

CHAPTER 18 ENVIRONMENTAL CONSERVATION PLAN

18.1 General

Environmental concerns are being addressed by responsible institutions – both in compliance with individual statutes and as a response to the wider requirements of the National Environmental Act, as mentioned earlier. According to the National Environmental Act, No. 56 of 1988, project approval is a legal requirement, and its approval is granted by “project approving agencies” which are state agencies and defined by the Gazette. The project for which approval is required will also be gazetted and is referred to as “prescribed project.” For the project approval, the implementing agencies of the prescribed projects should submit an initial environmental examination report or an environmental impact assessment report to the project approving agencies. As the prescribed projects, the following projects and undertakings related to the agricultural development have been listed in the 16A, Gazette Extraordinary of the Democratic Socialist Republic of Sri Lanka dated 24 June 1993.

- 1) All river basin development and irrigation projects excluding minor irrigation works (as defined by Irrigation Ordinance Chapter 453).
- 2) Reclamation of land, wetland area exceeding 4 hectares.
- 3) Extraction of timber covering land area exceeding 5 hectares.
- 4) Conversion of forests covering an area exceeding 1 hectare into non-forest use.
- 5) Clearing of land areas exceeding 50 hectares.

The development project of the priority irrigation schemes will be not included in the prescribed projects¹⁴. Basically, the development of the Priority Scheme is to help rural farming households to achieve targets of more profitable agriculture and higher standards of living through rehabilitation and improvement of existing irrigation infrastructure, more efficient use of water with participatory management, and improvement of support services including credit and marketing. And the land reclamation, clearing, and deforestation are not included in the development works of the priority schemes.

18.2 Environmental Impact Assessment and Environmental Mitigation Plan

At this stage, environmental problems have been identified and placed in two main categories. These are (a) significant and (b) not significant. In the former category is placed the human-elephant conflict. All the others listed in the previ-

¹⁴ The North Western Province Water Resources Development Project (1992-2000), which has almost same component with the development of priority irrigation schemes, was not included in the prescribed project, and had no IEE and EIA reports.

ous section are placed in the second category and these are more easily mitigated through various management options, of which the Project will recommend and implement. Some of these include problems of field drainage, surface water quality, catchment degradation and silting in minor tanks. Resolution of the human-elephant conflict requires much baseline field information in relation to their behaviour, the type of habitat they occupy, and a quantification of losses incurred by farmers on account of attacks. It has not been possible to undertake an exercise of this nature within the mandate of this Study. Preliminary field inquiries through talking to farmers, wildlife field officers, and the GEF (Global Environmental Facility) study consultant, discussions at PCM workshops, and perusing records of damage, have led to the measures recommended in this report.

One of the project focuses is on crop production for which adequate water is being provided. Resource use has to be based on long-term sustainability, where economic viability and environmental stability are fundamental. The current status of resource use has been outlined earlier and certain environmental issues have been identified. In the section below, measures for mitigation of these impacts are outlined and these will lead to enhancement of environmental quality.

(1) Human-elephant Conflict

A meaningful solution must take into account not only the project sites under reference in this report, but the larger area of Wayamba and Nuwara-kalaviya as well, where elephant presence is high. Some methods of mitigation utilised before and others desirable in an elephant management programme are briefly stated below.

Elephant drives:	In 1979, some 130 animals from the Mahaweli-H area, and in 1983, about 60 animals from Resvehera, were driven into the Wilpattu national park. These efforts were unsuccessful. The route was dotted with settlements and cultivated land. The cost was also very high. Drives of this nature are believed to be impractical at the present time.
Other methods of control:	Those tried before and also being made use of currently are immobilisation and translocation, short-term driving and training of farmers by the DWC to effect localised control with the help of fire crackers. All these are very temporary in nature and the larger problem would yet remain.
Baseline information:	Basic information for the preparation of an elephant management plan is lacking. The recently concluded study commissioned by the Department of Wildlife Conservation, titled "Ecology and ranging behaviour of wild elephants and human-elephant conflict in the Northwest region," would hopefully provide much basic information and some solutions as well.
Land use plan:	Demarcation of elephant habitat on the basis of a land use plan can be a first step in conflict resolution. In the preparation of a land use plan, some trade-offs between farm land and elephant habitat will be necessary.
Protected areas:	Animals should be discouraged from entering farm land by passive means such as habitat enrichment, watering holes and buffer zones within protected areas. The use of electric fencing can be of benefit where appropriate.
Reduction in numbers:	Since it is clear that elephant numbers in these areas far exceed the carrying capacities, some thinning out is necessary. Selected animals may be captured and given over for domestication, translocated to other wildlife parks, supplied to zoos or reared in orphanages.

(continued)

Training of villagers:	In the short-term, villagers in all susceptible areas should be trained in damage control methods that can be adopted by themselves. This is being carried out even now on a small scale.
Compensation:	The present levels of compensation for elephant damage seem inadequate. An increase in the amounts and eliminating the bottlenecks in its disbursement to enable speedy transfer to affected parties should be worked out.
Advance warning:	It will be useful if department field staff can pass on information about elephant movements to farmers so that the latter will be forewarned and adequate preparation can be made to prevent or at least minimise damage.
Staff capability:	In-service training at regular intervals and field exposure under experienced senior officers are necessary for better delivery of services by field staff. More staff postings are needed at strategic points.
Database:	As information is vital for decision-making at all levels, field staff should be trained in maintaining accurate data on a wide a range of topics and transfer these upwards at regular intervals for the use of senior management.
Equipment:	A variety of equipment is necessary and include vehicles, transmission equipment and observation items such as binoculars to strengthen field capability.
Institutional support:	The support of other institutions having responsibility in field level programmes is required in a co-ordinated effort to help reduce the conflict. Continuous review of progress will be helpful.

(2) Pesticide Use

Pesticide use often appears to be more by habit than by need. This shows a lack of awareness on current technology. Hence, it is of urgent need to educate farmers on ways and means of minimising use of chemicals. The way out of a poor income is to reduce cost of production and be competitive in the market. Towards this end a good extension system is necessary.

Integrated pest management (IPM) in paddy and chilli growing has been recommended by the Department of Agriculture. It is proposed to expand more in the priority irrigation schemes through a good extension system. It offers scope for reducing costs of production and keeping the environment clean and healthy. IPM focuses on an ecological approach to pest management using a variety of compatible strategies, placing greater emphasis on natural predators of pests, better cultural practices, and an understanding of pest ecology.

(3) Surface Water Quality

It is proposed to undertake analyses of water samples in all the schemes when the Project begins its implementation phase. This can be used as baseline data for evaluation and monitoring.

The adoption of IPM on a wider scale will help keep water sources free of pesticide residues as they are now. Hence, it is important to promote its wider application by more intensive farmer training.

Fears had been expressed about the high nitrogen levels in surface and ground waters of the Anuradhapura district. The optimum use of straight fertilisers based on soil analyses and the greater use of manure are recommended to minimise the impacts.

(4) Soil Erosion

Soil erosion control and methods of conservation farming are seen as means of overcoming loss of fertility and poor farm productivity. Some of these methods include strip mulching, hedgerows, alley cropping, sloping agricultural land technology, and agroforestry. These methods should be expanded to the priority irrigation schemes.

(5) Field Drainage

To ensure to some extent salinity free fields, it is essential to remove the encroachments of the drainage canal and its reservation, to eliminate waterlogging, so that water flows freely. It is proposed to free the drainage canal of its encroachments and mark out the reservation of the canal using boundary stones painted a bright orange colour, to serve as a constant reminder to people.

