surveys undertaken to estimate preliminary costs;
- (b) review all proposed works, unit prices, quantities, and cost estimates, particularly for schemes which only marginally satisfy the cost criteria, and where possible in consultation with field staff and the farmers amend the proposals to include cost effective systems;
- (c) check if there are any existing or potential environmental problems in the schemes or their basins which need to be studied in detail during the feasibility stage in order to define remedial actions; particular attention would be given to embankment erosion and seepage, drainage congestion, adverse effects on other schemes in the basin, and degradation of the catchment area;
- (d) assess the commitment of the farmers, their awareness of and views on the proposed works, and their willingness to contribute part of the investment cost and take over the responsibility for O&M of the scheme after completion of the works; and
- (e) assess the effectiveness of agricultural support services (extension, credit) and availability of inputs and storage, processing, marketing, and transport facilities.

Feasibility Studies

1.03 Medium/major Schemes. The Consultant would:

- (a) review all relevant previous engineering, agriculture and economic studies, reports and data, including studies on any ongoing or projected hydrological changes that may effect the schemes;
- (b) determine the technical causes of under-performance and/or other problems; identify all water resources, water demand, and flood risks;
- (c) determine all necessary repairs and replacement of existing structures and/or construction of new structures for the headworks and downstream parts of the system in order to restore and/or improve irrigation, drainage and, where applicable, salinity control; the preliminary proposals would include cost estimates and an O&M plan;
- (d) explain to farmers the preliminary proposals for rehabilitation and improvement works, the management system, the investment and O&M costs, and the contributions to be made by them; discuss with the

field staff of GOSL and farmers the activities and effectiveness of the supporting services, and the availability of inputs and other facilities; identify constraints and make appropriate recommendations;

- (e) evaluate all available agro-economic data and conduct farm surveys to collect up-to-date and accurate information related to soils, farm sizes and tenancy arrangements, present land use, cropping patterns, cropping intensity, crop yields, cultivation costs, land size, farm incomes etc.;
- (f) conduct a detailed survey of the environmental problems identified during the screening process and prepare proposals and preliminary designs for remedial measures to eliminate or minimize these problems;
- (g) identify the required topographical surveys and geotechnical investigations, and monitor the progress and quality of execution of these works, conducted by the range and provincial irrigation units;
- (h) prepare for each scheme a feasibility report, including a preliminary design of the works, an O&M plan, proposed management system, cost estimates, and economic analysis; and
- (i) together with GOSL staff, the engineering and institutional staff of the Consultant would visit the site and explain to the farmers the proposals, with costs (investment and recurrent), any changes to the management system discussed earlier, options for farmers' contributions to the investment cost; the views of the FOs would be reflected in the draft feasibility report.

1.04 Minor Schemes. The Consultant would provide guidance to the provincial irrigation units which would prepare the feasibility plans. The Consultant would review the completed plans, undertake field checks, and meet with the FOs to determine their acceptance of the plans.

Engineering Documentation

1.05 The Consultant would monitor progress of preparation of designs, construction drawings, quantity estimates, and tender documents, and recommend timely action to resolve any constraints which may adversely affect the agreed implementation schedule.

Construction Monitoring and Quality Control

1.06 The Consultant would:

- (a) monitor physical and financial progress of rehabilitation and improvement works and advice the Project Director on issues affecting implementation and achievement of targets;

- (b) monitor the quality of works;
- (c) check and certify reimbursement claims against civil works contracts, and monitor disbursements;
- (d) for medium/major schemes, prepare completion reports, including as-built drawings; and
- (e) for minor schemes, check the reports prepared by the provincial irrigation units.

1.07 Monitoring of progress would comprise: (a) preparation of work programs and annual budgets; and (b) follow-up on preconstruction activities such as land required for construction, topographical surveys, geotechnical investigations, borrow area investigations, detailed engineering documentation, and contract awards.

1.08 Monitoring of quality would be conducted by the Consultant's Regional Support Teams (RST) with assistance from the CMC headquarters staff, if required. The Consultant would carry out field inspections at critical stages of construction, including establishment of reference points for setting out works, foundations, stockpiling of construction materials, concrete pours, fabrication and erection of form work, reinforcements, and compaction of back fills at structures. Visits would also be made during earthwork filling for embankments. The Consultant would also discuss his findings with the field staff of GOSL and the management staff at the range and provincial level. Findings would be copied to the CMC. The regional laboratories of ID (to be strengthened under the project) would provide services for conducting tests on earthworks and concrete works. The RSTs would work closely with the staff of the regional laboratories. The specialist staff of the Consultant would provide advice as required in equipping the laboratories and conducting field tests.

Dam Safety

1.09 A Dam Safety Unit would be established in the Irrigation Department. The project would provide instruments needed for detecting possible dam failures. The Consultant would provide advisory services and assistance to the Unit on subjects specifically referred to him and arrange for relevant expertise, as needed.

Technical Support for Improved Operation and Maintenance

1.10 The Consultant would:

- (a) prepare a simplified manual for operation staff; and
- (b) monitor the system of water distribution and advise the FOs on corrective measures to ensure optimum utilization of water.

Institutional Support to Farmer Organizations

1.11 The Consultant would:

- (a) assist DAS and ID staff in the selection of institutional organizers (IO);
- (b) assist in the formal and on-the-job training of IOs;
- (c) guide the IOs in the formation of FOs, including establishment of management systems, to ensure their effective functioning;
- (d) together with technical project staff and IOs, participate in initial meetings of FOs to discuss and make arrangements for their participation in rehabilitation and improvement works, and for implementation of improved scheme maintenance plans and efficient water management practices;
- (e) provide follow-up support and guidance in the areas listed under (d) to the FOs (through the IOs), as needed;
- (f) monitor the performance of the FOs, identify any problems which may arise, and propose solutions; and
- (g) monitor the effectiveness of all agricultural support services in the scheme areas, identify any shortcomings, and propose remedial actions.

Management Support

1.12 The Consultant would assist the CMC in the following areas:

- (a) prepare annual work programs and budgets for the project;
- (b) annually review the capacity of the provincial administrations to carry out the work assigned to them in accordance with acceptable time schedules and quality standards, and propose solutions to anticipated problems in this regard; and
- (c) establish a management information system at each of the regional units which would be networked to the system at the CMC office. The system would provide information on annual budget allocations compared with appraisal estimates, physical and financial progress of construction works, topographical surveys and geotechnical investigations. The system would also provide information on contractors and FOs, progress of disbursements, feasibility studies, and detailed engineering documentation. Any issues would be brought to the notice of the Project Director in a timely manner to ensure that targets are achieved.

Preparation of Guidelines

1.13 The Consultant would during the first year prepare, and bi-annually update, guidelines to:

- (a) conduct hydrological studies covering rainfall and yield, reservoir operation, estimation of design flood, and flood routing;
- (b) conduct environmental assessments;
- (c) design headworks and canal systems;
- (d) prepare construction drawings, rate analysis, unit rates, and cost estimates;
- (e) prepare farm budgets, and methodology for economic analysis during the feasibility studies of medium/major schemes;
- (f) assist the IOs in organizing and motivating FOs;
- (g) prepare a simplified plan of operation for use of FOs which will include: (i) O&M activities at the headworks and canals to ensure adequate water supplies and prevent deterioration of infrastructure due to ineffective maintenance; and (ii) scheduling of water issues; and
- (h) update formats on: (i) identification and feasibility studies; and (ii) handing over of completed works for operation by the FOs.

C. Composition and Organization of Consultants Team and Period of Services

1.14 The Consultant's team would be located in the CMC in Colombo, with eight RSTs at the provincial level. The team leader of the Consultant would be in overall control of the Consultant's staff. The team would include specialists in planning and design of engineering works, operation and maintenance, agronomy, sociology, environment, and institutional development. The RSTs would be manned by a construction engineer, an institutional specialist, and a senior technical assistant or an experienced mid-level engineer. The Consultant's services would commence in about December 1991 and continue till the end of December 1997. The project would provide vehicles, office and drawing office equipment, including computers. The Consultant would be responsible for providing adequate support staff for the field and office operations, including incidentals such as O&M of vehicles, printing, stationery, per diem, etc. Total requirements are estimated as follows:

<u>Category</u>	<u>Staff Months</u>
<u>Internationally Recruited Professionals</u>	
Team Leader/Irrigation Management Specialist	42
Short Term Specialists	<u>8</u>
Total	50
<u>Locally Recruited Professionals</u>	
Senior Planning and Design Engineer	72
Planning and Design Engineers (3)	120
Construction Engineers (8)	540
Agronomist	30
Sociologist	24
Agro-economist	24
Institutional Specialist	72
Environmentalist	18
O&M Specialist	72
Short Term Specialists	<u>48</u>
Total	1,020
<u>Locally Recruited Mid-level Staff</u>	
Mid-level Engineers/Technical Assistants	540
Institutional Development Officers	<u>540</u>
Total	1,080

D. Reporting Requirements

1.15 The Consultant would keep the Project Director informed on the progress of project implementation, including any problems which may cause delay, and proposed solutions to these problems. The Consultant would submit the following reports:

- (a) an inception report, three months after the start of the Consultant's assignment. This report would include:
 - (i) an analysis of the project budget and work plan for the first two years;
 - (ii) comments on the organizational set-up of the new provincial irrigation units, particularly their capacity to plan and design the minor schemes;
 - (iii) program for the feasibility studies and detailed documentation required, with a network diagram for the full project period and bar charts for the first and second years;
 - (iv) program of activities of the RSTs with detailed responsibilities for the senior professionals;
 - (v) preliminary proposal for the management information system;

- (vi) comments on the engineering aspects of the 17 schemes for which documents have been completed, and the changes proposed, if any;
 - (vii) comments on the management system proposed for the 17 schemes, identification of any issues, and recommendations for changes, as required; proposals for any deviation from agreements reached earlier would be discussed with farmers and their views included in the report;
 - (viii) updated formats for identification and feasibility studies; and
 - (ix) forms for maintaining field records to ensure construction quality and facilitate monitoring of progress;
- (b) brief monthly and detailed quarterly reports within two weeks of the end of the reporting period;
 - (c) draft annual work programs and budgets to be submitted in time for inclusion in the GOSL budget;
 - (d) guidelines for the preparation of preliminary proposals and feasibility studies for all schemes; these would be updated bi-annually;
 - (e) a design and construction manual at the end of the first year; and
 - (f) an operations manual in a form which could be utilized by field staff and farmers, at the end of the third year.

II. Benchmark and Evaluation Studies

Introduction

2.01 Benchmark and evaluation studies would be undertaken in a representative sample of 30 minor and 15 medium/major schemes in order to assess the project's impact and draw lessons for similar future operations. The studies would cover the engineering, agricultural, environmental, socio-economic, and institutional aspects of the selected schemes.

Benchmark Studies

2.02 Benchmark studies would be conducted in order to assess scheme conditions prior to rehabilitation and introduction of improved O&M practices. The study team would review and verify all relevant data for the scheme, including those compiled for the identification and feasibility reports. Additional data would be collected through interviews with farmers, local leaders, and representatives of support agencies.

2.03 Engineering data would include: (a) command area of the scheme; (b) inventory and operational condition of headworks (reservoir, dam or diversion weir, sluices, spillway), irrigation distribution system (canals, sluices, turn-outs), and drainage facilities; (c) incidence and impact of floods and droughts during the previous five years; and (d) maintenance and repair works undertaken during last five years (cost, financing, execution).

2.04 Agricultural data would include: (a) crop areas, yields, and production during preceding year and average years; (b) cultivation practices, including use of inputs; (c) crop losses during previous five years due to floods, droughts, failure of irrigation facilities, etc.; and (d) other agricultural activities, if any (livestock, cropping outside the command area including home gardening, fisheries, etc.).

2.05 Socio-economic data would include: (a) family size and composition; (b) land distribution, tenancy, and fragmentation; (c) farm incomes and expenditures (separately for scheme related and other farm activities); (d) sales of farm produce; and (e) off-farm income, if any.

2.06 Institutional data would include: (a) details on existence and functioning of formal or informal farmer organizations in the scheme area; (b) management system for O&M of the scheme, including arrangements for distribution of water and farmer participation in maintenance works; and (c) presence and effectiveness of private and public agricultural support services (inputs, marketing, processing, credit, transport, extension, credit).

2.07 Environmental data would include: (a) embankment erosion and seepage; (b) drainage congestion; (c) reservoir siltation and cultivation in the reservoir bed; and (d) degradation of the catchment area.

2.08 In general, the study team should focus on technical or other reasons for under-performance of the scheme, seek the farmers' opinions on possible remedies of the problems, and ascertain their views on possibilities and priorities for further development. In order to provide a basis for post-project evaluation of the project works, the study team would prepare probable future crop production estimates should the proposed rehabilitation and improvement works not be executed.

Evaluation Studies

2.09 Evaluation studies would be conducted in order to assess the effectiveness of project activities and determine their impact on production, incomes, and employment. All relevant information collected during the benchmark studies would be updated using the same methodology and samples of respondents, to the extent possible. The evaluation studies would specifically:

- (a) identify technical reasons for under-performance of the schemes, if any, due to inadequacies in planning, design, or construction of rehabilitation and improvement works and recommend remedies;

- (b) identify environmental problems and recommend remedies;
- (c) identify deficiencies in the institutional arrangements for managing the schemes, if any, causing poor water distribution or maintenance practices and recommend alternative arrangements;
- (d) assess the effectiveness of the farmer organizations and GOSL support services and suggest improvements, where appropriate; and
- (e) identify the potential for further development, including cultivation of high value crops, and propose appropriate modifications of the scheme.

Execution of Studies

2.10 The benchmark studies would be conducted over a period of about 18 months during the first three project years. Collection of data would be completed before the start of rehabilitation works. Two evaluation studies would be conducted in each sample scheme after completion of all works. The first evaluation study would be conducted over a period of about 12 months in the fourth or fifth project year, preferably after the scheme has been operating for some time under the new improved conditions, and the second study would be undertaken over 12 months during the seventh (final) project year. This implies that sample schemes for the study would have to be selected among the first group of 17 schemes, for which feasibility studies have already been completed, and the second group of schemes to be studied during the second project year (1992).

2.11 The field surveys would be undertaken in two phases. During the first phase the study team would collect relevant information from statistical sources and agricultural support services operating in the scheme areas. The study team would also conduct group interviews with community leaders. During the benchmark studies the respondents would be asked to discuss their expectations from the proposed project works, both positive and negative. During the evaluation studies the respondents would be asked to state their views on the impact of the works and the management of the scheme.

2.12 During the second phase interviews would be conducted with about 50 farm families. A stratified random sample of households would be selected on the basis of farm size and ownership status. Factual information would be collected on all relevant aspects needed to prepare typical pre-project (benchmark studies) and post-project (evaluation studies) farm budgets and to estimate the economic rate of return on rehabilitation and improvement works. The farmers' opinions would be sought on subjects such as: (a) planned or actual changes in cropping patterns and practices due to the project; (b) functioning of farmer organizations and participation of farmers in O&M activities; (c) current problems and suggested solutions; and (d) assistance received from Government support agencies.

