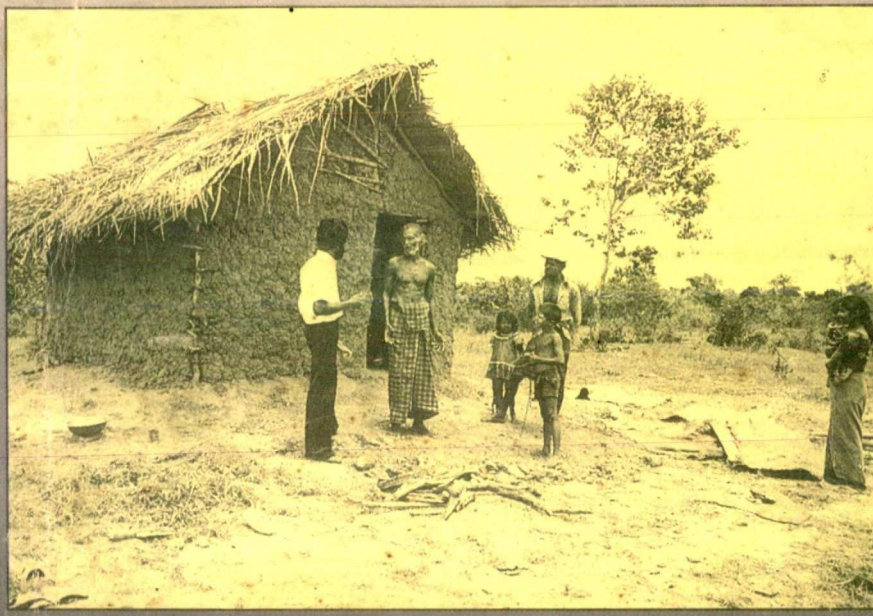
ANURADHAPURA DRY ZONE AGRICULTURAL PROJECT

A SOCIO ECONOMIC STUDY OF THE PROJECT BENEFICIARIES



ARTI

OCCASIONAL PUBLICATION NO. 40
AUGUST 1991

ANURADHAPURA DRY ZONE AGRICULTURAL PROJECT

A Socio Economic Study of the Project Beneficiaries

Occasional Publication No. 40
August 1991

Agrarian Research and Training Institute
114, Wijerama Mawatha
Colombo 7
Sri Lanka

Foreword

The Anuradhapura Dry Zone Agricultural Project was executed over a seven year period at a cost of around Rs.700 million. Funded by the Asian Development Bank and the World Bank's International Fund for Agricultural Development as well as the Government of Sri Lanka, the project proved to be so ill-designed that the implementation process was extended from five to seven years while the scale of the intervention was also drastically reduced.

Barely 10% of the landless families who were to be provided with land and a steady supply of water for irrigation eventually remained on the land. Some village tanks appear to have been selected in heavily forested areas more for timber extraction than for their potential to support irrigated settlements. At the end of the day the project beneficiaries showed income levels that were below the consumption component provided under the Janasaviya Programme. The project would seem to have destablized the existing land use pattern based on **Chena** cultivation without providing a viable alternative.

Funding for the project was made available at a time when lending agencies were awash with capital in search of projects for funding. Consequently the degree of scrutiny to which the viability of the project was subjected appears to have been far from rigorous.

This project sought to supplement other major interventions in and around Anuradhapura district, among them, System H of the Mahaweli Project and the Tank Irrigation Modernisation Project, both of which also suffered from substantial leakages and mis-allocation of resources.

The present study was carried out in 1985/86 and provides a baseline against which subsequent developments in the project area may be evaluated.

Director.

Acknowledgement

A number of persons extended their support to enable me to produce this report on the Anuradhapura Dry Zone Agricultural Project. Among them the peasant community in the project area is foremost. I wish to thank them for providing valuable information and giving every possible assistance to my research team during the field surveys.

A special word of thanks to Mr. T.B. Subasinghe, former Director of the ARTI, for the encouragement given at all stages of the field survey in Anuradhapura District. I would like to thank Mr. D.G.P. Seneviratne, Director of the ARTI, for making arrangements to publish this report under ARTI's research publication series.

