CHAPTER 6 CONSTRAINTS OF COMMUNITY AND NEEDS FOR DEVELOPMENT DERIVED FROM FARMERS

6.1 Farmers and RRA Workshop

RRA workshop sessions with presence of farmers were conducted as farmers' participatory approach to the Study. RRA procedures are described in Chapter 5 and summarised below. Details of the workshop are described in Appendix B.

(1) Objectives of the Workshop

The workshop was conducted with the following objectives:

a) To grasp constraints of community derived from farmers as beneficiaries,
b) To grasp needs for development derived from farmers,
c) To grasp development concerning organisations and person derived from farmers, and
d) To uplift awareness of farmers' participation to the Project through the workshop.

(2) Procedures Applied for the Workshop

The workshop sessions were held for common farmers except board members of FOs as well as for board members of other community organisations to grasp constraints and need of the communities in the Study area as widely as possible. Each session commenced with explanation of purpose of the Study and purpose of the workshop as farmers' participatory approach by the Study Team to the attendants. Free-discussion-style workshop among the attendants and the specialists of the Study Team followed for each objective from a) to c) in the previous paragraph. The objective d) was not directly concerning to the results of the workshop since it was general and ideological objective from the beginning of the Study. The workshop sessions were conducted in the period from the end of May to the beginning of July 1999 by one day one session.

(3) Numbers of the Workshop Session

Total number of the workshop sessions were 100 for entire irrigation schemes. Scales of each scheme were varied widely and therefore density of the workshop was so decided to grasp farmers' opinion evenly. Three sessions were held at a major scheme, two or three at a medium scheme, and four or five sessions within a cascade system for minor schemes. Number of workshop sessions held is shown below and further details are shown in Table 6.2.1.

Numbers of the Workshop Session

	Nos. of Scheme	Nos. of Household	Nos. of Session
Major Scheme	8 Schemes	18,100	28
Medium Scheme	12 Schemes	1,800	26
Minor Scheme	9 cascades (80 Schemes)	5,400	46
Total	100 Schemes	25,300	100

(4) Number of Attendants to the Workshop

As stated above, attendants to the workshop are common farmers and board members of other community organisations. Number of attendants to the workshop is summarised below and further details are shown in Table 6.2.1. At several schemes such as Uttimaduwa Wewa and Mahananeriya Wewa medium schemes, only 4 - 5 farmers attended the workshop since opening-time of the relevant session accidentally overlapped with harvesting period.

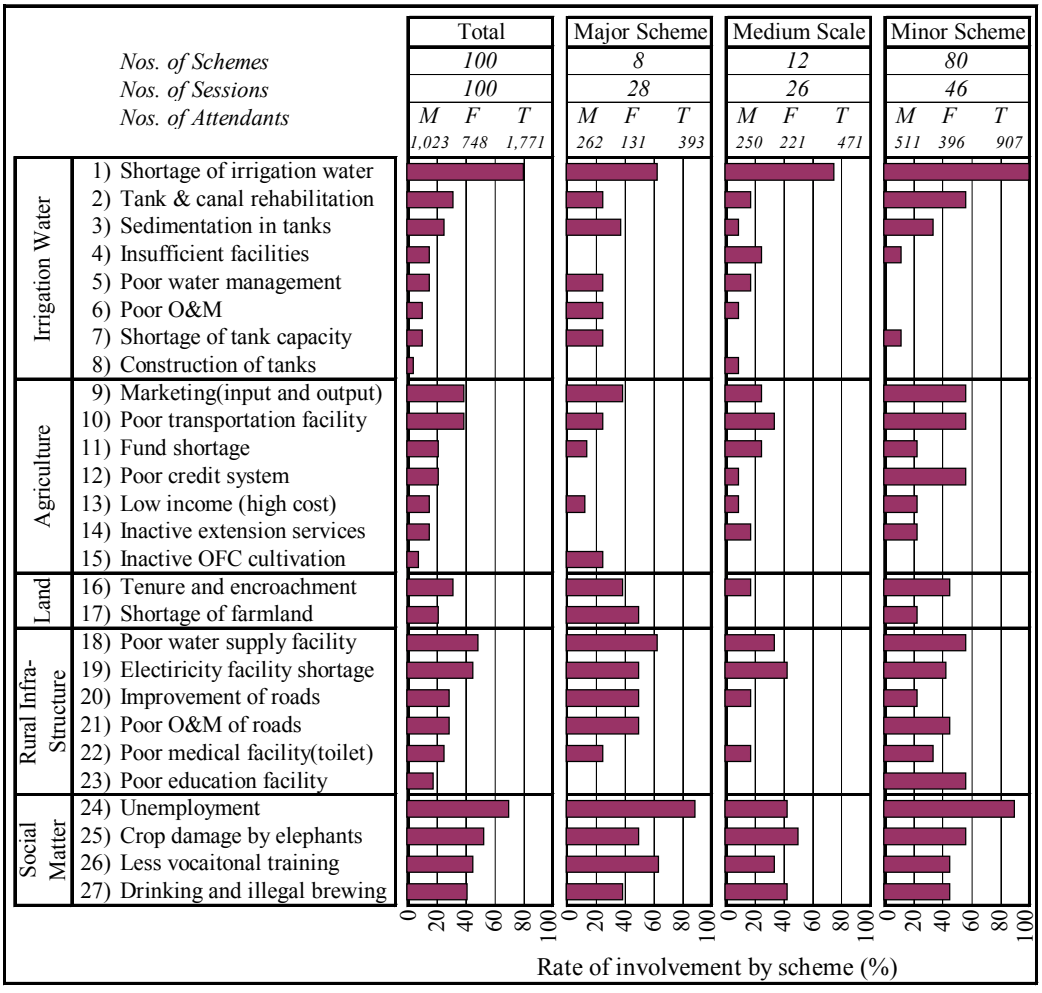
Number of Attendants to the Workshop

	Nos. of Schemes	Nos. of Session	Nos. of Attendants		
			Male	Female	Total
Major Scheme	8	28	262	131	393
Medium Scheme	12	26	250	221	471
Minor Scheme	9 cascades (80 Schemes)	46	511	396	907
Total	100 Schemes	100	1,023	748	1,771

6.2 Constraints of Community

The constraints pointed out in the workshop sessions were categorised into i) irrigation water resource, ii) agriculture, iii) land, iv) rural infrastructure, and v) social problem as shown in the following figure. Scheme wise constraints are listed in Table 6.2.1.

Constraints of Community derived from Farmers (Result of RRA Workshop)



Source: RRA workshop conducted by the Study Team (1999) Note: M:Male F:Female T:Total

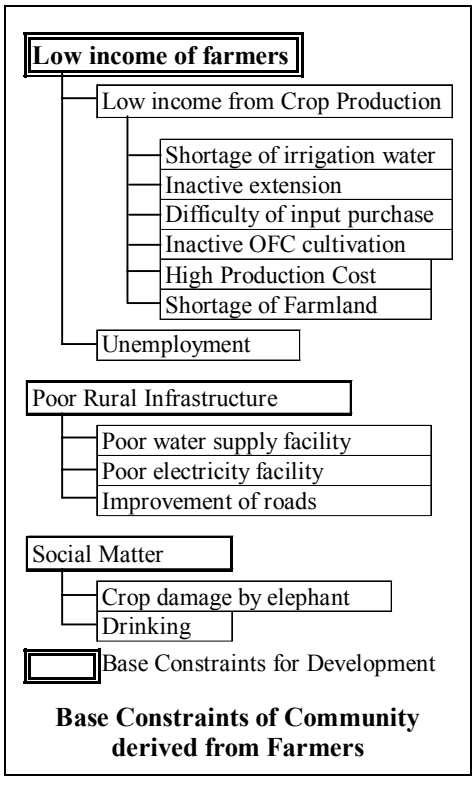
Category wise distinctive feature of the constraints is described below.

Distinctive Feature of Constraints by Category

Category	Distinctive Feature of Constraints
Irrigation Water	● Shortage of irrigation water was recognised as one of the biggest constraints throughout all sessions. Constraints regarding water management, O&M matter and deterioration of facilities as one of the reasons of water shortage was scarcely discussed. Such distinctive features above can be conceived that the other constraints than water shortage are still serious but that farmers accuse only water shortage as combined constraints of all.
Agriculture	● Low productivity of crop was not discussed in detail. However, constraints discussed regarding extension activities, marketing of farm inputs, capital fund and so on are much related to the productivity. Therefore, low productivity is likely considered as underlying them.
Land	● Constraints discussed regarding land tenure were 1) short tenancy for a crop season, 2) Fractionation or fragmentation of farmland and 3) Land tenancy in the upstream area of tanks.
Rural Infrastructure	● Electricity and water supply were the main topics. Local distribution network of electricity has reached most villages but connections to individual houses are delayed since the connection cost is fully user's burden. ● Most of houses have own wells for water supply but limited numbers of wells in a village can supply potable water during Yala season when water quality is subject to degradation. ● Farm roads were also focused in the category for the purpose of products' transportation out from farmland.
Social Problem	● Unemployment was discussed as the second serious matter to water shortage in the sessions. Damage by elephant followed. Particularly women participants pointed out drinking as current problem in villages.

Overall results of the workshop were:

1) There were no significant differences generally in the contents of discussion by scale of major, medium, and minor schemes.
2) The participants to the workshop spent the longest time to discussing water shortage problem and secondly to unemployment / low employment opportunity problem.
3) The participants hardly discussed about farmers' organisation matter in the sessions at any scale of schemes. The fact never means that there are no problems in that regard. Probable reasons are that the participants intentionally avoided to mention negative statement toward leaders of the community to which the participants belong but intended to point out constraints related external institutions with FO.



Base Constraints of Community derived from Farmers

4) As a whole, 27 items were discussed in the workshop but participants did not discuss further regarding their reasons and consequences.

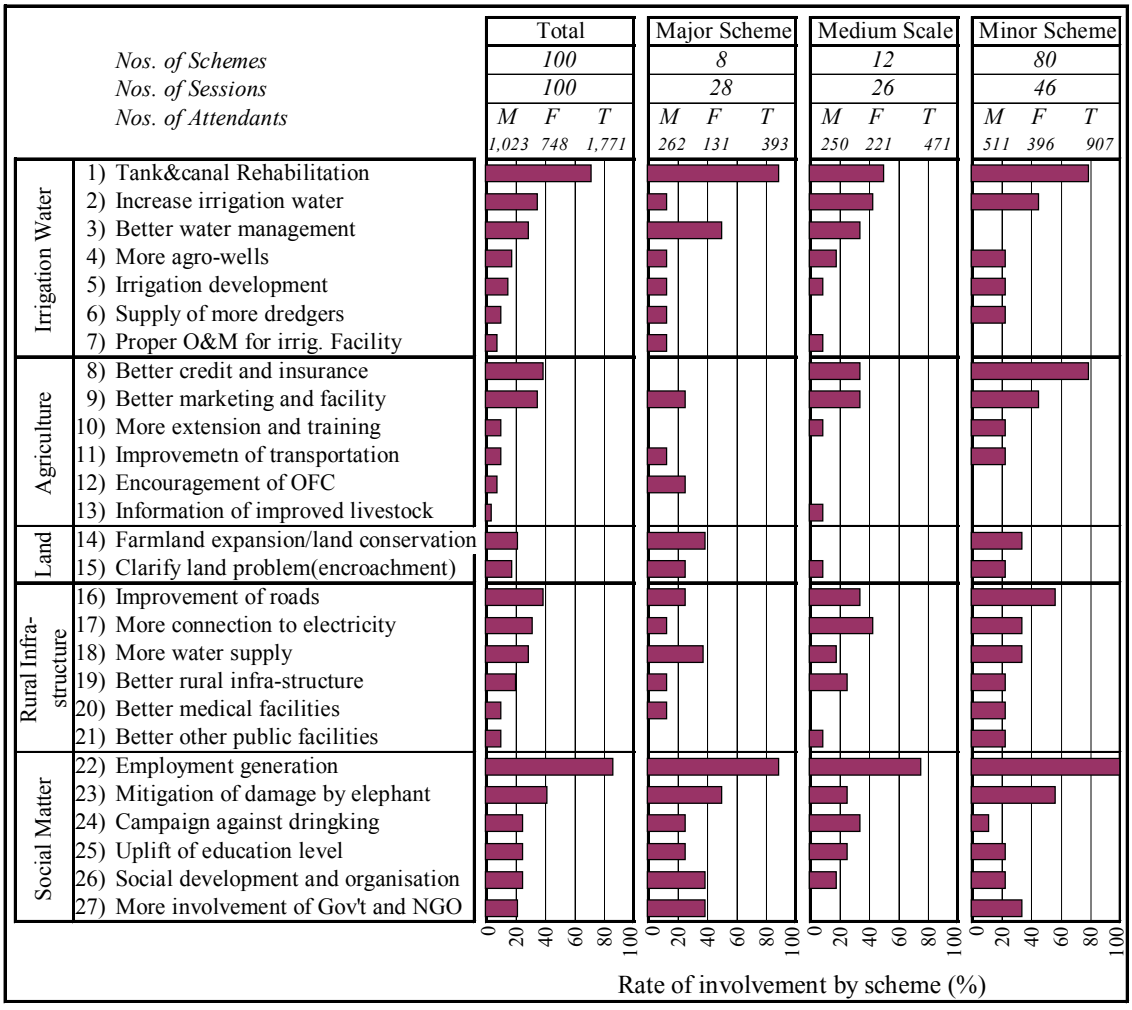
Base constraints of the irrigation schemes were analysed according to these results. The constraints by each scheme are listed in Table 6.2.2 and summarised in the above figure. Farmers recognised shortage of irrigation water and unemployment / low employment opportunity as the most significant problems and both lead to "low income of farmers." "Low income of farmers" is thus defined as base constraint of the Project.

Following the two major constraints, poor situation of water supply, electricity, and roads follow. Further, women attendants particularly pointed out damage by elephant and drinking problem.

6.3 Needs for Development

Following the discussion on constraints, development needs were discussed among the participants. Results of the discussion are summarised in the figure below and scheme wise details are listed in Table 6.3.1.

Development Needs derived from Farmers (Result of RRA Workshop)



Source: RRA workshop conducted by the Study Team (1999) Note; M: Male F: Female T: Total

The development needs pointed out in the workshop sessions were categorised into i) irrigation water resource, ii) agriculture, iii) land, iv) rural infrastructure and v) social matters, same as constraints. Category wise distinctive features of the development needs are described below.

Distinctive Feature of Development Needs by Category

Category	Distinctive Feature of the Development Needs
Irrigation Water Resource	- Shortage of irrigation water was recognised as one of the biggest constraints throughout all sessions. Constraints regarding water management, O&M matter and deterioration of facilities as one of the reasons of water shortage was scarcely discussed. Such distinctive features above can be conceived that the other constraints than water shortage is still serious but that farmers accuse only water shortage as combined constraints of all.
Agriculture	- Low productivity of crop was not discussed with strong intention. However, constraints discussed regarding extension activities, marketing of farm inputs, capital fund and so on are much related to the productivity. Therefore, low productivity is likely considered as underlying them.
Land	- Constraints discussed regarding land tenure were 1) short tenancy for a crop season, 2) Fractionation or fragmentation of farmland and 3) Land tenancy in the upstream area of tanks.
Rural Infra-structure	- Electricity and water supply were the main topics. Local distribution network of electricity has reached to most of villages but connections to individual houses are delayed since the connection cost is fully user's burden. - Most of houses have own wells for water supply but limited numbers of wells in a village can supply potable water during Yala season when water quality is subject to degradation. - Farm roads were also focused in the category for the purpose of products' transportation out from farmland.
Communal Matter	- Unemployment was discussed as the second serious matter to water shortage in the sessions. Damage by elephant followed. Particularly women participants pointed out drinking as current problem in villages.

Overall results of the workshop were:

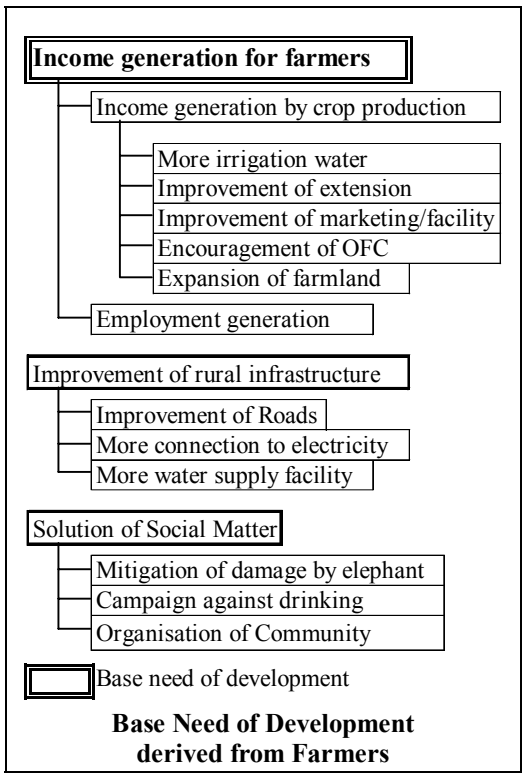
1) Many needs for development were discussed in the workshop and there were no significant differences in the contents of discussion by scale of major, medium, and minor schemes generally.

2) Among many needs for development, the attendants desired realisation of improvement of tanks and canals as well as solution of unemployment. Income generation is thought to be underlying below the desires. It was conceived that the farmers need stable income by improvement of irrigation facilities and income generation from other industries in addition since annual agricultural production in arid or semi-arid zone tends to fluctuate widely and therefore income is unstable.

3) The participants hardly discussed about farmers' organisation matter in the sessions at any scale of schemes though they mentioned organisation of community as need for development.

4) As a whole, 25 needs were discussed in the workshop but participants did not discuss further regarding relations to their methodology.

Base need was analysed according to these results above. The constraints by each scheme are listed in Table 6.3.2 and summarised in the figure below on the right. The farmers stated shortage of irrigation water and unemployment as constraints of community in the previous section. Correspondingly, they desired increase of irrigation water supply and generation of employment as need for development intensively. Increase of irrigation water supply leads to uplift of productivity, which is currently very low. Solution of unemployment targets increase of income from other industries. Base need for development analysed from the discussion above is income generation for farmers.

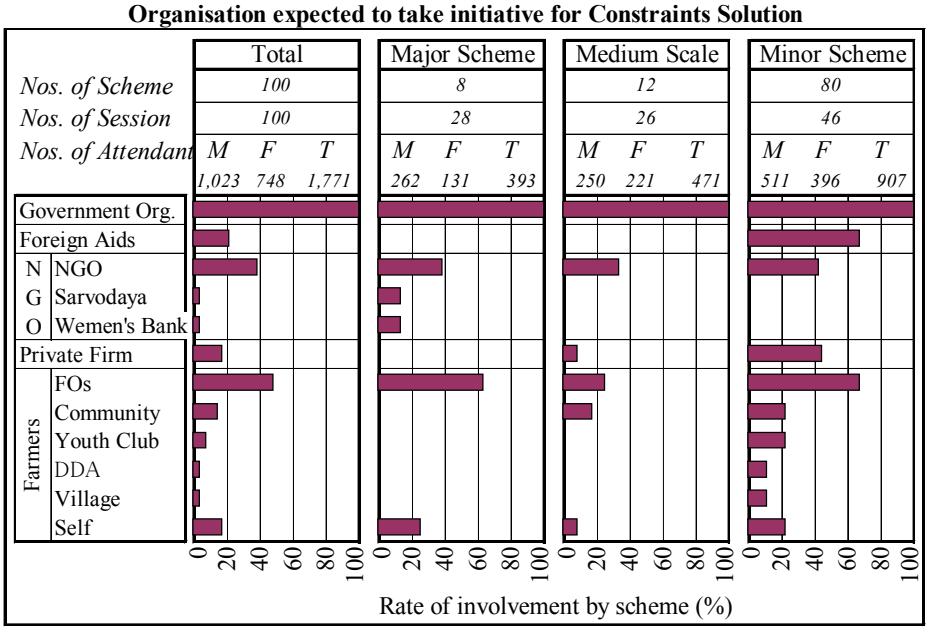


Base Need of Development derived from Farmers

As items for improvement of rural infrastructure, the farmers mainly desired four items namely as road, electricity, water supply and medical facilities. Though most farmers recognised such four items as constraints of community, they did not discuss the items much as needs for development. Rather, they desired to reduce damages by elephant. The farmers did not discuss much about drinking problem though most of them recognised it as considerable constraints of community on the other hand.

6.4 Development Concerning Organisation

Arguments about whoever or whatever organisations would take initiative on implementation of the countermeasures to solve the constraints and meet the need of development also took place in the workshop. The results of the argument are shown below.



Source: RRA workshop conducted by the JICA Study Team (1999)

As envisaged in this figure, most farmers expect that Government organisations or agencies take initiative for constraints solution. Secondly, they expect FOs involvement and they hardly recognise themselves to take initiative. From these results, it is obvious that farmers heavily depend on outside agencies, particularly on Government organisation or agencies.

6.5 Results of RRA Workshop and Its Evaluation

According to the analysis of the RRA workshop result, "Low income of farmers" is thus defined as base constraint of the Project and base need for development is income generation for farmers. The following problems were identified through RRA workshop sessions:

a) Farmers (the attendants) generally discuss topics concerning Government organisations or agencies and their officials but tend to show negative attitude to mention matters directly concerning habitats in the same community. Namely, they eagerly discussed about constraints or needs toward outside but hardly talked about FOs' problems which may lead to criticise leaders of FOs.

b) Most constraints and needs were discussed passively in the sessions. Namely, most discussions stayed at such a level of what Government could do for us. Few of them mentioned what the farmers (or the attendants) can do.

c) Most constraints and needs discussed in the sessions stayed within matters to which farmers (or the attendants) directly faced. Further discussions hardly occurred regarding constraints-reason or need-measures

relations on a logical basis. From different point of view, regarding priority of the constraints or need, farmers tended to select current topics directly concerning to themselves but hardly tried to grasp what was the base constraint or base need as a whole group of attendants. Finally, it was difficult to reach a consensus among the attendants.