(6) Catchment Degradation

As most of the small tanks are silted, catchment protection will be an important aspect of erosion control. Presently there are encroachments in the catchments and these are cultivated with the least regard to soil conservation.

It is proposed to determine the catchment by consensus among farmers and officials, and have it marked out on the ground by putting boundary stones painted a bright orange colour, so as to be a constant reminder to the farmers that encroachment is not allowed. On this strip of land will be grown trees of appropriate species, and maintained so for all time. In this manner silting of the tank will be minimised to a great extent and its lifetime increased.

(7) Agrowells

Presently, there are a number of institutions promoting agrowell construction. This is considered detrimental to the optimum use of the groundwater resource. Towards this end, a single institution with the necessary expertise for agrowell construction and management is seen necessary in the long-term for optimum benefit to be derived from the limited groundwater resource. Considerable work has been carried out by the Agricultural Development Authority in the use of groundwater and this knowledge base should be made use of.

(8) Public Health

The Divisional Development Communities under the divisional secretariats related to the priority schemes identify malaria as a significant health problem. Malaria is a problem that affects productivity. The close collaboration of farmer organisation and the Anti-malaria Campaign is seen as beneficial to the eradica-

tion of the disease.

(9) General Tree Cover

Increasing the general tree cover in the Project areas is seen largely as one of ecological benefit. It is proposed to carry out reforestation in the priority irrigation schemes. Within such a programme, firewood species can be grown in certain areas in anticipation of future shortages. Other potential areas for general tree planting are roadsides, canal and river banks, degraded lands, public places, school premises, and places of worship.

18.3 Monitoring Plan

For the development of the priority irrigation schemes, it is recommended to carry out monitoring of the following four items, as well as the proposed monitoring plan of the Master Plan Study mentioned in Section 10.1.

- 1) Land Management: The project executing agency carry out regular field inspections. Formation of rills and gullies, root exposure of plants and trees, and the deposition of sediment at the bottom of the slope are the first indication of soil run-off. For farmland where such indications are found and measures have already been undertaken for soil and water conservation, introduction of more appropriate countermeasures is necessary to protect.
- 2) Water Quality: It is recommended to carry out the water quality test by the project executing agency. It would be very useful to have some baseline survey after two cultivation seasons from the commencement of the programme when conditions are quite different. Subsequent analysis may be carried out in suspect areas at least twice a year over a period of two to three years to provide project management with information for decision-making.
- 3) Public Health: Under the Divisional Development Committee, a regular review of its rate of incidence of malaria has been made at the community-based meetings. The committee takes countermeasures to reduce incidence of malaria, based on the result of review. FOs should support to implement the countermeasures, and the executing agency collects information on malaria from the committees concerned and monitors the FOs' activities.
- 4) Elephant Management: DWC should station more staff at strategic places and monitor movements of animals constantly. FOs collect information on elephant movement from DWC.

CHAPTER 19 IMPLEMENTATION PLAN AND COST ESTIMATE

19.1 Implementation Plan

The development project covers two major schemes, two medium schemes and one minor scheme group including 6 schemes. The development plan of each scheme includes the strengthening of FOs, the rehabilitation and improvement of irrigation facilities, and so on. In addition, the development plans such as improvement of government's support facilities and training to officials for capacity building-up are also included in the Project, which are necessary to support farmers' activities in all priority schemes. Therefore, it is recommended that the Project is implemented as one unit including all development plans.

19.1.1 Project Executing Agencies

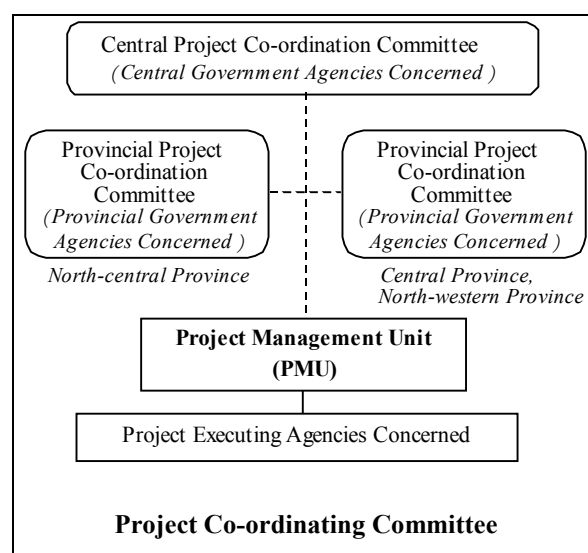
The Irrigation Management Division (IMD) of the Ministry of Irrigation and Power (MIP) would be the executing agency of the development programmes. In connection with the project implementation, IMD would co-ordinate all activities of the relevant government agencies and regional organisations.

The Project consists of various programmes, and many government agencies at central and provincial levels will participate in the implementation of these programmes. These agencies concerned are shown below:

Implementing Agencies related to Development Programmes

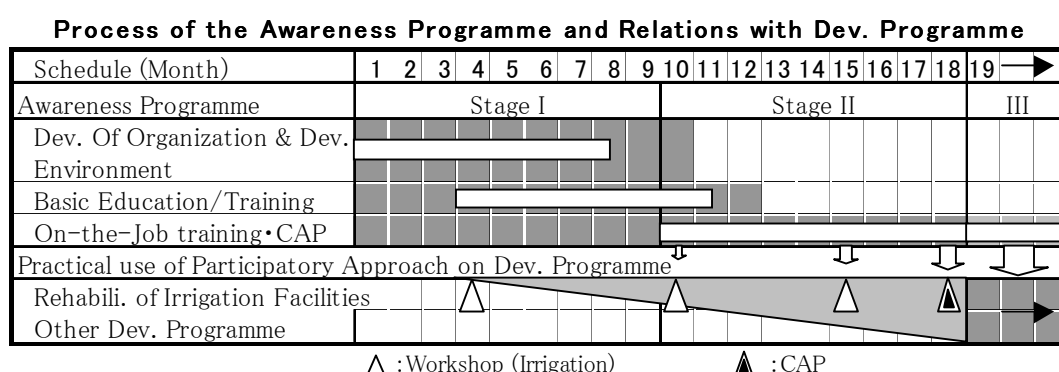
Development Programmes	Implementing Agencies										
	PDOA/ IPEU	DOI	PED	IMD	DAS	PDAPH	NAQDA	NYSC	NAITA	DS	KARTI
Awareness Programme											●
Strengthening of FOs and community development	Major scheme										
	Medium & Minor schemes										
Agricultural development (stable crop production and crop diversification)											
Income generation	Home garden development										
	Livestock development										
	Fishery development										
	Vocational Training										
	Small enterprises and business development										
Improvement of marketing					●						
Improvement of credit					●						
Rehabilitation and improvement of irrigation facilities	Major & Medium Schemes										
	Minor Schemes										
Improvement of water management	Major Schemes										
	Medium Schemes										
	Minor Schemes										
Improvement of farm roads		●									
Strengthening of agricultural support services	●				●	●	●				
Research programme for cascade system					●						
Monitoring and evaluation				●							

In order to co-ordinate all these agencies at central and provincial levels, it is proposed to set up a Central Project co-ordination Committee (CPCC) and Provincial Project Co-ordination Committee (PPCC) (Figure 11.1.1). Under CPCC, the Project Management Unit (PMU) would be established at the project site, and would have direct responsibility for the implementation of the development programmes. In order to manage the implementation of the development programmes effectively, PMU would have the following 7 subunits: i) administration, ii) agricultural supporting, iii) construction, iv) O&M of irrigation schemes, v) income generation, vi) farmers' supporting/credit, vii) monitoring and evaluation (Figure 19.1.2).