Composition of Study Team

2.13 The studies would be conducted by a team of qualified independent local experts under a contract with the Irrigation Department (e.g. a research institute such as the Agrarian Research and Training Institute, a university, or a firm of consultants). Given the number of schemes to be studied, about four separate field survey teams would be established. Total professional staff requirements are estimated as follows:

<u>Senior Professional Staff</u>	<u>Staff Months</u>
Agro-economist/Team Leader	42
Agro-economists (two persons)	84
Agriculturist	20
Institutional Specialist	20
Environmentalist	12
Irrigation Engineer	<u>12</u>
Sub-total	190
 <u>Junior Professional Staff</u>	
Research Assistants/Survey Team Leaders (four persons)	<u>168</u>
Total	358

The team would also require support staff, including field enumerators, data processors, secretaries, drivers, etc. The project would provide transport, office accommodation, equipment, and report printing and reproduction.

Reporting

2.14 The study team would submit the following reports:

- (a) an inception report within two months after the start of the studies which would include comments on the terms of reference, proposed work plan, data storage and retrieval procedures, formats of reports to be submitted, etc.;
- (b) brief monthly progress reports and detailed quarterly progress reports within two weeks of the end of the reporting period;
- (c) a draft final report for each of the benchmark and evaluation studies, detailing the team's findings and conclusions, one month before the end of the studies;
- (d) a final report for each of the three studies at the end of the study periods; and
- (e) lists of surveyed farms with location and addresses (to facilitate eventual follow-up studies), questionnaires and work files, with all relevant information collected during the study, at the end of the assignment.

**SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT
Project Implementation Schedule**

Activities	Year:		CY91		CY92		CY93		CY94		CY95		CY96		CY97							
	Quarter:		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
REHABILITATION & IMPROVEMENTS																						
Medium/Major Schemes - Prepared																						
1. Maha Galwewa-Meegahajandura Wewa																						
Preconstruction																						
Construction			C																			
2. Kallota Diversion																						
Preconstruction																						
Construction				3																		
3. Wannaruwewa Tank																						
Preconstruction																						
Construction																						
4. Udugoda Bandara Ela Diversion																						
Preconstruction																						
Construction				5																		
5. Gampolawela Raja Ela Diversion																						
Preconstruction																						
Construction				5																		
6. Buttala Amuna Diversion																						
Preconstruction																						
Construction				5																		
Minor Schemes - Prepared																						
7. Maha Kiri Ebbewa Wewa																						
Preconstruction																						
Construction																						
8. Nittawa Wewa																						
Preconstruction																						
Construction																						
9. Kobelgane Maha Wewa																						
Preconstruction																						
Construction																						
10. Dorakada Maha Ela Diversion																						
Preconstruction																						
Construction																						
11. Pothiyannekada Tank																						
Preconstruction																						
Construction																						
12. Nellugollakada Tank																						
Preconstruction																						
Construction																						
13. Moragaswewa Tank																						
Preconstruction																						
Construction																						
14. Karawdeniya Maha Wewa																						
Preconstruction																						
Construction																						
15. Beramadu Maha Ela Diversion																						
Preconstruction																						
Construction																						
16. Pitaha Maha Ela Diversion																						
Preconstruction																						
Construction																						
17. Ulugala Amuna Diversion																						
Preconstruction																						
Construction																						

S&L LAND
NATIONAL REHABILITATION RECONSTRUCTION PROJECT
Table 1. REHABILITATION INVESTMENT (IMPROVED - LAND IN SERVICE (L&S))
Multiple Cost Table
(\$ 1,000)

Activity	Year										Total Excludes Contingencies	
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980		
1. IMPROVEMENT COSTS												
A. STREETS AND UTILITIES												
B. ROAD (ASLT, L&S, ETC)												
C. RECREATION DEVELOPMENT												
Sub-Total REHABILITATION INVESTMENT	18.0	26.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0
2. OTHER WORK COSTS												
1. OTHER WORK COSTS												
2. LEFT BANK STREETS												
Sub-Total OTHER WORK COSTS	220.2	220.2	220.2	220.2	220.2	220.2	220.2	220.2	220.2	220.2	220.2	220.2
3. TOTAL COSTS	238.2	246.2	248.2	248.2	248.2	248.2	248.2	248.2	248.2	248.2	248.2	248.2

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SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT
Table 2. NEP(U)/MAJOR TANKS (APPRAISED) - MANGALMEWA-BEEDANJANDURA SCHEME (195 MA) /a
Detailed Cost Table
(RS '000)

	Unit	Quantity								Unit Cost	Base Costs								Totals Including Contingencies								
		1991	1992	1993	1994	1995	1996	1997	Total		1991	1992	1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total	
I. INVESTMENT COSTS																											
A. SURVEYS AND INVESTIGATIONS																											
B. MANGALMEWA SCHEME																											
1. HEADWORKS																											
EARTHWORKS - MAIN BOND	100 RS	-	16.5	22	16.5	-	-	-	55	13	-	214.5	284.0	214.5	-	-	-	715.0	-	268.5	380.2	300.9	-	-	-	949.6	
CONCRETE WORKS - SPILLWAY	RS	-	17.1	22.8	17.1	-	-	-	57	3.1	-	53.0	70.7	53.0	-	-	-	176.7	-	45.5	92.4	72.9	-	-	-	230.7	
REPAIRS TO SLUICES	SUM	-	-	-	-	-	-	-	-	-	4.0	-	-	-	-	-	-	4.0	4.6	-	-	-	-	-	-	4.6	
RIP RMP PROTECTION	100 RS	-	3.9	5.2	3.9	-	-	-	13	44	-	171.6	228.0	171.6	-	-	-	572.0	-	211.9	299.0	236.1	-	-	-	746.9	
DOWNSTREAM FILTER PROTECTION	SUM	-	-	-	-	-	-	-	-	-	-	870.0	1,160.0	870.0	-	-	-	2,900.0	-	999.4	1,385.9	1,079.7	-	-	-	3,464.9	
IMPROVEMENTS TO SPILLWAY	SUM	-	-	-	-	-	-	-	-	-	-	6.6	5.8	6.6	-	-	-	22.0	-	8.4	12.0	9.5	-	-	-	29.9	
Sub-Total HEADWORKS											4.0	1,315.7	1,754.3	1,315.7	-	-	-	4,389.7	4.6	1,553.7	2,169.4	1,699.0	-	-	-	5,426.7	
2. DOWNSTREAM DEVELOPMENT																											
EARTHWORKS - MAIN CANAL	100 RS	-	12.9	17.2	12.9	-	-	-	43	11.3	-	145.8	194.4	145.8	-	-	-	485.9	-	187.5	267.1	212.3	-	-	-	666.9	
CANAL STRUCTURES - FLUMES, RETAINING WALLS, GATES	RS	-	84.9	113.2	84.9	-	-	-	283	1.5	-	127.4	169.0	127.4	-	-	-	424.5	-	157.2	221.9	175.2	-	-	-	554.3	
ANCILLIARY WORKS - MAIN CANAL	SUM	-	-	-	-	-	-	-	-	-	-	52.2	69.6	52.2	-	-	-	174.0	-	64.5	71.0	71.8	-	-	-	227.2	
EARTHWORKS - DISTRIBUTORY CANALS	RS	-	97.2	129.6	97.2	-	-	-	324	0.15	-	14.6	19.4	14.6	-	-	-	48.6	-	18.8	26.7	21.2	-	-	-	66.7	
DISTRIBUTORY CANAL STRUCTURES - 7 NOS CHECKS, DROPS, CROSSINGS	RS	-	27	36	27	-	-	-	90	1.7	-	45.9	61.2	45.9	-	-	-	153.0	-	56.7	80.0	63.1	-	-	-	199.8	
EARTHWORKS - FIELD CANALS	100 RS	-	9.6	12.8	9.6	-	-	-	32	1.3	-	89.3	119.0	89.3	-	-	-	297.6	-	110.2	155.6	122.8	-	-	-	398.6	
STRUCTURES - FIELD CANALS (111 NOS DROPS/PIPE OUTLETS)	RS	-	105	140	105	-	-	-	350	1.5	-	157.5	216.0	157.5	-	-	-	525.0	-	194.5	274.4	216.7	-	-	-	685.6	
ANCILLIARY WORKS - DISTRIBUTORY & FIELD CANALS	SUM	-	-	-	-	-	-	-	-	-	-	63.0	84.0	63.0	-	-	-	210.0	-	77.0	109.8	86.7	-	-	-	274.2	
Sub-Total DOWNSTREAM DEVELOPMENT											-	495.6	727.4	495.6	-	-	-	2,310.6	867.1	1,226.4	989.9	-	-	-	3,063.3		
Sub-Total MANGALMEWA SCHEME											4.0	2,011.3	2,481.7	2,011.3	-	-	-	6,700.3	4.6	2,420.8	3,395.7	2,688.9	-	-	-	8,990.0	
C. BEEDANJANDURA SCHEME																											
1. HEADWORKS																											
MAIN BOND RESECTIONING	1000000000	3	-	13.5	18	13.5	-	-	45	13	-	175.5	234.0	175.5	-	-	-	585.0	-	219.7	311.0	246.2	-	-	-	776.9	
CONSTRUCTION OF SPILLWAY AND DROP WALL	SUM	-	-	-	-	-	-	-	-	-	-	284.0	-	-	-	-	-	284.0	-	326.0	-	-	-	-	-	326.0	
RECONSTRUCTION OF TWO SLUICES	NO	-	0.6	0.8	0.6	-	-	-	2	60	-	36.0	48.0	36.0	-	-	-	120.0	-	42.7	49.5	-	-	-	-	156.7	
RIP RMP PROTECTION	1000000000	3	-	2.1	2.8	2.1	-	-	7	44	-	92.4	123.2	92.4	-	-	-	308.0	-	114.3	161.0	127.1	-	-	-	402.2	
Sub-Total HEADWORKS											-	567.9	405.2	303.9	-	-	-	1,277.0	704.2	534.8	422.8	-	-	-	-	1,661.8	
2. DOWNSTREAM DEVELOPMENT																											
EARTHWORKS - RD 1 LB MAIN CANALS	1000000000	3	-	3.5	4.6	3.5	-	-	11.5	7.7	-	26.6	35.4	26.6	-	-	-	88.6	-	34.2	48.7	38.7	-	-	-	121.3	
REGULATOR IN MAIN CANAL (1 NO)	RS	-	0.3	0.4	0.3	-	-	-	0.9	1.7	-	0.5	0.6	0.5	-	-	-	1.5	-	0.6	0.8	0.6	-	-	-	2.0	
ANCILLIARY WORK - CANALS	SUM	-	-	-	-	-	-	-	-	-	-	10.2	13.6	10.2	-	-	-	34.0	-	12.4	17.8	14.0	-	-	-	44.0	
Sub-Total DOWNSTREAM DEVELOPMENT											-	37.2	49.6	37.2	-	-	-	124.1	47.3	47.2	53.4	-	-	-	-	147.9	
Sub-Total BEEDANJANDURA SCHEME											-	605.1	454.8	341.1	-	-	-	1,401.1	751.6	602.0	476.2	-	-	-	-	1,829.7	
D. ENGINEERING AND ADMINISTRATION																											
	SUM	-	-	-	-	-	-	-	-	-	2.3	315.8	376.4	282.3	-	-	-	974.7	2.7	406.2	517.2	411.2	-	-	-	1,337.2	
Total INVESTMENT COSTS											21.3	2,947.2	3,512.9	2,634.7	-	-	-	9,116.1	24.9	3,597.9	4,514.9	3,536.2	-	-	-	11,693.9	
Total											21.3	2,947.2	3,512.9	2,634.7	-	-	-	9,116.1	24.9	3,597.9	4,514.9	3,536.2	-	-	-	11,693.9	

/a EARTHWORKS INCL. COST OF CLEARING, STRIPPING TOP SOIL & TURFING. PROTECTION WORKS INCL. SAND FILTER COSTS. DOWNSTREAM FILTER PROTECTION INCL. COST OF EXCAVATION, SUPPLY AND PLACING FILTER MATERIAL AND LEAD AWAY DRAINS

SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT
Table 3, MINOR DIVERSION SCHEMES - (APPRAISED)- BORAKADA MAHA ELA DIVERSION SCHEME(16 HA) /a
Detailed Cost Table
IRS '000)

	Unit	Quantity								Unit Cost	Base Costs								Totals Including Contingencies									
		1991	1992	1993	1994	1995	1996	1997	Total		1991	1992	1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total		
I. INVESTMENT COSTS																												
A. SURVEYING AND INVESTIGATIONS																												
SUM		-	-	-	-	-	-	-	-		-	10.0	-	-	-	-	-	10.0	-	12.9	-	-	-	-	-	-	-	12.9
B. HEADWORKS																												
CONCRETE WORKS - REPLACEMENT OF STICK DAM BY A CONCRETE WEIR	M3	-	44.5	-	-	-	-	-	44.5	3	-	133.5	-	-	-	-	-	133.5	-	164.8	-	-	-	-	-	-	-	164.8
PROVISION OF SCREW TYPE LIFTING GATES	NO	-	2	-	-	-	-	-	2	24	-	48.0	-	-	-	-	-	48.0	-	59.3	-	-	-	-	-	-	-	59.3
CONCRETE WORKS CONTROLLED OUTLETETS	M3	-	6.4	-	-	-	-	-	6.4	3.44	-	22.0	-	-	-	-	-	22.0	-	27.2	-	-	-	-	-	-	-	27.2
EARTHWORKS - FLOOD AND TRAINING BUNDS	M3	-	310	-	-	-	-	-	310	0.089	-	25.1	-	-	-	-	-	25.1	-	32.3	-	-	-	-	-	-	-	32.3
Sub-Total HEADWORKS											-	228.6	-	-	-	-	-	228.6	-	283.6	-	-	-	-	-	-	-	283.6
C. DOWNSTREAM DEVELOPMENT																												
EARTHWORKS	M3	-	92.4	39.6	-	-	-	-	132	0.257	-	23.7	10.2	-	-	-	-	33.9	-	30.5	14.0	-	-	-	-	-	-	44.5
RUBBLE MASONRY RETAINING WALLS	M3	-	9.5	4.1	-	-	-	-	13.5	2.5	-	23.6	10.1	-	-	-	-	33.8	-	29.2	13.2	-	-	-	-	-	-	42.4
CONCRETE WORKS - DROPS AND FIELD OUTLETS	M3	-	7.5	3.2	-	-	-	-	10.7	3.3	-	24.7	10.6	-	-	-	-	35.3	-	30.5	13.8	-	-	-	-	-	-	44.4
Sub-Total DOWNSTREAM DEVELOPMENT											-	72.1	30.9	-	-	-	-	103.0	-	90.2	41.1	-	-	-	-	-	-	131.3
D. ENGINEERING AND ADMINISTRATION																												
SUM		-	-	-	-	-	-	-	-		-	37.3	3.7	-	-	-	-	41.0	-	48.0	5.1	-	-	-	-	-	-	53.1
Total INVESTMENT COSTS																												
											-	348.0	34.6	-	-	-	-	382.6	-	434.7	46.2	-	-	-	-	-	-	480.8
Total																												
											-	348.0	34.6	-	-	-	-	382.6	-	434.7	46.2	-	-	-	-	-	-	480.8

/a EARTHWORKS INCLUDES COST OF CLEARING, STRIPPING TOP SOIL, AND TURFING

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NATIONAL IRRIGATION REHABILITATION PROJECT
Table 4. MINOR TANKS (APPRAISED) - KOBETIGAMA MAHA MENA SCHEME (34 HA) /a
Detailed Cost Table
(RS '000)