A note of appreciation is due to Mr. Lalith Jayasuriya, Statistical Assistant of the ARTI, and also to Messers G.G. Gunasena, Wimalasiri Ratnayake, Sunil Bandara, Miss. G.G. Renuka Nandanie and L.C. Sirimathie, for their assistance in collecting and processing the survey data.

Mr. Sunil Abeysinghe and Mr. Nimal Bandara, Directors of the ADZAP are appreciated very much for providing facilities to collect necessary data from the project office and helping us to undertake our field survey in the project area.

My thanks are also due to Dr. R.D. Wanigaratne and Professor M. Karunanayake for their valuable comments on the final draft of the report.

Finally, I thank Miss. Rekha Sirimanne former Editor of the ARTI for her editorial assistance and Miss. U.P.C. Ramyalatha and Mr. Palitha Gunaratne who typed the final version of the report.

W.G. Jayasena.

EXECUTIVE SUMMARY

Anuradhapura Dry Zone Agricultural Project (ADZAP) was implemented in the dry zone district of Anuradhapura over a five year period from 1981-86. The main objective of this project was to establish a stabilized farming system in the project area through the restoration of abandoned minor tanks, development of adjoining lowland and upland, fostering livestock development and the provision of technical, institutional and infrastructural facilities.

The study was undertaken to establish a data base on socio-economic aspects of project beneficiaries in rehabilitated tank settlements. The study was mainly based on a sample survey of 120 settler families drawn from 12 rehabilitated tank settlements. In addition, a review was made on the progress of the project during the five year period from 1981-86, with the aim of providing useful information on the overall project management and implementation. The findings relating to both aspects are summarized below.

With the mid course correction made in 1984, with regard to project targets, it was envisaged to restore 138 minor tanks and develop the adjacent lowland and upland in 83 of these tanks during the project period. The study reveals that the restoration of 138 tanks had been completed by the Department of Irrigation by the end of 1986. However, the development activities relating to the lowland and upland appears to be sluggish and haphazard. Upland development activities had been completed only under 32 tanks and the development of lowlands had been completed under another 32 tanks over the five year period from 1981-86. Simultaneous development of both upland and lowland was carried out only under 19 tanks during the same period. Weakness in project planning, monitoring and management including poor co-ordination among the agencies responsible for development work, labour shortages and land disputes were prominent among the reasons given for the slow progress of land development activities. The progress achieved in implementing the project components such as agricultural research and extension, water management, farm credit etc. were also not satisfactory compared with the initial targets. However, the progress with regard to construction activities such as building input stores, infrastructure relating to livestock and rural roads seems to be satisfactory.

According to the project estimates about 10,000 landless families were to receive farm allotments under the rehabilitated tanks. However, during the 1981-86 period only 3000 families benefitted. Of this total, only about 958 (28%) families were reported to be residing in their respective allotments. Reluctance of the beneficiaries to take up residence in the new farm allotments is a major constraint for the development of these settlements. The reluctance to take up residence stems from the lack of physical and social infrastructural facilities, non-availability of water for drinking and other domestic uses lack of housing facilities, ownership of fixed assets outside the project and the lack of protection from wild animals.

Majority of the beneficiary families had been selected from the villages neighbouring the project area. Many of the farmers currently residing in the ADZAP settlements were previously **Chena** cultivators and whose lands were subsequently incorporated under the tank rehabilitation programme.

Pre-project employment pattern shows that, while the majority of beneficiaries had worked as cultivators, a substantial number of them had also worked as agricultural and non-agricultural labourers. Alienation of land under the project had increased their dependency on agriculture there by changing the overall occupational pattern. Under the project, most of the beneficiaries have become leases of state land allotted to them under a farming strategy different to that of major irrigated settlement projects. Most of the surveyed households derive their income from both farm and off-farm sources. Highland corps and off-farm employment are the dominant sources of household income. The annual and monthly average income reported are Rs. 15,264/= and Rs.1,272/= respectively. The household income levels of some tank settlements are below or very close to the poverty line of Rs.800/= per month which was used by the government to select low income earning household under the food stamp scheme. Average monthly incomes of about 1/3 of sample household appears to be below Rs. 1,000/=.