19.1.2 Awareness Programme

The Project is commenced with the awareness programme for both staff of the government agencies as well as the farmers. The programmes are followed by the rehabilitation and improvement and the farmers' supporting programme. The implementation schedule of the awareness programme is shown below. Further, it is proposed that an NGO, which has much experience in the grass-root level activities, will be involved in the awareness programmes.



19.1.3 Implementation Programme of Rehabilitation and Improvement Works for Irrigation Infrastructures

(1) Basic Considerations

Mechanised construction methods will be introduced principally for earthworks and major concrete works. Adopting the beneficiaries' participatory approach,

local farmers should be employed as much as possible for labour work, such as, small earthworks and concrete lining.

Consulting engineers should be employed to assist the PMU as well as other agencies concerned in the preparation of detailed design and tender documents, and in tendering and supervision of the construction works.

(2) Construction Plan

1) Construction Period

The schedule consists of the survey and design, tendering, and construction as in the table of the right.

2) Construction Plan

Implementation Period of Irrigation Facilities Rehabilitation

Name of Scheme(s)	Survey, Investigation, Design and Tendering	Construction
Nachchaduwa	2 years	3 years
Palukadawela	2 years	2 years
Periyakulama	1 year	1 year
Maha Nanneriya	1 year	1 year
Maha Nanneriya Minor Schemes	1 year	1 year

Tanks and main canals and related structures

Rehabilitation or improvement of the tanks will be carried out mainly during the dry season, when the tank water is the least. All major works will be completed by the end of the dry season.

Rehabilitation or improvement of canals, roads, and related facilities for all the schemes will be carried out mainly during the dry season. For all the schemes, the rehabilitation work should be carried out so as not to disturb the current irrigation water supply, as much as possible, or if the construction work has to disturb the current water supply, the disturbance period should be shortened as much as possible.

D- and F-canals

The government agencies, such as ID and PED, will make a contract with a FO for rehabilitation and improvement of D- and F-canals. The work will be carried out with the instructions of government agencies.

19.1.4 Procurement Plan

The PMU will be responsible for procurement of all goods and services under the Project. The civil works under irrigation infrastructure and institutional support components are numerous, simple in nature, labour intensive and dispersed widely over the area. The civil works, thus, will be carried out by pre-qualified contractors selected under local competitive bidding (LCB) procedure. The contract award will be made by PMU or the government agencies, depending on the contract amounts.

In the PCM workshop sessions, it is observed that the farmers are anxious to rehabilitate the D- and F-canals by themselves. It is expected that the farmers'

participation in the rehabilitation and improvement works of irrigation facilities could lead to enhance their ownership to the facilities. Therefore, evaluating the capacity of FOs based on the action plan prepared the farmers, the works are entrusted to the farmers as much as possible.

Ten percent of total rehabilitation / improvement cost for D and F-canals of the major and medium schemes and all canal systems of the minor schemes will be contributed by the farmers, as the system has been applied in the previous foreign-assisted projects. Such rehabilitation /improvement works of D and F-canals will be contractually and directly assigned for execution by capable FOs provided that (i) the FO has the capability to carry out the works; (ii) the work is located in the scheme benefiting the FO; and (iii) the FO agrees to proceed the proposed rehabilitation plan and to contribute 10% of total cost.

**Procurement for Rehabilitation
of Irrigation Facilities**

Name of Scheme(s)	Tank	Main Canal	D- & F-canals
Major Schemes	Contractor	Contractor	Farmers by contract
Medium Schemes	Contractor	Contractor	Farmers by contract
Minor Schemes	Contractor	Farmers by contract	Farmers by contract

Each supply contract for equipment, vehicle and materials will be awarded on the basis of international competitive bidding (ICB), LCB, or direct purchasing, depending the procurement cost. The awareness and training programme will be entrusted to a government organisation concerned or external institutes.

19.1.5 Overall Implementation Plan

The Project consists of five major items: (i) mobilisation of PMU, (ii) awareness programme / training programme, (iii) implementation of development programmes, (iv) monitoring and evaluation, and (v) follow-up programme. The period required for implementation of these works is estimated as follows, based on their work volumes and referring to the relevant ongoing projects.

Implementation Period for Development Components

Major Project Works		Period (Years)
1. Mobilization of PMU (including CPCC & PPCC)		3 (months)
2. Awareness Programme		1.5
3. Implementation of the Development Components		
1) Strengthening of FO		2-5
2) Rehabilitation and improvement of irrigation facilities and farm roads	Major scheme	
	- Survey, design & tendering	2
	- Construction and supervision	2-3
	Medium or minor scheme	
	- Survey, design & tendering	1
	- Construction and supervision	1
3) Improvement of water management and agricultural activities		2-5
4) Strengthening of agricultural support facilities (farmer centre, etc.)		1-2
4. Monitoring and Evaluation (including base line survey, bench mark survey, workshop with farmers, PCM, monitoring of environment)		5-7
5. Follow-up Programme		0.5-1

Implementation Period for Each Priority Scheme

Schemes	Duration (Year)
Nachchaduwa Major Scheme	7
Palukadawela Major Irrigation Scheme	6
Periyakulama Medium Irrigation Scheme	5
Mahananneriya Medium Scheme	5
Mahananneriya Minor Schemes (Cascade)	5

19.2 Cost Estimate

19.2.1 Initial Investment Cost

The initial investment costs for the Project are estimated for each development programme as shown below. It is noted that costs for works to be covered by the normal activities of the government are excluded from the project costs.

Categories of Initial Investment Cost

Development Programme	Hardware		Software				Remarks
	Rehabilitation / improvement	Supporting facilities & equipment	Awareness / training	PMU	Engineering	Loan funds	
I. Development Programme							
1. Strengthening farmers' organisation							
1) Awareness programme and training programme for FO leader	-	-	●	-	●	-	Awareness programme is carried out for both government staff and farmers
2) Establishment of multi function FO	-	-	-	-	-	-	Activities by FOs under regular guidance of ASC. The programme is achieved through the activities of items 3 4)
3) Implementation of income generation and social services	-	-	-	-	-	-	
4) Construction of farmer centre	-	●	-	-	●	-	
2. Supplying irrigation water							
1) Rehabilitation / improvement of irrigation facilities and farm roads	●	-	●	-	●	-	Training programme for both government staff and farmers
2) Improvement of water management	-	-	●	-	●	-	
3) Strengthening of O&M of irrigation facilities	-	-	●	-	●	-	
3. Improvement of agricultural activities							
1) Promotion of crop diversification and improvement of yield	-	-	-	-	-	-	Activities by FOs. The programme is achieved through the activities of items 3 2), 3), and 4)
2) Strengthening of agricultural extension services	-	-	●	-	●	-	Establishment of demonstration farm and farmers' training, etc.
3) Improvement of marketing of farm input and output	-	-	-	-	-	-	Activities by FOs. The programme is achieved through the activities of items 11)
4) Improvement of access to credit services	-	-	-	-	-	●	Activities by FOs. The programme is achieved through the activities of items 11)
5) Forestation / wild elephant	-	-	-	-	-	-	Activities by FOs under regular guidance of ASC
4. Strengthening of farmer supporting system							
1) Strengthening of implementing agencies	-	●	●	-	●	-	Training programme for government staff. Rehabilitation / improvement of ASC, institutes for agricultural research and extension with provision of training equipment
2) Strengthening of supporting system for farmers and FOs	-	●	●	-	●	-	
3) Supporting programme for income generation	-	●	-	-	●	-	
II. Mobilisation of PMU and administration	-	●	-	●	-	-	Costs for administration, monitoring & evaluation, and environmental monitoring, etc.