	Unit	Quantity							Unit Cost	Base Costs							Totals Including Contingencies									
		1991	1992	1993	1994	1995	1996	1997		Total	1991	1992	1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total
I. INVESTMENT COSTS																										
A. SURVEYS AND INVESTIGATIONS																										
SUM		-	-	-	-	-	-	-		7.5	7.5	-	-	-	-	-	15.0	8.8	9.6	-	-	-	-	-	-	18.5
B. HEADWORKS																										
EARTHWORKS (RESECTIONING)	M3	-	191	191	-	-	-	-	382	0.293	-	56.0	56.0	-	-	-	-	111.9	-	72.0	76.9	-	-	-	-	148.9
RECONSTRUCTION OF SLUICE	M3	-	5	5	-	-	-	-	10	2	-	10.0	10.0	-	-	-	-	20.0	-	12.3	13.1	-	-	-	-	25.4
ANCILLIARY WORKS - EMBANKMENT	SUM	-	-	-	-	-	-	-	-	-	-	9.0	9.0	-	-	-	-	18.0	-	11.1	11.8	-	-	-	-	22.9
EARTHWORKS - SPILL TAIL CANAL	M3	-	184	184	-	-	-	-	368	0.1	-	18.4	18.4	-	-	-	-	36.8	-	23.7	25.3	-	-	-	-	49.0
REPLACEMENT OF GATE AND OPERATING MECHANISM OF SLUICE	SUM	-	-	-	-	-	-	-	-	-	-	42.0	42.0	-	-	-	-	84.0	-	51.9	54.9	-	-	-	-	106.7
Sub-Total HEADWORKS																										
C. DOWNSTREAM DEVELOPMENT																										
1. MAIN CANALS																										
EARTHWORKS	M3	469	1,076	-	-	-	-	-	2,345	0.103	48.3	193.2	-	-	-	-	-	241.5	56.7	248.6	-	-	-	-	-	305.3
REGULATORS (8 NOS)	M3	2	8	-	-	-	-	-	10	1.7	3.4	13.6	-	-	-	-	-	17.0	3.9	16.8	-	-	-	-	-	20.7
TURBOUTS (28 NOS)	M3	17.4	49.6	-	-	-	-	-	87	1.5	26.1	104.4	-	-	-	-	-	130.5	29.9	128.9	-	-	-	-	-	158.8
DIVERSION WEIRS (2 NOS)	M3	8	32	-	-	-	-	-	40	2.1	16.8	67.2	-	-	-	-	-	84.0	19.3	83.0	-	-	-	-	-	102.2
ANCILLIARY WORKS - CANALS	SUM	-	-	-	-	-	-	-	-	-	11.8	47.2	-	-	-	-	-	59.0	13.5	58.3	-	-	-	-	-	71.8
Sub-Total MAIN CANALS																										
Sub-Total DOWNSTREAM DEVELOPMENT																										
D. ENGINEERING AND ADMINISTRATION																										
SUM		-	-	-	-	-	-	-	-	-	13.7	68.2	16.2	-	-	-	-	98.1	16.1	87.8	22.3	-	-	-	-	126.3
Total INVESTMENT COSTS																										
Total																										
											127.6	636.7	151.6	-	-	-	-	915.9	148.2	803.9	204.2	-	-	-	-	1,156.3
											127.6	636.7	151.6	-	-	-	-	915.9	148.2	803.9	204.2	-	-	-	-	1,156.3

/a EARTHWORKS INCLUDES COST OF CLEARING, STRIPPING TOP SOIL, AND TURFING

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NATIONAL IRRIGATION REHABILITATION PROJECT
Table 5. MINOR TANKS (APPRAISED) - MAHAKIRI IRRAWADI WEMA (41 HA) /a
Detailed Cost Table
(RS '000)

	Unit	Quantity							Unit Cost	Base Costs							Totals Including Contingencies											
		1991	1992	1993	1994	1995	1996	1997		Total	1991	1992	1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total		
I. INVESTMENT COSTS																												
A. SURVEYS AND INVESTIGATIONS																												
SUM		-	-	-	-	-	-	-	10.0	-	-	-	-	-	-	-	10.0	11.7	-	-	-	-	-	-	-	-	-	11.7
B. HEADWORKS																												
EARTHWORKS (RESECTIONING)																												
100000000	3	-	30	45	-	-	-	-	75	7.6	-	228.0	342.0	-	-	-	-	570.0	-	293.3	469.9	-	-	-	-	-	763.2	
CONCRETE WORK - HURD PIPE TOWER SLUICE AND MEASURING DEVICES /b																												
	M3	-	14.8	22.2	-	-	-	-	37	2.4	-	35.5	53.3	-	-	-	-	88.8	-	43.9	69.6	-	-	-	-	113.5		
Sub-Total HEADWORKS																												
C. DOWNSTREAM DEVELOPMENT																												
EARTHWORKS																												
100000000	3	-	5.3	8	-	-	-	-	13.3	9.5	-	50.5	75.8	-	-	-	-	126.4	-	65.0	104.2	-	-	-	-	169.2		
CONCRETE WORKS - DROPS(7 NOS), PIPE OUTLETS(9 NOS) AND END REGULATORS(2 NOS)																												
	M3	-	12.8	19.2	-	-	-	-	32	2.4	-	30.7	46.1	-	-	-	-	76.8	-	37.9	60.2	-	-	-	-	98.1		
Sub-Total DOWNSTREAM DEVELOPMENT																												
D. ENGINEERING AND ADMINISTRATION																												
SUM		-	-	-	-	-	-	-	-	-	-	81.3	121.9	-	-	-	-	203.2	-	102.9	164.4	-	-	-	-	267.3		
Total INVESTMENT COSTS																												
Total																												
Total																												
Total																												

/a EARTHWORKS INCLUDES COST OF CLEARING, STRIPPING TOP SOIL, AND TURFING
/b STRUCTURES INCL. COST OF SITE CLEARING AND SUPPLY AND INSTALLATION OF GATES AND CONTROL ARRANGEMENTS

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NATIONAL IRRIGATION REHABILITATION PROJECT
Table 6. MINOR TANKS (APPRAISED) - MITTEWA TANK SCHEME (22 HA) /a /b
Detailed Cost Table
(RS '000)

	Unit	Quantity							Unit Cost	Base Costs							Totals Including Contingencies										
		1991	1992	1993	1994	1995	1996	1997		Total	1991	1992	1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total	
I. INVESTMENT COSTS																											
A. SURVEYS AND INVESTIGATIONS																											
	SUM	-	-	-	-	-	-	-	10.0	-	-	-	-	-	-	-	10.0	11.7	-	-	-	-	-	-	-	-	11.7
B. HEADWORKS																											
EARTHWORKS - TANK BORD																											
	100 M3	-	22	33	-	-	-	-	55	8	-	176.0	264.0	-	-	-	-	440.0	-	226.4	362.7	-	-	-	-	-	589.1
CONCRETE WORKS - REPAIRS TO 300 MM DIAM. SLUICE																											
	M3	-	11.2	16.8	-	-	-	-	28	2.4	-	26.9	40.3	-	-	-	-	67.2	-	33.2	52.7	-	-	-	-	-	85.9
CONCRETE WORKS - REPAIRS TO 225 MM DIAM. SLUICE																											
	M3	-	0.4	0.6	-	-	-	-	1	2	-	0.8	1.2	-	-	-	-	2.0	-	1.0	1.6	-	-	-	-	-	2.6
EARTHWORKS - SPILLWAY																											
	M3	-	151.2	226.8	-	-	-	-	378	0.05	-	7.6	11.3	-	-	-	-	18.9	-	9.7	15.6	-	-	-	-	-	25.3
CONCRETE WORKS - NATURAL SPILLWAY																											
	M3	-	4.8	7.2	-	-	-	-	12	2	-	9.6	14.4	-	-	-	-	24.0	-	11.9	18.8	-	-	-	-	-	30.7
Sub-Total HEADWORKS																											
											-	220.8	331.3	-	-	-	-	552.1	-	282.2	451.4	-	-	-	-	-	733.6
C. DOWNSTREAM DEVELOPMENT																											
EARTHWORKS																											
	M3	-	224	336	-	-	-	-	560	0.1	-	22.4	33.6	-	-	-	-	56.0	-	38.8	46.2	-	-	-	-	-	75.0
0.3M DROPS (7 NOS), CONTROLLED PIPE OUTLETS (9NOS) AND END REGULATORS (4 NOS)																											
		-	9.6	14.4	-	-	-	-	24	2.4	-	23.0	34.6	-	-	-	-	57.6	-	38.4	45.2	-	-	-	-	-	73.6
Sub-Total DOWNSTREAM DEVELOPMENT																											
											-	45.4	68.2	-	-	-	-	113.6	-	57.3	91.3	-	-	-	-	-	148.6
D. ENGINEERING AND ADMINISTRATION																											
	SUM	-	-	-	-	-	-	-	-	-	1.2	32.0	47.9	-	-	-	-	81.1	1.4	41.1	65.9	-	-	-	-	-	108.4
Total INVESTMENT COSTS																											
											11.2	298.2	447.4	-	-	-	-	756.8	13.2	380.5	608.6	-	-	-	-	-	1,007.3
Total																											
											11.2	298.2	447.4	-	-	-	-	756.8	13.2	380.5	608.6	-	-	-	-	-	1,007.3

/a EARTHWORKS INCLUDES COST OF CLEARING, STRIPPING TOP SOIL, AND TURFING

/b THE SCHEME MARGINALLY EXCEEDS THE COST CRITERIA. REVISED COST SHOULD BE BASED ON 15 METER INTERVAL CROSSSECTIONS OF THE TANK BORD. AS COMMENTED AT APPRAISAL, COST WILL BE REDUCED

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Table 7. MEDIUM/MAJOR TANK AND DIVERSION SCHEMES(4 NOS.-1,115 HA) - PREPARED /a
Detailed Cost Table
(RS '000)

	Unit	Quantity							Unit Cost	Base Costs							Totals Including Contingencies											
		1991	1992	1993	1994	1995	1996	1997		Total	1991	1992	1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total		
I. INVESTMENT COSTS																												
A. SURVEYING AND INVESTIGATIONS	SUM	-	-	-	-	-	-	-	150.0	150.0	-	-	-	-	-	-	300.0	176.2	193.0	-	-	-	-	-	-	-	369.2	
B. HEADWORKS																												
EARTHWORKS(14,500 M3)	SUM	-	-	-	-	-	-	-	-	192.0	192.0	192.0	64.0	-	-	-	640.0	-	247.0	263.8	279.6	98.3	-	-	-	-	888.8	
STRUCTURES(1,240 M3 OF CONCRETE) /b	SUM	-	-	-	-	-	-	-	-	284.7	284.7	284.7	94.9	-	-	-	949.0	-	351.5	372.0	391.7	137.0	-	-	-	-	1,252.2	
SUPPLY AND SPREAD GRAVEL	SUM	-	-	-	-	-	-	-	-	13.2	13.2	13.2	4.4	-	-	-	44.0	-	17.0	16.1	19.2	6.3	-	-	-	-	61.1	
Sub-Total HEADWORKS										489.9	489.9	489.9	163.3	-	-	-	1,633.0	-	615.5	654.0	690.5	242.1	-	-	-	-	2,202.1	
C. DOWNSTREAM DEVELOPMENT																												
EARTHWORKS(107,000 M3)	SUM	-	-	-	-	-	-	-	-	2,205.0	2,205.0	2,205.0	735.0	-	-	-	7,350.0	-	2,836.4	3,029.8	3,211.6	1,129.2	-	-	-	-	10,207.0	
STRUCTURES(7,500 M3 OF CONCRETE)	SUM	-	-	-	-	-	-	-	-	3,900.0	3,900.0	3,900.0	1,300.0	-	-	-	13,000.0	-	4,815.5	5,096.5	5,365.2	1,876.2	-	-	-	-	17,153.4	
Sub-Total DOWNSTREAM DEVELOPMENT										6,105.0	6,105.0	6,105.0	2,035.0	-	-	-	20,350.0	-	7,651.9	8,126.3	8,576.7	3,005.5	-	-	-	-	27,360.4	
D. ENGINEERING AND ADMINISTRATION										18.0	809.4	791.4	791.4	263.8	-	-	2,674.0	21.1	1,041.1	1,087.4	1,152.7	405.3	-	-	-	-	3,707.6	
Total INVESTMENT COSTS										168.0	7,554.3	7,386.3	7,386.3	2,462.1	-	-	24,957.0	197.4	9,501.4	9,867.7	10,419.9	3,652.8	-	-	-	-	33,639.2	
Total										168.0	7,554.3	7,386.3	7,386.3	2,462.1	-	-	24,957.0	197.4	9,501.4	9,867.7	10,419.9	3,652.8	-	-	-	-	33,639.2	

/a EARTHWORKS INCLUDES COST OF CLEARING, STRIPPING TOP SOIL, AND TURFING

/b STRUCTURES INCL. COST OF SITE CLEARING AND SUPPLY AND INSTALLATION OF GATES AND CONTROL ARRANGEMENTS

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Table 8. MINOR TANK AND DIVERSION SCHEMES(7 NOS, 224 IIA) - PREPARED
Detailed Cost Table
(RS '000)

	Unit	Quantity							Unit Cost	Base Costs							Totals Including Contingencies									
		1991	1992	1993	1994	1995	1996	1997		Total	1991	1992	1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total
I. INVESTMENT COSTS																										
A. SURVEYING AND INVESTIGATIONS																										
SUM		-	-	-	-	-	-	-	100.0	100.0	-	-	-	-	-	200.0	117.5	128.6	-	-	-	-	-	-	-	246.1
B. HEADWORKS																										
EARTHWORKS(26,000 M3) /a	SUM	-	-	-	-	-	-	-	-	1,015.0	1,015.0	-	-	-	-	2,030.0	-	1,305.6	1,394.7	-	-	-	-	-	-	2,700.3
STRUCTURES(180 M3 OF CONCRETE) /b	SUM	-	-	-	-	-	-	-	-	210.0	210.0	-	-	-	-	420.0	-	259.3	274.4	-	-	-	-	-	-	533.7
PROTECTION WORKS /c	SUM	-	-	-	-	-	-	-	-	338.5	338.5	-	-	-	-	677.0	-	418.0	442.4	-	-	-	-	-	-	860.3
Sub-Total HEADWORKS									-	1,563.5	1,563.5	-	-	-	-	3,127.0	-	1,982.9	2,111.4	-	-	-	-	-	-	4,094.3
C. DOWNSTREAM DEVELOPMENT																										
EARTHWORKS(11,600 M3)	SUM	-	-	-	-	-	-	-	-	515.0	515.0	-	-	-	-	1,030.0	-	662.5	707.6	-	-	-	-	-	-	1,370.1
STRUCTURES(840 M3 OF CONCRETE)	SUM	-	-	-	-	-	-	-	-	730.0	730.0	-	-	-	-	1,460.0	-	901.4	954.0	-	-	-	-	-	-	1,855.3
Sub-Total DOWNSTREAM DEVELOPMENT									-	1,245.0	1,245.0	-	-	-	-	2,490.0	-	1,563.8	1,661.6	-	-	-	-	-	-	3,225.4
D. ENGINEERING AND ADMINISTRATION		-	-	-	-	-	-	-	-	12.0	349.0	337.0	-	-	-	698.0	14.1	449.0	463.1	-	-	-	-	-	-	926.1
Total INVESTMENT COSTS										112.0	3,257.5	3,145.5	-	-	-	6,515.0	131.6	4,124.3	4,236.1	-	-	-	-	-	-	8,492.0
Total										112.0	3,257.5	3,145.5	-	-	-	6,515.0	131.6	4,124.3	4,236.1	-	-	-	-	-	-	8,492.0