A majority of the beneficiary families currently live in semi-permanent or poorly constructed temporary houses/huts. This together with the ownership of only a few consumer durables is a reflection of the poor living standards of these families.

The project was expected to encourage settlers to grow paddy under rehabilitated minor tanks with the view of assuring their food security. However, the majority of the lowland distributed among the settler families were not fully utilized for paddy cultivation. This was mainly due to the incompletion of tank rehabilitation work and

land development activities such as forest clearing, levelling, construction of bunds and field channels etc. The study reveals that only about 38% of the total allotted lowland extent was utilized for paddy.

A high incidence of paddy crop failure was reported in most settlements. This was principally due to the inadequate rainfall and the shortage of irrigation water. It was reported that between 54-87 percent of the gross area sown under each tank failed at least partially during the 1986/87 **Maha** season.

Lowland cropping intensities were very low and well below the project targets in all tanks coming under the project. Inadequate rainfall, shortage of irrigation water and incompleteness of lowland development activities were the major constraints for increasing cropping intensities.

The study shows that 65-100 percent of the total highland extent distributed under each tank settlement was utilized for the cultivation of highland crops during the 1985/86 **Maha** season. In the subsequent **Yala** season (i.e. 1986) the corresponding figurre was 70-85 percent.

In most new settlements, highland crop cultivation was not very successful. The crops grown in both seasons were very similar to the traditional **Chena** crop mix. Except for the adoption of soil conservation measures by a substantial number of farmers, not much headway had been made by way of technological advancement in crop cultivation or in their management. As in the case of paddy, the application of fertilizer, control of weeds control of pests diseases in highland crops were unsatisfactory.

Highland crop yields in the majority of settlements were very low during **Maha** as well as **Yala** seasons. Apart from the water shortage experienced during the **Yala** season, low use of fertilizer, poor weed control, non-adoption of proper planting techniques (planting methods, plant densities etc.), poor quality of planting material and low adoption of improved seed varieties were reasons attributed for this situation.

In comparision with the project estimates, the highland cropping intensities in most settlements was satisfactory on account of the higher extent of land cultivated during **Maha** and **Yala** seasons and also due to double cropping. However, in spite of the increased cropping intensity, the crop output in these settlements was very low. This was mainly because fo widespread crop losses.

The achievement in animal husbandry were very low in almost all the tank settlements. Not taking up residence in new farm allotments, non-availability of water and animal fodder were cited by the majority

of the respondents to be the main constraint in developing the livestock sector in the settlements. The study reveals that the new land use patterns introduced by the project has partially resulted in eliminating the land rotation based Chena system from the project area.

CONTENTS

LIST OF TABLES

LIST OF APPENDIX TABLES

WEIGHTS, MEASURES AND ABBREVIATIONS

1	Kilogram (kg)	=	2.205	Pounds (lb)
1	Hectare (ha)	=	2.469	Acres (ac)
1	Kilo-Meter (km)	=	0.622	Miles

ac	-	acres
ADB	-	Asian Development Bank
ADZAP	-	Anuradhapura Dry Zone Agricultural Project
ARTI	-	Agrarian Research and Training Institute
Bu	-	Bushel
DAPH	-	Department of Animal Production and Health
DAS	-	Department of Agrarian Services
DDC	-	Divisional Development Council
DI	-	Department of Irrigation
DM	-	District Minister
DPD	-	Deputy Project Director
IDA	-	International Development Association
IFAD	-	International Fund for Agricultural Development
IRDP	-	Integrated Rural Development Project
LUPU	-	Land Use Planning Unit
MFP	-	Ministry of Finance and Planning
MLLD	-	Ministry of Lands and Land Development
mm	-	milimeter
MPH	-	Ministry of Power and Highways
MRID	-	Ministry of Rural Industrial Development
NLDB	-	National Livestock Development Board
NPCU	-	National Project Co-ordinating Unit
PD	-	Project Director
PIC	-	Project Implementation Committee
PMO	-	Project Management Office
Rs.	-	Rupees
UDU	-	Upland Development Unit