From these arguments, it is concluded that grasp of constraints to which farmers are facing is possible by the results of RRA sessions and that preparation of a master plan as a farmers' participatory development project consequently. As stated above, further discussions than the level to which farmers directly relate or face currently. Therefore, deeper analysis of constraints and needs from farmers' view points will be conducted by the Study Team considering development potential as well as elements of interference derived from analysis of the results of inventory surveys and questionnaires in addition to the results of RRA workshop.

It was recognised that the attitude of farmers (the attendants) at RRA sessions was passive toward the development and that they strongly tend to depend on outside organisation or agencies. Therefore, upon implementation of participatory development projects under such situation, it was judged that reformation of farmers' sense is prerequisite. For the side of the Government organisations or agencies concerned with the project, alteration of implementation procedures may also be necessary. Namely, though many projects have been implemented under participatory approaches, the projects have not change farmers passive attitude to the project as top-down-style projects have lead to as envisaged in the results of RRA workshop.

CHAPTER 7 CONSTRAINTS AND DEVELOPMENT POTENTIAL

7.1 Problems and Major Constraints for Agriculture Development

In Chapter 6, problems of the communities are identified. The problems and constraints on the development are reviewed based on the results of the field survey conducted by the Study Team in the Study area and 100 irrigation schemes. The results are summarised in the table below. The review was carried out from the information obtained by the Study Team from i) field investigation, ii) present situation from the inventory survey and the interview survey, iii) case study of past and on-going development projects within the Study area, and iv) information of the public institutions and private sector such as banks.

Problems and Development Constraints in the Irrigation Schemes
Survey Result of the Study Team

(1) Farmers' Increasing Dependence on Outside Support	Farmers have a general tendency to depend on outside sources for O&M of irrigation facilities and agricultural supporting services. 1) Difference between the farmers' and the government's views on O&M of the facilities The Government intended that O&M of the facilities should be carried out by farmers, however, farmers feel that it should be done by the Government. The support services for O&M had been done by the Government, so the farmers have become to feel that the works should be done by the Government too. 2) Superficial Participatory Approach Many development projects that have been implemented in the Study area had used the beneficiaries' participatory approach. However, the actual approach used at the field level is the "top down" system. 3) Rigid Implementing Plans of the Development Projects The rigid and inflexible implementation of plans, in terms of schedule and budget, meant that almost all farmers' views that did not match the plan had been rejected, and the agencies' own plan had been implemented without any explanation to farmers. The farmers have driven them to an increase dependence on the outside support.
(2) Weak Farmers' Organisation	In the Study area, FOs have been established in almost all irrigation schemes under the leadership of the Government. These organisations, however, are presently confronted with various problems as outlined below: a) Farmers' participation ratio in the activities of the farmers' organisations is very low, because there is no merit in joining FO, increase of "Ande" farmers and absentee landowners, scattering of farmers' houses over a wide area b) FOs' activities in O&M of irrigation facilities are weak

(to be continued)

	c) FO leaders lack experience in FO management d) Poor communication between leaders and members e) Farm-animators who are responsible for strengthening of FOs have no experience f) No practical training has been provided to FO leaders and animators
(3) Unclear Legal System on Water Management and O&M of the Facilities	Regarding of water management and O&M of the facilities, the Irrigation Ordinance and the Agrarian Services Act are enacted. However the following issues are unclear: a) Water management and O&M by FOs is legally unclear b) Unclear charging system of O&M fee to farmers c) No clear punishment rule for water stealing, damages facilities etc.
(4) Complicated Supporting Services of Agencies Concerned	Many government agencies involved in providing agricultural support services. These support services are very complicated, not co-ordinated and overlapped. In many instances, these services are provided unilaterally to the farmers, with no plan to develop farmers' self-reliance.
(5) Decline of Farm Income due to Subdivision and Fragmentation of Lands	Farm incomes have decreased mainly due to the subdivision of land and the present holding size is not enough to obtain a sufficient income from crop cultivation. There are many instances where farmers have abandoned crop cultivation of scattered land at remote plots and unprofitable crop cultivation.
(6) Price Fluctuation and Increasing Production Costs of OFC	The prices of OFC have fluctuated largely depending on the demand and supply. In addition, the production costs have increased remarkably together with increasing labour charges. Farmers hesitated to cultivate OFC extensively due to low profitability.
(7) Changes in the Traditional Village Community	Traditional customs in the village community has changed with the introduction of the money economy, the adoption of new cultural characteristics, improvement of communication, contacts with the outside world and non-agricultural income and diversification of value. Water management, O&M of the facilities and farming works by 'Shramadana' (without any payment) and 'Attam' (mutual exchange of labours between farmers and without any payment) become difficult according to change of the traditional and cultural diversification.
(8) Constraints for the Rehabilitation of Irrigation Facilities	1) There was a significant difference between FO rehabilitation requests, and what is actually being implemented under rehabilitation by the limitation of budget and time. 2) Inadequate government supports on the management of quality, term and finance to the farmers' contract rehabilitation work. 3) Low quality of the contractor's work.

(to be continued)

(9) Unused Resources in Community	Farmers' own considerable area of fallow land and homestead in the irrigation scheme. The area per household is as follows and it is not effectively utilised. Homestead (ha/H.hold): Major 0.43, Medium 0.43, Minor 0.42, Whole 0.42 Fallow land (ha/H.hold) 1) Maha: Major 0.09, Medium 0.38, Minor 0.26, Whole 0.26 2) Yala: Major 0.59, Medium 0.69, Minor 0.60, Whole 0.61 Fish culture is also possible in the reservoir though not in use in many place.
(10) Constraints in Agricultural Extension	A sort of confusion occurred in the major parts of the sector, food and horticultural crops and livestock, at field level caused by the devolution to the provincial authority. a) Co-ordination and collaboration between central and provincial institutions and among institutions involved in agricultural extension are still weak. b) Farmer participatory approach has been taken, but the system is not established yet due to limited manpower and farmers' attitudes still remain only as beneficiaries of programs, not as participants. c) Research-extension linkage in the food crops sector is still weak d) Extension or supporting systems for the livestock and fishery sector has not been established. e) Insufficient deployment of extension staff at the field level.
(11) Constraints in Agricultural Credit	1) Constraints Faced by Lending Institutions a) High administration/transaction costs involved in maintaining a large portfolio of small loans b) Lack of information of repayment ability causes default c) Existence of a substantial number of defaulters of past credit in the rural community d) Existence of wilful defaulters who may be waiting for a loan forgiveness by the government 2) Constraints Experienced by Borrowers a) Not familiar with the lending and recovery procedures adopted by banks b) Lack of collateral or security demanded by banks c) Failure to meet eligibility criteria set by banks d) Supplemental security insisted by bank, such as, issuance of crop insurance e) Lack of bank branches, still long distance to the branch.

7.2 Development Potential for Future Agricultural Development

Farmers' needs for the development are identified in Chapter 6. The development potential in the irrigation schemes is reviewed in order to identify, whether it is possible to realise their needs and what sort of development plan is possible, based on the results of the field survey in the target area and the 100 irrigation

schemes. The results are summarised as follows.

Development Potential for Future Agricultural Development

(1) Agro-ecological Resources	Although the water resources in the Dry Zone are limited, the Study area has much scope for development through rehabilitation and improvement of the existing irrigation systems, improvement of water management, and extension of appropriate crop cultivation in accordance with the agro-ecological zones recommended by DOA. Approximately 60% of the area is possible to cultivate OFCs almost throughout a year according to the agro-ecological classification and 25% of the area is also favourable for OFC in the Yala season. Such OFC production in the area will bring an excellent result for improving the farm economy.
(2) Rehabilitating and Improving Potential of Irrigation Facilities	Most of the irrigation schemes require a great deal of rehabilitation and improvement, because almost no or insufficient O&M of the facilities had been done by the farmers for a long period. In addition, the farmers' water management and O&M of irrigation facilities should also be strengthened with FOs. These works will make possible to use the limited water resources in the schemes more efficiently and effectively. Moreover, appropriate implementation of the rehabilitation and improvement of works will motivate the farmers to be self-reliant for O&M of the irrigation facilities.
(3) Human Resources	The Study area and the 100 irrigation schemes have the following favourable human resources; a) The farmers in the irrigation schemes have relatively high educational level. It is expected that these educated farmers will take a leading part in the strengthening of FOs and the sustainable development of the area. b) Although OFC cultivation is presently stagnating, it has flourished in the northern part of Kurunegala district and Anuradhapura district. Many farmers have sufficient experience in OFC cultivation, and this is an advantage for expanding crop diversification. c) The farmers have had a lengthy experience in tank irrigation, and had originally operated and maintained the facilities by themselves. In recent years, farmers have missed out on these techniques and the knowledge. But there are a few elders still living in the villages, who retain knowledge of O&M of irrigation facilities and a good understanding of water management at that time. The assistance of these elders could be sought to strengthen the O&M of irrigation system envisaged in the proposed plan.

(to be continued)

(4) Community's Potential for Making Preparation of Development	A notable feature of the Sri Lankan villages is that there is no autonomous organisation representing the community and covering the wide range of activities necessary for living. For sustainable and further development of the village community, an autonomous organisation having multipurpose functions in each village urgently needs to be established first, which would play an important role in developing the community. As an alternative of such autonomous organisation, FOs have a big potential.
(5) Favourable Location for Marketing of Products	The Study area has an advantage in location as it is close to the metropolitan area, which is a big market for crops produced, so also is Dambulla, which is a relay point for marketing of agricultural products. In addition, road access in the Study area is relatively developed.
(6) Linking-up with Private Sector	There are three large-scale milk buyers in the Study area. In addition, two major private companies are now handling poultry (broiler and eggs) in the entire area. These private companies provide the production materials and technical services with a guaranteed market to the farmers. The irrigation schemes have the possibility to develop milk and poultry production by tying up with these private companies.
(7) Effective Use of Resources in the Community	The farmers in the irrigation schemes have much fallow paddy fields (in irrigated area) and homestead area. Although the biggest limiting factor for utilising these lands is the shortage of water, there is room to develop for cultivating OFC and horticultural crops by using small pumps and wells.
(8) Improvement of Crop Yields and Profitability	a) Generally, the yields of crops grown in the schemes are relatively low, however, there is some room to increase such yields, not only, through rehabilitation and improvement of irrigation facilities, but also, by the introduction of adequate farming practices. b) At present, most OFCs in the irrigation schemes are cultivated in the highland under rainfed conditions. However, if farmers cultivate OFC in the irrigated paddy field, they will able to expect stable and high yields, and profitability of OFC will improve steadily by the relative reduction of production costs. Such OFC cultivation in the irrigated paddy fields is possible without using high techniques, since the farmers in System 'H' are now successfully cultivating OFC in such areas.
(9) Effective Use of Water Resources in the Cascade System	An expansion of irrigation area of scheme in the lower stream and the stable water supply are possible through effective use of the return flow in the cascade system.

CHAPTER 8 BASIC DEVELOPMENT CONCEPTS OF MASTER PLAN

8.1 Preparation Process of Basic Development Concepts

Beneficiary of the Master Plan is Farmer/Community. The development concept of the Master Plan is prepared as follows based on participation of the beneficiaries from the planning stage.

a) Prior to preparation of the basic development concept, the basic constraints and the basic objectives of the farmers are to be clarified by the analysis of problem and objective in the schemes.

b) At the formulation of the development plan, the basic policy of the Sri Lankan government is reviewed for examining the consistency with the national agriculture development policy.

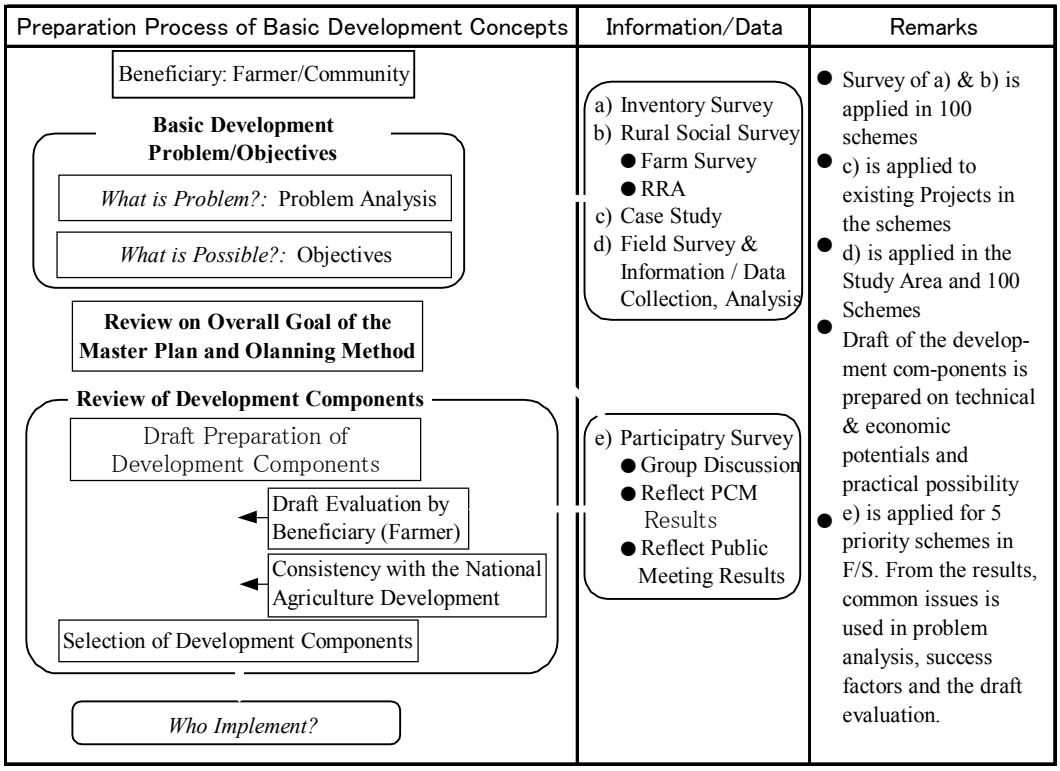
c) The overall goal and planning method are to be considered after reviewing the basic development constraints and objectives in the irrigation schemes and the national agriculture development policy and the background of the Project.

d) The means (development components) for achieving the development objectives in the irrigation schemes are to be considered. A draft of the development components are to be prepared by the Study Team taking into account technical potentials, economic potentials, and possibility of implementation. The draft is to be evaluated by farmers as to whether the plan is adaptive to the reality and possible to implement. Moreover its consistency with the national development policy is reviewed. The development components are determined finally from these evaluations.

e) It is to be clarified whom the development components are to be implemented for and what is the target group.

f) The development components are to be implemented according to the progress of respective scheme and the development stage is to be analysed.

The process is summarised in the figure below.



8.2 Basic Development Constraints and Basic Objectives of the Irrigation Schemes

Preparation of the Master Plan is based on farmers' viewpoints of the basic problems and the basic objectives of the development. The problem analysis and the objectives analysis of the development in the irrigation schemes were conducted.

8.2.1 Basic Development Constraints

The analysis of the irrigation schemes is conducted from the farmers' viewpoint based on "Community Problems Raised by Farmers" (Refer to Table 6.2.2) in the RRA workshops mentioned in the section 6.2 and "Development Constraints and Problems" by the Study Team described in the section 7.1.[5] The results are shown in the Problem Tree of page 8-5. As seen in the problem tree, the problem is summarised to "Low Income of Farm Household", "Inadequate Rural Infrastructure", and "Rural Social Problem", though the schemes involve many problems. Insufficient irrigation water and unemployment were the largest farmers' problem in the RRA workshops. It is due to low-income level of farm households. The basic constraint of the schemes is concluded as "Low income of Farm Household." The followings are the major causes of the basic constraint.

[5] Farmers have raised many problems in the RRA workshops. Further details on respective causes and results were not discussed. Therefore the Study Team reviewed them based on the results of the inventory survey, the questionnaire survey, the case study and the field survey. Referring the results of "Development Constraints and Problems", detail analysis was carried out from farmers' viewpoints.

Basic Constraints: Low Income of Farm Household

1) **Low Income of Crop Cultivation**
   - a) Deterioration of irrigation facilities
   - b) Water management problem
   - c) Weak Farmers' Organisations
   - d) High dependency of farmers to outside
   - e) Agricultural extension problem
   - f) Marketing and rural credit problems
   - g) Inactive OFC cultivation
   - h) Low paddy productivity
   - i) Land problem

2) **Unemployment / Low Employment Opportunity**
   - a) Insufficient vocational training
   - b) Lack of job information
   - c) Inactive small-scale enterprise

3) **Unused Resources of Community**
   - a) Unused farmland and homestead
   - b) Unused tank for inland fishery

Items c), d) and h) were pointed out by the Study Team as the development constraints and problems, though these have not been discussed in the RRA workshops. On the former item c), the workshop participants have tried to avoid confrontation with community leaders living in the same community was considered to be the major cause. The item d) was due that farmers are not awaken yet. Item h) is the problem on low rate of the cropping intensity and low yielding due to insufficient irrigation water and farmers have raised this item as "Insufficient Irrigation Water".

Item f) regarding OFC was raised at RRA workshops in the major scheme, however it was not raised in the medium and minor schemes. Inactive OFC cultivation was also possible cause of low income in the medium and minor schemes. Unused resources of community were also the results of the development constraints and problems and were considered as one of the cause of low farm households.

Regarding inadequate rural infrastructure, Farmers have especially raised concerns about insufficient electrification, road and farm road, and domestic water supply facility. The problems of elephant damages and liquor addict were raised by women as rural social problems.

8.2.2 Basic Development Objectives

The basic development objectives are to be clarified from the problem analysis and the objective analysis of the irrigation schemes. The analysis is carried out on "Development Needs Raised by Farmers" discussed in RRA workshops and the development potentials reviewed by the Study Team[6]. The results are shown in the objectives tree of page 8-6.

[6] As the problem analysis, farmers did not discuss in depth on the relation of means and purpose on respective development needs. Therefore, the analysis was conducted by farmers' viewpoints based on the development potentials reviewed by the Study Team.

As seen in the figure, the development objectives raised by the farmers are summarised as "Increase Income of Farm Household", "Improvement of Rural Infrastructure", and "Development of Rural Society" as the problems tree. Among them, the farmers had the strongest needs for increased farm household income. The highest needs in the RRA workshops were rehabilitation of irrigation facilities and the improvement of employment opportunity. (Refer Table 6.3.2) The former "the rehabilitation" is meant the increment of irrigation water and is purposed to increase income from crop cultivation. The latter "improvement of employment opportunity" is meant the increment of non-farm income. It is concluded that many farmers require income increases by crop cultivation and improved employment.

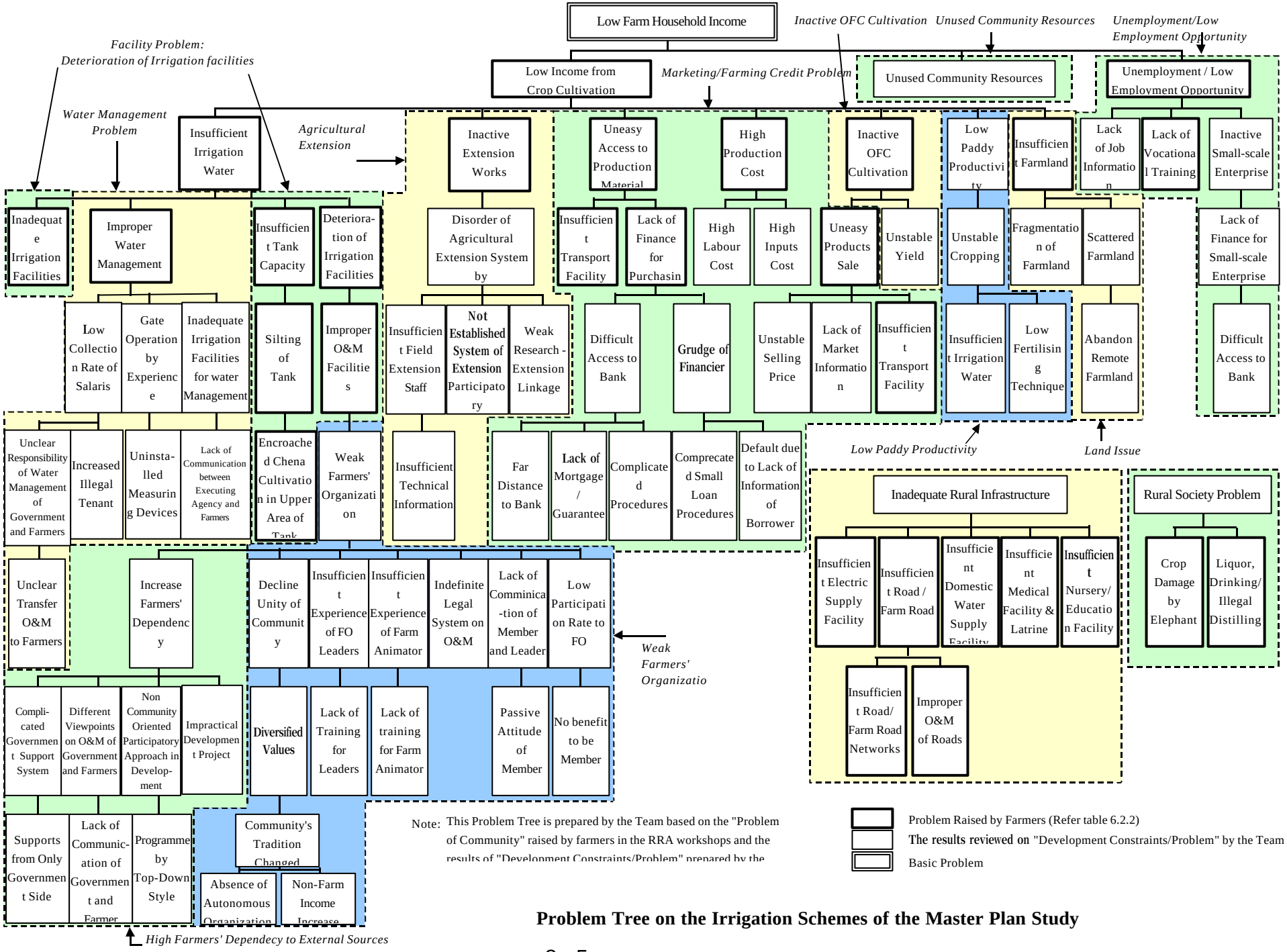
On the other hand, the need for farm roads for carrying out harvests from the field was especially high in the rural infrastructure. The need for development of domestic water supply and electrification were relatively low in spite the fact that many farmers have raised them as the problems. Farmer wants to reduce elephant damage and to campaign anti-alcohol addiction but the need is relatively low in the social development.