/a EARTHWORKS INCLUDES COST OF CLEARING, STRIPPING TOP SOIL, AND TURFING

/b STRUCTURES INCL. COST OF SITE CLEARING AND SUPPLY AND INSTALLATION OF GATES AND CONTROL ARRANGEMENTS

/c COST INCLUDES UPSTREAM RIP-RAP AND SAND FILTER, AND DOWNSTREAM FILTERS FOR SEEPAGE CONTROL

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Table 9. HEADWORK/MAJOR SCHEMES (UNPREPARED) - TANKS AND DIVERSIONS(10,355 HA) /a /b
Detailed Cost Table
(RS '000)

	Quantity									Base Costs									Totals Including Contingencies							
	Unit	1991	1992	1993	1994	1995	1996	1997	Total	Unit Cost	1991	1992	1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total
I. INVESTMENT COSTS																										
A. SURVEYS AND INVESTIGATIONS	HA	-	2,588.8	2,588.8	2,588.8	2,588.8	-	-	10,355	0.38	-	983.7	983.7	983.7	983.7	-	-	3,934.9	-	1,265.4	1,351.7	1,432.8	1,511.4	-	-	5,561.3
B. HEADWORK/MAJOR TANKS(7,160 HA)																										
1. HEADWORKS																										
EARTHWORKS(126,000 RS)	HA	-	-	1,430	1,430	1,430	1,430	1,430	7,150	1.4	-	-	2,002.0	2,002.0	2,002.0	2,002.0	2,002.0	10,010.0	-	-	2,750.8	2,915.9	3,075.9	3,204.4	3,313.4	15,260.4
STRUCTURES(9,500 RS OF CONCRETE)	HA	-	-	1,430	1,430	1,430	1,430	1,430	7,150	2.8	-	-	4,004.0	4,004.0	4,004.0	4,004.0	4,004.0	20,020.0	-	-	5,232.4	5,508.2	5,778.7	6,008.0	6,212.3	28,739.8
D/S & U/S PROTECTION WORKS(4,500 RS) /c	HA	-	-	180	180	180	180	180	900	9	-	-	1,620.0	1,620.0	1,620.0	1,620.0	1,620.0	8,100.0	-	-	2,117.0	2,228.6	2,338.0	2,430.8	2,513.5	11,628.0
GRANELLING OF ROADS	HA	-	-	360	360	360	360	360	1,800	0.11	-	-	39.6	39.6	39.6	39.6	39.6	198.0	-	-	54.4	57.7	60.8	63.4	65.5	301.9
Sub-Total HEADWORKS																										
2. DOWNSTREAM DEVELOPMENT																										
EARTHWORKS(317,000 RS)	HA	-	-	1,430	1,430	1,430	1,430	1,430	7,150	7	-	-	10,010.0	10,010.0	10,010.0	10,010.0	10,010.0	50,050.0	-	-	13,754.2	14,579.5	15,379.3	16,022.2	16,566.9	76,302.1
STRUCTURES(13,600 RS OF CONCRETE)	HA	-	-	1,430	1,430	1,430	1,430	1,430	7,150	5	-	-	7,150.0	7,150.0	7,150.0	7,150.0	7,150.0	35,750.0	-	-	9,343.7	9,836.1	10,319.1	10,728.7	11,073.4	51,321.0
GRANELLING OF ROADS	HA	-	-	360	360	360	360	360	1,800	0.11	-	-	39.6	39.6	39.6	39.6	39.6	198.0	-	-	54.4	57.7	60.8	63.4	65.5	301.9
Sub-Total DOWNSTREAM DEVELOPMENT																										
Sub-Total HEADWORK/MAJOR TANKS(7,160 HA)																										
C. HEADWORK/MAJOR DIVERSIONS(3,195 HA)																										
1. HEADWORKS																										
EARTHWORKS(65 RS)	HA	-	-	640	640	640	640	640	3,200	0.001	-	-	0.6	0.6	0.6	0.6	0.6	3.2	-	-	0.9	0.9	1.0	1.0	1.1	4.9
STRUCTURES(11,000 RS OF CONCRETE)	HA	-	-	640	640	640	640	640	3,200	4	-	-	2,560.0	2,560.0	2,560.0	2,560.0	2,560.0	12,800.0	-	-	3,345.4	3,521.7	3,694.7	3,841.3	3,971.9	18,375.1
Sub-Total HEADWORKS																										
2. DOWNSTREAM DEVELOPMENT																										
EARTHWORKS(18,100 RS)	HA	-	-	640	640	640	640	640	3,200	0.31	-	-	198.4	198.4	198.4	198.4	198.4	992.0	-	-	272.6	289.0	304.8	317.6	328.4	1,512.3
STRUCTURES(34,000 RS OF CONCRETE)	HA	-	-	640	640	640	640	640	3,200	11	-	-	7,040.0	7,040.0	7,040.0	7,040.0	7,040.0	35,200.0	-	-	9,199.9	9,684.8	10,160.4	10,563.6	10,922.8	50,531.4
GRANELLING OF ROADS	HA	-	-	360	360	360	360	360	1,800	0.11	-	-	39.6	39.6	39.6	39.6	39.6	198.0	-	-	54.4	57.7	60.8	63.4	65.5	301.9
Sub-Total DOWNSTREAM DEVELOPMENT																										
Sub-Total HEADWORK/MAJOR DIVERSIONS(3,195 HA)																										
D. ENGINEERING AND ADMINISTRATION	SUR	-	-	-	-	-	-	-	-																	
Total INVESTMENT COSTS																										
Total																										

/a EARTHWORKS INCLUDES COST OF CLEARING, STRIPPING TOP SOIL, AND TURFING
/b STRUCTURES INCL. COST OF SITE CLEARING AND SUPPLY AND INSTALLATION OF GATES AND CONTROL ARRANGEMENTS
/c COST INCLUDES UPSTREAM RIP-RAP AND SAND FILTER, AND DOWNSTREAM FILTERS FOR SEEPAGE CONTROL

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Table 10. RIVER SCHEMES (UNPREPARED) - TANKS AND DEVERS(24,640 HA) /a /b
Detailed Cost Table
(RS '000)

	Unit	Quantity							Unit Cost	Base Costs							Totals Including Contingencies										
		1991	1992	1993	1994	1995	1996	1997		Total	1991	1992	1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total	
I. INVESTMENT COSTS																											
A. SURVEYING AND INVESTIGATIONS																											
B. RIVER TANK SCHEMES(15,640 HA)																											
1. HEADWORKS																											
EARTHWORKS(2 MILLION M3)																											
NA	-	-	3,452	3,452	3,452	3,452	3,452	17,260	10.5	-	-	36,246.0	36,246.0	36,246.0	36,246.0	36,246.0	181,230.0	-	-	49,803.8	52,792.1	55,687.9	58,016.0	59,928.5	276,288.4		
STRUCTURES(19,600 M3 OF CONCRETE)																											
NA	-	-	3,452	3,452	3,452	3,452	3,452	17,260	2.3	-	-	7,939.6	7,939.6	7,939.6	7,939.6	7,939.6	39,698.0	-	-	10,375.5	10,922.4	11,458.7	11,913.5	12,318.5	56,988.5		
PROTECTION WALLS(1,300 M) /c																											
NA	-	-	200	200	200	200	200	1,000	2.36	-	-	472.0	472.0	472.0	472.0	472.0	2,360.0	-	-	616.8	649.3	681.2	708.2	732.3	3,387.9		
GRANELLING OF ROADS (M)																											
NA	-	-	400	400	400	400	400	2,000	0.11	-	-	44.0	44.0	44.0	44.0	44.0	220.0	-	-	60.5	64.1	67.6	70.4	72.8	335.4		
Sub-Total HEADWORKS																											
2. DOWNSTREAM DEVELOPMENT																											
EARTHWORKS(11 MILLION M3)																											
NA	-	-	3,452	3,452	3,452	3,452	3,452	17,260	4.7	-	-	16,224.4	16,224.4	16,224.4	16,224.4	16,224.4	81,122.0	-	-	22,293.1	23,630.7	24,927.0	25,969.1	26,852.0	123,671.9		
STRUCTURES(25,000 M3 OF CONCRETE)																											
NA	-	-	3,452	3,452	3,452	3,452	3,452	17,260	3.8	-	-	13,117.6	13,117.6	13,117.6	13,117.6	13,117.6	65,588.0	-	-	17,142.2	18,045.6	18,931.8	19,683.1	20,352.3	94,155.0		
Sub-Total DOWNSTREAM DEVELOPMENT																											
Sub-Total RIVER TANK SCHEMES(15,640 HA)																											
C. RIVER DIVERSION SCHEMES(9,933 HA)																											
1. HEADWORKS																											
EARTHWORKS(8,000 M3)																											
NA	-	-	1,480	1,480	1,480	1,480	1,480	7,400	0.09	-	-	133.2	133.2	133.2	133.2	133.2	666.0	-	-	183.0	194.0	204.6	213.2	220.5	1,015.3		
STRUCTURES(21,000 M3 OF CONCRETE)																											
NA	-	-	1,480	1,480	1,480	1,480	1,480	7,400	4.9	-	-	7,252.0	7,252.0	7,252.0	7,252.0	7,252.0	36,260.0	-	-	9,477.0	9,976.4	10,466.3	10,881.7	11,231.7	52,053.1		
Sub-Total HEADWORKS																											
2. DOWNSTREAM DEVELOPMENT																											
EARTHWORKS(100,000 M3)																											
NA	-	-	1,480	1,480	1,480	1,480	1,480	7,400	1.07	-	-	1,583.6	1,583.6	1,583.6	1,583.6	1,583.6	7,918.0	-	-	2,175.9	2,306.5	2,433.0	2,534.7	2,620.9	12,071.1		
STRUCTURES(50,000 M3 OF CONCRETE)																											
NA	-	-	1,480	1,480	1,480	1,480	1,480	7,400	12	-	-	17,760.0	17,760.0	17,760.0	17,760.0	17,760.0	88,800.0	-	-	23,208.9	24,432.1	25,631.9	26,649.1	27,533.1	127,477.0		
Sub-Total DOWNSTREAM DEVELOPMENT																											
Sub-Total RIVER DIVERSION SCHEMES(9,933 HA)																											
D. ENGINEERING AND ADMINISTRATION																											
SUM	-	-	-	-	-	-	-	-	-	-	-	281.1	12,373.8	12,373.8	12,373.8	12,692.7	12,692.7	41,587.9	-	-	361.6	17,002.2	18,022.4	19,011.0	19,355.8	20,813.9	93,766.9
Total INVESTMENT COSTS																											
Total																											
- 2,623.8 115,480.9 115,480.9 115,480.9 115,480.9 112,865.1 112,865.1 574,820.7																											
- 3,375.1 155,537.9 164,447.7 173,100.4 175,994.7 181,978.5 184,454.5																											

/a EARTHWORKS INCLUDES COST OF CLEARING, STRIPPING TOP SOIL, AND TURFING
/b STRUCTURES INCL. COST OF SITE CLEARING AND SUPPLY AND INSTALLATION OF GATES AND CONTROL ARRANGEMENTS
/c COST INCLUDES UPSTREAM RIP-RAP AND SAND FILTER, AND DOWNSTREAM FILTERS FOR SEEPAGE CONTROL

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Table 12. DAM SAFETY, QUALITY CONTROL AND RESEARCH MANAGEMENT UNITS
Detailed Cost Table
(RS '000)