CHAPTER ONE

Introduction

Agrarian Research and Training Institute (ARTI), was commissioned by the Ministry of Agricultural Development and Research (MADR) to undertake socio-economic survey of the project beneficiaries settled under the minor tanks rehabilitated under the Anuradhapura Dry Zone Agricultural Project (ADZAP). This is the first of the series of studies which will be conducted periodically. The study examines the current socio-economic status of project beneficiaries, lowland and highland agricultural activities, socio-economic problems of project beneficiaries, agroecological, administrative and management constraints that affected the project implementation. It is hoped the survey findings and the recommendations would be useful to policy makers and implementing agencies to re-direct project activities and also to make necessary corrections in order to attain anticipated project objectives and goals.

1.1 The Project

The ADZAP is being implemented in the Dry Zone district of Anuradhapura since 1981 with financial and technical assistance from the Asian Development Bank (ADB), International Fund for Agricultural Development (IFAD) and the Government of Sri Lanka. Initially the project was scheduled to be implemented over a five year period from 1981-85. The slow progress of project implementation, especially during the first two years resulted in the project being extended upto February 1988 and the targets were correspondingly scaled down. The total project cost is estimated at Rs.690 million.

The major goal of the project is to increase food production and productivity, employment and the income of substantial proportion of the rural population in Anuradhapura district through the optimum utilization and development of available resources and especially to assure the equitable distribution of land and water. The ADZAP has been designed to establish a technically viable and economically attractive farming system including irrigated paddy-cum rainfed upland[1] crops supplemented by livestock enterprises in the project

---

1 The term "upland" has been used synonymously with the terms "highland"

area, where about 10,000 landless farm families are expected to be settled on the lands developed under about 200 restored minor tanks (ADB, 1984:10). The project provides a strong production base for development of about 3000 hectares of newly irrigated paddy lands and establishment of a permanent farming system on about 14,000 hectares of adjoining uplands where **Chena** cultivation (shifting cultivation) was practiced over several decades.

The protection of available productive resources from further depletion because of shifting cultivation and the development of a model of farming system which can be replicated in other Dry Zone areas with similar agro-ecological conditions become the secondary objectives of the project. As irrigated paddy land is scarce in relation to the population, each settler family will be allocated 1 acre of irrigated paddy land and 3 acres of rainfed upland for growing subsidiary crops.

In terms of project goals, components, management and implementation procedures, ADZAP is comparable with Integrated Rural Development Projects (IRDP) which are being implemented in several districts in the country. The project components focus on rehabilitation of minor tanks and development of adjoining uplands and lowlands, as well as the development of agricultural infrastructure, livestock, agricultural support services and improving rural roads in the project area. These components are discussed in detail in the next chapter.

1.2 Project Area

The project area is located in the dry zone district of Anuradhapura (see map 1.1) but excludes areas and pockets that are covered by the accelarated Mahaweli Development Scheme the five Tank Modernization Project (financed by IDA-UK), Wilpattuwa national forest reserve and some locally financed projects. Anuradhapura is one of the nine districts in the Dry Zone that is located in the north central part of the country. It is the largest district in the country, with a total geographical area of about 7275 sq.km. of which about 145 sq.km. are under major inland water (Census and Statistics, 1983).

The total population of the Anuradhapura district in the year 1981 was estimated at 587822. The population density was estimated at 77 persons per sq.km. Total population of the project area was 269,000 distributed in about 1000 villages and comprising about 43200 families. About 23100 of these families were practicing **chena** cultivation for their subsistences. The income and living standards of

these people were very low at the time of project appraisal in 1980 (ADB, 1980). About 13400 of these families did not own any land.