These results generally coincide with the results of the PCM workshops in the priority irrigation schemes during the Feasibility Survey. In the PCM workshops, the main objectives that the farmers raised were "Strengthen Farmers' Organisation", "Obtaining Sufficient Irrigation Water" and "Improvement of Agriculture Activity" for increasing their economic levels, while the improvement of rural infrastructures and rural society issues relatively become lower priority.

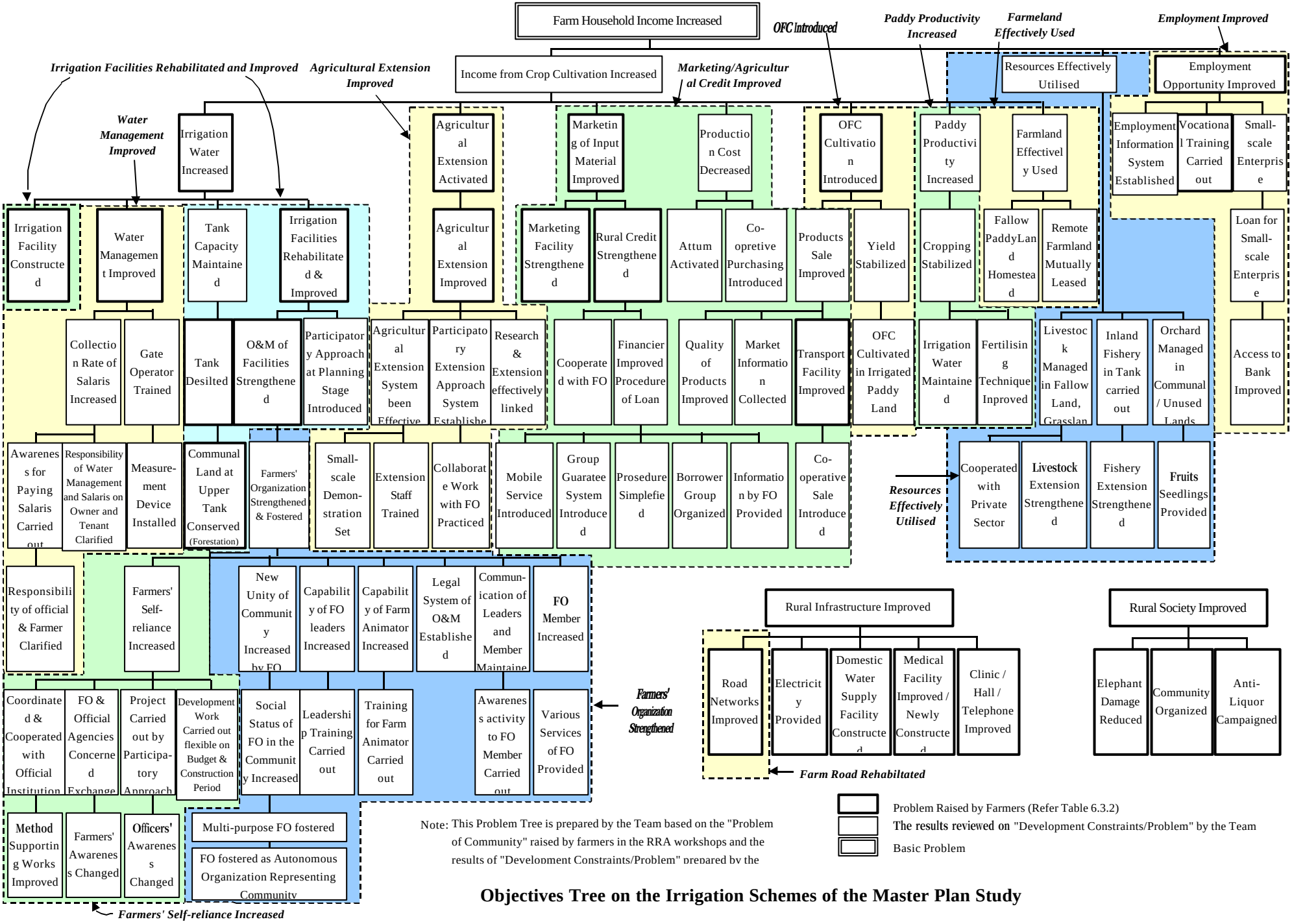
"Increase Income of Farm Household" is concluded as the basic development objective in the irrigation schemes. The following major approaches are raised for increasing income of farm household as seen in the objectives tree.

Basic Development Objective: Increase Income of Farm Household

1) **Income Increase by Crop Cultivation**
   - a) Rehabilitation of irrigation facilities
   - b) Improvement of water management
   - c) Strengthening Farmers' Organisation
   - d) Uplift farmers' independence
   - e) Improvement of agricultural extension
   - f) Improvement of marketing & rural credit
   - g) Introduction of OFC
   - h) Improvement of paddy productivity
   - i) Effective farmland use
2) **Improvement of Employment**
   - a) Implementation of vocational training
   - b) Establishment of job information
   - c) Promotion of small-scale business
3) **Effective Use of Resources**
   - a) Promotion of homestead gardening
   - b) Fruits cultivation in communal land
   - c) Livestock in fallow land and grassland
   - d) Promotion of inland fishery in tank



Problem Tree on the Irrigation Schemes of the Master Plan Study



Note: This Problem Tree is prepared by the Team based on the "Problem of Community" raised by farmers in the RRA workshops and the results of "Development Constraints/Problem" prepared by the

Objectives Tree on the Irrigation Schemes of the Master Plan Study

"Increase Income of Farm Household" as the basic development objective is the main component in the Master Plan. The needs for farm roads is high in the category of development rural infrastructures, therefore, farm road rehabilitation is to be included in the rehabilitation of the irrigation facilities. Elephant damages are to be considered in the environment sector and the issue of liquor drink is to be included in the "Provision of Various Services by FOs" in the activities of farmers' organisation.

8.3 Basic Approach to Programmes Formulation on the Overall Goal of the Master Plan

8.3.1 The Overall Goal of the Master Plan

During the recent past, the agricultural sector in Sri Lanka has faced the following problems: (i) a stagnant production of rice, (ii) decreasing productivity and profitability of OFC and vegetables, and (iii) declining farm economy. To overcome these problems, the Sri Lankan Government has worked out several development policies, such as, a changeover to commercial agriculture having a high productivity, and the encouragement of export oriented crops. Emphasis has been laid on the agricultural development in the dry and intermediate zones, which produce about 70% of total crops in the whole country. The Government has envisaged encouraging irrigated agriculture in these zones, with the goal of achieving more profitable agriculture and higher standards of living for rural farm households.

However, as observed in the results of the problem and objectives analysis, the irrigation schemes in the Study area have various problems such as insufficient irrigation water, deterioration of irrigation facilities, and unemployment. In the meantime, the farmers have shown a strong desire to increase their incomes through crop cultivation and improvement of employment opportunity. Although a great deal of government's effort has been put into agricultural development in the schemes in co-operation with the foreign aid agencies, it is still far from achieving its goals.

Under such circumstances, the overall goals of the Master Plan are set as (i) the improvement of agricultural productivity and farm economy and (ii) sustainable development of rural agriculture.

8.3.2 Basic Approach on the Programme Formation

The Master Plan is to be formulated based on "Basic Development Objectives", which has been reviewed for the farmers' standpoints. Programme formulation is to take account of the following points.

1) Programme implementation through farmers' initiative

The case study of past and ongoing projects has shown a problem of farmers' increasing dependency. In order to arouse farmers' self-reliance, in a real sense, the development programmes conceived in the Study area should be implemented on the initiatives of the farmers, and these should be based on the following approaches.

a) In order to achieve sustainable development, 'farmer driven development programmes' should be adopted, and the main points of such plans should be decided by the farmers themselves or with their satisfactory consensus.
b) To keep close communications with farmers for reflecting their intentions sufficiently, the programmes should be taking enough duration and more flexible programmes for implementation of the development programmes.
c) Training of leaders of FOs and official front line staffs who are concerned directly with the implementation of programmes should be commenced at first, in order to develop their awareness and capability on programme implementation.

In the formulation and implementation of the development programmes, a system of farmers' initiative role in the programmes should be established and the institutions concerned should promote positive farmers' participation.

2) Comprehensive development

As mentioned in the basic approach of the Ministry of Irrigation and Power, it is difficult to increase the income of farm household by only rehabilitation and improvement of the irrigation facilities. So a comprehensive approach including the improvement of employment opportunity is required. The limited resources should be utilised effectively by the comprehensive development of the cascade system including upper and lower tanks in the minor scheme. Thus, the Master Plan takes comprehensive approach and development by the unit of cascade in the minor scheme.

3) Programme implementation according with the present development stage

The irrigation schemes selected for the Study will be classified into the following three stages in accordance with the present development stages. The development programmes will then be formulated in accordance with the present conditions.

First stage : Rehabilitation of irrigation facilities and improvement of water management are still necessary.

Second stage : Improvement of farm income through crop diversification, increase the rate of cropping intensity, co-operative purchasing and shipping by FOs has been realised.

Third stage : Further economic activities have been developed and it is possible to develop independently.

4) Equal distribution of the fruits of development

In the formulation of development programmes, over investment into a specific area is avoided and equitable distribution of development fruits among the farmers is considered.

5) Close communication and maintaining transparency

In order to keep a close communication between the executing agencies and the farmers, system to open all information related to the implementation of the programmes to all farmers is established. This is also very important for maintaining transparency in the programmes.

8.4 Review of Development Components in the Master Plan

8.4.1 Formulation of the Preliminary Development Components

The development components are reviewed to realise the basic development objectives formulated through the objectives analysis. The results are shown in the table on the next page. The details of the preliminary development components are in Appendix-N.

Farmers have many problems and their strong needs are clarified as (i) Increase farming income by the rehabilitation of irrigation facilities and (ii) "Increase income of farm household" through improvement of employment opportunity from the results of analysis of problem and objectives to the irrigation schemes in the Study area. Ten development programmes are proposed as a means for resolving the problems, responding to farmers' needs, and successfully achieving the overall goal of the Master Plan.

Following two development programmes to be implemented by the Government institutions are also proposed as components of the Master Plan.

Development Components	Objectives
1) Research Programme of Cascade System and Subsurface Water	The minor scheme is to develop based on the cascade including tanks of the upper and lower streams for an effective use of the limited resources. The necessary study and verification trial on hydrological aspect on the development is proposed. In addition, potential of subsurface water is studied.
2) Monitoring and Evaluation on Activities of Development Components	Monitoring and evaluation on the on-going project are proposed for feedback and project improvement, and the results are opened for concerned organisation and personnel for maintaining transparency.

Development Components

Overall Goal : *I. Improvement of Agriculture Productivity and Farm Household Economy* *II. Sustainable Rural Agriculture Development* *Basic Development Objectives: Increase Income of Farm Household*			Proposed Development Components									
Development Objectives		Programmes *(Programmes from the Objectives Tree)*	Awareness/Educational Training	Strengthening FOs	Stable Production/Crop Diversification	Income Increase	Rehabilitation of Irrigation Facilities	Improvement of Farm Road	Improvement of Water Management	Improvement of Marketing	Improvement of Rural Credit	Strengthening Agriculture Extension
1. Income Increase from Crop Cultivation	a) Rehabilitation of Irrigation Facilities	- Rehabilitation of irrigation facilities - Installation of measurement devices - Strengthening O & M - Communal land conservation (afforestation) at the upper part of tank	●	●			●	●				
	b) Improvement of Water Management	- Training operators - Clarify responsibility of the Government and FO on water management - Clarify responsibility of land road and tenant on water management	●	●			●		●			
	c) Strengthening FOs	- Create new unity of community by FOs - Foster multi-function FOs - Provision of various services by FOs - Training leaders of FO and official staffs	●	●							●	●
	d) Promote Farmers' Self-reliance	- Awareness programme for official staffs and FO leaders	●	●								
	e) Improvement of Agricultural Extension	- Establish participatory extension system - Establish small-scale demonstration plots - Training extension staffs - Establish marketing information system with FOs		●	●							●
	f) Improvement of Marketing and Rural Credit	- Introduction of co-operative purchasing and shipping system - Improvement of marketing and transportation facilities - Organisation of credit borrowers - Co-operation with FOs - Establish market information system		●						●	●	●
	g) Introduction of OFC	- Promotion of OFC in paddy land			●		●					●
	h) Improvement of Paddy Productivity	- Stable supply of irrigation water - Dissemination of appropriate fertilisation			●		●					●
	i) Effective Use of Farmland	- OFC/orchard/livestock in fallow land and homestead - Leasing remote farmland mutually among the farmers			●	●						●
2. Improvement of Employment		- Vocational training and promotion of self-employment - Promotion of small-scale business and provision of loan - Establish job information system				●					●	●
3. Effective Resources Use		- Inland fishery in tank - Livestock/orchard in grassland and land - Co-operation with private sector on live-stock and fishery				●						●

8.4.2 Review of the Preliminary Development Components

(1) Discussion FO Leaders and Members

Method of Group Discussion

A group discussion with the leaders of FO regarding the proposed development components in the Master Plan was conducted in order to review and understand what is the beneficiaries' opinion of the components, and whether it matches up to real situation of the area and the development plan is possible to implement. The method of discussion and the participants are as follows.

Participants	FO Leaders, Farm Animator and the Team (Farmers' Organisation Expert)				
Meeting Location and Participants	Irrigation Schemes	No. of Meeting	Participants		
			Male	Female	Total
	Nachchaduwa	5	84	7	91
	Palkadawela	3	42	7	49
	Periyakulama	1	6	1	7
	Mahananneriya	1	6	1	7
	Mahanannneriya (Cascade)	2	24	12	36
	Total	12	162	28	190
	The locations are the irrigation schemes of the F/S study areas.				
Method of Discussion	The Study Team presented the preliminary development components to participants. (Refer Appendix-N) Free discussions among the participants are carried out whether it is match up to the situation of the area and it is possible to implement.				

The Results of the Discussion

The result of discussion with FO leaders is shown in Appendix-N. The leaders mostly agreed on the proposed development components and concluded that they have a high potential for implementation. The opposed opinions and suggestions are itemised as follows.

Contents of the Preliminary Development Components	Opposed Opinions and Suggestions of the Leaders	The Study Team's Comments to Opinions and Suggestions
Awareness Programme	● Many leaders pointed out importance of awareness training to senior officials and field officers.	● Awareness programme is confirmed its importance. It is to be implemented by the officers and the leaders before commencement of the rehabilitation works.
Strengthening FOs: FOs were proposed as multi-functional organisations as representing the organisations of the community.	● FOs in the leaders' idea are multifunctional organisation and they are considering FOs as the leading organisation in community.	● Possibility of introduction of multi-fuctional organisation is confirmed. FOs recommended in the Master Plan is multifunction and foster to be leading organisation in community.
Stable Production / Crop Diversification: OFC cultivation at 10% in Maha and 20% in Yala	● OFC 10% in Maha is difficult due to rain. In Yala more than 20% is possible. ● Extension on cultivation technique is important.	● OFC in Maha is possible as the System H. Resistant to rain as fruits vegetables are recommended. ● Technical extension is in the Plan. ● OFC 20% in Yala is set due to the risk of price fluctuation.

(to be continued)

Stable Production / Crop Diversification: Mutual leasing and use among farmers on non-cultivated farmland	● Most of the leaders are thinking of difficulty of mutual leasing of land.	● Immediate application into the Project is difficult.
Income Generation Programme: Livestock development in the upper part of tank and grassland	● Grassland in the upper tank is water lodging, not available year round. ● Leaders agree on live-stock development and prefer shed-keeping style.	● Grassland in the upper tank causes water pollution, the Plan will be changed. (Especially in the minor scheme) ● The shed-keeping is recommended, to be small-scale due to more la-bour requirement.
Income Generation Pro-gramme: 500 to 1000 size poultry programme	● Generally farmers are negative due to less profit with high feed cost on 500-1000 size.	● Understood profitable poultry is over 2000. Large scale is risky from demand. The Plan is changed for home consumption.

These opinions and suggestions from the FO leaders are to be reflected in formulation of the respective development components.

(1) Adaptability to the Government Agricultural Policy

The proposed development components of the Master Plan and the Government Agriculture Policy were reviewed. The results are as follows.

Adaptability of the Development Components and the Government Agriculture Development Policy

	Government Policy	Development Components of Master Plan
6 Year Devel-opment Plan (1999-2004)	a) Change to Commercial Agriculture	● OFC promotion by Stable Production/Crop Diversification Plan ● Processing of by-products(Coconut fibre) and other agri-culture products in Income Generation Plan
	b) Promotion of Export Crops	● Promotion of Sesame for export in Stable Production/Crop Diversification Plan
	c) Co-operation with Private Sector	● Co-operation with private sector on livestock & fishery in Income Generation Plan
	d) Create Employment in Rural Area	● Improvement of employment opportunity(Vocational training, small-scale enterprise) in Income Generation Plan
Basic Development Approach of Ministry of Irrigation & Power *	a) Transfer O & M of Irrigation Scheme	● Smooth transferring of O & M in Rehabilitation Plan of Irrigation Facilities and Strengthening Plan of FOs
	b) Income Increase of Farm Household	● Income increase by crop cultivation and improvement of employment in Stable Production/Crop Diversification Plan and in Income Generation Plan
	c) Comprehensive De-velopment Approach	● Comprehensive Development Plan by 10 development programmes
	d) Effective Resources Use in Cluster and Cascade in the Dry & Intermediate Zones	● Group development by Cascade base in the minor scheme ● Propose Research Programme of Cascade System and Subsurface Water

Note: * Basic Development Approach is expressed by the ministry during the discussion with the Study Team. It is mentioned in the record of discussion of the annex.

The proposed development components are generally adapted with the Government Agricultural Development Policy.

8.4.3 Development Components Proposed in the Master Plan

As mentioned before, the FO leaders concluded that the preliminary development components are adaptable to the area's situation and are technically possible. The development components proposed in the Master Plan are basically the same

as in the draft with minor adjustments applied based on the suggestions from the leaders. There are finally 12 proposed components including the "research programme of cascade system and subsurface water" and the "monitoring and evaluation" carried out by the Government institution.

Final Development Components Applied in the Master Plan

a) Awareness/ Training Programmes	g) Improvement of Water Management
b) Strengthening FOs/Rural Development	h) Improvement of Marketing
c) Stable Crop Production/ Crop Diversification	i) Improvement of Rural Credit
	j) Strengthening Agricultural Extension Services
d) Income Generation Programme	k) Research Programme of Cascade System and Subsurface Water
e) Rehabilitation of Irrigation Facilities	
f) Farm Road Improvement	l) Monitoring and Evaluation

The details of basic approach and programme on the formulation of the development components are described in Chapter 9.

8.5 Executing Agency of Development Components

The executing agencies of the development components are shown in the following table. Awareness programme of the item a) of the development components is to be conducted by the Government agency. The components b) to i) are to be carried out mainly farmers/FOs and the Government agencies are to support them. The components j) to l) are to strengthen the Government institutes concerned. Private sectors are mainly traders in marketing system and banks.

Development Components and executing Agencies

Overall Goal	Development Objectives	Development Components	Executing Agencies		
			Farmer (FO)	Official Institut-ions	Private Sector
Agricultural Production/ Improve Farm Household Economy Sustainable Development of Agriculture	Income Increase of Farm Household	a) Training/Awareness Programmes		●	
		b) Strengthening FOs / Rural Development	●		
		c) Stable Crop Production /Crop Diversification	●		
		d) Income Generation Programme	●		●
		e) Rehabilitation of Irrigation Facilities	●	●	
		f) Farm Road Improvement	●	●	
		g) Improvement of Water Management	●		
		h) Improvement of Marketing	●		●
		i) Improvement of Rural Credit	●	●	●
		j) Strengthening Agricultural Extension Services		●	
		k) Research Programme of Cascade System and Subsurface Water		●	
		l) Monitoring and Evaluation		●	

8.6 Review of Development Stage of Irrigation Schemes

In order to formulate development programmes in accordance with the present conditions, the irrigation schemes are classified into three stages as mentioned in section 3) of 8.2.3. The following indicators were adopted in the classification of development stage.

Classification of Development Stage

First stage:	Necessity for rehabilitation of irrigation facilities and improvement of water management
For rehabilitation:	
1) Farmers' need for rehabilitation of irrigation facilities Data obtained from inventory survey Data obtained from RRA	
2) Engineer's judgment for necessity of rehabilitation	
For improvement of water management:	
1) Participation rate of Kanna Meeting 2) Collecting irrigation service charge 3) O&M of main and branch 4) O&M of D- and F-canals	5) Existence of FO 6) Farmers' joining ration of FO 7) Irrigation rotation
Increasing ratio of cropping intensity between without and with project	
Second stage: Improvement of farm income	
1) Registration of FO (56B) 2) Cooperative purchasing and shipping	3) Crop yield 4) Cultivation ratio of OFC 5) Net farm income
Third stage:	Economic activities have been developed further, and it is possible to develop independently.
Schemes passed all items mentioned above	

Based on these indicators, the development stage of each irrigation scheme is classified as follows. Details are shown in Table 8.6.1 and 8.6.2.