Note: ● Investments for the Project

(1) Rehabilitation and Improvement Costs of Irrigation Facilities and Farm Roads

The rehabilitation and improvement cost of irrigation facilities including farm roads for respective schemes is estimated on the basis of the following conditions, mainly for economic evaluation of each scheme.

- Exchange rates used for the estimate are US\$ 1.0 = Rs. 71 as of January 2000.
- Direct cost for civil works are estimated by “Unit Rates for Construction works 1999 MIP” and “Rate Analysis for 1999 ID Kurunegala”.
- Overheads and profit factor is estimated at 26% of direct cost in major and minor schemes, and as 21% of direct cost in minor schemes
- The rehabilitation cost includes physical contingencies which is estimated at 10% of civil cost as pre-feasibility level estimates

The rehabilitation and improvement costs for the respective schemes were estimated as follows, and details are shown in Table 19.2.1.

**Rehabilitation and Improvement Costs of Irrigation Facilities and Farm Roads
(Excluding Price Contingencies and G.S.T.)**

Scheme	Area (ha)	Direct cost (Rs. 1,000)	Contingency (Rs. 1,000)	Total (Rs. 1,000)	Cost per ha	
					(Rs. /ha)	(US\$/ha)
Nachchaduwa major scheme	2,540	343,600	51,500	395,100	155,600	2,190
Palukadawela major schemes	956	51,000	7,700	58,700	61,400	860
Periyakulama medium scheme	91	16,200	1,600	17,800	195,600	2,750
Mahananneriya medium scheme	158	12,800	1,200	14,000	88,600	1,250
Mahananneriya minor scheme group	117	14,500	700	15,200	129,900	1,830
Total	3,862	438,100	62,700	500,800	129,700	1,830

Remarks : Exchange rate : US\$ 1.00 = Rs. 71, GST : Goods and Services Tax

(2) Costs for Rehabilitation and Improvement of Supporting Facilities and Provision of Equipment

The Project would be commenced with establishment of the PMU. Further, the Project provides various buildings, vehicles and equipment for strengthening of agricultural support system including agricultural extension, income generation, etc. Their capital costs were estimated as follows, and details are shown in Table 19.2.2.

**Costs for Rehabilitation and Improvement of Supporting Facilities and
Provision of Equipment (Excluding Price Contingencies and G.S.T.)**

(Unit : Rs. 1,000)

Items	Amount	Description
1 Mobilisation of PMU	200	Vehicle and Office equipment
2. Construction of farmer Centre	35,640	27 Nos., Floor space 140 m ² /no.
4. Strengthening of Agricultural Support Services		
1) Institutional Strengthening Programme		
- Logistic Support Strengthening Programme	700	Vehicle x 1, and computer x 1 for PODA/NCP & PODA/NWP

(continued)

- Upgrading of ISTI, Maha Illuppallama	9,900	Video camera (VHS) x 1, Video deck (VCR) x 2, TV x 1, Overhead projector & screen x 2, Printing machine x 1, Copy machine x 1, Bus (60 seats) x 1.
2) Strengthening of Farmers / FOs Support Facilities		
- ASC Strengthening Programme	300	Vehicles x 3, Renovation of building, Provision of Office / Training Equipment
- Strengthening of DAS	2,400	Vehicle : Anuradhapura DAS x 1, Kurunegala DAS x 1
3) Support programme for Income Generation		
- Upgrading of Seed Farm, Galgamuwa	11,150	Potting Shed x 2, Office x 1, Shade house x 2, Water storage tank x 1, Pumping station x 1, Irrigation System x 1, 4 t Truck x 1, Office / Training Equipment
- Upgrading of IFTC, Nikaweratiya	11,610	Training building(120 m ²) x 1, Hostel x 1, Manager quarter x 1, Dairy shed x 1, Dairy laboratory x 1, Mini bus x 1
- Strengthening of Aquaculture Extension Centre	3,250	Extension centre building x 1, Training equipment, Facilities for extension centre, Office equipment
4) Strengthening RPM Office	200	
5. Physical Contingency (5%)	5,230	
Total	109,780	

(3) Costs for Awareness and Training Programme

Costs for awareness and training programme for both the government staff and farmers are presented in the following table (see Table 19.2.3 for details).

Costs for Awareness and Training Programme (Excluding Price Contingencies and G.S.T.)

(Unit : Rs. 1,000)

Item	Amount	Description
1. Strengthening of Farmers' Organisations		
1) Awareness programme	16,000	Costs for both government staff and farmers
2) Training of FO's leaders	2,880	448M/M for facilitators, vehicle rental costs
2. Supplying irrigation water in accordance with schedule		
1) Training for construction supervision	870	Costs for both government staff and farmers
2) Training for water management	700	Costs for both government staff and farmers
3) Training for operation and maintenance	700	Costs for both government staff and farmers
3. Improvement of agricultural activities		
1) Strengthening of agricultural extension services		
- Field programme	11,430	Inputs (50% of necessary quantity), texts, and transportation costs for farmers
- Farmer training programme	1,650	Texts, and transportation costs for farmers
- Seed production programme	1,300	140 ha for paddy and 45 ha for OFC.
4. Strengthening of agricultural support programme		
1) Institutional strengthening programme for agricultural extension		
- Staff training programme	460	Participants: 25persons/course, 11 courses
- Institutional strengthening	7,600	Strengthening of coordination between farmers, extension staff, and researching staff
2) Strengthening of farmers / FOs support institutes		
- Induction & refresher training of DO/ASC	460	Participants: 25persons/course, 11 courses
- Induction & refresher training of farmer animator	460	Participants: 25persons/course, 11 courses
5. Follow-up programme	1,950	10% of items 1. 2), 2., and 3.
6. Physical contingency(5%)	2,320	
Total	48,780	

(4) Costs for Administration of PMU, Engineering and Capital of Loan

Costs for administration of PMU, capital of loan are estimated as follows: (see Table 19.2.4 for details)

**Costs for Administration of PMU, Capital of Loan
(Excluding Price Contingencies and G.S.T.)**

(Unit : Rs. 1000)

Item	Amount	Description
1. Administration Cost of PMU	56,280	Personnel cost, consumables, monitoring and survey cost
2. Capital of Loan	20,000	Capital for revolving loan
3. Contingencies (5%)	3,810	
Total	80,090	

The estimated administration costs of PMU are Rs. 56.3 million for 7 years. In connection with the improvement of access to credit, the group loan, and revolving loan, and mutual aid credit would be proposed. The loan capital will be arranged as described below.