Unit	Quantity							Unit Cost	Base Costs							Totals Including Contingencies									
	1991	1992	1993	1994	1995	1996	1997		Total	1991	1992	1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total
I. INVESTMENT COSTS																									
A. DAM SAFETY UNIT																									
ALLOWANCES FOR STAFF AND ADVISORS	SUN	-	-	-	-	-	-	-	-	-	75.0	75.0	100.0	100.0	100.0	50.0	500.0	-	91.9	98.1	138.7	146.3	152.4	78.0	706.3
PRINTING, STATIONARY AND OPERATIONAL COSTS OF VEHICLES	SUN	-	-	-	-	-	-	-	-	-	150.0	150.0	200.0	200.0	200.0	100.0	1,000.0	-	183.8	196.3	277.4	292.4	304.9	157.6	1,412.4
EQUIPMENT (CONCRETE AND SOOLS) & VEHICLES (FOR AND B I NO PICK UP)	SUN	-	-	-	-	-	-	-	-	-	3,200.0	-	-	-	-	-	3,200.0	-	5,561.2	-	-	-	-	-	5,561.2
Sub-Total DAM SAFETY UNIT											3,425.0	225.0	300.0	300.0	300.0	150.0	6,700.0		5,836.8	294.4	416.1	437.0	457.3	236.0	7,680.1
B. QUALITY CONTROL UNIT																									
NEW BUILDINGS (4 NOS)	NO	-	2	2	-	-	-	4	1,500	-	3,000.0	3,000.0	-	-	-	-	4,000.0	-	3,473.3	3,725.9	-	-	-	-	7,601.1
ALLOWANCES FOR FIELD STAFF AND OPERATING COSTS OF VEHICLES	SUN	-	-	-	-	-	-	-	-	-	50.0	100.0	100.0	100.0	100.0	50.0	500.0	-	81.2	138.7	138.7	146.3	152.4	78.0	706.4
EQUIPMENT FOR CENTRAL AND PROVINCIAL LABORATORIES	SUN	-	-	-	-	-	-	-	-	-	2,100.0	-	-	-	-	-	2,100.0	-	2,245.9	-	-	-	-	-	2,245.9
VEHICLES (12 NOS DOUBLE CAB, TWO AND 8 36 NOS MOTOR CYCLES)	SUN	-	-	-	-	-	-	-	-	-	9,500.0	-	-	-	-	-	9,500.0	-	10,159.8	-	-	-	-	-	10,159.8
Sub-Total QUALITY CONTROL UNIT											14,650.0	3,100.0	100.0	100.0	100.0	50.0	18,100.0		16,142.2	4,056.7	138.7	146.3	152.4	78.0	20,715.2
C. RESEARCH MANAGEMENT UNIT																									
1. ADVISORY SERVICES PROVIDED BY THE IRRIGATION MANAGEMENT UNIT (IMI)																									
INTERNATIONALLY RECRUITED TECHNICAL ADVISOR (39 M/M)	N / B	-	12	12	9	6	-	39	417	-	5,004.0	5,004.0	3,753.0	2,502.0	-	-	16,263.0	-	5,351.6	5,333.5	4,291.2	2,958.1	-	-	18,134.4
INTERNATIONALLY RECRUITED SHORT TERM RESEARCH STAFF (2 NOS)	M / B	-	6	12	6	6	-	30	417	-	2,502.0	5,004.0	2,502.0	2,502.0	-	-	12,510.0	-	2,675.8	5,333.5	2,840.8	2,958.1	-	-	14,028.2
LOCALLY RECRUITED RESEARCH ASSOCIATE (1 NO) / OFFICERS (2 NOS)	N / B	-	36	36	36	36	-	144	17	-	612.0	612.0	612.0	612.0	-	-	2,448.0	-	749.8	800.9	848.9	895.5	-	-	3,295.1
RESEARCH SUPERVISORS FROM UNIVERSITIES (2 NOS)	N / B	-	24	24	24	24	-	96	17	-	408.0	408.0	408.0	408.0	-	-	1,632.0	-	499.8	533.9	566.0	597.0	-	-	2,197.7
WORKSHOPS (10 NOS) AND FELLOWSHIPS (10 NOS)	SUN	-	-	-	-	-	-	-	-	-	168.0	206.4	206.4	206.4	-	-	1,680.0	-	185.8	380.3	603.7	627.2	-	-	1,997.2
SUPPLIES, TRAVEL, SERVICES AND PUBLICATIONS	SUN	-	-	-	-	-	-	-	-	-	3,360.0	4,160.0	4,360.0	4,080.0	-	-	16,770.0	-	4,011.7	5,275.1	5,835.4	6,010.1	-	-	21,932.3
DIRECT COSTS (10% OVERHEADS)	SUN	-	-	-	-	-	-	-	-	-	3,113.0	4,210.0	3,292.0	2,947.0	-	-	13,472.0	-	3,692.6	5,293.8	4,246.5	4,105.2	-	-	17,340.1
Sub-Total ADVISORY SERVICES PROVIDED BY THE IRRIGATION MANAGEMENT UNIT (IMI)											15,167.8	19,904.4	15,343.4	14,317.4			64,733.0		17,167.8	23,533.3	19,252.5	18,951.1			78,923.9
2. IRRIGATION DEPARTMENTS SERVICES																									
LOCALLY RECRUITED CONSULTANT TEAM LEADER	N / B	-	12	12	12	12	-	48	80	-	960.0	960.0	960.0	960.0	-	-	3,840.0	-	1,176.1	1,256.3	1,331.7	1,404.7	-	-	5,168.7
IRRIGATION DEPARTMENT PROFESSIONAL STAFF	SUN	-	-	-	-	-	-	-	-	-	400.0	400.0	400.0	400.0	-	-	1,600.0	-	380.9	428.1	665.8	702.3	-	-	2,384.4
SUPPORT STAFF, TRAVELLING, SUPPLIES AND SERVICES	SUN	-	-	-	-	-	-	-	-	-	1,060.0	1,060.0	1,060.0	860.0	-	-	4,040.0	-	1,298.6	1,307.1	1,470.4	1,258.4	-	-	5,414.5
DIRECT RESEARCH	SUN	-	-	-	-	-	-	-	-	-	800.0	1,400.0	1,000.0	1,400.0	-	-	3,000.0	-	980.1	1,832.1	1,942.0	2,048.5	-	-	6,802.6
CONTRACT RESEARCH	SUN	-	-	-	-	-	-	-	-	-	2,040.0	4,000.0	4,000.0	4,000.0	-	-	14,040.0	-	2,499.2	5,734.3	5,548.5	5,052.9	-	-	19,135.1
WORKSHOPS	SUN	-	-	-	-	-	-	-	-	-	-	40.0	80.0	80.0	-	-	200.0	-	-	52.3	111.0	117.1	-	-	280.4
MEMORANDA	SUN	-	-	-	-	-	-	-	-	-	240.0	320.0	320.0	320.0	-	-	1,200.0	-	294.0	418.8	443.9	448.2	-	-	1,624.9
EVALUATIONS	SUN	-	-	-	-	-	-	-	-	-	-	160.0	-	240.0	-	-	400.0	-	-	289.4	-	331.2	-	-	560.4
Sub-Total IRRIGATION DEPARTMENTS SERVICES											5,588.0	8,420.0	8,300.0	8,340.0			30,640.0		6,836.8	11,018.4	11,313.2	12,203.3			41,571.1
3. PROCUREMENT OF VEHICLES AND EQUIPMENT																									
VEHICLES	SUN	-	-	-	-	-	-	-	-	-	4,400.0	-	-	-	-	-	4,400.0	-	4,705.8	-	-	-	-	-	4,705.8
LITRARY	SUN	-	-	-	-	-	-	-	-	-	600.0	800.0	800.0	800.0	-	-	3,000.0	-	641.7	884.7	914.7	945.8	-	-	3,386.9
OFFICE EQUIPMENT	SUN	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	164.9	-	-	-	-	-	164.9
VEHICLES AND EQUIPMENT FOR IMI	NO	-	-	-	-	-	-	-	-	-	2,800.0	-	-	-	-	-	2,800.0	-	2,994.5	-	-	-	-	-	2,994.5
Sub-Total PROCUREMENT OF VEHICLES AND EQUIPMENT											7,900.0	800.0	800.0	800.0			10,300.0		8,448.7	884.7	914.7	945.8			11,193.1
Sub-Total RESEARCH MANAGEMENT UNIT											28,647.8	29,124.4	24,443.4	23,457.4			105,673.0		32,451.7	35,456.5	31,680.5	32,100.2			131,688.9
Total INVESTMENT COSTS											48,722.8	32,449.4	24,843.4	23,857.4	400.0	200.0	130,473.0		54,430.7	39,807.7	32,235.4	32,685.5	609.8	315.2	160,084.2
Total											48,722.8	32,449.4	24,843.4	23,857.4	400.0	200.0	130,473.0		54,430.7	39,807.7	32,235.4	32,685.5	609.8	315.2	160,084.2

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Table 14. TRAINING - SPECIALIST STAFF, BUILDINGS, EQUIPMENT, FURNITURE AND VEHICLES
Detailed Cost Table
(US '000)

	Quantity								Unit Cost	Base Costs								Totals Inclusive Contingencies										
	1991	1992	1993	1994	1995	1996	1997	Total		1991	1992	1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total			
I. INVESTMENT COSTS																												
A. TECHNICAL ASSISTANCE																												
INTERNATIONALLY RECRUITED TRAINING PROGRAM MANAGEMENT SPECIALIST (24 M/M)	M / M	-	12	3	3	3	3	-	24	300	-	6,000.0	1,500.0	1,500.0	1,500.0	1,500.0	-	12% x 1.0	-	6,414.7	1,470.7	1,713.1	1,773.4	1,833.7	-	13,197.7		
LOCALLY RECRUITED FARMER TRAINING PROGRAM SPECIALISTS (40 M/M)	M / M	-	12	12	12	12	-	-	40	50	-	600.0	600.0	600.0	600.0	-	-	2,400.0	-	735.1	705.2	832.3	877.9	-	-	3,230.4		
Sub-Total TECHNICAL ASSISTANCE																												
B. CIVIL WORKS - IMPROVEMENTS/ADDITIONS TO BUILDINGS /a																												
TRAINING INSTITUTE - GALLEMUDA (10)	000	-	-	-	-	-	-	-	-	970.0	3,520.0	970.0	-	-	-	-	5,200.0	1,094.0	4,228.0	1,264.6	-	-	-	-	-	-	6,587.4	
TRAINING INSTITUTE - ANURADHAPURA (05)	000	-	-	-	-	-	-	-	-	1,000.0	-	-	-	-	-	-	1,000.0	-	1,201.5	-	-	-	-	-	-	-	1,701.1	
TRAINING INSTITUTE - GALLE (06)	000	-	-	-	-	-	-	-	-	130.0	670.0	200.0	-	-	-	-	1,000.0	143.0	804.0	255.5	-	-	-	-	-	-	1,204.0	
Sub-Total CIVIL WORKS - IMPROVEMENTS/ADDITIONS TO BUILDINGS /a										1,120.0	5,190.0	1,170.0	-	-	-	-	7,200.0	1,238.5	6,233.9	1,520.1	-	-	-	-	-	-	8,992.4	
C. EQUIPMENT, FURNITURE AND VEHICLES																												
1. EQUIPMENT - GALLEMUDA(10) (1), ANURADHAPURA(05) (1), GALLEMUDA(06) (1) /b	000	-	-	-	-	-	-	-	-	970.0	6,400.0	3,421.0	-	-	-	-	11,000.0	1,833.3	7,122.4	3,005.1	-	-	-	-	-	-	11,900.9	
2. FURNITURE - GALLEMUDA(10) (1), ANURADHAPURA(05) (1), GALLEMUDA(06) (1)	000	-	-	-	-	-	-	-	-	500.0	1,210.0	400.0	-	-	-	-	2,700.0	566.1	1,822.6	433.0	-	-	-	-	-	-	2,481.9	
3. VEHICLES																												
GENIUS - 25 SEATER FOR GALLE, ANURADHAPURA & BAMBAYNELLS	00	-	3	-	-	-	-	-	3	2,900	-	6,000.0	-	-	-	-	6,000.0	-	4,414.7	-	-	-	-	-	-	-	4,414.7	
GENIE AND PICK UP FOR GALLEMUDA	00	-	4	-	-	-	-	-	4	800	-	3,200.0	-	-	-	-	3,200.0	-	3,022.3	-	-	-	-	-	-	-	3,022.3	
GENIUS - 15 SEATER FOR GALLEMUDA	00	-	2	-	-	-	-	-	2	1,500	-	3,000.0	-	-	-	-	3,000.0	-	3,200.4	-	-	-	-	-	-	-	3,200.4	
OPERATING COSTS OF VEHICLES AND EQUIPMENT	00	-	-	-	-	-	-	-	-	-	100.0	100.0	100.0	100.0	100.0	-	500.0	-	184.9	110.6	114.3	118.2	122.2	-	-	-	572.3	
Sub-Total VEHICLES																												
Sub-Total EQUIPMENT, FURNITURE AND VEHICLES										1,500.0	20,170.0	4,423.0	100.0	100.0	100.0	-	20,000.0	1,999.4	21,739.2	4,549.1	114.3	118.2	122.2	-	-	-	26,282.5	
Total INVESTMENT COSTS																												
Total																												

/a AT GALLEMUDA: BRICKS FOR A SELF STUDBY, COMPUTER, 4 LIBRARY, HOSTEL, STAFF QUARTERS AND KITCHEN, A RECREATIONAL FACILITIES. AT ANURADHAPURA AND GALLE, NEW BUILDINGS
 /b INCLUDES TRAINING AIDS SUCH AS AUDIO VISUAL EQUIPMENT ETC, LABORATORY AND FIELD DEMONSTRATION EQUIPMENT

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Table 15. IMPLEMENTATION SUPPORT FOR REHABILITATION AND IMPROVEMENT WORKS- CONSULTANCY SERVICES, VEHICLES AND EQUIPMENT
Detailed Cost Table
(US '\$000)

UNIT	Quantity										Unit Cost	Base Costs							Totals Including Contingencies								
	1991	1992	1993	1994	1995	1996	1997	Total	1991	1992		1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total		
	1991	1992	1993	1994	1995	1996	1997	Total	1991	1992		1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total		
I. INVESTMENT COSTS																											
A. CONSULTANCY SERVICES																											
1. INTERNATIONALLY RECRUITED SPECIALISTS																											
TEAM LEADER/BOSS SPECIALIST	H / B	-	12	12	12	4	-	-	42	500	-	6,000.0	6,000.0	6,000.0	3,000.0	-	-	21,000.0	-	6,416.7	6,434.9	6,860.5	3,546.9	-	-	23,459.0	
SHORT TERM SPECIALISTS	H / B	-	2	2	2	2	-	-	8	500	-	1,000.0	1,000.0	1,000.0	1,000.0	-	-	4,000.0	-	1,049.5	1,105.8	1,143.4	1,182.3	-	-	4,501.0	
Sub-Total INTERNATIONALLY RECRUITED SPECIALISTS																											

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Table 16. IMPACT ASSESSMENT STUDIES
Detailed Cost Table
(RS '000)

	Quantity								Base Costs								Totals Including Contingencies																
	Unit	1991	1992	1993	1994	1995	1996	1997	Total	Unit Cost	1991	1992	1993	1994	1995	1996	1997	Total	1991	1992	1993	1994	1995	1996	1997	Total							
I. INVESTMENT COSTS																																	
a. CONSULTANCY SERVICES																																	
1. LOCALLY RECRUITED SPECIALISTS, MIDLEVEL STAFF AND INCIDENTALS																																	
SENIOR AGRO-ECONOMIST/TEAM LEADER	M / N	-	12	6	6	6	-	12	42	60	-	720.0	360.0	360.0	360.0	-	720.0	2,520.0	-	832.1	471.1	495.4	524.8	-	1,134.9	3,514.2							
AGRICULTURALIST(20 M/N)	M / D	-	10	-	5	-	-	5	20	50	-	500.0	-	250.0	-	-	250.0	1,000.0	-	612.5	-	346.0	-	-	-	358.1	1,353.0						
INSTITUTION SPECIALIST	M / N	-	10	-	5	-	-	5	20	50	-	500.0	-	250.0	-	-	250.0	1,000.0	-	612.5	-	346.0	-	-	-	374.1	1,353.0						
ENVIRONMENTALIST	M / N	-	4	-	3	-	-	3	12	50	-	300.0	-	150.0	-	-	150.0	600.0	-	367.5	-	208.1	-	-	-	236.4	812.0						
AGRO-ECONOMIST(2 NOS - 04 M/N)	M / N	-	24	12	12	12	-	24	84	50	-	1,200.0	600.0	600.0	600.0	-	1,200.0	4,200.0	-	1,470.1	785.2	832.3	877.9	-	1,891.5	5,857.0							
IRRIGATION ENGINEER	M / N	-	4	-	3	-	-	3	12	50	-	300.0	-	150.0	-	-	150.0	600.0	-	367.5	-	208.1	-	-	-	236.4	812.0						
RESEARCH ASSISTANTS(4 NOS)	M / N	-	48	24	24	24	-	48	168	30	-	1,440.0	720.0	720.0	720.0	-	1,440.0	5,940.0	-	1,764.1	942.2	998.7	1,053.5	-	2,219.8	7,628.4							
FIELD ENGINEERS, DRAUGHTSMEN AND OTHER SUPPORT STAFF	SUM	-	-	-	-	-	-	-	-	-	-	472.0	336.0	336.0	336.0	-	720.0	2,880.0	-	823.3	439.7	464.1	491.6	-	1,134.9	3,355.6							
OSR OF VEHICLES,PER DIEM AND INCIDENTALS	SUM	-	-	-	-	-	-	-	-	-	-	336.0	168.0	168.0	168.0	-	360.0	1,200.0	-	411.6	219.8	233.0	245.8	-	367.4	1,477.8							
Sub-Total LOCALLY RECRUITED SPECIALISTS, MIDLEVEL STAFF AND INCIDENTALS																																	
Sub-Total CONSULTANCY SERVICES																																	
b. PROCUREMENT OF VEHICLES AND EQUIPMENT																																	
4WD VEHICLES	NO	-	2	-	-	-	-	-	2	1,400	-	2,800.0	-	-	-	-	-	2,800.0	-	2,974.5	-	-	-	-	-	-	2,974.5						
DOUBLE CAB PICKUP	NO	-	2	-	-	-	-	-	2	1,220	-	2,440.0	-	-	-	-	-	2,440.0	-	2,609.5	-	-	-	-	-	-	2,609.5						
MOTOR CYCLES	NO	-	5	-	-	-	-	-	5	40	-	200.0	-	-	-	-	200.0	-	213.9	-	-	-	-	-	-	213.9							
COMPUTERS WITH SOFTWARE & PRINTERS	NO	-	2	-	-	-	-	-	2	200	-	400.0	-	-	-	-	400.0	-	427.8	-	-	-	-	-	-	427.8							
OFFICE EQUIPMENT	SUM	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	106.9	-	-	-	-	-	-	106.9							
Sub-Total PROCUREMENT OF VEHICLES AND EQUIPMENT																																	
Total INVESTMENT COSTS																																	
Total																																	

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SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT
Financial Plan by Subcategory Accounts
(US\$ '000)