Development Stage of Each Irrigation Schemes

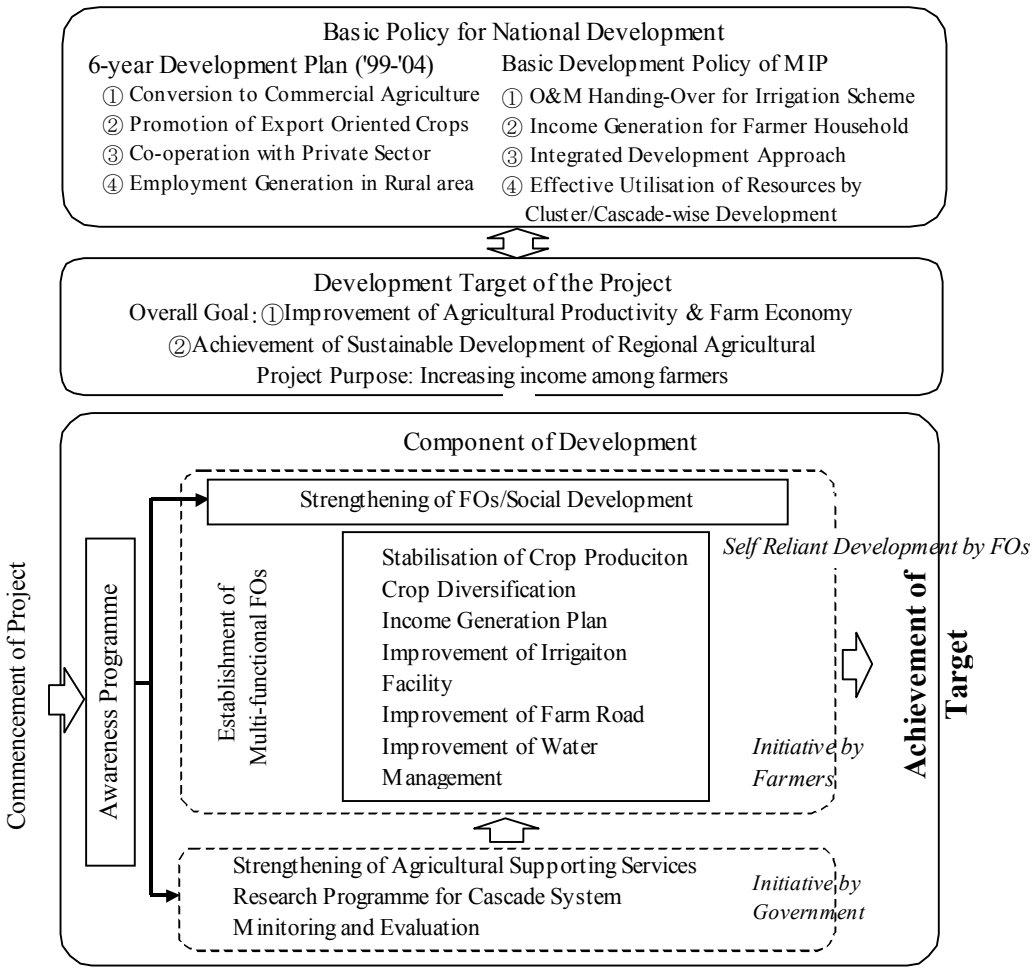
Stage	Irrigation Schemes			Development Components
1st Stage	Major	1MA-01	Nachchaduwa Wewa	All irrigation facilities have relatively good water management, but rehabilitation of irrigation facilities is still necessary. In order to achieve sustainable irrigation, maintenance work should be activated with strengthening of FO. Improvement of farm income through crop diversification, increase in utilising rate of cultivated land, co-operative purchasing and shipping by FOs, etc. should be realised.
		1MA-02	Nuwarawewa	
		1MA-03	Tissawewa	
		2MA-01	Rajangana Wewa	
		4MA-01	Palukadawela	
		4MA-03	Abakola Wewa	
		5MA-01	Magallewewa	
	Medium	1ME-01	Thuruweli Wewa	
		1ME-02	Eru wewa	
		1ME-03	Uttimaduwa Wewa	
		1ME-04	Periyakulama	
		1ME-05	Maminiya Wewa	
		1ME-06	Mahabulankulama	
		2ME-01	Angamuwawewa	
		4ME-01	Mahananeriyawewa	
		4ME-02	Mahagalgamuwawewa	
		5ME-01	Hulugalla Wewa	
		6ME-02	Moragoda Anicut	
	Minor	I	8 Minor Schemes	
		II	8 Minor Schemes	
		III	10 Minor Schemes	
		IV	9 Minor Schemes	
		V	10 Minor Schemes	
		VI	11 Minor Schemes	
		VII	10 Minor Schemes	
		VIII	10 Minor Schemes	
		IX	4 Minor Schemes	
2nd Stage	Major	4MA-02	Attaragalla Wewa	These two schemes have no necessity on rehabilitation of facilities. But, all other improvement and strengthening activities will be required for improving farm economy and achieving sustainable agriculture.
	Medium	6ME-02	Moragoda Anicut	
3rd Stage	None			

The most of the irrigation schemes in the Study area belong to the first stage. Therefore, the development components are applied to the entire scheme except the rehabilitation works in Attaragalla Wewa and Moragoda Anicut.

CHAPTER 9 MASTER PLAN ON DEVELOPMENT OF AGRICULTURE

9.1 Outline of Master Plan on Development of Agriculture

Master plan on development of agriculture is formulated with priority targets such as improvement of crop productivity & farm economy and sustainable development of regional agriculture and with basic objective of development as income generation of farmer household. Outline of the master plan is shown in the figure below.



Outline of Master Plan Development

The development project would commence with awareness programme to farmers and Government officials and both development components with initiative by farmers and those by Government would follow. Farmers' Organisations would implement the farmer initiative component with their drive.

9.2 Awareness Programme of Participatory Approach

Implementation of participatory development project is proposed to attain the basic purpose as well as the overall goal, self-reliant development of regional

agriculture. Implementation of such participatory project to the priority irrigation schemes first requires reformation of sense for project by both beneficiaries and implementation agencies. For beneficiary side, passive attitude of farmers toward development must be changed. In addition, for the implementation agency side, understanding of practical approaches to motivate farmers' self-reliance and capability of project implementation are necessary. Farmers pointed out requirements in the public hearing regarding the draft of PDM as well as in the discussion with farmer leaders regarding the development components proposed in the Master plan. Accordingly, implementation of the awareness programme on participatory approach for both the farmers and Government agencies is thus proposed.

(1) Purpose of Awareness Programme

Final targets of the awareness programme are i) Initiative implementation of the development components proposed in the Study by farmers or Fos, and ii) Undertaking of such implementation approach to motivate farmers' self-reliance by the Government agencies concerned.

(2) Target of the Programme

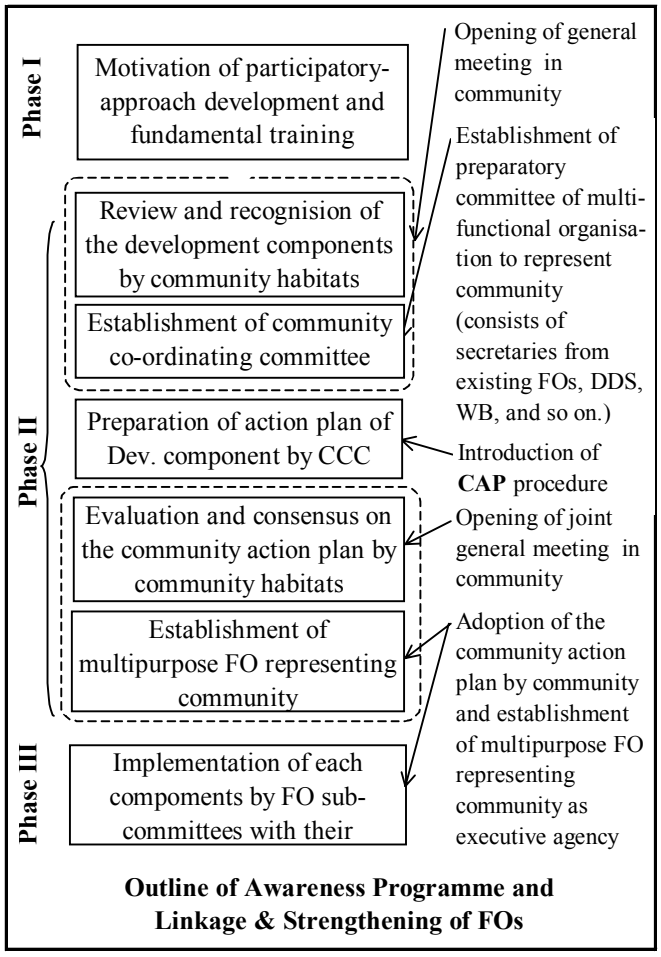
The awareness programme is to be applied to i) executive government officers with relevant authority, ii) government officials who are supposed to attend agricultural committees of districts and divisions, iii) local officials who are supposed to contact farmers directly, and iv) leaders of FOs and community organisations. The programme is to be applied to all field offers who belong to the relevant area under the divisional agricultural committee since their understanding of the project within the regions and their co-operation are required even if the area they are in charge of outside of the Project area. The purpose by target is shown in the table below.

Target and Purpose of the Awareness Programme

Target of the Programme	Purpose of the Programme
1) Senior Government Officials with relevant authority (IMD, ID, DAS, PC, DC)	Introduction of system considering sustainability (acceptability of participatory approach as organisation) and motivation of the officers concerned for activities by improvement of knowledge and know-how on evaluation and management of the project implementation
2) Members of districts/divisional agricultural committees of (IMD/RPM, DOI, ASC, PDAPH, NYSC, PEA and women's bureau(WB))	Right knowledge of the basic development policy of the project and co-operation by agricultural committee or related organisations (several groups concerning to regional agricultural development belong to)
3) Local officials who are supposed to contact farmers directly	Improvement of individual attitude and moral for activity by wide range training mainly on workshop management procedure and participatory approach technique
4) Leaders of FOs and community organisations	Promotion of awareness of self-motivated participation to the project by transfer basic knowledge, information and technology

(3) Implementation Procedure of the Programme

Three-phase implementation of the awareness programme is proposed. The first phase consists motivation of participatory-approach development and fundamental training, the second consists of on-the -job training on participatory-approach development activities, and the third consists of implementation of project components by beneficiaries with their initiatives. Overall implementation period of the awareness programme of 1.5 years at the beginning of the project implementation is proposed.



Outline of Awareness Programme and Linkage & Strengthening of FOs

Procedures of the programme are to be prepared so that participants not only acquire knowledge and technology at seminar-style training but also to get them through practical activities by reformation of sense of the attendants relevantly. As a measure prior to the implementation of the programme, strengthening of FOs is necessary. Succeeding linkage of the strengthened FOs and the programme is the key to realise the reformation of sense for both farmers and Government officials. Outline of this approach is shown in the figure above and details of the activities of the programme are described in the table on the next page. Details of the activities and curriculum of the awareness programme are presented in Tables 9.2.1 and 9.2.2.

(4) Implementation Agencies

Awareness programme will be implemented by a task-force team named the "Research and Advisory Team for Participatory Approach" (RATPA) that consist of specialists who are competent and have adequate experiences for participatory development. They will be selected from the agencies listed in the following table. Since the awareness programme holds the key to further sustainable development, the team has to give proper advice and guidance to both of senior official levels and community levels on politically and socially neutral ground.

Implementing Procedures for Awareness Programme

	Item of Activity	Object Agency / Organisation	Contents of Programme and Results	Imple-ment. Agency	Co-operator
Phase I	Establishment of task team for the awareness programme and preparation of training materials		● Review of the development plan ● Preparation of guideline, handbook and syllabus	RATPA	Divisional / District Secretariat
	Openings of participatory seminar for development	Senior officials, District/divisional agri. committee members, & Field officers	● Sharing of principles and importance of participatory development and motivation of it ● Organisational and institutional improvement to secure participatory development project and its transparent management	RATPA	NGO, NHDA (Facilitator), KARTI
	Execution of participatory training programme (workshop style)	Divisional agri. committee members, and local officials	● Attain basic knowledge and techniques of participatory development approach ● Motivation of participatory development	RATPA	NGO, NHDA (Facilitator)
	Openings of joint general meeting among FOs (by schemes)	Leaders of FOs and other community organisations	● Sharing of principles regarding participatory development approach and motivating for it ● Recognising and sharing to the importance of obvious management of project through joint general meeting	RATPA	NGO, NHDA (Facilitator), DS, ASC
	Openings of joint meeting of FO and other community organisations (by community)	Farmers and leaders of FO and other community organisations	● Sharing of principles regarding participatory development approach and motivating for it. ● Recognising and sharing to the importance of transparent management of project ● Review of project purpose, development component and their schedule of M/P	RATPA	NGO, NHDA (Facilitator), DS, ASC, Animator
Phase II	Openings of general meeting in community and establishment of CCC*1	All community habitats	● Review of proposed development component in the master plan ● Establishment of Community Co-ordinating Committee (CCC)	RATPA	NGO, NHDA (Facilitator), DS, ASC
	Openings of participatory seminar	CCC	● Attaining of basic knowledge and techniques for the participatory development project	RATPA	NGO, NHDA, DS, ASC
	Participatory research inside community by CCC	CCC	● Implementation of community resources research and ascertaining community's intention to the development project	RATPA	NGO, NHDA, DS, ASC
	Openings of CAP workshop	CCC	● Producing draft community action plan	RATPA	NGO, NHDA ASC, Animator
	Openings of general meeting of community	All community habitats	● Obtaining consensus about draft action plan from the community ● Establishment of multipurpose FO as represent community. ● Join sub-committee based on development component to FO ● FO absorbs CCC functions	Community Representatives, FO (RATPA)	NGO, NHDA, DS, ASC
Phase III	Commencement of activities by sub-committees of FO	Sub-committee	● Making a complete action plan for each development component ● Submitting each development component to relevant organisations and make the supporting matters in consultation with the organisations. Implementation of development programme.	FO (RATPA)	Relevant organisations and DS

*1 CCC: Community Co-ordination Committee consisting of secretaries from community based organisations such as FOs, DDS, WB, NYSC and so on. CCC has function as preparatory committee for future multifunction organisation to represent community

*2 After establishment of multifunction organisation, continuity of the community organisation such as WB, NYSC and so on is to be decided by habitats.

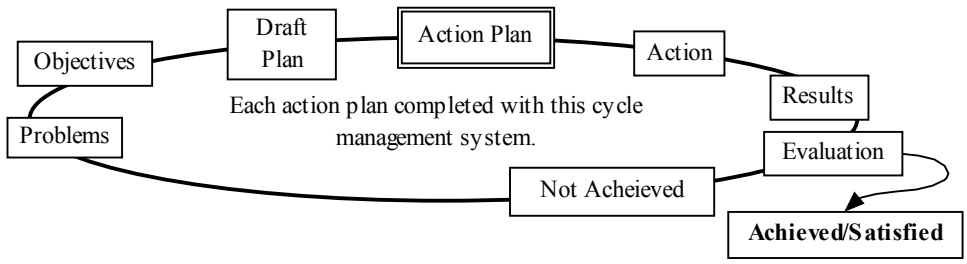
KARTI has much experience on implementation and research for the participatory development approach such as Gal Oya Project[7] in the 1980s, which was implemented by USAID fund. The almost first participatory irrigation management by farmers' organisation was introduced by the KARTI in collaboration with Cornell University at the Gal Oya project and the results of it was adopted to present ideas and systems of participatory management by the farmers' organisations. In addition, a number of research studies not only related irrigation but also marketing and other agricultural subjects has been done by the KARTI and their publications and research papers could be utilised in this project.

Implementation Agencies for Awareness Programme/RATPA

1) Kobbekaduwa Agricultural Research and Training Institute (KARTI)
2) International Water Management Institute (IWMI)
3) Irrigation Management Division (IMD)
4) Department of Agrarian Services (DAS)
5) NGO, Local/Overseas Volunteers
6) Project Consultant

(5) Community Action Planning (CAP)

Final achievement of the awareness programme is to enable farmers to conduct Community Action Planning (CAP) with their initiative ideas. CAP has been developed and utilised for participatory housing development in low-income community area by National Housing Development Authority (NHDA). CAP implemented in Sri Lanka in the early 1980s and it is one of PRA type approach that residents in a particular area initiate own action to prepare regional development plan (Community Action Plan) to develop, operate, and maintain their own town. This movement has been adopted by the UN as the international year of 'Shelter for All.'



Each development component (Action plan) will implement with CAP approaches. To be able to function of the first CAP, farmers need knowledge and information to make their action plan and officers work with farmers should also have knowledge, information and techniques to give appropriate advice to farmers in this cycle.

In this Project, the CAP type workshop, which is shown above, is proposed to be

[7] Norman Uphoff, Learning from Gal Oya: Possibilities for Participatory Development and Post-Newtonian Social Science, Cornel University Press, 1992.

conducted repeatedly during project implementation period after the awareness programme. Outputs anticipated from the workshop are: i) participatory-approach for the community activities would be routinely practised, ii) participatory discussion and democratic decision-making system would be formulated and iii) proper new norms for the community will be formed in each relevant region would be expected. Since CAP has been utilised in Sri Lanka already and there are many candidates as instructor domestically, smooth introduction and utilisation to government local officials is expected.

9.3 Strengthening of Farmers' Organisation and Community Development

9.3.1 General

Overall goal of the Master Plan of the Study is the increase income of farm household and self-reliant development of regional agriculture. The objectives require not only rehabilitation or upgrading of irrigation facilities but also sustainable operation and maintenance of the facilities by farmers, appropriate water management as well as improvement of supporting fields such as agricultural extension and marketing. In addition, as shown in the objective tree in Chapter 8 and the following figure, strengthening of the farmers' organisations (FO) as execution organisation on the farmers side are proposed for mutual communication among FOs to activate agricultural extension, co-operative purchasing to reduce production cost, and co-operative sales to promote OFC cultivation.

On the other hand, there are presently no autonomous organisations to represent a community for the region and FOs in the region have very limited functions. Further, such regional communities are prone to change in accordance with development of economy, transportation, telecommunication and information media and habitats' sense of value has been diversified. Operation and maintenance, water management and agricultural production activities based on farmers' co-operative group work and common sense of value as prevailing in traditional village in the past have been fading gradually. Under the present situation of FO and the new change of community, increasing farmers' self-reliance and strengthening FOs as the proposed procedure mentioned in the right table and the expected FO is to be a multipurpose.

Proposed Procedures for Strengthening FOs by Objective Analysis

Strengthening of FO	Formation of new norm of community by FO Rise in social position of FOs in community Upbringing of multi-functional FOs Upbringing of FOs as autonomous organisation to represent community
	Offer of various services by FOs
	Holding of firm communication between leaders and members
	Improvement of legal part of operation and maintenance
	Improvement of job ability of FO leaders
	Improvement of job ability of government staff in charge

The Master Plan will lead FO to be an autonomous or-

ganisation to represent the community and a multi purpose organisation providing not only O&M of irrigation facilities but also socio-economic activities to develop the community

9.3.2 Farmers' Organisation

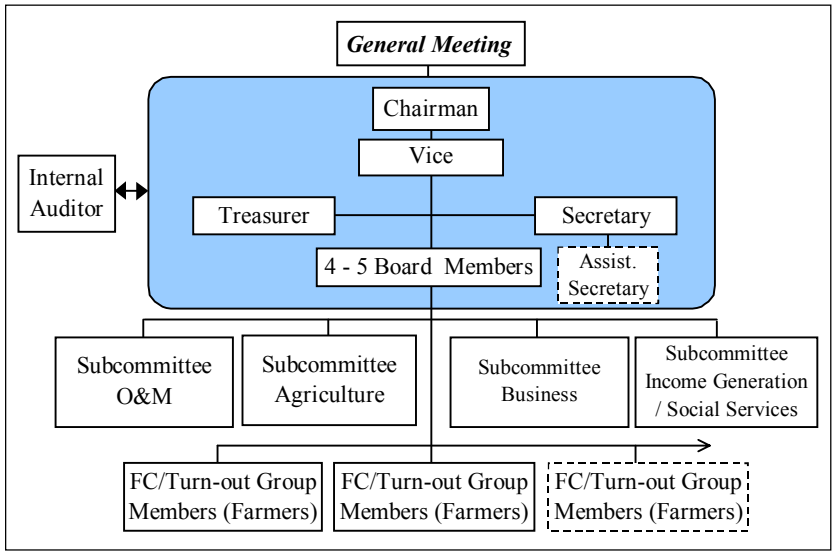
(1) Objectives and Role of Farmers' Organisations

FOs in the irrigation scheme should have the following extensive objectives and aim to uplift farmer families' income and autonomous growth of agriculture in each region:

a) Operation and maintenance of the irrigation facilities and water management;
b) Agricultural support activities including marketing of farm inputs and outputs as well as rural credit services;
c) Providing support services to farmers for small-scale enterprise and income generation;
d) Providing social support services such as drinking-control campaign; and
e) Co-ordinating agricultural and social activities between government agencies and the farmers of the area.

(2) Organisational Structure and Managing Activities

In order to manage all activities of the multi-purpose organisation more efficiently, it is proposed to re-organise existing FOs. The proposed organisational structure is shown below.



Proposed Organisational Structure of FO

The proposed organisational structure of FO consists of the following four components: (i) general meeting, (ii) board of management, (iii) subcommittees and (iv) auditor. The subcommittees include O&M, promotion of agriculture, income generation and enterprises, and social services. Their main functions and activities are as follows:

1) General Meeting

The highest authority in FO is the general meeting. Meetings of the organisations are to be held annually and ad-hoc on urgent occasions.

2) Board of Management (Committee)

The committee is composed of the following members: Chairman, Vice Chairman, General Secretary, Treasurer, Auditor, and several members who are representatives of the subcommittees. All these posts should be opened to both genders. In addition, one or several volunteer porters are to be appointed in the committee in order to ensure close communication among the members and between the committee and the farmers.

Main tasks of the committee are (i) to prepare annual management plans and budget, (ii) to instruct and supervise activities implemented by the subcommittees, (iii) to manage complaints and grievance from the farmers, (iv) to arrange and appoint volunteers to work in the subcommittees, (v) to manage accounting and general affairs, (vi) to co-ordinate with other agencies and associations, and so on.