Type of Loans	Arrangement of Capital of Loan
Group loan (Cultivation loan)	Finance from banks. The loan arrangement will be carried out by PMU.
Revolving loan (mid-term loan)	The capital of the loan is arranged by FOs' themselves. If capital is not enough, FOs obtain a loan from banks, and PMU supports to FOs for obtaining loan.
Mutual aid credit system	Finance from Women Bank

The engineering works including survey, planning, detailed design, etc. were estimated at 10% of rehabilitation and improvement, capital for project management and strengthening of support system, and awareness and training programmes.

(5) Total Project Cost

The total project costs including all irrigation schemes were estimated to be Rs.805 million, excluding price escalation. The costs per hectare was estimated at Rs.208,400 (US\$ 2,950), and the rehabilitation and improvement costs of irrigation facilities and farm roads account for 62% of total costs.

Total Project Costs (Excluding Price Contingencies and G.S.T.)

(Unit : Rs. Million)

	Commanding Area (ha)	Rehabilitation Cost*1	Capital for Support Facilities*1	Awareness and Training *1	PMU Administration and Loan*1	Engineering Cost*1	Total
Nachchaduwa	2,540	395.1	67.0	27.5	51.4	49.1	590.1
Palukadawela	956	58.7	27.6	12.2	19.9	9.8	128.2
Periyakulama	91	17.9	1.7	1.6	1.9	2.1	25.2
Mahananneriya	158	14.0	4.4	2.3	4.0	2.0	26.7
Mahananneriya Minor Group	117	15.2	9.1	5.2	2.9	2.8	35.2
Total	3,862	500.9	109.8	48.8	80.1	65.8	805.4
Proportional Extent		62%	14%	6%	10%	8%	100%
Cost per Hectare	(Rs./ha)	129,700	28,400	12,600	20,700	17,000	208,400
	(US\$/ha)	1,830	400	180	300	240	2,950

Remarks : *1 Including physical contingency Exchange Rate : US\$1.0 = Rs. 71

(6) Project Costs per Implementing Agency

Many government agencies at central and provincial levels will participate in the implementation of the Project. The project costs per implementing agency are as follows.

Project Costs per Implementing Agency (Excluding Price Contingencies and G.S.T.)
(Unit : Rs. Million)

Implementing Agency	Rehabilitation Cost	Capital for Support Facilities	Awareness & Training Programmes	PMU Administration and Loan	Engineering Cost	Total	%
IPEU	-	0.3	14.2	-	-	14.5	1.8%
PDOA / NCP	-	0.1	0.9	-	-	1.0	0.1%
PDOA / NWP	-	22.4	8.0	-	-	30.4	3.8%
DOI	485.7	-	2.3	-	-	488.0	60.6%
PED / NCP	-	-	-	-	-	0.0	0.0%
PED / NWP	15.2	-	0.1	-	-	15.3	1.9%
IMD	-	68.3	4.8	80.1	65.9	219.1	27.2%
DAS	-	5.4	1.7	-	-	7.1	0.9%
PDAPH / NCP	-	0.1	-	-	-	0.1	0.0%
PDAPH / NWP	-	9.8	-	-	-	9.8	1.2%
NAODA	-	3.4	-	-	-	3.4	0.4%
KARTI	-	-	16.7	-	-	16.7	2.1%
Total	500.9	109.8	48.7	80.1	65.9	805.4	100.0%

Note : * The costs for works to be covered by the normal activities of the government are excluded from the project costs.

(7) Annual Disbursement Costs

The annual disbursement programme of the Project costs is presented below. The detail of the cost for each irrigation scheme is shown in Table 19.2.5.

Annual Disbursement Schedule

(Unit : Rs. Million)

	Year							Total
	2002	2003	2004	2005	2006	2007	2008	
Rehabilitation Cost	-	-	224.5	185.5	90.9	-	-	500.9
Capital for Support Facilities	41.3	31.1	27.7	9.7	-	-	-	109.8
Awareness and Training Programmes	12.8	10.5	7.7	6.8	6.2	3.4	1.3	48.7
PMU Administration and Loan	8.4	8.4	14.8	14.2	14.2	11.6	8.5	80.1
Engineering Cost	13.2	13.2	13.2	6.6	6.6	6.6	6.5	65.9
Total	75.7	63.2	287.9	222.8	117.9	21.6	16.3	805.4
Price contingency	15.9	20.9	133.6	136.0	91.0	20.5	18.7	436.6
G.S.T. (12.5%)	11.4	10.5	52.7	44.9	26.1	5.3	4.4	155.3
Grand Total	103.0	94.6	474.2	403.7	235.0	47.4	39.4	1,397.3

Remarks : G.S.T. : Goods and Services Tax

The price contingency of the Project is set at 10% per year based on the average of the escalation rate of the retail price in Colombo in last 5 years (1994 – 1998)¹⁵.

¹⁵ Annual Report 1996 and 1998, Central Bank of Sri Lanka.

19.2.2 O&M and Replacement Cost

Annual operation and maintenance costs after completion of the Project are estimated at Rs.2,000/ha (Rs.1,000/ha for farmers' share and Rs.1,000/ha for government's share) for the major irrigation schemes and Rs.1,500/ha (all farmers' share) for the medium and minor schemes. Among the costs shared by the farmers, the amount of Rs.500/ha is allocated to an allowance for gate operators, named by Salaris. The remaining costs are used for the maintenance of irrigation facilities. The maintenance costs are composed of material and labour costs. They are in the ratio of 3 : 7. The estimated O&M costs of supporting facilities and equipment are 1 % of the investment costs.

The replacement cost are estimated, assuming that the steel gate of irrigation facilities, O&M equipment, vehicle, and equipment for extension and training will be replaced every 10 years, and buildings every 25 years.

CHAPTER 20 PROJECT EVALUATION FOR THE FEASIBILITY STUDY

20.1 General

The project evaluation for the development of the priority irrigation schemes was made to “economic evaluation” in terms of EIRR, “financial evaluation” consisting of cash flow analysis of the executing agency and farm budget analysis, and “socio-economic impact” obtained through implementation of the Project. The project evaluation was based on the following assumptions:

- a) As the project costs comprise primarily construction costs for rehabilitation of existing irrigation systems, the project life is assumed to be 25 years.
- b) All values are expressed in 1999 constant Sri Lankan Rupees. For internationally traded goods, prices were obtained from the latest World Bank Commodity Forecasts as appear in Global Commodity Markets (February 1999) while those for non-traded goods are based on domestic financial prices. Appropriate adjustments were made for freight, handling, processing and quality differentials.
- c) The exchange rate of US\$ 1.00= Rs. 71.00 (January 2000) is used.
- d) Given insufficient information to quantify many of the benefits from infrastructure and social amenities as well as environmental benefits, the economic analysis considers agricultural production from the rehabilitated works only. These consist of increased cropping intensity due to increased availability of water, increased yields due to more reliable water supply and the new additional cultivated areas as a result of increased water from the rehabilitated works.

20.2 Economic Evaluation

(1) Conversion Factors and Prices of Products

As mentioned in Chapter 12, the Standard Conversion Factor (SCF) was estimated using trade data (imports and exports values for the five most recent years) and is applied to all non-traded goods and services, in order to evaluate project costs and benefits in terms of world market prices. The calculated SCF is estimated at 0.95. Economic farm gate price of internationally traded commodities of rice and maize were estimated using international market price forecasts by IBRD in Global Commodity Markets¹⁶ in 1999 current prices. Namely, based on forecasted

¹⁶ Global Commodity Market, the World Bank, February 1999.

prices of these crops, international prices were adjusted for freight, internal transport and packaging to derive farm gate prices in the project area. Conversion factors were also estimated for agricultural inputs, namely for fertilisers, agro-chemicals and seeds as 0.84, 0.71 and 0.73, respectively. The shadow wage rate of unskilled labour was estimated at 0.55, based on the recent project which was implemented in the Study area. Financial prices were collected during the fieldwork at the farm gate and these prices for locally traded agricultural commodities were converted to economic values using the SCF.