1.2.1 Climatic Features of the Project Area

The average annual precipitation in the project area (1931-60) is 1445 mm. with a range of 875-1875 mm. characterized by well defined bi-model rainfall pattern. The average monthly rainfall and rainy days at the Regional Research Centre, Mahaillupallama, which may be taken as representative of the district, are given in Appendix Table 1.1. It will be observed that the bi-model pattern of rainfall distribution remains unaltered in the three periods under reference, 1931-60, 1969-78, 1981-85, even though, the quantum of rainfall received during the period 1969-78 is less. During, the major rainy season (**Maha**) the average rainfall in the district is about 900 mm.[1] There is adequate rain during this season for lowland upland crop production under rainfed conditions. The average rainfall during the minor rainy season (**Yala**) is only about 550 mm.[2] The uncertain **Yala** rain is not adequate for satisfactory crop production. Hence, the crop grown in this season are limited to a few drought resistance crops.

The mean maximum temperature varies from 32.0 C in March to 28.4 C in December and the mean minimum temperature varies from 20.6 C in June.

The topography is generally undulating with a slope of 2 to 4 percent. The principal soil group is reddish brown earth comprising of sandy loam with weak structural properties.

1.2.2 Present Farming System

The **chena** farming, paddy cultivation, home gardening and livestock are the main components of the farming system of the project area. The **chena** farming has been practiced in the region for over several decades by substantial portion of farmers mainly on state lands, legally as well as illegally for their subsistence. This system of cultivation, however, has resulted in reducing soil fertility,

---

1 From both the cyclonic rains of October and November and the North-East monsoon which extends from December to February.

2 From both the South West monsoon which extends from May to September and the convectional rains of March, April.

depletion of vegetative growth and increasing soil erosion, in addition to the destruction of forest reserves in the area (ADB, 1980). The **chena** cultivation is characterized by a system of mixed cropping. The **Maha Chena** is planted with a wide variety of crops such as upland Paddy, Maize, Sorghum, **Kurakkan** (finger millet), **Meneri** (Indian Millet), chillies, Mustard, Manioc (Cassava), Sweet Potato and Vegetables. The **Yala Chena** is mainly devoted to the cultivation of gingelly. Paddy is grown mainly in command areas of 11 major irrigation schemes and other minor irrigation schemes rehabilitated in the recent past. Some farmers grow paddy on highlands under rainfed conditions.

Home gardens are cultivated mainly with root crops and vegetables for domestic consumption. Also, permanent and semi-permanent crops like coconut, mango, banana etc. are grown. There is very little income from these gardens, except for the occasional sale of mangoes and bananas. Livestock in the project area seems to be unorganized and management standards are very poor.

Inadequate water has become the major climatic constraints to increase agricultural production in the project area. It is apparent that the present input delivery system, transport facilities, marketing facilities for agricultural produce and other social infrastructural facilities in the area are also poor. The project attempts to overcome some of these constraints through the allocation of funds under its development components.

1.3 Objectives of the Study

The objectives of the study are to review the project progress and performance in view of identifying major problems and constraints that affected the project implementation and to establish a strong data base on various aspects which will be useful to evaluate the overall project impact in the future.

The specific objectives of the study are as follows:

(a) To review project progress and performance achieved during 1980-86.

(b) To identify major constraints (if any) that affected the implementation of the project.

(c) To document agro-ecological information and information relating to physical development of the rehabilitated tanks.

(d) To document bench-mark socio-economic conditions of the project beneficiaries currently settled at rehabilitated tanks, and gather information relating to present farming systems practiced by the new settlers.

(e) To identify socio-economic problems of the project beneficiaries.

(f) To assess immediate effects of the project on the project beneficiaries and on the agro-ecological environment of the project area.

1.4 Method of Data Collection

Background data needed for the study were collected from the official records maintained by the Project Management Office (PMO) and other line agencies such as Departmenty of Irrigation (DI), Department of Agrarian Services (DAS), Department of Animal Production and Health (DAPH) and National Livestock Development Board (NLDB) etc. In addition, other relevant information was gathered from the key officials responsible for implementing the project such as Project Director (PD), Consultants, Land Use Planning Unit and Upland Development Unit and the Assistant Commissioner of Agrarian Services etc.