3) Subcommittees

The Subcommittees have the following activities under supervision of the Committee.

Subcommittee	Contents of Activities
Operation and Maintenance of Irrigation Facilities and Water Management	1) Preparation of annual irrigation schedule and water management. 2) Maintenance of facilities and Management of communal works such as canal cleaning and maintenance of farm roads. 3) Security service for irrigation facilities, etc. 4) Estimate of irrigation service charge and collection of irrigation service fee (ISF).
Agriculture	1) Supporting activities for farming, including transmission and notification of information on governments extension services, arrangement of farmers' meetings on extension, arrangement and guidance for group farming such as communal control of pests and diseases, seeding and harvesting, etc.
Business	1) Management of profit activities including cooperative purchasing, agricultural credit services, machinery services, fish farming, etc. 2) Management of credits. 3) Exploitation of new marketing channels.
Income Generation /Social Services	1) Promotion of income generation including vocational training, small agro-business, and transmitting employment information. 2) Improvement of social welfare and health care. 3) Educating activities on home economy and management, drinking-control campaign, etc.

4) Auditing Section

Although the registered farmers' co-operatives should be subject to auditing by DAS, it is proposed that each FO has an internal auditing system in addi-

tion to the official auditing. Namely, an auditing section, which consists of several volunteers (youth with knowledge of accounting will be suitable), is established apart from the Committee. In order to keep transparency of the collection of ISF, this section always checks the FO's accounting including collection of ISF, and reports those results at the general meeting.

(3) Funds of FO

Most of the FOs have not adopted a progressive plan to collect funds. Therefore, the following profit activities by FOs are recommended. Commencement of such activities also contributes to generate employment opportunities for youth.

a) Levying of acreage tax (10% commissions are paid),
b) Co-operative purchasing of farm inputs,
c) Small scale processing factory (rice and flourmill, etc.)
d) Undertaking of contracts from the relevant government such as Parth Sabha (road repairs and other construction work).

For the co-operative purchasing, it is proposed to obtain the agency rights from agricultural inputs and the registration to Fertiliser Co-operation and other state companies to obtain special discount for the FO.

(4) O&M of Irrigation Facilities

In the case of Major/Medium irrigation Schemes, water management and operation and management of irrigation facilities are decided by Kanna meeting and executed by co-operative management by FOs. Each field canal's O&M is implemented by the field canal group under instruction and supervision by FO concerned. It is important to perform the following duties and responsibilities severally and individually by the field canal group.

Expected duties and responsibilities of members of DCO/FO

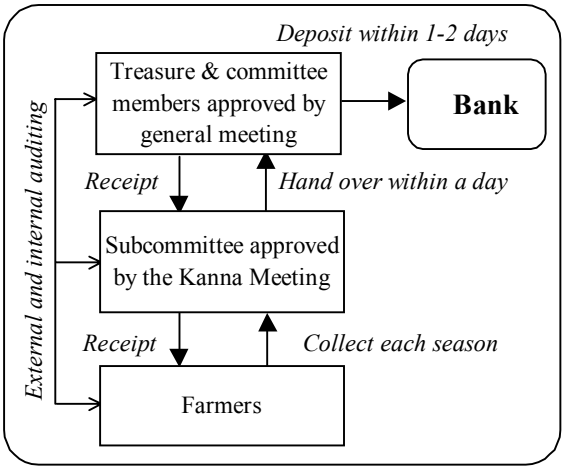
a) Co-operate with the committee in water distribution and implementing agricultural plan
b) Work in close co-operation with other members' in order to ensure safety of the irrigation system, improvement maintenance and operation of the scheme and the efficient use of water
c) Be vigilant about the volume of water released to the field channel from the distributary canal and use such water efficiently
d) Ensure the performance of the duties and responsibilities assigned to members at the project committee meeting or the cultivation meeting with regard to water distribution and the implementation of the agricultural plan.
e) Ensure uninterrupted participation in field channel level discussions always engage in agricultural activities as a group and avoid at waste in the use of water

However, in minor irrigation schemes and some small scale medium irrigation schemes, water management and O&M of irrigation facilities are decided through the Kanna meeting and the farmer in-charge of water management, named 'Yaya (paddy tract) representative' is nominated at the meeting. Therefore, it is rec-

ommended that a water management subcommittee be established, under the FO through the Kanna meeting.

(5) Collection of Irrigation Service Fees

Irrigation service fee (ISF) collected from beneficiaries covers the cost of O&M. The proposed collecting procedure of ISF is presented in the figure on the right. The committee is responsible for management and use of ISF, on behalf of the Kanna Meeting. To achieve smooth collection of ISF, it is recommended to include the following punishment rule and incentive, after discussions at the Kanna meeting.



Proposed Collecting System of Irrigation Service Charge

a) If a farmer fails to pay on time, FO imposes on him a fine equivalent to some percentage of total ISF per month during the non-payment period.
b) When a farmer pays the full amount of ISF and on time, some percentage of the full amount is reimbursed to him as an incentive.

(6) By-laws of FO

Standard articles and by-laws of FO have been prepared by the Department of Agrarian Services. But this is for the general co-operative, and articles necessary for FOs which are responsible for the O&M of the irrigation facilities are not included at all. Although these standard articles and by-laws apply basically to FO, it is necessary to enact several new articles. These are listed below.

a) FO has the right of operation and management of irrigation facilities on behalf of the Kanna Meeting.
b) FO has the right to collect ISF from the beneficiaries who receive irrigation services from FO, and the beneficiaries have the duty to pay ISC to FO.
c) FO inflicts a punishment on the beneficiaries who use irrigation water and facilities illegally or fail to pay ISC.
d) The beneficiaries have the duty to participate in the communal works on O&M planned by FO.

(7) Farmer Centre

The proper execution of all these activities (especially activities for the commu-

nity action planning) would require an effective communication system between the CCC & FOG, FO/CBO members, villagers who are not members of the FO/CBOs and the participating organisations. A primary need for the operation of such a communication system would be an office for the organisation, together with an assembly hall and storage house. The office will be the focal point for the dissemination of information, through notices displayed on a notice board or through the distribution of leaflets and pamphlets. The hall will be used both as a venue for the holding of meetings, as well as a collection and delivery point for agricultural inputs and outputs. Furthermore, the necessary support services for the provision of loans and credit, and the storage space to keep tools and implements used in canal maintenance and other seminars, training and community development work should be provided.

9.3.3 Community Co-ordinating Committee

In order to keep close co-ordination between FO and CBOs and to unify the village community, establishment of the Community Co-ordinating Committee (CCC) is proposed. The CCC will consist of the Secretaries of FOs and all the CBOs being operated within the village community. The CCC is to strengthen and utilise local talent for the benefit of their community and establish linkages within the community. The objectives of CCC will be:

a) Gathering and sharing information for the community (public relations activities)
b) Discussing future plans for community development
c) Considering proposals submitted by members for implementation,
d) Participatory monitoring and evaluation together with field officers group
e) Advising to the FOs and other CBOs
f) Resolving conflicts and problems among community

One of the important activities of CCC is public relations. In order to keep transparency, all of the information collected by CCC should be open to all people in the community.

9.3.4 Kanna Meetings

The Kanna meeting is the only important occasion, for cultivators (landowners, tenant farmers, members of FOs and non-members) to participate in the planning of the cultivation season and the enforcement of the decisions. To activate the meeting, the following reforms are recommended:

<u>Minor Irrigation Schemes</u>

a) As stated in paragraph (4) of subclause 9.3.2, connection between the Kanna meetings and FOs are generally weak for minor irrigation schemes particularly regarding water management and O&M of irrigation facilities. To strengthen the operation and maintenance of irrigation systems and the connections between the Kanna meetings and FOs, water management committees under Kanna meeting is proposed, which will automatically be a subcommittees of the FOs. The Yaya Representatives to be appointed as leaders of the subcommittees.
b) Copies of minutes of the Kanna meetings are generally not provided to the FOs, at present. Therefore, copies should be provided to FOs and proposed CCC for them to be aware of matters discussed and decisions taken at the Kanna meetings.
c) CCC to be present at Kanna meetings, as a representative of CBOs in the community.

Major Irrigation Schemes

a) Appoint subcommittee for the water management and O&M of irrigation facilities in each FO. (DCO)
b) Hold pre-Kanna meetings at ASC divisional level to make farmers have a deeper understanding regarding importance of O&M of irrigation facilities. Provision of permission to non-member to attend the pre-Kanna meetings.
c) CCC to be present at Kanna meetings, as representative of CBOs in the community

9.3.5 Community Based Organisations

In the quest for sustainable development it is necessary to blend tradition with modernity, especially, to harness the spirit of the traditional rural settlements. To cater to the various needs of the rural community, a number of community-based organisations are in operation. If all community-based organisations could work together, the community could share information and maintain transparency. Therefore, it is proposed to appoint a Co-ordinating Committee for each community to connect and co-ordinate such activities stated above by CBOs, of which FOs act major role.

Further, the Farmers' Organisations should jointly work with other CBOs to implement social development programmes. In keeping with tradition the FOs should work closely with the temple Dayaka Sabhas and the Kulangana Samithies. This would help foster goodwill and unity among the villages and possibly, also help to reintroduce some of the old customs and traditional systems that are valuable for FOs activities.

9.3.6 Women's Participate to Development

Women's involvement in the process of economic development is important and necessary, not only because they have to be brought into the mainstream of economic activity, but also because their participation will be invaluably requisite in bringing about the envisaged social changes in the village. The following proposals are made on women's participation in the development process:

a) Appointment of women's leaders in the subcommittees of FO in the field of 1) provision of public health and family nutrition and 2) income-generation activities for female etc. in order to encourage greater participation of women and use of their talent.
b) Establishment of women's banking activities, such as, rotating loans, savings and credit associations, in order to encourage rural women to get into income generating and business activities, especially to provide initial capital to the group.

A basic training program for the women's group and other assistance could be provided by the Women's Banks' already set up in the Study area. Because such women's groups have much experience, both, failures and successes, their advice and guidance could be more acceptable to those living under similar social and economic conditions. Therefore, a group-to-group transferring system of knowledge and experience is proposed. In addition this group would create an opportunity to consult each other on subjects, such as sanitation, nutrition and alcoholism.

9.4 Agricultural Production Plan (Stabilisation of Productivity and Crop Diversification)

9.4.1 General

Through objective analysis as described in subclause 8.2.2, basic objective of irrigation schemes was set as income generation of farmer households. A stable crop production and crop diversification as base concept of improvement by introducing high return crops is proposed for increasing farm income as shown in the figure on the right. Agricultural production plan is to be formulated through the following procedure based on the concept above.

Income Generation for Farmers	Income Increase by Crop Production	Introductoin of OFC Stabilisation of Yield OFC cultivation in Irrigated Land Market Activation for Farm Products
		Increase of Rice Productivity Stabilisation of Cultivation Security of Irrigaiton Water Source Improvement of Fertiliser Application Technology

1) OFC Cultivation in Farm

OFC is traditionally cultivated in highland under rainfed condition, not many in paddy land, except Mahaweli System-H. Such OFC cultivation under rainfed condition has unstable and low yield, and has relatively high production cost and higher risk of cultivation. Therefore, it is important on extension works in order to reduce the relative cost of production by achieving stable production and increased yield.

2) Improvement of Paddy Productivity

Securing of adequate irrigation water supply is pointed out through the objective analysis and rehabilitation or upgrading of irrigation facilities are proposed for the purpose (described later in detail). On the other hand, introduction of cropping pattern considering effective utilisation of water resource is also proposed from crop production viewpoint as stated below:

a) Low water-consuming and high profitable crops are proposed for the schemes where effective utilisation of water resource is hardly expectable with facility rehabilitation or upgrading.
b) For those schemes where there is potential for water resource development, paddy cultivation is proposed as major crop corresponding to farmers' intention and OFCs are to be introduced partly.

Presently, unit yield of paddy remains as low as 3.5 ton/ha, nevertheless unit use of fertiliser is as large as 350 kg/ha. The reason for such unbalance is, as already stated in subclause 5.2.2, that fertiliser has not been applied well according to crop growing stage. Extension of proper application of fertiliser is proposed to cope with this situation.

9.4.2 Land Use Plan

Effective utilisation of farmland is pointed out through objective analysis for income generation from crop production field. The concept is proposed as countermeasures against such current situation that farmland is so fragmented and abandoned in some plots apart from homesteads and that no cultivation has been done in vast farmland. On the other hand, devastation of forests and grassland upstream of tanks is one of the environmental problems in the Study area recently. Namely, Chena cultivation or even continuous cultivation practice is conducted in the forest and grassland in order to recover agricultural income lost due to fragmentation of the land and moreover development works by population pressure and forest has accelerated devastation. Thus, land use in the plan is proposed to increase land productivity by effective use of the existing farmland and to reduce pressure of expansion of Chena cultivation in forest and grassland as follows.

a) Rehabilitation and improvement of irrigation facilities and introduction of high return crops are to be proposed for increasing productivity in the existing irrigated paddy land.
b) The fallow paddy lands have less potential from water resource viewpoint, however, they still have potential on the development of crop and livestock production as highland.
c) Homestead garden is to be promoted. Household owns 0.4 ha on average and there is potential for development.
d) Effective utilisation of scattered and unused farmland is to be supported by preparation of regulations and acts required.

In these countermeasures, item a) and d) are considered in the agricultural production plan and item b) and c) are in income generation plan in the Master Plan.

9.4.3 Proposed Crops and Cropping Pattern

(1) Proposed Crops

The proposed crops to be introduced in the irrigation schemes are as follows, taking marketability, farmers' intention, and profitability of each crop into account. The details of marketability are given in Section 3.7.6.

Proposed Crops

Introduced Crops	Background of Selection	Crop Season
Paddy	Farmer's Request. Home consumption of the staple food of household	Maha, Yala
OFC・Vegetable		
Sesame	Expected for export market, demand in domestic market, Processing(oil for domestic market)	Yala
Chilli	Importing, High demand of domestic market, High farmer's intention	Maha, Yala
Onion	Importing, high demand of domestic market, strong intention in Minor scheme	Yala, Maha (Red)
Pulses	Rotation , Soil maintenance	Maha, Yala
Vegetable(Egg Plant, Capsicum, Pumpkin, etc)	High return crop, Selection on transport and storage capability for marketing.	Maha, Yala

In addition to these crops, lime for processing and cashew nut for export market are potential crops. These crops are recommended for small-scale cultivation in highland and homestead garden.

(2) Proposed Cropping Pattern

Proposed cropping pattern is prepared by considering potential of water resource, agro-ecological zone of the DOA and strong farmers' intention to paddy cultivation. Irrigation schemes are classified in potential water resource and agro-ecological zone as shown in the table below.

Proposed Cropping Pattern

	Water Resources		Agro ecologi-cal Zone	Classifi-cation	Proposed Cropping Pattern*2	Name of Scheme
	Increase C.I. *1	Potential				
Major	<50%	M	D	MD	OFC	Nachchaduwa
	Nearly 0%	L	D	LD	OFC	Nuwarawewa, Tissawewa, Rajangana, Palukadawewla, Attaragallewea, Abakolawewa
			I	LI	OFC	Magalle Wewa
Medium	Over 50%	H	D	HD	Paddy	Uttimaduwa Wewa, Mahananeriyawewa
			I	HI	Paddy	Hulugalla Wewa, Meddeketiya Wewa
	<50%	M	D	MD	OFC	Thuruweli Wewa, Periyakulama, Maminiya, Wewa Mahabulankulama
	Nearly 0%	L	D	LD	OFC	Eru wewa, Mahagalgamuwawewa
			I	LI	OFC	Moragoda Anicut
Minor	Over 50%	H	D	HD	Paddy	II, IV, VII
			I	HI	Paddy	VIII
	<50%	M	D	MD	OFC	I, III, V, VI
			I	MI	Paddy	IX

*1 C.I. = Cropping Intensity *2 OFC: OFC promotion pattern, Paddy: Paddy promotion pattern

Note: Increment of crop intensity rate in the above table is shown potential irrigation area by 75% dependability on without project and with project. Larger figure exhibits larger increment of paddy irrigation area after the implementation of the programme. The classification was made into three (3) levels over 50% as high (H), less than 50% as medium (M) and around 0% as low (L) in the table. Agro-ecological zone is divided into the Lowland Dry zone (D) and the Lowland Intermediate zone (I). The Class is the combination of potential water resource and agro-ecological zones.

The irrigation schemes are classified into six classes as HD, HI, MD, MI, LD, and LI, as shown in this table. Based on this classification, two types of cropping patterns of paddy promotion pattern and OFC promotion pattern are proposed.

1) "Priority to Paddy" Type : Irrigation schemes belonging to HD and HI are indicating high potential of water resource. MI is medium level of potential and belongs to the lowland intermediate zone with higher rainfall. HD, HI, and MI are proposed paddy strengthening cropping pattern since farmers' strong intention to paddy cultivation.

2) "More Encouragement of OFC" Type : The irrigation schemes belonging to LD and LI are hardly expected to develop paddy even though farmers' have a strong intention of paddy. MD is the medium level of potentiality; however, it belongs to the dry zone and is rather adaptable for OFC. Therefore, the irrigation schemes belonging to LD, LI, and MD are also recommended for OFC promotion cropping pattern.

Extension targets (crop intensity) of paddy and OFC in their promotion patterns are estimated as follows by OFC production size of the Study area, Kurunegara and Anuradhapura.

Extension targets of paddy and OFC

	Paddy Promotion Pattern				OFC Promotion Pattern				Paddy	OFC
	Maha		Yala		Maha		Yala			
	Paddy	OFC	Paddy	OFC	Paddy	OFC	Paddy	OFC		
Cultivation Rate	100%	-	90	10%	90%	10%	80%	20%		
Cultivation Area										
- Major (ha)	-	-	-	-	12,342	1,371	6,750	1,688	19,092	3,059
- Medium (ha)	470	-	404	45	777	86	440	110	2,091	241
- Minor (ha)	1,134	-	303	34	993	115	256	104	2,686	253
Total (ha)	1,604	-	707	79	14,112	1,572	7,446	1,902	23,869	3,553

Note: Above OFC including Vegetable

Most OFC is not cultivated in irrigated paddy land and cultivation area with project is additionally increased acreage within paddy area. This production area is equivalent to 19% of annual production area of Kurunegara and Anuradhapura as shown in the following figure and is hardly an extreme expansion. It is possible to attain this figure as extension target of OFC.

Extents of OFC Cultivated Area

	Anuradhapura & Kurunegala	Irrigation Scheme	Increment Rate
Maha	12,800 ha	1,570 ha	12%
Yala	5,700 ha	1,980 ha	35%
Total	18,500 ha	3,550 ha	19%

9.4.4 Proposed Farming Practices and Crop Production

(1) Proposed Farming Practices

Proposed farming in the irrigated paddy land emphasises intensive crop cultivation under diversified crop production. The risk of unreliable water supply is to be reduced through the implementation of the programme, applying proposed cropping patterns and improving water management. The major technical approach on farming practices is on water management, efficient fertiliser application, effective weed and pest management, effective labour use, crop production management of high return crops. The following farming practices are to be applied through the implementation of the programmes.

a) Effective water management is to be carried out under responsibility of farmers' organisation to secure water supply for crop production.

b) Fertiliser is to be applied in terms of right kind, amount, and timing.

c) The Department of Agriculture (DOA) recommends use of straight fertilisers such as Urea, Triple Super Phosphate (TSP) and Muriate of Potash (MOP) instead of the present compound fertiliser for reliable nutrient contents and economical reasons. Re-cycling of paddy straw and green manure and animal dung are also recommended.

d) Entire system of pest control as the Integrated Pest Management (IPM), which DOA practised in the other area, is to be applied in the pro-

gramme.

e) Increasing farmer's intention for high productive farming considering high profit is suggested.

f) Technical and management support has to be conducted through practical demonstrations in field.

g) Financial support on credit for farming may be required stable supply of agricultural inputs for achieving high yield and profit under stable water supply and risk-less crop production circumstances.

(2) Proposed Crop Production

Production of paddy and proposed crops in OFC is estimated according to planned cropping area based on the cropping rates, as shown in the table below, and the respective cropping patterns. Rates are determined considering profitability, crop rotation, and labour use of the survey area.

Cropping Rate of Cropping Pattern

(Unit: %)

Crops	Paddy Promotion Pattern		OFC Promotion Pattern	
	Maha	Yala	Maha	Yala
Paddy	100.0	90.0	90.0	80.0
Sesame	0.0	2.0	0.0	4.0
Chillies	0.0	2.5	3.0	5.0
B'onion	0.0	2.0	0.0	4.0
Red Onion	0.0	0.0	2.0	0.0
Pulse	0.0	2.5	3.5	5.0
Vegetable	0.0	1.0	1.5	2.0
Total	100.0	100.0	100.0	100.0

Crop production of proposed crops in the irrigation schemes according to the proposed cropping patterns is shown in the following table.