(2) Economic Costs

Based on the financial project costs of the development of priority irrigation schemes, the economic project costs were estimated as follows.

Total Economic Costs			
	Financial Cost *1	Conversion Factors	Economic Cost
Rehabilitation and Improvement Costs	500.8	0.95	475.8
Project management and support facilities	109.8	0.95	104.3
Awareness and Training Programmes	48.8	0.95	46.3
Administration Cost	80.1	0.95	76.1
Engineering Cost	65.9	0.95	62.7
Total	805.4		765.2

Remark: *1 Excluding price contingency and GST

The steel gate of irrigation facilities, O&M equipment, vehicles, extension and training equipment will be replaced every 10 years, and facilities and buildings will be replaced every 25 years. Annual economic O&M costs of the irrigation facilities were estimated based on the financial O&M costs (Rs.2,000/ha/year for the major irrigation schemes and Rs.1,500/ha/year for the medium and minor irrigation schemes) multiplying by conversion factor¹⁷ of 0.67. Annual economic O&M cost for agricultural support facilities and equipment were estimated at 1% of those total investment costs.

(3) Economic Benefits

The net incremental benefit valued in economic terms is the increase in value of agricultural production as a result of the rehabilitation and improvement to the irrigation schemes. Based on the economic crop budgets of each crop under with and without project, the annual incremental benefit of each irrigation scheme was estimated below.

¹⁷ Conversion factor for economic O&M costs = material costs 30% x SCF 0.95 + labour cost 70% x SWR 0.55 = 67%

Total Annual Incremental Benefit

(Unit: Rs. million/year)

	Without Project	With Project	Incremental Benefits
Nachchaduwa Major Scheme	46.3	180.4	134.1
Palukadawela Major Scheme	14.9	47.7	32.8
Periyakulama Medium Scheme	2.3	5.1	2.8
Mahananneriya Medium Scheme	1.6	9.1	7.5
Mahananneriya Small Scheme Group	1.0	4.0	3.0
Total	66.1	246.3	180.2

As for the negative benefits, net income of two paddy cropping for the major schemes and one paddy cropping for the medium and minor schemes were deducted from the project economic benefits, assuming that dry season crop will be unable to cultivate during the period of rehabilitation works. No production foregone was estimated in the benefits because of no land acquisition for the project implementation.

(4) Economic Internal Rate of Return

Based on the project economic costs and annual incremental benefits, the EIRR, B/C, and B-C are estimated as follows. The B/C and B-C were based on a discount rate of 10%.

- 1) Economic Internal Rate of Return (EIRR) : 15.3 %
- 2) B/C (10% discount rate) : 1.53
- 3) B-C (10 discount rate) : Rs. 326 million

With an EIRR of 15.3%, the Project would be economically viable.

(5) Sensitivity Analysis

Project sensitivity in terms of EIRR was analysed in respect of changes in project cost and benefit as follows:

- 1) Project costs increase 10%.
- 2) Project costs increase 20%.
- 3) Generating of benefits delay in 1 year.
- 4) Target yields of crops decrease 10%.

The result of analysis is summarised below. The Project has no economic viability, if the costs increase 20% and the target yields of crops decrease 10%.

Result of Sensitivity Analysis (EIRR)

Project Costs	Project Benefits			
	Base	Benefits delay 1 year	Target yields decrease 10%	Benefit delay 1 year and target yields decrease 10%
Base	15.3%	13.5%	11.7%	10.4%
+10%	14.1%	12.5%	10.6%	9.5%
+20%	13.1%	11.6%	9.7%	8.7%

20.3 Financial Evaluation

20.3.1 Cash Flow Analysis

The cash flow analysis was made under the following conditions and on the assumption that MIP implements the Project under the financial co-operation from foreign aid agency.

- 1) Loan condition of foreign aid agency
 - a) Interest rate : 2.3 % per year
 - b) Grace period : 10 years
 - c) Repayment period : 30 years (including grace period)
 - d) Items not eligible for financing are as shown below.
 - General administration expense
 - Taxes and duties
 - Purchase of land and other real property
 - Compensation
 - Other indirect items
- 2) Raising capital other than foreign loan: the national treasury covers all the costs other than foreign-aid loans under the condition of no interest and no repayment.
- 3) Farmers' share
 - a) The farmers (FOs) bear 10% of total costs for their contract works.
 - b) The O&M costs for D- and F-canals of the major schemes and all irrigation facilities of the medium and minor schemes are covered by the Farmers, and the Government shares all O&M costs except for the above facilities.

Based on these conditions, the total fund requirement and internal raising amount were estimated as follows.

Raising Capital Costs of the Project

(Unit: Rp. Million)

	Foreign Loan	Treasury	Farmers' Share	Total
1) Rehabilitation and improvement of irrigation facilities and farm roads	470.4	-	30.5	500.9
2) Up-grading of agricultural support facilities and equipment	109.8	-	-	109.8
3) Awareness and training programmes	48.8	-	-	48.8
4) Administration costs of PMU and capital of revolving loan	21.0	59.1	-	80.1
5) Engineering services	65.9	-	-	65.9
6) Price escalation	381.2	37.9	17.5	436.6
7) GST (12.5%)	-	149.2	6.0	155.2
Total	1,097.1	246.2	54.0	1,397.3

*1 Capital of revolving loan

As seen in this table, the loan requirement from the foreign aid agency was estimated at about Rs.1,100 million (US\$15.4 million). The MIP's cash flow statement to this loan amount is presented in Table 20.3.1. The annual repayment of the fund is estimated to be Rp.56 - 80 million during the repayment period

from 11th to 30th year. Repayment of the fund will have to be made by subsidy from the Government.

20.3.2 Farm Budget under with Project

(1) Farm Budget Analysis

In order to evaluate the improvement of farm economy and to clear the farmers' capacity to pay for irrigation service charge, the farm budgets of farmers under with and without project conditions were analysed as follows.