A field survey covering 119 farm households settled at 12 tanks restored under the project was also conducted to gather first hand data relating to socio-economic and agronomic aspects. At the time of planning the field survey, only about 22 tanks had been taken up for development. These tanks were in different stages of development in terms of highland development, lowland development, alienation of land among beneficiaries and settlement of beneficiaries on the allotments. Hence, in the first instance, 12 tank settlements (see table 1.1) were purposively selected out of the 22 tanks by using the following two criterion;

(a) Completeness of the upland and lowland development work.

(b) Settlement of at least 10 farm families (the minimum sample size) at each tank.

The 12 selected tanks are well distributed over the district (see Map 1) and represents 99% of the total number of tanks which had been taken up for upland development between 1984 and 1985.

Secondly, 10 farm families were selected randomly from the farm families which had been settled at each of those 11 tank settlements - Gulupettawewa, Ulukkulama wewa, Randoowa wewa, Ambagaha wewa-Kudawewa, Anduketiyawa wewa, Ihalawewa, Ittewewa, Gananketiyawa wewa, Timbalawa wewa, Ihala Attikulama wewa, Pahalamawatha wewa and a farm families from Hempitigama wewa - making the total of 119 sample households for the entire field survey. The list of beneficiaries actually settled at these 12 tank settlements by end of July 1986 was used for the selection of these sampled households. As shown in Table 1.1, the number of sample households selected for the survey represent 20-100% of farm families settled at the time of survey under each tank. Therefore, it is believed that the sample produce adopted in the survey was representative enough to generalize the survey findings.

A structured questionnaire was used by the investigators who conducted interviews with household heads with a view to maintaining the systematic way and the uniformity of collecting data.

1.5 Limitations of the Study

In broader terms this study attempts to evaluate the project progress achieved during the period from 1981-85 and also to provide information relating to the living conditions of the project beneficiaries settled at the tanks restored and developed under the ADZAP.

Accordingly, the project progress and performance during 1981-86 is discussed in the first chapter. This analysis is heavily depend upon the author's observation made during the field survey in addition to the information gathered from the official records, progress reports and from the officers involved in implementing the project.

The field survey mainly covered the 1985/86 **Maha** crop season. Some of the data relating to highland and lowland agriculture in the 1986 **Yala** season was also collected where it was possible and has been discussed in the report. In terms of rainfall, these two cropping seasons represent a 'normal crop year'.

Table 1.1

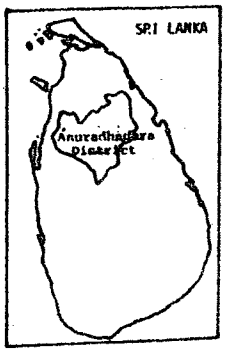
Distribution of the Sample under the Tanks Selected for the Survey