Proposed Crop Production

(Unit: ton)

Crops	Maha Season			Yala Season			Annual			Total
	Major	Medium	Minor	Major	Medium	Minor	Major	Medium	Minor	
Paddy	61,712	6,233	10,635	33,750	4,220	2,796	95,462	10,453	13,431	119,346
Sesame	-	-	-	304	28	25	304	28	25	357
Chillies	617	39	52	633	58	51	1,250	97	103	1,450
Onion	4,117	259	346	3,375	310	275	7,492	569	621	8,682
Pulse	720	45	61	633	58	51	1,353	103	112	1,568
Vegetable	2,059	130	173	1,688	155	137	3,747	285	310	4,342
Paddy	61,712	6,233	10,635	33,750	4,220	2,796	95,462	10,453	13,431	119,346
OFC	7,513	473	632	6,633	609	539	14,146	1,082	1,171	16,399

9.4.5 Crop Budget

Crop budget for proposed crops is analysed using inputs and prices of crop basi-

cally from the information obtained on the farmers' interview survey and the technical recommendations of the Department of Agriculture. The summaries of gross income, production cost, and new return "with project" according to the cropping pattern and scale of scheme are shown below:

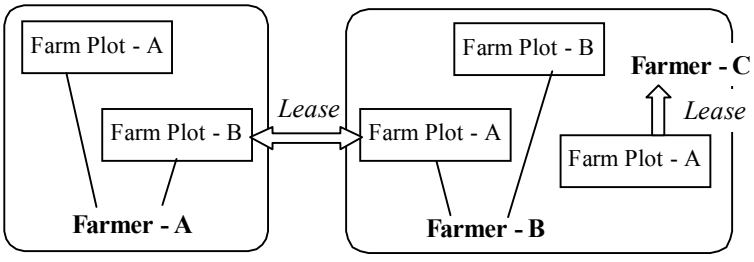
Crop Budget - With Project

	Major Scheme				Medium and Minor Scheme			
	Planned Yield (kg/ha)	Gross Income (Rs./ha)	Production Cost (Rs./ha)	Net income (Rs./ha)	Planned Yield (kg/ha)	Gross Income (Rs./ha)	Production Cost (Rs./ha)	Net income (Rs./ha)
Paddy – Maha	5,000	56,000	33,540	22,460	5,000	54,000	33,090	20,910
Paddy – Yala	5,000	56,000	32,760	23,240	5,000	54,000	32,490	21,510
Sesame	900	31,500	22,110	9,390	900	31,500	21,600	9,900
Pulses	1,500	43,520	25,410	18,110	1,500	43,520	23,930	19,590
Chillies	1,500	120,020	68,260	51,760	1,500	120,020	55,600	64,420
B. Onion	10,000	335,000	70,500	264,500	10,000	335,000	70,960	264,040
Red Onion	15,000	450,000	223,060	226,940	15,000	450,000	201,480	248,520
Vegetable	10,000	161,300	68,300	93,000	10,000	161,300	73,130	88,170

9.4.6 Improvement of Land Fragmentation

Generally, farmers in the medium and minor schemes have land fragmented into several plots and are scattered in and around the village or several tanks. Since crop cultivation has become less profitable in recent times, there are many cases where farmers have abandoned crop cultivation at remote plots. It is expected that such problem could be mitigated through the improvement of crop productivity proposed in the Master Plan. Further, if the problem still remains, the following countermeasures are recommended.

1) Land consolidation: The farmers exchange mutually their plots by equal value.
2) Mutual lease of land: The farmers lease mutually their fragmented lands, or lease to other farmers, as shown below.



A radical reform for fragmentation is land consolidation, but it won't work out in practice, because it directly affects farmers' interests. Mutual lease of land may also have a lot of opponents according to the result of group discussion with leaders of farmers' organisations, but it may be more acceptable by farmers since it may cause less movement of farmers' asset than land consolidation case. There-

fore, mutual lease of land is to be adopted as a countermeasure. Active communication with powerful mediation by FO is essential to make sure this countermeasure is implemented.

9.5 Proposed Income Generating Activities

9.5.1 General

Income generating activities in the irrigation schemes are being promoted because the farm incomes are extremely unstable and the farmers need to sustain their incomes through increased incomes from occupations other than crop production.

To improve and stabilise farmers' incomes, the following income generation activities are proposed, considering the farmers' needs shown in the above table, and potentials in and around the irrigation schemes: i) home gardening, ii) livestock development, iii) development of inland fisheries, iv) agro-processing and marketing development, v) vocational training, and vi) credit services for income generation. These programmes are formulated based on the following concepts:

a) Target group of the income generation is mainly to the poor.
b) Maximum utilisation of existing resources - in and around the village.
c) Stage-wise implementation of the programme, with those using, relatively simple techniques and small investments and resources available in and around the villages should be commenced initially.
d) Environmental issues should be considered.

The income generation is prerequisite to support the poor. At present, about 24% of total households per village are categorised as poor[8]. Generally, the poor have small benefits from the rehabilitation and improvement of irrigation facilities because of small holding size of their farmlands. From the standpoint of equitable distribution of the development benefits, the income generation will focus on the poor.

9.5.2 Components of Income Generation

Considering farmers' intention and development potential in and around the Study area, income generation components proposed in the Study are divided into a) home garden development, b) livestock development, c) inland fishery development, d) vocational training, and e) small scale enterprises. Income generation plan is proposed to be implemented in two stages as shown in the following table by each component and the easier components will be commenced in the first stage.

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[8] Recognised by FO leaders through RRA, and not Samurdhi people.

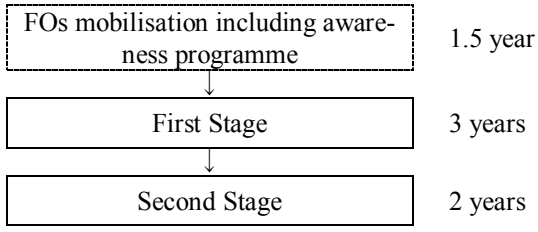
	Resources	1st Stage	2nd Stage
Home Garden Development	- Home garden: 0.4 ha - Farmers' experience for OFC cultivation - Rice straw, sawdust - Coconuts leaves - Wells for living (over 80% of farmers have obtained drinking water from small) - Favourable location for OFC and vegetable marketing (Dambulla)	Cultivation of OFC and vegetables for home consumption under hand watering by the use of wells, canals, tanks, etc.	Expansion of OFC cultivation by using small pump and cultivating in fallow paddy field and highland
		Cultivation of Abalone, Oyster and Straw Mushrooms for local consumption using rice straw and sawdust	Expanding mushroom cultivation for selling urban area (Colombo)
		Cultivation of horticulture crops such as banana, cashew and citrus (lime)	Expansion of horticulture crops in highland
Livestock Development	- Grassland in and fallow paddy field in and around the village and tank - Rice straw and bran as fodder - High demand of milk Marketing service by private companies	Milk production using by existing cattle and buffalo	Expanding milk production by increasing cattle and introducing high quality breed
		Egg production for home consumption	Egg and Broiler for local and urban consumption
			Goat raising
Inland Fishery	- Tank - Demand of fish	- Major & medium tanks: rent to fisherman - Minor tank: rent to fisherman or introduction of stock culture by farmers	- Major & medium tanks: introduction of cage culture by farmers - Minor tank: stock culture by farmers
			Ornamental fish culture
Vocational Training	- Relatively high educational level of farmers - Existing training facilities - Existing information system	- Encouraging vocational training	
		- Encouraging acquisition of qualification	
		- Providing employment information	
Small Scale Enterprise	- Rock for metal work of road and building - Potential of agro processing - Coconuts fibre -Employment generation by marketing improvement	Organising metal production	Expanding of metal material
		- Rice milling grinding of maize and chillies - Stoning of rice and sesame	Oil extraction (sesame) for local market
		Marketing business of agricultural products	

Revolving loan system and mutual aid credit proposed in the agricultural credit plan are introduced to assist the income generation plan above.

9.5.3 Implementation of Income Generation Activities

The income generation activities are to be implemented in two stages as stated above taking the following three points into consideration:

Stepwise Implementation



a) In the first stage, income generation activities with the resources available in and around the village and using existing practices will start with the poor. Home garden development, and encour-

aging the acquisition of qualifications, etc. will be emphasised and encouraged.

b) Successful implementation of income generation activities requires encouraging and ensuring farmers' independence. In order to ensure the successful implementation, it is proposed to link up with NGOs, which have enough experience in such activities.

c) A top-down implementation will bring adverse effects on farmers' independence. As a countermeasure, it is proposed that FO should take the initiative to encourage farmers' independence in income generation activities. Farmers' Organisations, which are autonomous bodies and representatives of village community, should maintain a close co-ordination between government agencies and the farmers for smooth implementation of the Project.

In order to implement the programme effectively and successfully the programme, it is proposed to establish a Subcommittee for Income Generation under FO (see 9.2.2) and a Subunit for Income Generation in the Project Management Unit (see 11.1.2). The existing conference rooms of ASC and the Farmer Centres newly constructed under the programmes (see 7.8) are utilised for lecture and meeting. As for the vocational training, the existing facilities are to be utilised, and construction of new facility is not included in the Master Plan. At present, seven (7) training facilities are available in and around the Study area with capacity of about 700 people.

9.6 Improvement of Marketing and Agricultural Credit

9.6.1 Improvement of Marketing

The improvement plans as shown in the following table are proposed in objective analysis as well as Master Plan Study. Detailed explanation of the implementation plan of five items proposed in the Master Plan is given further below.

Improvement Plan from Objective Analysis and in Master Plan

Improvement Plan by Objective Analysis		Implementation Plan in Master Plan
Improvement of farm input marketing	Strengthening of marketing facilities	a) Installation of Deposit of Products b) Installation of Polas
Introduction of OFC cultivation	Strengthening of Product Sales Improvement of transportation facilities Introduction of co-operative sales Collection of market information Improvement of product quality	c) Organisation of OFC farmers targeting for Co-operative purchase, improvement of quality of products and transportation facilities d) Preparation of information system for marketing
Reduction of production cost	Introduction of co-operative purchase	e) Introduction of co-operative purchase of farm inputs

(1) Establishment of Collecting Point

In dealing with traders, it is proposed to establish collecting points of products in Farmer Centres in each GN (see 7.8.3 (3)). Periodical shipping at fixed collecting points will have several merits for both farmers and traders; i.e., reduction of farmers' transportation cost, effective collection of traders, and decreasing handling losses of products.

(2) Establishment of Pola

For the marketing improvement within the irrigation schemes, it is proposed to establish at least one Pola in each major/medium schemes and hydrological group of minor schemes. By the establishment of Pola, merchants and traders will be attracted to the area, and marketing of products will be activated. Marketable surplus produced at home garden or in the highland will be marketed through such Pola. Pola is to be managed by FO. Construction of building facilities is not suggested to reduce O&M cost but proper location should be secured and levelled.

(3) Organising of Producer Group of OFCs

One of the important factors for OFC and vegetable production is a close linkage between producers and traders. And the condition of the linkage from the traders' side is producers' stable supply with a certain quantity. Production by an individual farmer is too small to keep stable supply for the market. Therefore, organising particular OFC producer groups becomes essential. The farmers cultivate OFC individually, but sell their products by the group for stable supply to the traders.

At implementation of the activity, farmers' training is crucial and strongly suggested through several kinds of courses conducted by ASC on technical and marketing aspects of OFC. The training programs should cover, (i) cultivation techniques of OFCs, (ii) understanding of price variation mechanism (time and quality to maximise the profits), and (iii) packaging to prevent lowering of quality of products during the transportation using locally available materials.

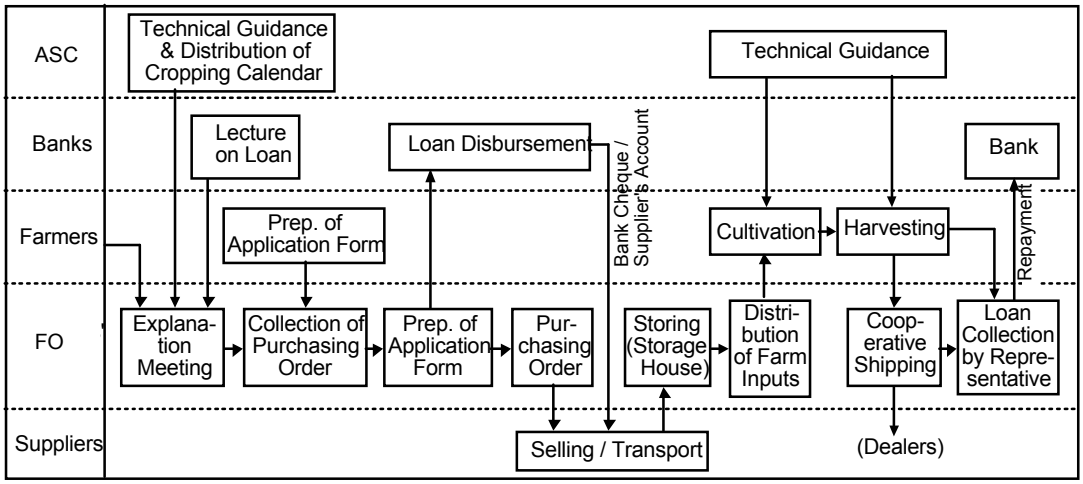
(4) Establishment of Marketing Information System

To improve marketing of products, a marketing information system should be established. Presently, the publications related to market information are issuing by the Agrarian Research and Training Institution (ARTI). The biweekly prices of farm products not only at farm gate but also at Pettah market are available. It is recommended that the market information be provided to all the farmers at least every two weeks. ASC is supposed to play an important role for information services of marketing.

(5) Expansion for Group Purchasing of Farm Inputs

Supplying farm inputs on time is one of the important factors for improving crop yields. To ensure smooth supply of farm inputs, a group purchasing system managed by FO is proposed. The overall flow of group purchasing system is presented in the chart below.

Proposed Group Purchasing



This system is closely connected with group loan system (see 9.5.2 (1)) and technical guidance, and has the following merits:

a) By directly purchasing from suppliers, the farmers can obtain the necessary quantity of farm inputs;
b) Through this system, the farmers can arrange all necessary farm inputs before the crop season, and they can use those inputs on time according to the necessity;
c) Under a blanket purchase system, the farmers can purchase farm inputs at discount prices; and
d) Transportation services will be available from the suppliers.

9.6.2 Agricultural Credit

Improvement plans derived from this objective analysis are proposed as shown below.

Improvement Plan from Objective Analysis and in Master Plan

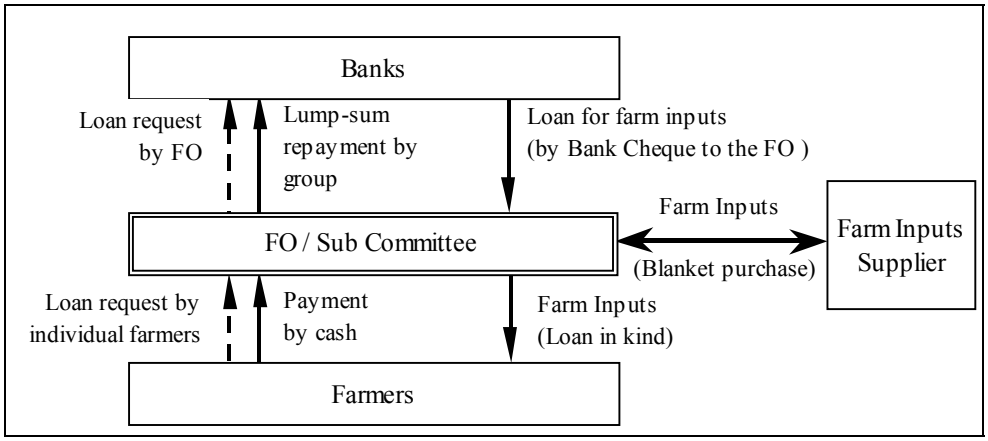
Improvement Plan from Objective Analysis			Proposal in Master Plan
Improvement of Market for Farm Input - Strengthening of Credit	Improvement of Teller system of Loan Provider	Provision of Information by FO Grouping of Loan User Introduction of Mobile Services	- Introduction of Group Loan managed by FO - Introduction of Revolving Loan managed by FO
	Improvement of Bank Access	Simplification of Application Introduction of Joint Liability System	
Activation of Small business - by loan offer	Improvement of Bank Access		- Introduction of Mutual Aid Credit

Improvement of bank access is suggested since it is difficult for individuals to access bank credit in the Study area at present. To overcome this situation, the following three types of credit system, namely, group loan, revolving loan, and mutual aid credit are proposed.

(1) Group Loan System

The proposed system is based on group loans, which will be managed by FO. The system will be applied mainly for purchasing farm inputs such as fertilisers and agro-chemicals. The following figure outlines the proposed credit system:

Proposed Group Loan



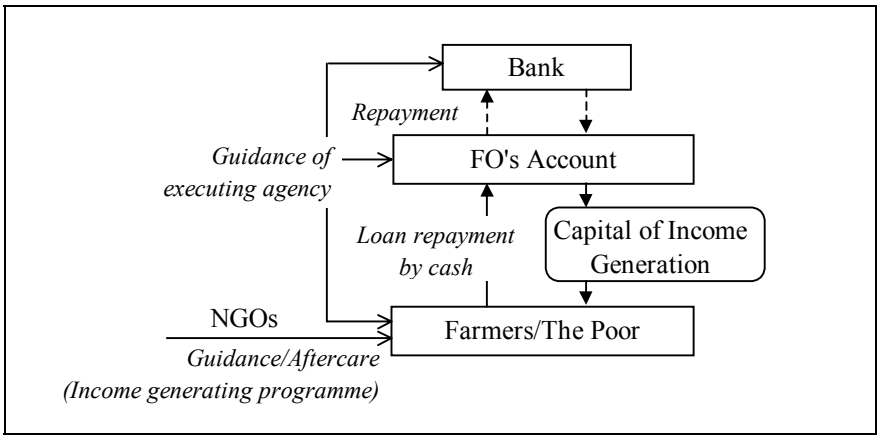
Since this loan system is realised on the basis of mutual trust, the borrowers should be limited to those farmers living in the same community. The state banks and several private banks (Hatton National Bank, Seylan Bank[9]) are now providing such group loans, and these group loans will possibly be introduced in the irrigation schemes.

(2) Revolving Loan System

The revolving loan system managed by FO is proposed for the irrigation schemes. The capital of loan is profits obtained through business activities such as co-operative purchasing of farm inputs, and collecting shares from the members. FO provides loan to the farmers at an interest rate lower than the market rate. The repayment amount from the farmers is to be deposited in FO's account and to be utilised again.

[9] Implementing the group loan in Rajangana Major Scheme.

Proposed Revolving Loan



If capital of loan is not enough, FOs obtain a loan from banks. The executing agency of the Project supports FOs for obtaining loan. Surplus from the revolving loan goes to repay the investor (banks). It is suggested that PMU organise supporting services section to assist FO for management of the revolving loan system, because FO has no knowledge and experience on such banking business. NGO's involvement is expected in such grass-root activities.

This revolving loan system is to be utilised comprehensively co-operating with the agricultural extension services. This loan system is thus adopted not only to purchase farm inputs but also to procure equipment like rice mills under the income generation programme. Enough guidance with continuous aftercare by the executing agency of the programmes is essential for loan management of the borrowers (farmers / the poor).

(3) Mutual Aid Credit System

The mutual aid credit system proposed is just like "rotating-funds credit association" or loan system by Woman's Bank, which is prevailing in urban area or southern part of Sri Lanka.

The members of a rotating funds credit association, by means of monthly fixed deposits decided by all members, make up a communal fund. The assignment of the regular withdrawals can be made through a "lottery" system or decided by mutual agreement among the members. The deposits and withdrawals continue until each member has received the agreed standard sum of money. This credit system will be applied to the capital of living and the income generation. Penalties for defaulting must be established in the rules governing the association. These rules must be clearly defined and enforced. Peer pressure plays an important role for the enforcement of the rules.

9.7 Irrigation and Drainage Plan

9.7.1 General

The irrigation development plan was formulated considering the lessons learned and the currently envisaged problems and constraints, aiming to establish a sustainable irrigation system in the Study Area. During formulation of the plan, a special focus was given to the following matters:

a) Estimation of the irrigation water requirement based on the actual measurement, soil conditions, and irrigation method.
b) Design of the canal system considering applicable water management.
c) Provision of simple irrigation and drainage facilities including measuring devices, for easy operation, maintenance and water management by farmers' organisations.

9.7.2 Irrigation Water Demand

Irrigation water requirement is calculated on a monthly basis on the basis of the design booklet "Design of Irrigation Headwork for Small Catchments, May 1994" which is published by ID.

(1) Cropping Pattern

The following cropping patterns are set to assess the water resources potential and to delineate the irrigation areas. A chilli is represented to estimate the crop water requirement for OFC.

Cropping Patterns for assessment of Water Resources Potential

Type	Maha	Yala
Paddy Type	Paddy 100%	Paddy 100%
Paddy Promoted Type	Paddy 100 %	Paddy 90% OFC 10%
OFC Promoted Type	Paddy 90% OFC 10%	Paddy 80% OFC 20%

(2) Irrigation Water Demand for Each Cropping Pattern

The gross water requirement for each cropping pattern used to assess the water resources potential are shown in Table 9.7.1 and summarised below. Calculation detail of irrigation water requirement is described in Appendix F.

Irrigation Water Demand

(Unit : m3/ha/year)

Agro-ecological Zone	DL1	IL1	IL3
Paddy Type	22,000 – 33,100	20,800 – 31,200	21,900 – 32,800
Paddy Promoted Type	21,600 – 32,400	20,200 – 30,300	21,400 – 32,100
OFC Promoted Type	20,900 – 31,400	19,400 – 29,200	20,600 – 31,000

9.7.3 Water Resources Assessment

(1) Purpose of Water Resources Assessment

The water resources assessment is carried out based on the crop intensity obtained by the inventory survey and the result of the water balance study. The water balance study is carried out based on the monthly inflow and outflow of each tank on the basis of 75% probability, irrigation water requirement and loss of water such as evaporation. Details of water balance study are given in Appendix - F. Purpose-wise method applied for the assessment is explained below.

1) Adequacy of water resources potential to gross command area: Larger value of either of a) 75% probable cropping intensity obtained from previous five years cultivation records in the inventory survey or b) 75% probable cropping intensity obtained from water resource assessment study is used for assessment of water resources potential to gross command area. Adequacy of water resources is evaluated and classified into three categories: "H" for the case where the larger value of crop intensity stated above is more than 150%, "M" for the case where the value is between 100 to 150% and "L" for the value less than 100%.

2) Improvement of water resources utilisation through the implementation of the programme: The possibility to improve water resources utilisation through the implementation of the programme is assessed by difference between a) 75% probable cropping intensity obtained from previous five years cultivation records in the inventory survey and b) 75% probable cropping intensity obtained from water resource assessment study as improvement potential. The classification of the irrigation schemes by the incremental cropping intensity is such that "H" for the case where the increment of crop intensity stated above is more than 50%, "M" for the case where the value is between 0 to 50% and "L" for the value nearly equal to 0%.