Farm Budget Analysis

Holding size of irrigated paddy field	Present *1			With Project		
	Average	0.4-0.8 ha	Below 0.4 ha	Average	0.4-0.8 ha	Below 0.4 ha
(No. of samples) *2	210	68	38			
(Proportional Extent)	100%	32%	18%	100%	32%	18%
I. Extent of irrigated paddy field (ha/household)	<u>0.81</u>	<u>0.46</u>	<u>0.22</u>	<u>0.81</u>	<u>0.46</u>	<u>0.22</u>
II. Cultivated area (ha/ household)	<u>0.96</u>	<u>0.70</u>	<u>0.30</u>	<u>1.63</u>	<u>0.90</u>	<u>0.46</u>
1) Paddy-Irrigated Maha	0.63	0.44	0.20	0.73	0.41	0.20
2) Paddy-Irrigated Yala	0.14	0.10	0.02	0.55	0.31	0.15
3) OFC	0.05	0.10	0.03	0.21	0.12	0.06
4) Others	0.14	0.06	0.05	0.14	0.06	0.05
III. Farm budget (Rs./household/year)						
1) Gross income	130,100	93,600	66,900	187,500	133,300	85,500
- Farm income	53,000	22,400	11,800	101,600	56,500	28,200
- Non farm income *3	72,900	70,300	53,900	72,900	70,300	53,900
- Loan	2,400	700	900	11,200	6,300	3,100
- Others	1,800	200	300	1,800	200	300
2) Gross outgoing	97,600	66,200	63,600	116,800	81,200	71,300
- Production cost *4	33,200	13,800	6,200	41,300	22,700	11,100
- Loan repayment *5	800	600	500	11,900	6,700	3,300
- Living expenditure *3	63,500	51,800	56,900	63,500	51,800	56,900
- Others	100	0	0	100	0	0
3) Net income	<u>32,500</u>	<u>27,400</u>	<u>3,300</u>	<u>70,700</u>	<u>52,100</u>	<u>14,200</u>
(Bank deposit)	(3,900)	(1,300)	(1,400)			
IV. Incremental net income (Rs./household/year)				<u>38,200</u>	<u>24,700</u>	<u>10,900</u>
V. Salaris and O&M cost (Rs./household/year)*7						
1) Major schemes				<u>820</u>	<u>460</u>	<u>220</u>
- Salaris *6				410	230	110
- Material cost				120	70	30
- Labour cost				290	160	80
2) Medium & minor schemes				<u>1,260</u>	<u>690</u>	<u>330</u>
- Salaris *6				410	230	110
- Material cost				280	140	70
- Labour cost				570	320	150

*1 Present holding size, cultivation extent and farm budget in the table were obtained from the result of the farm economic survey carried out by the Study Team in 1999, and indicate figures of one year in the 1998 Yala and 1998/99 Maha seasons.

*2 Samples of questionnaire survey.

*3 Non-farm income and living expenditure under with project are assumed to same amount with the present condition.

*4 Excluding family labour.

*5 Assuming that farmers borrow group loan (cultivation loan) from the banks.

*6 Allowance of gate operator.

*7 O&M costs after completion of the project were estimated at Rs.2,000/ha/year for the major schemes (Rs.1,000 for farmers' share) and Rs.1,500/ha/year (all farmers' share). Out of the amount of farmers' share, Rs.500/ha/year is for the Salaris (same amount with the present), 30% for material cost and 70% for labour costs.

(2) Improvement of Farm Economy

Under the with project condition, an average gross income of farmers in all schemes would increase about 30-40%, and annual net incremental income would average Rs.10,000-38,000. These would be accrued from increasing cropping intensity with crop yields through the rehabilitation of irrigation facilities and strengthening of agricultural support services. As for the non-farm income accrued from the income generating programme, it is not included in the farm budget analysis, because no accurate and reliable information is available.

(3) Farmers' Solvency for Irrigation Service Charge

After completion of the rehabilitation works, irrigation facilities of D- and F- canals for the major schemes and all facilities for the medium and minor schemes will be maintained by the farmers themselves. All costs including material and labour required for O&M of facilities will be borne by the farmers. In addition, the farmers will shoulder all allowance (Salaris) for gate operator. In general, such irrigation service charge defined by the farmers is material cost, and Suramadana is not included in the charge. The farmers distinguish Salaris from the irrigation service charge. Therefore, the farmers' solvency for these costs was evaluated to the following two cases: i) bearing all of those costs including material, labour and Salaris by cash, and ii) paying only material costs.

In case of i), the farmers' solvency is evaluated to a ratio of the irrigation service charge including all costs (material, labour and Salaris) to the annual net incremental income under with project. As seen in the table of farm budget analysis, the irrigation service charge including all costs is estimated at Rs.220-820/year/household for the major schemes and Rs.330-1,260/year/houshold for the medium and minor schemes. These amounts account for below 5% of the annual net incremental income, which will enable almost all farmers to pay the irrigation service charge.

As for the case ii), the evaluation is based on the farmers' willingness to pay the irrigation services charge (material cost), because farmers' share of the charge is largely influenced by their willingness. According to the questionnaire survey and RRA carried out by the Study Team (see Section 12.3), more than half of the farmers have estimated at Rs.250/ha/year as its appropriate charge, and the majority of FOs' leaders have been Rs.500/ha/year. To such answers, the required amount of material cost under with project is estimated at Rs.150/ha/year for the major schemes and Rs.300/ha/year for the medium and minor schemes. These amounts are below estimation of FOs' leaders or similar levels with the farmers'

estimation so it can be concluded that the farmers will pay such amount for material cost, if the irrigation facilities are rehabilitated.

20.4 Socio-economic Impact

The development plan of the priority irrigation schemes aims not only at the rehabilitation and improvement of irrigation facilities but also at the comprehensive development for increasing social and economic levels in the communities. After implementation of the Project, various indirect benefits and socio-economic impacts are expected as mentioned below.

(1) Improvement of Farmers'/People' Income and Employment Opportunity

As a result of rehabilitation and improvement of irrigation facilities and strengthening of agricultural support services, the farmers' income will improve considerably through increasing of crop yields. In addition, it would be expected to improve employment opportunity and farmers'/people's incomes in consequence of the implementation of income generating programme consisting of home garden activities, livestock raising and inland fisheries, employment information system, job training, loan services (revolving loan) for self employment and small enterprises activities.

(2) Activation of Regional Economy

In addition to increase of production, marketing of farm inputs and outputs would expand through establishment of Pola and collecting points, introduction of co-operative shipping system, improvement of agricultural credits, etc. Farmers' purchasing power would increase along with improvement of farmers' income. All these would contribute to activate the regional economy.

(3) Poverty Alleviation

As the consideration toward the poor who are landless farmers, widow, etc., the income generating programme for them was planned as one of the development component, and its programme will be implemented by FOs. The implementation of this programme would contribute to alleviate poverty in the community. Moreover, the poor can access not only revolving loan planned in the income generating but also multi-aid credit, and such financial support would also be able to improve the poor.

(4) Empowerment of Women

It was proposed to appoint women's leaders in the subcommittee of income gen-

eration / social services organised in FO. This is to provide “place” and “organisation” for women’s equal activities with men in the community. In addition to such programme, multi-aid credit managed mainly by women’s groups was recommended. These would certainly enable improving social status of women in the community.

(5) Reduction of Social Problems in the Communities through FOs’ Social Support Services

A serious problem in the community from women standpoint is men’s drinking (alcohol). The causes of this problem are low income, unemployment (no regular occupation), etc. The Project will improve farm income and employment opportunity through the rehabilitation of irrigation facilities and income generating programme. Moreover, as the autonomous and representative organisation in the community, the subcommittee of income generation / social services consisting of women’s leaders is to be established in FO as mentioned above, and will cope with this problem. These activities would contribute to reduce such social problem.

(6) Reduction of Elephant Damage

At present, damage by elephant is also a serious problem in the communities. The Project proposed to take systematic measures by FOs and involving all villagers, and the measures would contribute to reduce its damage.

(7) Environmental Conservation

Deforestation and soil erosion due to expanding and continuous chena cultivation in the catchment area has become a problem for the environment. It is caused by increasing dependence of villagers to the chena due to low income. The Project would enable to increase people’s income through improvement of land productivity and employment opportunity by the rehabilitation of irrigation facilities and the income generating programme. Therefore, the Project would be able to reduce the people’s dependence on chena.