	INTERNATIONAL DEVELOPMENT ASSOCIATION		EUROPEAN ECONOMIC COMMUNITY		GOVERNMENT OF SRI LANKA		Total		For. Exch.	Local (Excl. Taxes)	Duties & Taxes
	Amount	%	Amount	%	Amount	%	Amount	%			
INVESTMENT COSTS											
A. REHABILITATION AND IMPROVEMENTS											
1. SURVEYS AND INVESTIGATIONS	502.9	100.0	-	-	-	-	502.9	1.0	-	502.9	-
2. CIVIL WORKS											
MINOR SCHEMES	16,086.5	85.3	-	-	2,728.1	14.5	18,814.6	37.7	2,183.1	16,210.7	420.9
MEDIUM/MAJOR SCHEMES	6,633.5	85.3	-	-	1,125.0	14.5	7,758.5	15.6	1,366.1	6,136.1	256.3
VIRP CARRY OVER WORKS (CIVIL WORKS ONLY)	782.0	95.0	-	-	41.2	5.0	823.2	1.7	115.5	687.1	20.6
Sub-Total CIVIL WORKS	23,502.0	85.8	-	-	3,894.3	14.2	27,396.3	54.9	3,664.6	23,033.9	697.8
3. ENGINEERING AND ADMINISTRATION	1,674.4	50.0	-	-	1,674.4	90.0	3,348.8	6.7	-	3,348.8	-
Sub-Total REHABILITATION AND IMPROVEMENTS	25,679.3	82.2	-	-	5,568.6	17.8	31,248.0	62.7	3,664.6	26,085.5	697.8
B. IMPROVED OPERATION AND MAINTENANCE											
SALARIES, ALLOWANCES AND OPERATING COSTS	2,242.9	100.0	-	-	-	-	2,242.9	4.3	-	2,242.9	-
BUILDINGS (RENTAL OR NEW)	324.1	95.0	-	-	17.1	5.0	341.1	0.7	14.3	318.3	8.5
AGRICULTURAL DEMONSTRATIONS	97.6	100.0	-	-	-	-	97.6	0.2	-	97.6	-
Sub-Total IMPROVED OPERATION AND MAINTENANCE	2,664.6	99.4	-	-	17.1	0.6	2,681.6	5.4	14.3	2,658.9	8.5
C. TRAINING											
TRAINING ACTIVITIES	-	-	947.4	53.2	768.4	44.8	1,715.8	3.4	952.8	734.2	88.8
BUILDINGS (NEW AND ADDITIONS)	-	-	-	-	223.1	100.0	223.1	0.4	29.9	187.7	5.6
TECHNICAL ASSISTANCE FOR TRAINING	-	-	332.5	80.6	80.2	19.4	412.6	0.8	332.5	80.2	-
Sub-Total TRAINING	-	-	1,279.8	54.4	1,071.7	45.6	2,351.6	4.7	1,315.1	1,022.1	14.4
D. ENVIRONMENTAL PROTECTION											
REFORESTATION	-	-	-	-	752.2	100.0	752.2	1.5	-	752.2	-
SURVEYS AND STUDIES	-	-	-	-	250.7	100.0	250.7	0.5	-	250.7	-
Sub-Total ENVIRONMENTAL PROTECTION	-	-	-	-	1,003.0	100.0	1,003.0	2.0	-	1,003.0	-
E. OTHER COMPONENTS											
1. RESEARCH MANAGEMENT UNIT	-	-	1,054.1	35.3	1,935.8	64.7	2,990.0	6.0	1,023.8	1,966.1	-
2. DAM SAFETY UNIT	-	-	-	-	52.6	100.0	52.6	0.1	-	52.6	-
3. QUALITY CONTROL UNIT	-	-	-	-	-	-	-	-	-	-	-
ALLOWANCES FOR STAFF AND OPERATIONAL COSTS OF VEHICLES AND EQUIPMENT	-	-	-	-	17.6	100.0	17.6	0.0	-	17.6	-
NEW BUILDINGS	-	-	-	-	188.6	100.0	188.6	0.4	-	188.6	18.9
Sub-Total QUALITY CONTROL UNIT	-	-	-	-	206.2	100.0	206.2	0.4	-	187.3	18.9
4. HYDROLOGICAL AND WATER MANAGEMENT STUDIES	-	-	-	-	128.7	100.0	128.7	0.3	-	128.7	-
5. SOCIO-ECONOMIC STUDY	-	-	-	-	344.6	100.0	344.6	0.7	-	344.6	-
6. VIRP CARRY OVER STUDIES	124.9	100.0	-	-	-	-	124.9	0.3	-	124.9	-
Sub-Total OTHER COMPONENTS	124.9	3.2	1,054.1	27.4	2,667.9	69.4	3,847.0	7.7	1,023.8	2,804.3	18.9
F. TECHNICAL ASSISTANCE											
CONSULTANCY SERVICES FOR PLANNING AND IMPLEMENTATION	-	-	693.8	15.6	3,741.9	84.4	4,435.7	8.9	693.8	3,741.9	-
IMPACT ASSESSMENT	-	-	-	-	639.3	100.0	639.3	1.3	-	639.3	-
Sub-Total TECHNICAL ASSISTANCE	-	-	693.8	13.7	4,381.2	86.3	5,075.0	10.2	693.8	4,381.2	-
G. PROCUREMENT OF VEHICLES AND EQUIPMENT											
	1,069.9	29.3	1,010.3	27.6	1,577.3	43.1	3,657.4	7.3	1,857.0	253.1	1,547.3
Total INVESTMENT COSTS	29,538.7	59.2	4,038.0	8.1	16,286.9	32.7	49,863.6	100.0	8,568.6	39,008.1	2,286.8
Total Disbursement	29,538.7	59.2	4,038.0	8.1	16,286.9	32.7	49,863.6	100.0	8,568.6	39,008.1	2,286.8

SRI LANKA

NATIONAL IRRIGATION REHABILITATION PROJECT

Proposed Credit Allocation

<u>Category</u>	<u>Allocated (US\$ million)</u>	<u>Percentage of Expenditures to be financed</u>
Civil Works	21.5	95%
Surveys and Investigations	0.4	100%
Engineering and Administration	1.5	50%
Farmer Organizations	2.5	100%
Vehicles and Equipment	1.0	100% for imported and locally manu- factured goods and 70% for locally procured goods
Consultants' Services	0.1	100%
Unallocated	<u>2.6</u> 29.6	

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NATIONAL IRRIGATION REHABILITATION PROJECT

Estimated Schedule of Disbursements

<u>IDA Fiscal Year</u>	<u>Semester</u>	<u>Disbursements</u> -----US\$ million-----	<u>Accumulated</u> <u>Disbursements</u>
1992	I	1.5	1.5
	II	0.5	2.0
1993	I	0.9	2.9
	II	1.0	3.9
1994	I	2.7	6.6
	II	2.8	9.4
1995	I	2.8	12.2
	II	2.8	15.0
1996	I	2.8	17.8
	II	2.8	20.6
1997	I	2.5	23.1
	II	2.5	25.6
1998	I	2.0	27.6
	II	2.0	29.6

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SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT
Procurement of Vehicles and Equipment

<u>Financier</u>	-----IDA-----					-----EEC-----			
<u>Project Components</u>	<u>Rehab & Improvement</u>	<u>Improved O&M</u>	<u>DSU</u>	<u>QCU</u>	<u>TA for Planning & Impl.</u>	<u>TA for Impact Assesment</u>	<u>RMU</u>	<u>Training</u>	<u>Total</u>
<u>Vehicles</u>									
Car (1400 cc)	8	-	-	-	2	-	-	-	10
Four-wheel drive	19	4	4	2	6	4	4	-	43
Double-cab pick-up	-	-	1	12	-	2	-	3	17
Minibus (26 seater)	-	-	-	-	-	-	-	3	3
Microbus (15 seater)	-	-	-	-	-	-	-	2	2
Motor cycle	35	-	-	36	5	5	6	-	87
Bicycle	-	300	-	-	-	-	-	-	300
<u>Equipment</u>									
Computer with software	20	-	-	-	10	2	4	-	36
Photocopier	-	-	-	-	-	-	1	-	1
Survey	1ot	-	-	-	-	1ot	-	-	2 lots
Office	1ot	1ot	-	-	-	1ot	-	1ot	4 lots
Concrete and soil testing	-	-	-	1ot	-	-	-	-	1 lot
Dam surveillance	-	-	1ot	-	-	-	-	-	1 lot
Training	-	-	-	-	-	-	-	1ot	1 lot

Note: All vehicles and equipment would be procured in 1992.

Abbreviations:
DSU Dam Safety Unit
QCU Quality Control Unit
RMU Research Management Unit

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SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT

CROP AREA, YIELD AND PRODUCTION

SCHEME: KALTOTA

Crop	1/			2/			Production (m.t)		
	Area (ha)			Yield (m.t/ha)			Production (m.t)		
	P	W/O	N	P	W/O	N	P	W/O	N
Maha Season:									
Paddy	819	655	819	3.9	2.7	4.2	3194	1769	3440
OFC1_3/	-	-	-	-	-	-	-	-	-
OFC2	-	-	-	-	-	-	-	-	-
All	819	655	819				3194	1769	3440
Yala Season:									
Paddy	819	655	799	3.8	2.6	4.1	3112	1703	3276
OFC1	-	-	-	-	-	-	-	-	-
OFC2	-	-	20	-	-	1.2	-	-	24
All	819	655	819				3112	1703	3300
Total:									
Paddy	1,638	1,310	1,618				6306	3472	6716
OFC1	-	-	-				-	-	-
OFC2	-	-	20				-	-	24
All	1,638	1,310	1,638				6306	3472	6740

1/ Present cropping intensity is 200%. Without project, cropping intensity would remain unchanged during first five years and decline thereafter to 160% over a period of ten years. With project, cropping intensity would remain as at present.

2/ Without project, paddy yields would remain unchanged for three years and decline thereafter as indicated, over ten years.

3/ OFC1 indicates other field crops (OFCs) of low value, such as cow pea and green gram. OFC2 indicates other high value field crops such as chillies and onions.

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SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT

CROP AREA, YIELD AND PRODUCTION

SCHEME: MAHAGAL WENA

Crop	Area (ha) ^{1/}			Yield (m.t/ha) ^{2/}			Production (m.t)		
	P	W/O	W	P	W/O	W	P	W/O	W
Maha Season:									
Paddy	195	150	195	3.9	2.1	4.1	760.5	315.0	799.5
OFC1_3/	-	-	-	-	-	-	-	-	-
OFC2	-	-	-	-	-	-	-	-	-
All	195	150	195				760.5	315.0	799.5
Yala Season:									
Paddy	10	-	20	3.7	-	3.9	37.0	-	78.0
OFC1	-	-	5	-	-	1.2	-	-	6.0
OFC2	-	-	3	-	-	0.9	-	-	2.7
All	10	-	28				37.0	-	86.7
Total:									
Paddy	205	150	215				797.5	315.0	877.5
OFC1	-	-	5				-	-	6.0
OFC2	-	-	3				-	-	2.7
All	205	150	223				797.5	315.0	886.2

^{1/} Present cropping intensity is 105%. Without project, cropping intensity would remain unchanged during first five years and decline thereafter to 77% over a period of ten years. With project, cropping intensity would increase to 114%.

^{2/} Without project, paddy yields would remain unchanged for three years and decline thereafter as indicated, over ten years.

^{3/} OFC1 indicates other field crops (OFCs) of low value, such as cow pea and green gram. OFC2 indicates other high value field crops such as chillies and onions.

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NATIONAL IRRIGATION REHABILITATION PROJECT

CROP AREA, YIELD AND PRODUCTION

SCHEME: DORAKADA LIYADDE

Crop	1/			2/			Production (m.t)		
	Area (ha)			Yield (m.t/ha)			Production (m.t)		
	P	W/O	N	P	W/O	N	P	W/O	N
Maha Season:									
Paddy	17	12	17	2.3	2.0	2.5	39.1	24.0	42.5
OFC1_3/	-	-	-	-	-	-	-	-	-
OFC2	-	-	-	-	-	-	-	-	-
All	17	12	15				39.1	24.0	42.5
Yala Season:									
Paddy	17	12	15	2.1	1.8	2.2	35.7	21.6	33.0
OFC1	-	-	-	-	-	-	-	-	-
OFC2	-	-	2	-	-	0.8	-	-	1.6
All	17	12	17				35.7	21.6	34.6
Total:									
Paddy	34	24	32				74.8	45.6	75.5
OFC1	-	-	-				-	-	-
OFC2	-	-	2				-	-	1.6
All	34	24	34				74.8	45.6	77.1

1/ Present cropping intensity is 200%. Without project, cropping intensity would remain unchanged during first five years and decline thereafter to 141% over a period of ten years. With project, cropping intensity would remain as at present.

2/ Without project, paddy yields would remain unchanged for three years and decline thereafter as indicated, over ten years.

3/ OFC1 indicates other field crops (OFCs) of low value, such as cow pea and green gram. OFC2 indicates other high value field crops such as chillies and onions.

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SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT

CROP AREA, YIELD AND PRODUCTION

SCHEME: KOBRIGANE

Crop	1/			2/			Production (m.t)		
	Area (ha)			Yield (m.t/ha)					
	P	W/O	W	P	W/O	W	P	W/O	W
Maha Season:									
Paddy	32	25	32	4.0	3.1	4.4	128.0	77.5	140.8
OFC1_3/	-	-	-	-	-	-	-	-	-
OFC2	-	-	-	-	-	-	-	-	-
All	32	25	32				128.0	77.5	140.8
Yala Season:									
Paddy	-	-	-	-	-	-	-	-	-
OFC1	-	-	4	-	-	1.1	-	-	4.4
OFC2	-	-	2	-	-	1.0	-	-	2.0
All	-	-	6			2.1	-	-	6.4
Total:									
Paddy	32	25	32				128.0	77.5	140.8
OFC1	-	-	4				-	-	4.4
OFC2	-	-	2				-	-	2.0
All	32	25	38				128.0	77.5	147.2

1/ Present cropping intensity is 100%. Without project, cropping intensity would remain unchanged during first five years and decline thereafter to 78% over a period of ten years. With project, cropping intensity would increase to 118%.

2/ Without project, paddy yields would remain unchanged for three years and decline thereafter as indicated, over ten years.

3/ OFC1 indicates other field crops (OFCs) of low value, such as cow pea and green gram. OFC2 indicates other high value field crops such as chillies and onions.

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SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT

CROP AREA, YIELD AND PRODUCTION

SCHEME: MAHA KIRI IBBEWA

Crop	Area (ha) ^{1/}			Yield (m.t/ha) ^{2/}			Production (m.t)		
	P	W/O	W	P	W/O	W	P	W/O	W
Maha Season:									
Paddy	39	25	40	4.0	3.1	4.5	156.0	112.5	180.0
OPC1_3/	-	-	-	-	-	-	-	-	-
OPC2	-	-	-	-	-	-	-	-	-
All	39	25	40				156.0	112.5	180.0
Yala Season:									
Paddy	-	-	-	-	-	-	-	-	-
OPC1	-	-	4	-	-	1.2	-	-	4.8
OPC2	-	-	3	-	-	1.1	-	-	3.3
All	-	-	7				-	-	8.1
Total:									
Paddy	39	25	40				156.0	112.5	180.0
OPC1	-	-	4				-	-	4.8
OPC2	-	-	3				-	-	3.3
All	39	25	47				156.0	112.5	188.1

1/ Present cropping intensity is 98%. Without project, cropping intensity would remain unchanged during first five years and decline thereafter to 63% over a period of ten years. With project, cropping intensity would increase to 118%.