(2) Result of Water Balance Study and Assessment of Water Resources Potential

Result of water balance study and assessment of water resources potential are summarised in the following table.

Result of Water Balance Study and Assessment of Water Resources

Cluster		Code	(1) Gross Command Area	(2) With Project 2)	(3) Without Project 3)	(4)=(2)-(3) Increase	Assessment of Water Resources	
			(ha)	CI 1)	CI	CI	(a) 4)	(b) 5)
Major Schemes	Nachchaduwa	1MA-01	2,540	200%	158%	42%	H	M
	Nuwarawewa	1MA-02	1,134	107%	100%	7%	M	L
	Tissawewa	1MA-03	365	104%	100%	4%	M	L
	Rajangana	2MA-01	5668	152%	152%	-	H	L
	Palukadawewla	4MA-01	956	146%	146%	-	M	L
	Attaragallewea	4MA-02	462					
	Abakolawewa	4MA-03	410					
	Magalle Wewa	5MA-01	2,632	150%	150%	-	H	L
Medium Schemes	Thuruweli Wewa	1ME-01	227	160%	160%	-	H	L
	Eru Wewa	1ME-02	34	202%	202%	-	H	L
	Uttimaduwa	1ME-03	93	180%	100%	80%	H	H
	Periyakulama	1ME-04	91	150%	118%	33%	H	M
	Maminiya Wewa	1ME-05	211	142%	107%	35%	M	M
	Mahabulankulama	1ME-06	90	139%	116%	23%	M	M
	Angamuwawewa	2ME-01						
	Mahananeriya	4ME-01	158	198%	100%	98%	H	H
	Mahagalgamuwa	4ME-02	193	50%	50%	-	L	L
	Hulugalla Wewa	5ME-01	121	200%	150%	50%	H	H
	Meddeketiya	6ME-01	98	200%	100%	100%	H	H
	Moragoda Anicut	6ME-02	194	226%	226%	-	H	
Minor Schemes	Nachchaduwa	I	303	67%	67%	-	L	L
	Nachchaduwa	II	278	76%	5%	71%	L	H
	Nachchaduwa	III	412	138%	138%	-	M	L
	Kala Oya 1	IV	349	101%	32%	69%	M	H
	Kala Oya 2	V	179	90%	90%	-	M	L
	Mi Oya	VI	318	80%	80%	-	L	L
	Mi Oya	VII	260	123%	17%	106%	M	H
	Deduru Oya 1	VIII	271	111%	56%	55%	M	H
	Deduru Oya 2	IX	139	125%	125%	-	M	L

Notes 1) Cropping Intensity
2) Result of Water Balance Study
3) Result of Inventory Survey
4) Assessment of water resources amount
5) Assessment of water resources utilisation

The result of water balance study is expressed in "With Project", and the result of 75% probability cropping intensity obtained from the inventory survey is expressed in "Without Project".

From these results comprehensively, amount of water resources in major schemes is more abundant comparing with medium and minor schemes, amount of water resources is showing a tendency to decrease in proportion with the scale of schemes diminish. As for water resources utilisation, the effects such as increasing cultivation area through improvement of water resources utilisation are expected much in medium scheme where irrigation facilities are not provided.

9.7.4 Delineation of Irrigation Area

A water balance study is carried out to assess irrigable area under the Master Plan, applying the cropping pattern for each scheme in accordance with criteria indicated in the agricultural development plan. The results are shown in Table 9.7.2 and summarised below. The result of the water balance study indicated that the estimated irrigable area in six schemes named Maha Galgamuwa (4ME-02),

Minor-I, Minor-II, Minor-III, Minor-V, Minor-VI is smaller than gross command area. Careful attention should be paid for such schemes to decide rehabilitation area.

Result of Water Balance Study

(Unit : ha)

Scheme Category	Commanding Area	Maha	Yala	Total
Major Scheme	14,167	13,712	8,448	22,150
Medium Scheme	1,509	1,334	999	2,333
Minor Scheme	2,509	2,237	703	2,940
Total	18,185	17,283	10,140	27,423

9.7.5 Rehabilitation and Improvement Plan of Irrigation Facilities

(1) General

Since rehabilitation projects funded by foreign aid such as MIRP, ADB, ISMP, etc., have been implemented for all major schemes in the last decade, the conditions of the existing facilities, in general, are not remarkably deteriorated. Therefore the deterioration of facilities are not major obstacles for agriculture. However, the rehabilitation works for such projects have only treated a selected portion of facilities where deterioration was terrible due to the restricted fund and there are some deteriorated facilities remaining. In addition, since proper rehabilitation works have been not given due to restricted fund, some facilities appear to be damaged soon after being rehabilitated.

On the other hand, few rehabilitation projects have been implemented for medium and minor schemes except Thuruwila. The standards of existing facilities are still low. Earth canals are dominant even in the main canals, and turnout gates are not introduced in most of the medium and minor schemes.

Therefore, these facilities should be rehabilitated, applying the improved standards of rehabilitation compared with previous rehabilitation projects. The expansion of lined canals and introduction of division and measuring facilities should be adopted for all the schemes. The expansion of lining canals is needed since that would contribute to alleviate O&M cost after rehabilitation.

The existing condition of major and medium schemes and the rehabilitation plan for respective schemes are presented in Table 9.7.3 and Table 9.7.4, respectively.

(2) Irrigation Facilities

1) Tank

Rehabilitation works for most of the tanks are necessary. Main civil works are bund earthworks, riprap protection, desilting, removing watergrass, improvement of sluice, sluice gates and spillway.

Several medium schemes have drainage problems because of inadequate cross section of the drainage canal downstream of spillway to convey spill-

ing water properly. Consequentially, unnecessary spilling water is flowing to the command area. Improvement of the spill tail canal is needed for such schemes.

In addition, there are a few constraints that the spilled water in the upstream scheme is not flowing into the downstream reservoir owing to poor condition of spillway tail canal. This may lead to water shortage in the downstream irrigation schemes and wastage of water resources. For a more functional cascade system, it is necessary to improve these spillway tail canals.

2) Canal System

Method of irrigation predominant in the Study area is gravity irrigation corresponding to the topographic situation. The method is the most economical considering initial investment and O&M cost. No alternative method of irrigation will be applied for the facility rehabilitation plan for the Project.

Provision of a masonry or reinforced concrete retaining wall is recommended for irrigation canal rehabilitation except for field canals. The canal gradient must be carefully selected to where erosion occur along slope due to high velocity in accordance with canal lining materials to prevent slope failure owing to high velocity.

Turnout facilities with not only water distribution function but also measuring devices are desirable in order to distribute water fairly. In addition, installation of measuring facilities at the head of main canals to manage released water from the tank are proposed in medium and minor schemes. It is also desirable to facilitate bathing steps.

(3) Farm Road

In most of the major irrigation schemes, farm roads have been already facilitated along the main canal for O&M of irrigation facilities, and they are rather maintained well. Therefore, the needs of rehabilitation and improvement for these roads are not so high at present. However, since there are very limited farm loads in the area far from the canals, farmers are obliged to convey agricultural production as well as input by manpower because of poor accessibility to their fields.

Construction of farm roads based on farmers' intention are recommended for contributing to labour saving and marketability improvement. However, careful attention needs to be paid to road construction because it could lead to reduced farmland. From the findings of the site investigation and the inventory survey, farm roads are proposed for five schemes, namely Nuwarawewa, Magalle Wewa, Maminiyawa, Maha bunankulama, and Mahananneriya.

9.8 Operation and Maintenance of Irrigation Facilities and Farm Roads

9.8.1 General

As described in the Chapter 4, the operation and maintenance of irrigation facilities are carried out independently by the ID or the FOs, or as joint operations of the ID and FOs. Although their activities, in general, come up to the expected standard, to some extent, there are some areas that need to be improved in both technical and institutional aspects as shown below.

a) Responsibilities of O&M between the government and FOs,
b) Preparation of O&M plan by FOs themselves,
c) O&M cost borne by FOs considering affordability, and
d) Monitoring of O&M activities.
e) Improvement of mechanisms for settlement of irrigation disputes,

9.8.2 Clarification of Scope of Responsibility for Water Management, Operation and Maintenance

The responsibilities of O&M in the medium and minor irrigation schemes should be handed over to FOs as the activities are at present being carried out by them in some schemes anyway. The proposed responsibilities of O&M are as follows.

Responsibilities of O&M

Description	Major	Medium	Minor
Water Distribution			
- Tank Sluice	ID	FO	FO
- Main / Branch Canals	ID	FO	FO
- Distributary Canals Head Gate	ID	FO	FO
- Field canals Head Gate	FO	FO	FO
Maintenance			
- Tank	ID	FO	FO
- Main / Branch Canals	ID	FO	FO
- Distributary Canals	FO	FO	-
- Field Canals	FO	FO	FO

Handing over the O&M of irrigation facilities to FOs are to be implemented considering load of construction works and ability of relevant FO. Officials in ID and PED are supposed to compile or list necessary drawings such as structure drawings and canal chart and so on and hand them over to FO at the same time. Government officials concerned are supposed to conduct hearing and meeting to explain and discuss responsibilities of FO as well as of Government side, facilities to be handed over to and contents of document or drawings concerned. The document concerned is to be kept by ID, PED, IMD, and FO.

9.8.3 Water Management

Efficient operation of an irrigation system should ensure that the right amount of water is supplied to crops at the right time. The irrigation schedule will be decided at the Kanna Meeting. The regular operation of the irrigation facilities will be performed in accordance with the irrigation schedule prepared.

To realise effective and equitable water distribution to each farmer, the turnout and

farm inlet should be operated properly. The Jalapalaka or the person employed by the ID and FOs, and the staff involved in the system's operation, are responsible to operate daily all irrigation facilities in the Study area and monitor actual water delivered and adjustment of discharge accordingly. Off-take discharge from the parent canal should be checked at the turnout, by reading the water level at the staff gauge placed, and adjusted it by controlling the gate opening as necessary.

9.8.4 Maintenance Plan

Proper planning is the most important component in the execution of proper maintenance. The ID officials should provide technical support to the FOs, so that they are able to prepare the plan by themselves. A preventive maintenance plan is worked out in the following steps:

a) make an inventory survey of all facilities regularly;
b) compare the survey results with deficiency levels and maintenance cycle for each facility or a part of facility, and check the necessity of the maintenance work;
c) estimate quantities and costs required for the maintenance work according to the maintenance standard;
d) determine the work procedures to be used, and machinery and manpower requirements to undertake the maintenance work; and
e) prepare the budget requirements and establish the maintenance priorities.

In a normal case, head sluices of main canals are closed twice a year to clean canals and related structures.

9.8.5 Maintenance Activities

(1) Tanks

The tanks will be maintained and repaired by the ID staff for major schemes and by the farmers for medium and minor schemes. Special attention must be paid to seepage, piping, and leakage of water from bunds of the tanks to prevent bunds from sliding. Regular patrol of the bunds of tanks is essential so as to find abnormal conditions in bunds as early as possible. In case an abnormal condition is located, emergency repairs must be carried out immediately until permanent repairs are done later.

(2) Irrigation Canals

Maintenance activities are to be conducted by farmers in general except for main canals in major schemes. The principal components of maintenance activities in a canal comprises silt removal (de-silting), removing earth weeds (secondary growth clearing), aquatic weeds removal, and repairs to erosion of the bund. Among the various kinds of structures, proper maintenance of diversion structures

such as regulators, turnout, and farm inlets is essential to control the facilities for the optimum use of irrigation water. The principal components of maintenance activities in the canal structures comprise a) removal of materials deposited on the bed of the structure, b) repairs to erosion of canals immediately upstream and downstream of the structures, c) repair or replacement of gates, and d) repair of concrete work and staff gauges.

(3) Operation and Maintenance Roads

Operation and Maintenance roads (O&M roads) constructed along the irrigation canals for the operation and maintenance of irrigation facilities are generally paved with gravel or natural soils and maintenance of the roads is frequently required especially during the rainy season. The principal components of the maintenance work to O&M roads are grading, crack sealing, filling potholes, weed control, and material hauling.

9.8.6 Data Collection, Monitoring and Reporting System

For proper O&M of the irrigation schemes, it is important to keep basic data and operation records obtained through regular O&M activities. The records of every field in the scheme operation should be collected regularly and kept neatly in the Flow Monitoring Unit. The review of the records should be made to evaluate the achievements and reflect it in the operation works in the future.

Data relevant to water management to be collected are the data for routine monitoring comprises meteorological data, cultivation progress, water distribution and system operation data, and so on and the data for special studies focusing on particular parts of the water management, comprises of field water requirement, percolation losses, canal losses, stage-discharge curves of measuring devices, return flow rate, and so on. The data are collected by the ID and FO and compiled in the Project Management Unit.

The Project Management Unit has the responsibility of preparing seasonal and annual reports covering the irrigation season, to account for the water distribution affairs throughout the season. Items to be included in such a report are General provision (meteorology, irrigated area, cropping pattern, and so on), Irrigation schedule, Actual diversion discharge at each turnout, Water management activities, Maintenance activities with summarised records of maintenance, and Observed problem and action taken.

9.8.7 O&M Costs

All O&M costs of irrigation facilities on D- and F-canals in major irrigation schemes and all facilities in medium and minor irrigation schemes are covered by

the Irrigation Service Fee (ISF) collected from the farmers. ISF includes operation cost, maintenance cost, and collecting cost, such as, the transportation costs of collectors and treasurers and its amount is estimated by each FO, taking into consideration the affordability of the farmers. In order to minimise the labour cost, it is proposed that farmers as communal work should carry out maintenance works, which is already in use by farmers (Sramadana).

The procedure of O&M cost allocation should be improved. The contract should be given only to FO that carries self-prepared annual maintenance plan and its cost estimates. Thus, the guidance for O&M allocation, contracting, as well as, its invoicing system should be carried out by the government officials.

The preliminary analysis by the JICA Study Team estimates that the annual O&M cost is some Rs. 2,000/ha for the major schemes and Rs. 1,500/ha for the medium and minor schemes. These costs includes Rs.500/ha/year for "Salaris."

9.8.8 Training on Water Management, Operation and Maintenance

Training items as shown in the following table are proposed regarding water management and O&M of facilities. Farmers, Government staff such as TA and WS are encouraged to participate to the training and Instructors are invited from training centre of ID at Galgamuwa or from outside.

Training for Water Management and O&M of Facilities

Item of Training	Major Scheme		Medium Scheme		Minor Scheme	
	Gov't	FO	Gov't	FO	Gov't	FO
1) Awareness of Water Management and O&M of Facilities	●	●	●	●	-	●
2) Strengthening of Communication	●	●	●	●	-	●
3) Water Management Plan	●	●	●	●	-	●
4) Water Distribution Technique	●	●	●	●	-	●
5) Facility O&M Technique	●	●	●	●	-	●
6) Research and Measurement	●	-	-	-	-	-
7) Monitoring and Evaluation	●	●	-	-	-	●

Awareness programme for water management and O&M of facilities to farmers and Government officials is the most important step of the training. Implementation of the training is proposed in two phases. In the first phase, training on knowledge acquisition about participatory development methodology, communication with farmers and problem solution methodology is given to Government officials by instructors from outside. Through the training, trainees aware that they have to change their attitude to carry out water management and O&M by their own. In the second phase, workshop is to be held among instructors outside, Government officials, and farmers to identify importance of water management and O&M of facilities by farmers themselves through discussion. The following items are to be discussed in the workshop:

a) Observance of pre-decided irrigation schedule,

b) Participation to FO meetings,
c) No damage to facilities,
d) Participation to joint O&M activity (Sramadana),
e) Due payment of O&M charge, and
f) Participation to training programmes by the Government

The workshop is proposed to hold in the periodical meetings regarding facility rehabilitation/upgrading plan of the Government and farmers as described in Subclause 9.6.6.

9.9 Proposed Plans for Strengthening of Agricultural Supporting Services

9.9.1 Basic Approach for Formulation of Strengthening Plans

The basic approach, established for the formulation of strengthening plans of agricultural support services under the Study, is illustrated in Figure 9.9.1. The basic approach consists comprehensive studies such as i) investigation on current status of the fields, ii) identification of constraints/problems in agricultural development and support services, iii) identification of needs for support programmes, iv) establishing priority areas to be addressed under the Master Plan, v) formulation of agricultural support programmes, and vi) formulation of implementation schedules of support programmes by scheme.

In the formulation of the strengthening plans for agricultural support services or programmes, special emphasis has been placed on the crop sub-sector because it is the primary economic activity in the Study area and it is the target of the proposed agricultural development plan for the potential realisation of irrigated agriculture. The support programmes on other sectors/sub-sectors have been formulated from viewpoint of income generation.

9.9.2 Scope of Planning and Supporting Programmes for Crop Sub-sector

(1) Scope of Planning for Crop Sub-sector

Constraints or weakness in crop sub-sector, needs of agricultural support services by the extension organisations and agricultural production plan proposed were evaluated to decide scope of planning for strengthening of agricultural support services in the sub-sector. The scope evaluated includes i) agricultural support programmes consisting of agricultural research, agricultural extension, seed production and supply, agricultural credit, agricultural support facilities and logistic support and staff training, ii) farmers/FOs support institutions and facilities, and iii) management system and institutional set up for the agricultural support services.

(2) Supporting Programmes for Crop Sub-sector

The support programmes in the crop sub-sector should be implemented as a pack-

age programme or in an integrated manner to ensure the multiplied impacts of individual element programmes and to materialise the efficient inputs of activities of limited extension staffs. The formulation of package programmes and the integration of support programmes aim at introducing knowledge-based technology and material technology in an integrated manner for ensuring the adoption of recommended farming practices in a large scale. The proposed support programmes in the crop sub-sector formulated in accordance with the approaches discussed in the previous sections are shown in Table 9.9.3 and summarised in the table below.

Proposed Support Programmes under the Project

Agricultural Support Programme		Implementation
- Field Programmes	1. Adaptive trials 2. Small-scale demonstration programme 3. Cropping pattern demonstration prog. 4. Large-scale demonstration programme 5. Productivity increase programme 6. IPM	Implemented by scheme
- Farmer Training Programme	1. Induction farmer training 2. Induction farmer guidance 3. Farmer training 4. Workshop/mass guidance 5. Campaign 6. Study tour	Implemented by scheme
- Seed Production Programme	1. Seed production prog. (paddy/ OFC)	By scheme
- Agricultural Credit Programme	1. Cultivation loan with revolving funds 2. Medium term credit programme	Implemented by scheme
- Institutional Strengthening Programme	1. Logistic support strengthening prog. 2. Staff training programme 3. Institutional strengthening 4. Upgrading ISTI, Maha Illuppallama	Implemented by project, province or district basis
Strengthening of Farmers/FOs Support Institutions & Facilities		
1. Establishment of "Farmer Centre" 3. Institutional strengthening programme	2. AS Centre strengthening programme	Implemented by district etc.

Note: Implemented by Project: programmes implemented by project, province or district basis

Among the programmes, the institutional strengthening programme and strengthening of farmers/FOs support institutions & facilities except for establishment of "Farmer Centre" are to be implemented by the Project, on a province or district basis.

9.9.3 Scope of Planning and Supporting Programmes for Income Generation

The scope of planning for income generation according to the improvement programmes of the related sectors of crop sub-sector (planting material production), livestock sub-sector and inland fisheries sub-sector are shown below. The programme descriptions are presented in Table 9.9.3.

Areas to Be Addressed for Supporting Income Generation Plans

Sub-sector	Areas to be Addressed
Crop	Upgrading provincial seed farm to enhance planting materials production
Livestock	Upgrading of the IFTC, Nikaweratiya & logistic support strengthening
Inland Fisheries	Establishing extension activities of NAQDA

9.9.4 Annual and Overall Implementation Programme for Support Programmes

Annual and overall implementation programme to be executed by unit of scheme, project, province, and district are described in table 9.9.4 and 9.9.5. The implementation schedules for the support programmes have been formulated for a period of three to six years depending on the size of the schemes, the schedules of irrigation works, and the current status of crop production in the project schemes. The implementation of the support programmes is scheduled to start simultaneously with or prior to the commencement of the implementation of the construction works aiming at the earlier expansion of extension coverage. The formulation of the implementation schedules has been made through the comprehensive study on: i) programmes required by scheme, ii) programme sequence and capacity of extension staffs for programme implementation, iii) schedules of irrigation works and iv) implementation schedules of the support activities of the irrigation and farmer organisation sectors.

The implementation schedules of the support programmes in other sectors or subsectors have been formulated taking into account the implementation schedules of income generation plans, irrigation works, crop sub-sector support programmes, and other implementation schedules.

9.9.5 Proposed Management System and Institutional Set-up for Agricultural Support Services

(1) Basic Concepts

The concepts for the establishment of the management system and the institutional set-up for the planning, implementation and monitoring & evaluation of the agricultural support programmes under the Project are:

a) Planning and implementation of the agricultural support programmes are to be performed under the "rolling plan" concept. Under this concept, annual work plan, consisting of implementation schedule and cost schedule of each project scheme, is to be reviewed annually on the basis of the lessons learnt from the implementation of the programmes in the preceding year and through the participatory approach for their planning,
b) Strengthening of agriculture extension services in the crop sub-sector is to be aimed at within the present policy and institutional framework and through the strengthening of co-operation and collaboration between the IPEU/PDOAs and the DAS,
c) Enhancement of farmers contribution in extension as well as institutionalisation of their participation in extension activities from the planning stage,
d) Strengthening of research-extension-farmer linkage is to be sought

through the programme implementation, and

e) Management of support programmes of sub-sectors other than the crop sub-sector should be executed under the present system and under the supervision of the project management body as scale of programmes in such areas are limited.

(2) Proposed Management System for Agricultural Extension Programme

On the basis of these concepts, the management system for the implementation of agricultural supporting programmes under the Project is proposed as shown in Figure 9.9.2. The proposed management system consists of four basic actions of: 1) identification of constraints and needs, 2) participatory planning & programme formulation, 3) budget arrangement, and 4) programme implementation, monitoring and evaluation as shown in the figure.