At present, over application of fertilisers and agro-chemicals is seen in a part of the major irrigation schemes. Although no water pollution is found in these areas so far, it will be necessary to take some measures. In the extension programme to the farmers, it was planned to implement training on proper use of fertilisers and chemicals. It would be possible to raise farmers’ awareness on environment and to mitigate likely water pollution in the future.

(8) Capacity Building-up of Staff Concerned

The development plan includes the following programmes: i) training on participatory planning to officers of the executing agencies concerned, ii) training on agricultural extension to officers related to agriculture, livestock and inland fisheries, and iii) training to officers of the department of agrarian services (staffs for strengthening of FOs). Such capacity building to them would be helpful largely to implement other development projects in the future.

(9) Effect on Strengthening of Extension System to Other Area

The plan for agricultural support services includes upgrading and strengthening of IPEU and PDOA offices, Galgamuwa seed farm (nursery tree), ISTI (Maha Illupallama), IFTC (Nikaweratiya), Aqua-culture Extension Centre (Anuradhapura). This strengthening and improvement plan would enable activating support services not only in the 100 irrigation schemes but also in those surrounding schemes.

(10) Ripple Effect as Model Development in the Dry and Intermediate Zones

A characteristic of this Project differing from others is “implementation of awareness programme” and “strengthening of FOs which play an important role on sustainable development of rural agriculture” through its programme. Prior to commencement of the Project, the awareness programme is implemented to both officials concerned and FOs’ leaders for improving their awareness on participatory development and building-up its implementing system. Secondly, the farmers/community people review the development component proposed in this report, then take up them into their own action plan. At the final stage of the awareness programme, the farmers/community people reorganise FO as an autonomous and representative organisation in their community, and the action plan is implemented by this FO. The government agencies concerned will support FOs by the participatory approach for raising farmers’ self-reliance. As a model project, this development approach would have a considerable ripple effect on development of the irrigation schemes in the dry and intermediate zones.

CHAPTER 21 CONCLUSIONS AND RECOMMENDATIONS FOR THE FEASIBILITY STUDY

21.1 Conclusions

Based on the result of the Master Plan Study, the following priority schemes were selected for the feasibility study: Nachchaduwa major scheme, Palukadawela major scheme, Periyakulama medium scheme, Mahananneriya medium scheme, and Mahananneriya minor scheme group consisting of 6 minor schemes. Total commanding area of all these schemes was estimated at 3,860 ha. The numbers of beneficial farm household and population were estimated at 5,500 and 18,000, respectively. As the participatory development, the workshops based on PCM method were held at these schemes, and the participants, consisting of farmers and officers related to the project, identified and selected the overall goals, project purpose and activities, as shown in the following table. The development plan (component) was formulated in accordance with these results. In addition, the strengthening of the agricultural support services necessary for increasing crop production and promoting income generation was also planned in the Project.

<i>Overall Goal</i>
Achieving sustainable development of regional agriculture
Improving agricultural productivity of the rural community
<i>Project Purpose</i>
Socio-economic status is improved.
<i>Activities</i>
1) Strengthening FOs.
Implement awareness and training programmes.
Reorganise FOs to have multi function.
Implement income generation and social services through FOs.
Construct Farmer Centres
2) Supplying irrigation water in accordance with schedule.
Rehabilitate and improve irrigation facilities.
Improve water management.
Strengthen O&M of irrigation facilities.
3) Improving agricultural activities.
Promote OFC cultivation.
Strengthen agricultural extension services.
Improve marketing of farm inputs and outputs.
Improve access to credit services.
Promote reforestation in the catchment area.
Establish surveillance system of wild elephant in FOs.

With exception of price escalation and GST, total project cost including all components amounts to Rs.805 million (US\$ 11.3 million). As the result of economic evaluation, EIRR of the Project is estimated at 15.3%. It is concluded that the Project is economically viable and technically feasible.

Under the with project condition, the average gross income of farmers in all priority schemes would increase about 40% from the present level, and the annual net incremental income would average Rs.38,000/household. For the small farmers having irrigated paddy field less than 0.4 ha, their gross income would also increase about 30%, and their annual net incremental income would be Rs.10,900/household.

In addition, various indirect benefits and Socio-economic impacts would be expected by implementing the Project, as mentioned below.

- 1) Improvement of the farmers'/people's non-farm income and employment opportunity, and poverty alleviation through the income generating programme.
- 2) Activation of regional economy through increasing of production and improvement of marketing and rural credits.
- 3) Empowerment of women in their activity and social standing through establishment of the FO's sub-committee on income generating / social services managed by women's leaders.
- 4) Reducing of social problems (drinking problem) by FO's social support services.
- 5) Reducing elephant damage by taking FOs' systematic measures.
- 6) Mitigation of deforestation and soil erosion in the catchment area by FO's reforestation (planting of fruit trees).
- 7) Manpower development of staff concerned by implementing awareness and training programmes.
- 8) Effect on strengthening of extension system to other area.
- 9) Ripple effect as the participatory development in the dry and intermediate zones.

21.2 Recommendations

- (1) Implementing of Priority Scheme Development as the Pilot Project of the Master Plan Area

A main point of the development plan in both the Master Plan and Feasibility studies is to the awareness programme during the period of 1-1.5 year at the initial development stage. By the implementation of this programme, participatory development system is established in the Government side, and FOs are strengthened as the core of sustainable development of the regional agriculture. Therefore, it is proposed to implement firstly the development of the priority as the pilot project, so that an implementing system of participatory development is built up. Secondly, the development of master plan area is commenced based on the system

established.

In addition, the number of farmer centres proposed in the Master Plan area will need to review in view of utilisation of the centres to be constructed in the Feasibility Study area as the pilot project. It is proposed to provide few numbers on the Feasibility Study area, and review the total number in the Master Plan area based on experience of the pilot project.

(2) Implementing Comprehensive Development

The benefits obtained from the rehabilitation programme of irrigation facilities will be limited to landholders, and the larger holders will take more big benefits than the smaller landholders. Taking into account the fair and equal development in the community, it was decided to adopt comprehensive development including not only rehabilitating irrigation facilities but also promoting income generation for the poor and providing social services by FOs. In addition, it was also planned to strengthen FOs into multi-functional organisation and upgrading of the government agencies concerned, in order to promote its development. Therefore, it is proposed to implement comprehensively the Project including all of them. Moreover, the priority schemes consisting of five areas should be developed as one unit, because individual development of priority scheme will bring about over investment on upgrading of the government agencies concerned.

(3) Establishment of Project Co-ordination Committee

The Project Management Unit (PMU) established under the Ministry of Irrigation and Power has direct responsibility for the implementation of the Project. However, many government agencies at central and provincial levels will participate in the implementation of this Project consisting of various programmes. In order to co-ordinate all these agencies at central and provincial levels, it was planned to establish the Central Project Co-ordination Committees (CPCC) in the central government and the Provincial Project Co-ordination Committee (PPCC) in the provincial government. The role of CPCC and PPCC is very important in order to have smooth and effective implementation of the Project. Therefore, it is recommended to establish these co-ordination committees before commencement of the Project.

(4) Demarcation of Agencies' Activities/Services Concerned

Many government agencies participate in the implementation of the Project, as mentioned earlier. However, scopes of their activities are not distinct among them, and overlap with others. Especially, three agencies of DAS, IMD and ID

have unclear demarcation on support services to FOs. In order to implement the Project smoothly and invest the project costs efficiently (especially foreign loan), it is necessary to make a clear distinction on their activities/duties among them.