2/ Without project, paddy yields would remain unchanged for three years and decline thereafter as indicated, over ten years.

3/ OPC1 indicates other field crops (OFCs) of low value, such as cow pea and green gram. OPC2 indicates other high value field crops such as chillies and onions.

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NATIONAL IRRIGATION REHABILITATION PROJECT

CROP AREA, YIELD AND PRODUCTION

SCHEME: NITTENA

Crop	1/			2/			Production (m.t)		
	Area (ha)			Yield (m.t/ha)					
	P	W/O	N	P	W/O	N	P	W/O	N
Maha Season:									
Paddy	22	17	22	3.6	2.7	4.0	79.2	45.9	88.0
OFC1_3/	-	-	-	-	-	-	-	-	-
OFC2	-	-	-	-	-	-	-	-	-
All	22	17	22				79.2	45.9	88.0
Yala Season:									
Paddy	2	-	3	3.1	2.8	3.4	6.2	-	10.2
OFC1	-	-	2	-	-	1.2	-	-	2.4
OFC2	-	-	1	-	-	0.9	-	-	0.9
All	2	-	6				6.2	-	13.5
Total:									
Paddy	24	17	25				85.4	45.9	98.2
OFC1	-	-	2				-	-	2.4
OFC2	-	-	1				-	-	0.9
All	24	17	28				85.4	45.9	101.5

1/ Present cropping intensity is 109%. Without project, cropping intensity would remain unchanged during first five years and decline thereafter to 77% over a period of ten years. With project, cropping intensity would increase to 127%.

2/ Without project, paddy yields would remain unchanged for three years and decline thereafter as indicated, over ten years.

3/ OFC1 indicates other field crops (OFCs) of low value, such as cow pea and green gram. OFC2 indicates other high value field crops such as chillies and onions.

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NATIONAL IRRIGATION REHABILITATION PROJECT

FARM BUDGET: KALTOTA a/

	Maha Paddy			Yala Paddy			Yala OFC1			Yala OFC2			Total		
	P	W/O	W	P	W/O	W	P	W/C	W	P	W/O	W	P	W/O	W
Crop Area (ha)	0.4	0.32	0.4	0.4	0.32	0.39	-	-	-	-	-	0.01	0.8	0.6	0.8
Production Cost (Rs/Farm)															
Seed	416	333	416	416	333	405	-	-	-	-	-	2	832	665	823
Labour	2,750	2,200	2,860	2,750	2,200	2,681	-	-	-	-	-	127	5,500	4,400	5,668
Power	1,040	800	1,080	1,040	832	1,014	-	-	-	-	-	18	2,080	1,632	2,112
Urea	323	242	343	323	259	315	-	-	-	-	-	9	646	501	667
TSP	293	234	312	293	234	285	-	-	-	-	-	7	585	468	605
NOP	209	152	209	209	167	204	-	-	-	-	-	8	418	319	420
Chemicals	500	416	560	460	304	468	-	-	-	-	-	15	960	720	1,043
Other	340	272	360	340	272	335	-	-	-	-	-	15	680	544	710
Total Cost:	5,554	4,377	5,780	5,491	4,328	5,373	-	-	-	-	-	184	11,044	8,705	11,337
of which															
Cash Cost <u>c/</u>	4,422	3,509	4,634	4,382	3,441	4,295	-	-	-	-	-	137	8,803	6,780	8,863
Gross Value of Production (Rs/Farm)															
	10,140	5,616	10,920	9,880	5,408	10,394	-	-	-	-	-	348	20,020	11,024	21,662
Net Value of Production (Rs/Farm)															
	4,587	1,239	5,140	4,390	1,080	5,021	-	-	-	-	-	164	8,976	2,319	10,324
Net Farm Income (Rs/Farm) <u>d/</u>															
	5,719	2,107	6,286	5,499	1,967	6,099	-	-	-	-	-	211	11,217	4,244	12,798

Source: Feasibility Study Reports and Mission Estimates.

a/ Based on farm size of .4 ha. and 1991 financial prices in Annex 12, Table 1

b/ Based on yield and cropping intensities given in Annex 11, Table 1

c/ Assuming hired labour and farm power accounts for 60% and 30% of total labour and farm power costs, respectively.

d/ Including the value of family labour and own farm power; excluding other farm income and off-farm income.

Note: P = Present

W/O = Without

W = With

SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT

FARM BUDGETS: MAHAGALWEWA

	Maha Paddy			Yala Paddy			Yala OFC1			Yala OFC2			Total		
	P	W/O	W	P	W/O	W	P	W/O	W	P	W/O	W	P	W/O	W
Crop Area (ha)	1.1	0.85	1.1	0.06	-	0.11	-	-	0.03	-	-	0.02	1.16	0.85	1.26
Production Cost (Rs/Farm)															
Seed	1,126	665	1,126	133	-	137	-	-	36	-	-	-	1,259	665	1,295
Labour	6,958	4,111	7,260	751	-	822	-	-	125	-	-	-	7,708	4,111	8,208
Power	2,860	1,625	2,970	338	-	351	-	-	81	-	-	-	3,198	1,625	3,402
Urea	889	525	833	92	-	92	-	-	30	-	-	-	981	525	955
TSP	804	444	858	76	-	82	-	-	29	-	-	-	880	444	970
MOP	470	247	575	62	-	68	-	-	31	-	-	-	532	247	674
Chemicals	1,265	683	1,320	143	-	169	-	-	33	-	-	-	1,408	683	1,522
Other	990	553	990	104	-	107	-	-	88	-	-	-	1,094	553	1,185
Total Cost	14,097	8,170	14,612	1,556	-	1,656	-	-	421	-	-	-	15,653	8,170	16,689
of which:															
Cash Cost_c/	10,863	6,233	11,246	1,195	-	1,285	-	-	355	-	-	-	12,538	6,477	13,397
Gross Value of Production (Rs/Farm)															
	28,958	15,120	31,185	3,247	-	5,002	-	-	1,466	-	-	-	32,204	15,120	37,653
Net Value of Production (Rs/Farm)															
	14,860	6,950	16,573	1,691	-	3,346	-	-	1,046	-	-	-	16,552	6,950	20,964
Net Farm Income Rs/Farm)_d/															
	18,094	8,887	19,939	2,051	-	3,716	-	-	1,111	-	-	-	19,666	8,643	24,256

Source: Feasibility Study Reports and Mission estimates.

_a/ Based on farm size of 1.1 ha. and 1991 financial prices given in Annex 12, Table 1

_b/ Based on yield and cropping intensities given in Annex 11, Table 2

_c/ Assuming hired labour and farm power accounts for 60% and 40% of total labour and farm power costs respectively.

_d/ Including the value of family labour and own farm power; excluding other farm income and off-farm income.

Note: P = Present
W/O = Without
W = With

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NATIONAL IRRIGATION REHABILITATION PROJECTFARM BUDGET: DORAKADA LIYADDE a/

	Maha Paddy			Yala Paddy			Yala OFC1			Yala OFC2			Total		
	P	W/O	W	P	W/O	W	P	W/O	W	P	W/O	W	P	W/O	W
Crop Area (ha)	0.2	0.14	0.2	0.2	0.14	0.17	-	-	-	-	-	0.02	0.40	0.28	0.39
Production Cost (Rs/Farm)															
Seed	205	143	205	205	143	174	-	-	-	-	-	4	410	287	382
Labour	1,380	924	1,500	1,260	840	1,173	-	-	-	-	-	222	2,640	1,764	2,695
Power	360	210	380	360	224	315	-	-	-	-	-	30	720	434	725
Urea	115	81	106	115	74	114	-	-	-	-	-	14	230	155	234
TSP	98	61	107	107	68	99	-	-	-	-	-	13	205	130	219
HOP	55	32	64	92	58	86	-	-	-	-	-	9	147	90	160
Chemicals	160	112	180	160	112	153	-	-	-	-	-	25	320	224	358
Other	180	126	180	160	112	136	-	-	-	-	-	25	340	238	341
Total Cost:	2,396	1,564	2,542	2,299	1,519	2,114	-	-	-	-	-	317	4,695	3,083	4,973
of which															
Cash Cost _{c/}	1,905	1,276	2,025	1,847	1,234	1,694	-	-	-	-	-	256	3,752	2,397	3,794
Gross Value of Production (Rs/Farm)															
	3,174	1,932	3,588	2,898	1,739	2,698	-	-	-	-	-	504	6,072	3,671	6,790
Net Value of Production (Rs/Farm)															
	778	368	1,046	599	219	584	-	-	-	-	-	187	1,377	588	1,817
Net Farm Income (Rs/Farm) _{d/}															
	1,269	656	1,563	1,051	505	1,004	-	-	-	-	-	248	2,320	1,274	2,996

Source: Feasibility Study Reports and Mission estimates.

a/ Based on farm size of .2 ha. and 1991 financial prices given in Annex 12, Table 1b/ Based on yield and cropping intensities given in Annex 11, Table 3c/ Assuming hired labour and farm power accounts for 60% and 30% of total labour and farm power costs, respectively.d/ Including the value of family labour and own farm power; excluding other farm income and off-farm income.

Note: P = Present

W/O = Without

W = With

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NATIONAL IRRIGATION REHABILITATION PROJECT

FARM BUDGET: KOBRIGANE a/

	Maha Paddy			Yala Paddy			Yala OFC1			Yala OFC2			Total		
	P	W/O	W	P	W/O	W	P	W/O	W	P	W/O	W	P	W/O	W
Crop Area (ha)	0.20	0.16	0.20	-	-	-	-	-	0.03	-	-	0.01	0.20	0.16	0.24
Production Cost (Rs/Farm)															
Seed	205	164	205	-	-	-	-	-	12	0	0	2	205	164	219
Labour	1,265	968	1,320	-	-	-	-	-	76	0	0	135	1,265	968	1,531
Power	440	336	460	-	-	-	-	-	34	0	0	22	440	336	516
Urea	154	115	173	-	-	-	-	-	10	0	0	9	154	115	192
TSP	127	94	156	-	-	-	-	-	12	0	0	8	127	94	176
NOP	101	74	129	-	-	-	-	-	12	0	0	6	101	74	146
Chemicals	220	156	240	-	-	-	-	-	14	0	0	20	220	156	274
Other	180	144	180	-	-	-	-	-	15	0	0	18	180	144	213
Total Cost:	2,534	1,906	2,682	-	-	-	-	-	169	-	-	201	2,534	1,906	3,052
of which															
Cash Cost <u>c/</u>	2,026	1,541	2,167	-	-	-	-	-	139	-	-	164	2,026	1,514	2,422
Gross Value of Production (Rs/Farm)															
	5,200	3,224	5,460	-	-	-	-	-	261	-	-	468	5,200	3,224	6,189
Net Value of Production (Rs/Farm)															
	2,666	1,318	2,778	-	-	-	-	-	92	-	-	267	2,666	1,318	3,137
Net Farm Income (Rs/Farm) <u>d/</u>															
	3,174	1,683	3,293	-	-	-	-	-	122	-	-	304	3,174	1,710	3,768

Source: Feasibility Study Reports and Mission estimates.

a/ Based on farm size of .2 ha. and 1991 financial prices given in Annex 12, Table 1

b/ Based on yield and cropping intensities given in Annex 11, Table 4

c/ Assuming hired labour and farm power accounts for 65% and 30% of total labour and farm power costs, respectively.

d/ Including the value of family labour and own farm power; excluding other farm income and off-farm income.

Note: P = Present

W/O = Without

W = With

SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT

FARM BUDGET: MAHA KIRI IBBENA a/

	Maha Paddy			Yala paddy			Yala OFC1			Yala OFC2			Total		
	P	W/O	W	P	W/O	W	P	W/O	W	P	W/O	W	P	W/O	W
Crop Area (ha)	0.35	0.22	0.36	-	-	-	-	-	0.04	-	-	0.03	0.35	0.22	0.42
Production Cost (Rs/Farm)															
seed	358	225	369	-	-	-	-	-	22	-	-	5	358	225	395
Labour	2,520	1,518	2,700	-	-	-	-	-	172	-	-	347	2,520	1,518	3,220
Power	840	484	900	-	-	-	-	-	56	-	-	51	840	484	1,007
Urea	286	148	311	-	-	-	-	-	16	-	-	23	286	148	350
TSP	222	129	246	-	-	-	-	-	12	-	-	22	222	129	280
NOP	177	101	199	-	-	-	-	-	15	-	-	16	177	101	230
Chemicals	438	264	504	-	-	-	-	-	20	-	-	43	438	264	567
Other	315	198	324	-	-	-	-	-	22	-	-	40	315	198	386
Total Cost:	4,863	2,869	5,228	-	-	-	-	-	312	-	-	508	4,863	2,869	6,048
of which															
Cash Cost _{c/}	3,853	2,297	4,157	-	-	-	-	-	246	-	-	411	3,853	2,239	4,683
Gross Value of Production (Rs/Farm)															
	9,100	4,433	9,594	-	-	-	-	-	517	-	-	788	9,100	4,433	10,898
Net Value of Production (Rs/Farm)															
	4,237	1,564	4,366	-	-	-	-	-	205	-	-	279	4,237	1,564	4,851
Net Farm Income (Rs/Farm)_{d/}															
	5,247	2,136	5,437	-	-	-	-	-	271	-	-	376	5,247	2,194	6,215

Source: Feasibility study reports and Mission estimates.

Note: P = Present

a/ Based on farm size of 0.35 ha. and 1991 financial prices given in Annex 12, Table 1

W/O = Without

b/ Based on yield and cropping intensities given in Annex 11, Table 5

W = With

c/ Assuming hired labour and farm power accounts for 65% and 30% of total labour and farm power costs, respectively.

d/ Including the value of family labour and own farm power; excluding other farm income and off-farm income.

SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT

FARM BUDGET: HITTEWA a/

	Maha Paddy			Yala Paddy			Yala OFC1			Yala OFC2			Total		
	P	W/O	W	P	W/O	W	P	W/O	W	P	W/O	W	P	W/O	W
Area (ha)	0.60	0.47	0.60	0.06	-	0.08	-	-	0.06	-	-	0.03	0.66	0.47	0.76
Production Cost (Rs/Farm)	-----														
Seed	673	527	673	62	-	90	-	-	31	-	-	5	735	527	798
Labour	3,795	2,844	3,960	336	-	528	-	-	229	-	-	297	4,131	2,844	5,014
Power	1,440	1,034	1,500	105	-	156	-	-	86	-	-	53	1,545	1,034	1,795
Urea	346	226	403	32	-	54	-	-	16	-	-	24	378	226	497
TSP	410	298	410	22	-	39	-	-	24	-	-	23	431	298	496
MOP	386	281	386	18	-	33	-	-	23	-	-	22	404	281	464
Chemicals	660	447	720	50	-	88	-	-	28	-	-	44	710	447	880
Other	540	423	540	47	-	68	-	-	33	-	-	39	587	423	680
Total Cost:	7,732	5,656	8,052	624	-	988	-	-	436	-	-	468	8,357	5,656	9,944
of which	-----														
Cash Cost _{c/}	6,175	4,553	6,429	502	-	796	-	-	345	-	-	383	6,677	4,489	7,829
Gross Value of Production (Rs/Farm)	-----														
	14,040	9,471	14,430	1,550	-	2,236	-	-	632	-	-	961	15,590	9,471	18,259
Net Value of Production (Rs/Farm)	-----														
	6,308	3,815	6,378	926	-	1,248	-	-	196	-	-	493	7,233	3,815	8,315
Net Farm Income (Rs/Farm) _{d/}	-----														
	7,865	4,917	8,001	1,048	-	1,440	-	-	287	-	-	577	8,913	4,982	10,430

Source: Feasibility Study Reports and Mission estimates.