The basic time schedule for planning and implementation of the agricultural supporting programmes under the Project are to be shown in Table 9.9.6 consisting of 1) workshop for annual programme formulation, 2) programme formulation, 3) preparation of AWP, 4) budget arrangement, 5) preparation of action plan, and 6) programme implementation.

(3) Proposed Institutional Set-up for Implementation of Agricultural Support Programmes

The institutional set up for the implementation of the crop sub-sector support programs proposed in accordance with the present institutional set up of the PDOAs and IPEU is shown in Figure 9.9.3. The PDOA, NCP and IPEU, Anuradhapura are the extension agencies responsible for the implementation of crop sub-sector support programmes in NCP. The PDOA, NWP is the agency for the programmes in NWP as shown in the Figure.

(4) Linkage among Proposed Extension System and Research, Extension and Farmers in Crop Sub-sector

The linkage among extension system and research, extension and farmers in the crop sub-sector are to be similar to the currently established system as shown in Figure 9.9.4 under the Project. The basic extension approaches involved in the system are: 1) approach through farmer groups or FOs and 2) participatory approach in planning process; to be top-down as well as bottom-up and reciprocal. In the aspect of the linkage among research, extension and farmers, the aim is the activation of the system and the strengthening of the linkage through allocation of necessary budget and research related programme implementation.

9.10 Research Programme of Cascade System and Subsurface Water

Planning of rehabilitation or improvements to any tank system requires assessing

and understanding the entire hydrological characteristics of the cascade. Up to now, with a few exceptions such as the International Irrigation Management Institute (IIMI) study conducted in the Anuradhapura District however, there is very few research or experimental activities for hydrology and water balance of a system of cascade in Sri Lanka. Neither the government nor others have had positive intention to such research and experimental activities.

Thus, the following research programmes for tank cascade system are proposed:

a) Collection of base data such as rainfall, flow into tanks, diverted water to downstream, evaporation from tank, evaporation and percolation in paddy field,
b) Preparation of a simulation model for water balance within a cascade,
c) Formulation of optimum water utilisation and management plan,
d) Strengthening of FO to realise the optimum water utilisation and management, and
e) Conduct of a field awareness programme for the water management plan.

In addition, research on subsurface water is proposed in the Study area. The subsurface water plays an important role in meeting crop demands when the irrigation intervals are stretched beyond the required limits during droughts. This also gives the much-needed flexibility in water delivery for raising OFC. Main research items will be i) pumping test, ii) permissive sustained yield, iii) environmental effect by the use of subsurface water, and so on.

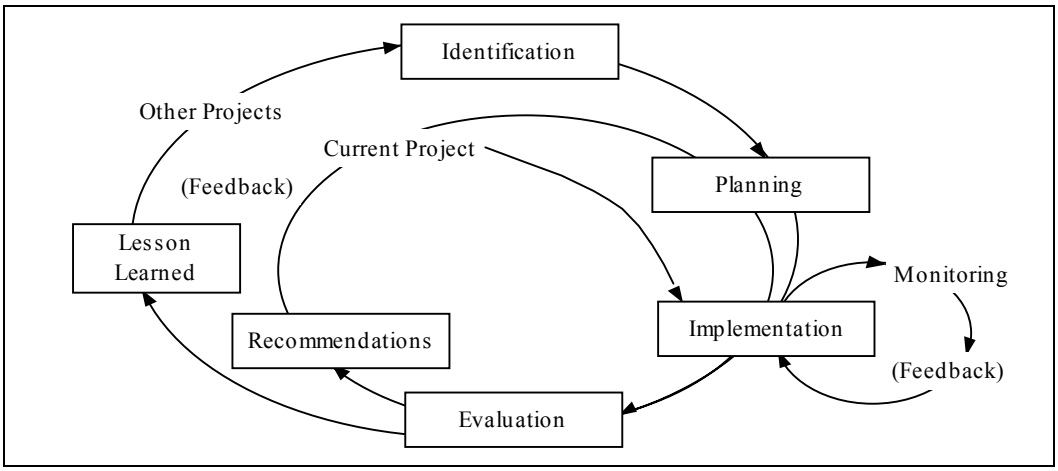
9.11 Monitoring and Evaluation of the Project

9.11.1 General

It is recommended that the Project is monitored and evaluated based on the PCM method[10]. The important point of this method is to feedback the results of monitoring and evaluation into projects, so that the operation and management of ongoing and future projects are improved, and not to criticise the project for any shortcomings.

Main purposes of this method are to (i) optimise the operation and management of ongoing projects, (ii) ensure accountability to the investors, and (iii) draw lessons from experience. In principle, project staff of PMU performs monitoring activities, while external collaborators / agencies undertake the evaluations. Overall concept of monitoring and evaluation based on PCM method are outlined below:

[10] The monitoring and evaluation method proposed in this Chapter was established by the Foundation for Advanced Studies on International Development (FASID), Japan. The terms of "monitoring" and "evaluation" are the same with that defined by FASID.



9.11.2 Monitoring

Monitoring is the continuous or periodical surveillance of the implementation of a project, and is carried out during the implementing period of the project. The following three items are monitored: (i) activities, (ii) outputs, and (iii) project purpose in the PDM and Plan of Operation. In addition, the situations of the "inputs", "important assumptions" and "preconditions" in the PDM are reviewed to identify cause and effect of the former three items.

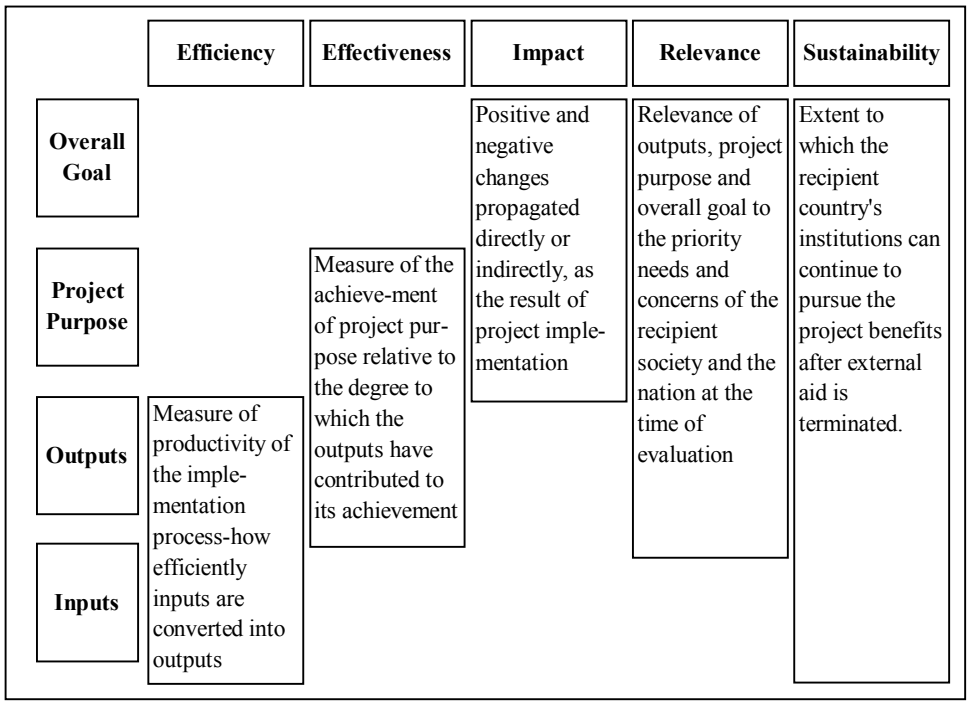
The Subunit of Monitoring and Evaluation under PMU deals with monitoring. In order to keep transparency, it is recommended that officers of external agencies join this subunit. The following monitoring system is proposed to be established in the Project.

Process	Contents	Officers/Agencies in Charge
Identifying and making decision on monitoring items	Indicators of the project purpose and outputs, expected results of activities, etc. in the PDM and the Plan of Operation.	Subunit of Monitoring and Evaluation in co-operation with external agencies. Final decision is made by the Central Project Co-ordinating Committee (CPCC).
Collecting data and its method	Responsible persons, timing, frequency, method, etc.	The Subunit of Monitoring and Evaluation is responsible for collecting data, and analyse and compile these data into the monthly progress report. Collecting route: Implementing Agencies → subunits related to their activities → Subunit of Monitoring and Evaluation.
Reporting	Monthly Progress Report	Chairman of CPCC through the project director of PMU MIP reports it to the funding agency.
Judgement		Final judgement is made by MIP, and CCPP and Provincial Project Co-ordinating Committee (PPCC) assist MIP.
Feedback	The monitoring results should be shared among the project officials and agencies concerned.	The project director of PMU submit the copies of the progress report to PPCC and agencies concerned.

The progress reports provide a major information input to the project review, and these should use a format based on the elements in the PDM and the Plan of Operations.

9.11.3 Evaluation

The PCM method assesses the Project based on the following five evaluation criteria: (i) efficiency, (ii) effectiveness, (iii) impact, (iv) relevance, and (v) sustainability. These are directly linked to the design elements of the narrative summary of PDM, as shown below:



In addition, cross-cutting issues, such as, policy, technological, environmental, socio-cultural, institutional and management, economic and financial aspects will be take into consideration to evaluate the Project, in order to study the detailed evaluating items on the five criteria, and to analyse the reasons and causes of the results obtained through the evaluation.

The process of the evaluating the Project is summarised as follows:

Step	Procedure
1. Narrative summary for evaluation	1.1 Designing the PDM_E. 1.2 Establishing narrative summary for evaluation
2. Evaluation design	2.1 Defining the main evaluation questions 2.2 Selecting the data collection methods 2.3 Finalising the evaluation design
3. Data analysis	3.1 Collecting data 3.2 Analysing data 3.3 Drawing conclusions of five evaluation criteria
4. Conclusion	4.1 Drawing overall conclusions 4.2 Recommendations and lessens learned 4.3 Presenting evaluation results

With an appropriate monitoring system and sufficiently frequent and comprehensive project review, there will be no need for detailed historical investigations when the project is evaluated. Rather, the evaluation team will be able to concentrate on the evaluation itself to assess the proposed one above.

CHAPTER 10 ENVIRONMENTAL ASSESSMENT

10.1 Basic Approach

In the course of fieldwork of the Study, sectors or areas where environmental quality has been diminishing were identified. The Study concluded that the development components would not lead to a loss of environmental quality at implementation. Rather, there could be an enhancement of the quality by mitigating existing issues as part of management strategies during implementation of the development components. The Master Plan will also seek to mitigate those unfavourable impacts that may arise during the course of implementation. The active participation of the farmers will be sought to focus on local environmental issues during the various training programmes and search for solutions that would be economically feasible, environmentally sustainable and socially acceptable.

10.2 Institutional Aspects

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. There is currently a greater awareness on the need to maintain environmental quality, both among institutions and the people.

Crop production for purposes of this Study is concerned with paddy, other field crops, fruits, and vegetables. Research and extension centres for most of these crops are found within the Study area. DI and DAS share development of water resource for irrigation in the Study area. Institutional weaknesses are often seen by way of personnel and funding shortages. Training of farmers and staff in conservation matters needs continuous work and warrants constant review.

Forestry activities now go beyond the mere protection of designated areas into surrounding area involving habitats, and such tendency is getting somewhat a new concept. People-oriented forestry takes into account the active participation of the people in different activities that can cumulatively contribute towards an increase in the overall tree cover. The Department of Wildlife Conservation continues environmental conservation activities but is hard pressed to fulfil its mandate because of funding and staffing shortages.

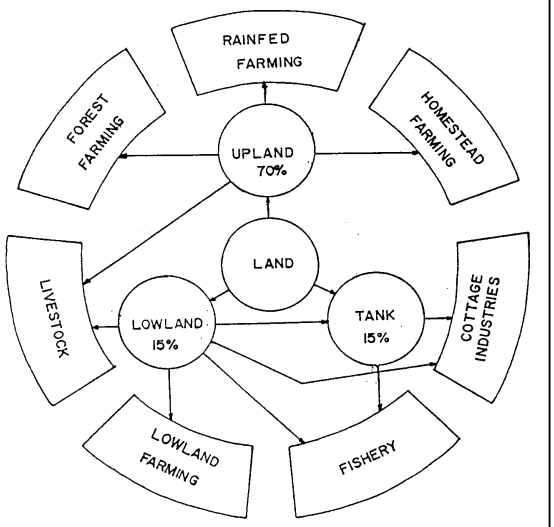
In the Kurunegala and Puttalam districts, the Provincial Environmental Authority, having its own law, has responsibility for environmental management. Elsewhere in the Study area the provisions of the National Environment Act take precedence.

10.3 Environmental Conservation Plan

The plan proposed here takes into consideration issues relating to the conservation of the rainfed upland, maintaining water quality, improving public health, and elephant management. Environmental education components are relevant in some of the training programmes.

(1) Land Management on the Rainfed Uplands

Recent work carried out at Maha Illuppallama (MI) have shown that the development potential in the tank-village system is very high and as many as seven production avenues have been identified as shown in the figure on the right. Referring to the production avenues above, environmental protection measures are proposed by the Study in the following table.



Seven Production Avenues

Catchment Protection	The tank catchment has to be demarcated and protected by growing trees or pasture to prevent silting of the tank. A variety of multi-purpose tree species can be used to obtain multiple benefits.
Hedgerows	As MI research has also shown, graded hedgerows effectively countered soil movement on the slope resulting from the high intensity Maha rainfall. Gliricidia sepium, because of its nitrogen fixing and other good attributes, is an acceptable species. The rows are planted at a slight gradient to allow surplus water to be conducted at non-erosive velocities as runoff. A small bund is created on the upper side of the hedgerow to facilitate this.
Strip Mulching	Live strip mulches of either Centrosema pubescens or Mucuna utilis are grown at intervals across the slope. The strips act as filters and trap soil particles moving down the cultivated part of the slope.
Alley Cropping	Gliricidia sepium grown in two double rows with sufficient space for seasonal crops between the double rows has proved useful in MI trials as a sustainable form of upland farming. The Gliricidia plants are pruned at regular intervals to allow sunlight into the cropping space and the loppings are used as mulch.
Sloping Agricultural Land Technology (SALT)	In this system of farming, tree species, preferably leguminous, are grown on the contour at the required interval leaving appropriate space for short age crops. The trees are pruned at the beginning of the cultivating season to allow for sunlight into the growing space of annual crops. Prunings are used as mulch or as green manure and also provide farm poles.
Agroforestry	The multipurpose tree species provide favourable micro-climatic effects and utilise the multi-strata system, allowing the maximum utilisation of sunlight of varying intensities filtering through the different canopy layers. The roots tap soil moisture at different depths and the leaf fall provides mulching material and humus. Thus, nutrient cycling is effected, simulating the forest ecosystem.

(continued)

Home Gardens	The home garden can also be developed on similar lines; on a multi-storey basis and should provide many items of food for family nutrition. Cultivation of a variety of trees, shrubs, and herbs is possible with appropriate soil and moisture conservation methods. A large number of present day farmers have the benefit of agrowells.
Integration of Crops and Livestock	The integration of plants and animals enables mutual benefits to both forms of farming. Farmyard manure and other manures help in improving the organic-matter levels and the water holding capacity of soils. Soil-faunal activity is promoted allowing it to be maintained in better physical condition. Animals feed on crop residues and provide manure to the soil.
Firewood Plots	The demand for firewood, particularly in the Anuradhapura district, can make the cultivation of appropriate species at suitable places a good investment. Such places include the poorer land classes, degraded land, canal banks, and river reservations. Such planting will have an ecological benefit as well. These places may also be grown to timber species in view of the short supply of good quality timber.
Stream and Canal Reservations	The need to have waterway reservations is laid down in the Crown Lands Ordinance but it applies only to state land. Establishing reservations at all appropriate places is, however, a very good conservation practice, no matter whether the land is state or privately owned. The prescribed reserved width on each bank varies depending on the width of the waterway. For water bodies less than 4.5m wide, a strip of land 20m wide on each bank is recommended as the reservation. When the stream is between 4.5m and 15m wide, the reservation is 40m on each side and for streams over 50m in width, the reservation is 60m.

(2) Use of Chemicals

The following items are proposed for utilisation of fertiliser and agro-chemicals.

1) Fertiliser: Besides the environmental issues of fertiliser use, there is a cost factor to be considered as well. The unit cost is very high because all fertilisers are imported. The fertiliser subsidies that were given over a long period of time have now been withdrawn except in the case of urea. Excessive nitrates in surface and ground water should be controlled by rational application of fertiliser and by using more organic manure. The Department of Agriculture current recommendation for paddy is for straight fertiliser supplying nitrogen, phosphorus and potassium from individual compounds rather than from mixtures. This keeps the quantities of total application low and costs down, advantageous both economically and environmentally. The department promotes the use of organic manure. It encourages the application of straw, which would bring about some cost reductions as well as reduction and/or elimination of nitrogen and potassium.
2) Agro-chemicals: Since most farmers do not know how to use agro-chemicals by kind, it tends to endanger environmental quality and increase their cost of production. There is an urgent need to transfer adequate knowledge on usage of agro-chamicals for the benefit of both the farmer and the environment. Although Sri Lanka is not yet in a position to introduce biotechnology, Integrated Pest Management (IPM) methodologies is proposed to be introduced for the knowledge transfer

purpose. IPM focuses on an ecological approach to pest management using a variety of compatible control strategies. It takes into account a range of options, which carry synergism effect for the control of pests in agricultural crops.

The pest control method is extended through training in the farmers' fields by way of Farmer Field Schools (FFS). The training continues one day per week, in a selected farmer's field, and lasts the entire cultivation season. Farmers are shown how to establish economic injury levels and economic threshold values. The former is the critical population density where the pest damage equals in value the cost of control. The latter is the density of pest population above which control measures should be commenced. It has also been shown in the evaluations that farmers who practised IPM had achieved higher yields/ha than those who did not. This is attributed to the technical knowledge provided at the training school and its subsequent field application.

(3) Water Quality

The maintenance of water quality within acceptable limits is a very necessary requirement by caring use of fertiliser and agro-chemicals as well as disposal of urban waste and by keeping conformity to the Sri Lankan standards. While the quality in the Kurunegala district has been reported to be within permissible limits, fears have been expressed about that in Anuradhapura district as it shows increased nitrate levels given the high fertiliser use in paddy. The optimum use of straight fertilisers based on soil analyses and the greater use of manure are ways of minimising the impacts.

(4) Mitigating Elephant Damage

Presently the department trains villagers in the problem areas on how to use thunder-flashes and other tools for chasing away elephants so as to protect their crops. The measure has shown its effect to reduce the damage by some extent. If the problem happens in a particular location of a serious nature, departmental officers are required to visit and take appropriate action further. The actions taken are generally short-term and temporary measures and prone to make situation more serious without terminal solution and let the problems happen over and over again.

In the short- and medium-term, it is proposed that the department strengthens its capability, educates farmers in the affected areas on measures they can adopt by themselves, makes available crackers and thunder-flashes in sufficient quantities, evacuates troublesome loners, places sufficient resident staff in critical areas and begins the required studies.

In the medium- and long-term, a detailed study of the issue of elephant populations in the area and its environs should be undertaken along with available habitats. Based on this study, a comprehensive management plan should be prepared and implemented with the least possible delay.

(5) Management of Water-related Diseases

The Divisional Development Communities under the divisional secretariats (DS) in the Study area identify malaria as a significant health problem. As malaria is the most prevalent, efforts should be directed towards effectively control it. Simultaneously, control of other vector-transmitted diseases such as dengue will also be brought about, as the underlying factor is the elimination of mosquito breeding sites.

The state programmes, which are presently decentralised, have been operated within the framework of the National Malaria Control Policy. The main components of the control programme are i) detecting early and treating promptly, ii) applying selective vector control methods, iii) developing methods to forecast outbreaks and making quick responses to epidemics, and iv) assessing control methods regularly.

(6) Training and Extension

The removal of the Krushi Viyapti Sevaka (KVS) for other duties about a decade ago has seriously hampered extension activities in the opinion of many, including farmers. It is suggested that this claim be examined in order to determine whether it is justified, and if so remedial action is urgently necessary.

Training and extension should play an important role as part of the support services. For the programme utilising natural resources, training, education or extension activities are to involve environmental components. Training of community leaders should be given with due consideration of its contents, since members of farmers organisations will seek supervision by the leaders in the sama manner in their farming affairs later.

10.4 Monitoring Plan

Usually, the project-implementing agency is burdened to execution careful monitoring on any changes of resource taking place over time and space. Under the current trend, such responsibility of monitoring changes of resources is being transferred by certain aspects to the users themselves (FOs). Hence, farmers must acquire the basic knowledge and skills to observe and identify problems and take remedial action. The following monitoring plans will be recommended to

the Project, which will be carried out by the project executing agency and FOs.

(1) Land Management

The project executing agency carry out regular field inspections, particularly on the upland to assess soil run-off. Such field inspection enable farmers to recognise current situation. 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

Possibility of salt mix into irrigation water is always a threat and needs close watching out. In the Anuradhapura district, a likely trend of increased nitrates and phosphates in the groundwater has been indicated and requires investigation. Bacteriological analysis will be another useful parameter for consideration since drinking water is mostly from groundwater sources in the area.

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 meetings at one of the community-based organisations for public health and home nutrition. Based on the result of review, the committee takes countermeasures such as, chemoprophylaxsis, insecticidal spraying, draining of stagnant water and maintenance of household hygiene. FOs should maintain regular contact to the committee, and support to implement the countermeasures. The executing agency collects information on malaria from the committees concerned and monitors the FOs' activities.

(4) Elephant Management

If the people can be kept informed of elephant movements by DWC, they could then anticipate the problem ahead and take some form of countermeasures rather than wait until they find elephants on their doorstep. For this, DWC must station more staff at strategic places and monitor movements of animals constantly. FOs collect information on elephant movement from DWC.