Note: P = Present

a/ Based on farm size of 0.6 ha. and 1991 financial prices given in Annex 12, Table 1 W/O = Without

b/ Based on yield and cropping intensities given in Annex 11, Table 6 W = With

c/ Assuming hired labour and farm power accounts for 65% and 30% of total labour and farm power costs respectively.

d/ Including the value of family labour and own farm power and excluding other farm income and off-farm income.

SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT
SUMMARY OF ECONOMIC AND FINANCIAL PRICES a/

Outputs	Unit	Financial _{b/} (1991)	Economic			
			(1991)	(2000)	(2005)	
Paddy	Rs/kg	6.50 - 7.65	6.37	7.09	6.43	<u>c/</u>
Cowpea	Rs/kg	9.10 - 9.70	7.99	7.99	7.99	<u>d/</u>
Chillies	Rs/kg	29.50 - 35.50	27.63	27.63	27.63	<u>d/</u>
Inputs						
Fertilizer:						
Urea	Rs/kg	9.20 - 10.40	10.47	11.37	10.86	<u>c/</u>
TSP	Rs/kg	9.60 - 9.75	9.64	10.99	11.05	<u>c/</u>
NOP	Rs/kg	8.75 - 9.50	7.78	8.29	8.29	<u>c/</u>
Labour	Rs/day	55.00 - 60.00	51.75	51.75	51.75	<u>e/</u>
Seed:						
Paddy	Rs/kg	9.25 - 9.75	8.08	8.08	8.08	<u>d/</u>
Cowpea	Rs/kg	11.50 - 12.50	10.20	10.20	10.20	<u>d/</u>
Chillies	Rs/kg	175.00 - 225.00	170.00	170.00	170.00	<u>d/</u>
Farm Power:	Rs/ha	2250 - 2750	2125	2125	2125	<u>d/</u>
Weed/Pesticides	Rs/ha	900 - 1100	850	850	850	<u>d/</u>

Source: Feasibility Study Reports and Mission Estimates

a/ In constant 1991 prices.

b/ Indicates the range of lowest and the highest price used in the analysis of the six appraised schemes.

c/ Derivation of economic prices given in Annex 12, Table 1

d/ Adjusted by the SCF of .85

e/ Unskilled labour wage rate adjusted by CF of .9

February 6, 1991

SRI LANKA
NATIONAL IRRIGATION REHABILITATION PROJECT

SUMMARY OF PROJECT ECONOMIC RATE OF RETURN AND NET PRESENT VALUE
OF SIX APPRAISED SCHEMES
(Rs. 000)

Year	Incremental Net Benefit					
	Kaltota wewa	Mahagal wewa	Dorakada Liyadde	Kobeigane	Mahakiri Ibbewa	Nittewa
1	(564)	(70)	(7)	(130)	(30)	(32)
2	(4,896)	(2,755)	(316)	(588)	(369)	(312)
3	(4,796)	(1,948)	(18)	(65)	(537)	(455)
4	(4,749)	(1,214)	62	186	67	50
5	(34)	1,626	101	255	155	86
6	3,849	2,046	168	387	307	185
7	8,243	2,495	171	397	472	223
8	12,360	2,872	179	413	557	278
9	16,339	3,350	180	419	581	290
10	16,751	3,389	183	424	600	293
11	16,387	3,382	178	413	603	282
12	15,954	3,465	175	403	588	273
13	15,522	3,380	170	394	586	265
14	15,090	3,568	167	381	570	258
15	14,691	3,575	162	373	555	258
16	14,661	2,999	162	373	555	258
17	14,661	2,999	162	373	555	258
18	14,661	2,999	162	373	555	258
19	14,661	2,999	162	373	555	258
20	14,661	2,999	162	373	555	258
21	14,661	2,999	162	373	555	258
22	14,661	2,999	162	373	555	258
23	14,661	2,999	162	373	555	258
24	14,661	2,999	162	373	555	258
25	14,661	2,999	162	373	555	258
<u>a/</u>	38.10	29.81	30.40	30.60	30.89	21.51
<u>b/</u>	58,509	12,423	1,454	1,716	2,229	827

a/ Economic Rate of Return
b/ Net Present Value at 10% OCC

SRI LANKA

NATIONAL IRRIGATION REHABILITATION PROJECT

Project Performance Indicators

	<u>Unit</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>Total</u>
Completion Feasibility Studies and Engineering Documents:									
Minor Schemes	ha	332	4,418	6,750	6,750	6,750	-	-	25,000
Medium/Major Schemes	ha	<u>2,130</u>	<u>1,300</u>	<u>3,250</u>	<u>3,250</u>	<u>2,570</u>	-	-	<u>12,500</u>
Total	ha	2,462	5,718	10,000	10,000	9,320	-	-	37,500
Start Construction Works:									
Minor Schemes	ha	-	332	5,918	6,250	6,250	6,250	-	25,000
Medium/Major Schemes	ha	-	<u>2,130</u>	<u>1,300</u>	<u>3,250</u>	<u>3,250</u>	<u>2,570</u>	-	<u>12,500</u>
Total	ha	-	2,462	7,218	9,500	9,500	8,820	-	37,500
Completion Construction Works:									
Minor Schemes	ha	2,600 ^{a/}	-	332	5,918	6,250	6,250	6,250	27,600
Medium/Major Schemes	ha	-	-	-	<u>2,000</u>	<u>3,050</u>	<u>3,900</u>	<u>3,550</u>	<u>12,500</u>
Total		2,600	-	332	7,918	9,300	10,150	9,800	40,100
Employment Institutional Organizers	No	24	120	315	465	375	165	36	1,500
Training:									
Staff (in-country)	No	-	290	385	360	270	30	-	1,335
Institutional Organizers	No	24	214	499	520	197	16	-	1,470
Farmer Representatives	No	270	1,100	2,920	5,070	5,600	4,404	2,450	21,814
Farmers	No	130	480	1,280	2,130	2,368	2,018	1,218	9,624
Trainers	No	50	136	120	20	-	-	-	326

^{a/} VIRP carry-over works

April 10, 1991

SRI LANKA

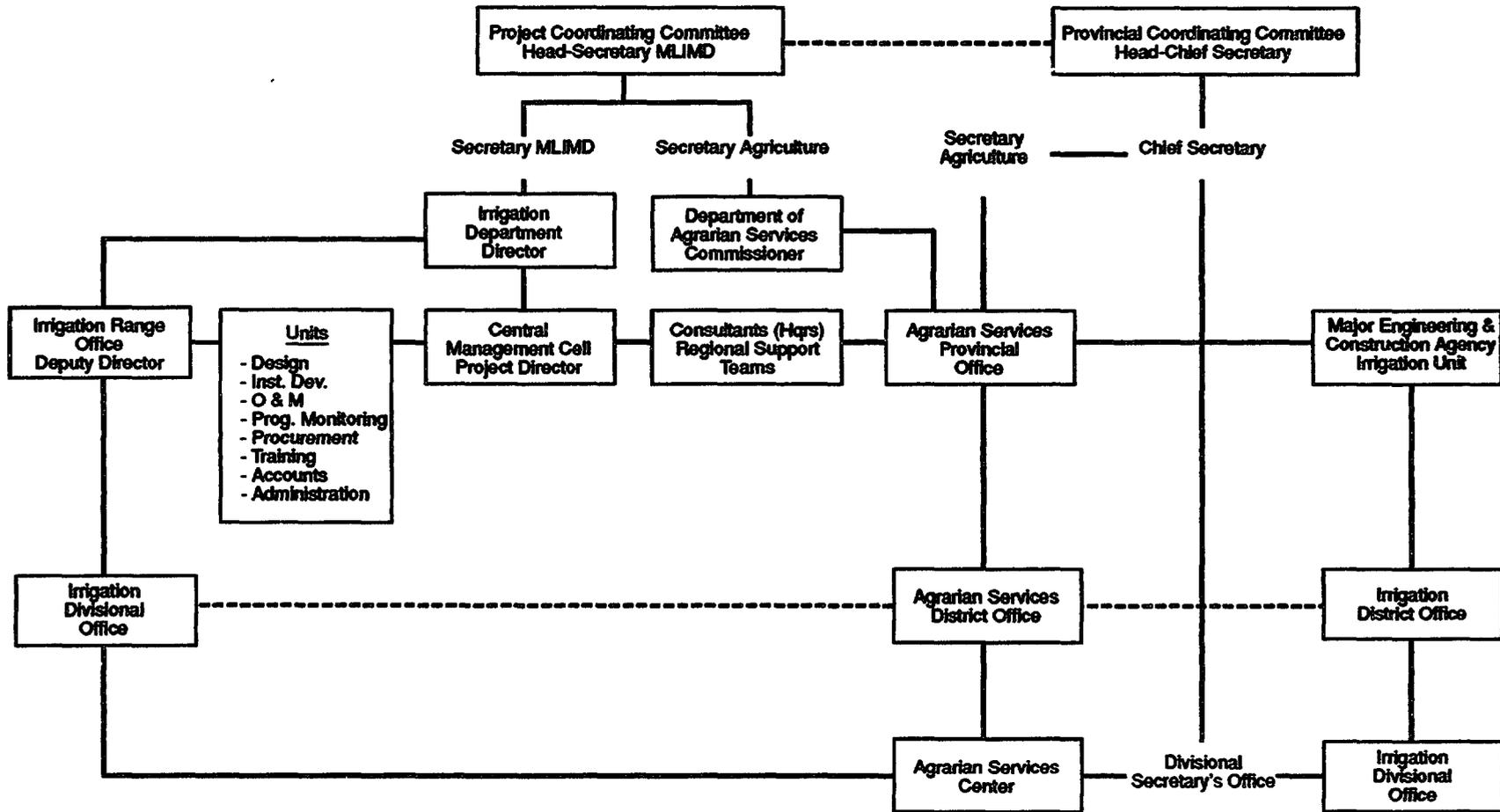
NATIONAL IRRIGATION REHABILITATION PROJECT

Related Documents in Project File

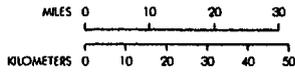
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SRI LANKA NATIONAL IRRIGATION REHABILITATION PROJECT Project Management and Implementation Organization Structure



SRI LANKA NATIONAL IRRIGATION REHABILITATION PROJECT LOCATION OF SCHEMES



Appraised Schemes:

- Medium and Major Schemes
- Minor Schemes

Prepared Schemes

- Medium and Major Schemes
- Minor Schemes

--- Agro-Climatic Zones

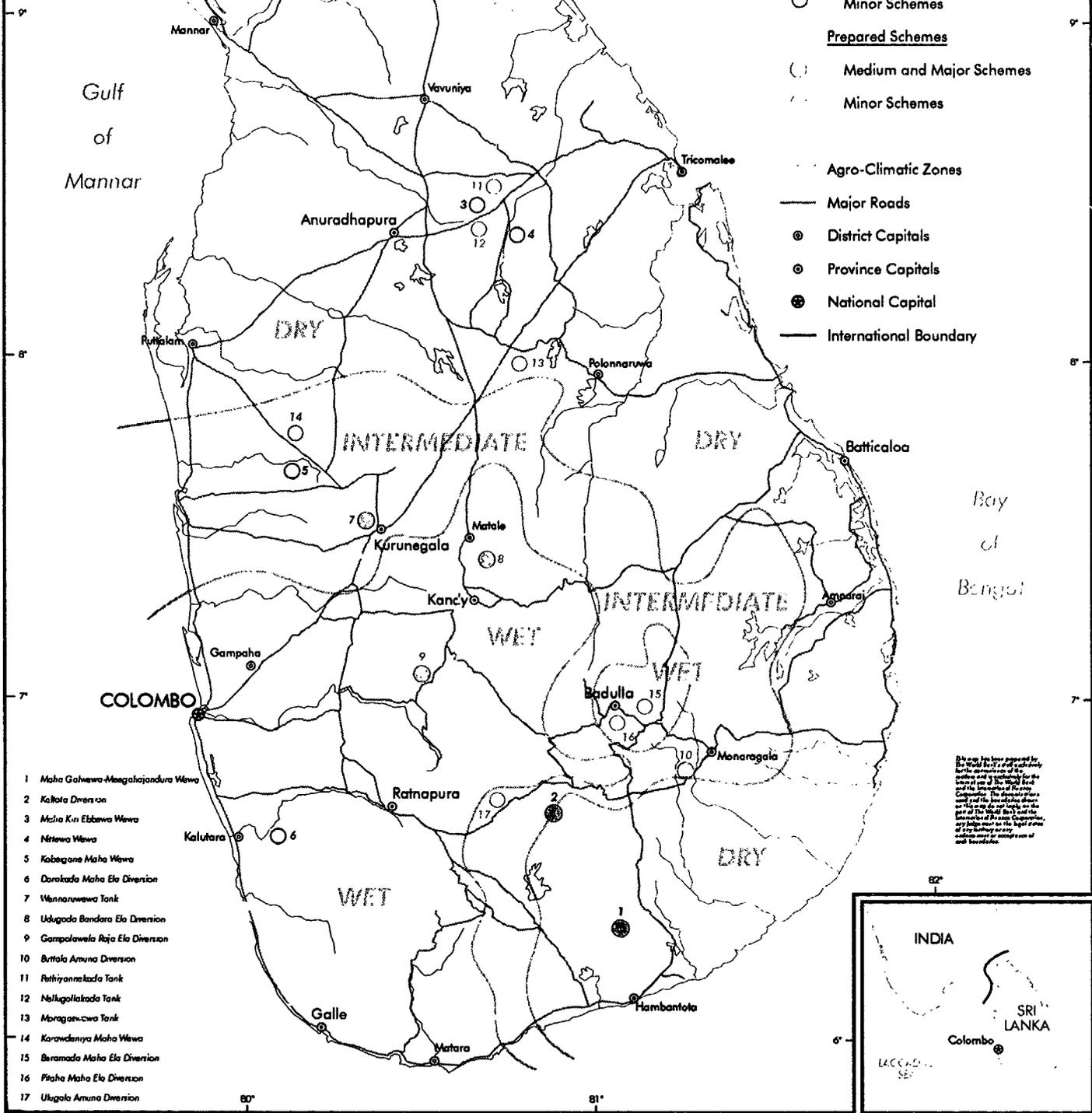
— Major Roads

● District Capitals

○ Province Capitals

● National Capital

— International Boundary



- 1 Maha Gahewa-Meegahajandura Wewa
- 2 Kalota Diversion
- 3 Maha Kin Elabawa Wewa
- 4 Nitawa Wewa
- 5 Kobagone Maha Wewa
- 6 Darakada Maha Ela Diversion
- 7 Wannarawewa Tank
- 8 Ulagoda Bandara Ela Diversion
- 9 Gampalawela Raja Ela Diversion
- 10 Britala Amuna Diversion
- 11 Pathiyanelakada Tank
- 12 Nalkugallakada Tank
- 13 Maraganawa Tank
- 14 Karavelanya Maha Wewa
- 15 Beramada Maha Ela Diversion
- 16 Pihaha Maha Ela Diversion
- 17 Ulagala Amuna Diversion

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