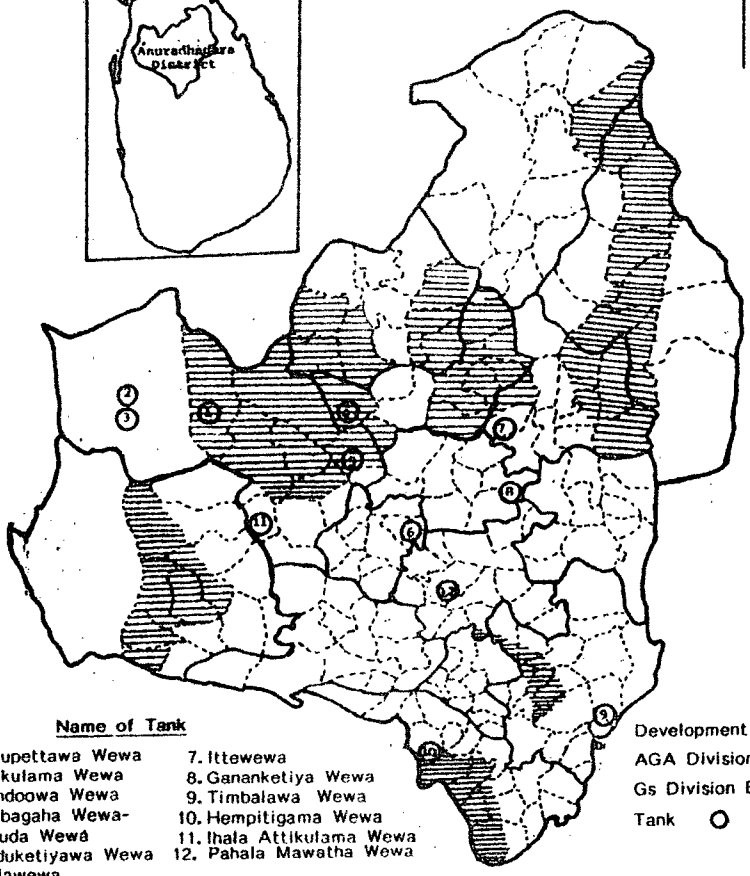
Name of Tank	Project Population		Sample Population	
	Total No. of Selectees	Number actually settled upto July 1986	Number of settlers inter-viewed	Sample fraction (as a percentage of actual no. of farmers settled by end of July 1986)
1. Gulupettawewa	58	41	10	24.3
2. Ulukkulama wewa	65	48	10	20.8
3. Randoowa wewa	26	11	10	90.9
4. Ambagahawewa-Kudawewa	40	12	10	83.3
5. Anduketiyawa wewa	41	19	10	52.6
6. Ihala wewa	20	10	10	100.0
7. Ittewewa	52	18	10	55.5
8. Gananketiyawa wewa	39	12	10	83.3
9. Timbalwa wewa	40	28	10	35.7
10. Hempitigama wewa	51	9	9	100.0
11. Ihala Attikulama wewa	30	12	10	83.3
12. Pahalamawatha wewa	42	11	10	90.9
Total	504	231	119	51.5

Source : PMO : Anuradhapura, ARTI Survey data, 1986.

Map 1

Project Area and Location of Tanks Selected for the Survey





Name of Tank

1. Gulupettawa Wewa
2. Ulukulama Wewa
3. Randoowa Wewa
4. Ambagaha Wewa-Kuda Wewa
5. Anduketiyawa Wewa
6. Ihalawewa
7. Ittewewa
8. Gananketiya Wewa
9. Timbalawa Wewa
10. Hempitigama Wewa
11. Ihala Attikulama Wewa
12. Pahala Mawatha Wewa

Scale : 6 miles to an inch

CHAPTER TWO

DESCRIPTION OF THE PROJECT : AN ASSESSMENT OF PROJECT MANAGEMENT

The proposed development programme envisaged in the project was to be implemented over a five year period from 1981-86. But at the revision stage, (in 1985) project life was further extended up to the end of 1987 mainly because of the slow progress of implementation of the original development programme. This chapter discusses the progress of development work achieved over the five year period (1981-86) and highlights the problems and constraints encountered during the implementation of the scheduled programme under each component.

2.1 Components of the Project

The project includes components which covers production, infrastructure and service aspects. Details of the programme of work under each component is given in appendix 2.1.

The rehabilitation of abandoned or partly utilized minor tanks and the establishment of permanent settlements on the adjoining uplands has been the major component of the project. The largest portion of the project investment, 27%, has been allocated to this programme. The project also has allocated 23% and 17% of the investment to develop agricultural infrastructure and agricultural support facilities respectively in the areas where these development projects are located. To promote livestock development as an important component of the farming system in the area, the project has also provided 11% of the total investment. The project investment for rural road infrastructure and project management have been 12% and 9% respectively.

There is no provision in the project for the development of social infrastructural facilities such as housing, health and sanitation, schooling and drinking water which are essential basic needs of project beneficiaries. Lack of such facilities seems to be adversly affecting the settlement programme (see sec. 2.6).

2.2 Project Implementation

The project seeks to achieve active participation of several key ministries for implementation of various development activities envisaged in the project components. Thus, the Ministry of Agriculture Development and Research (MADR), Ministry of Lands and Land Development (MLLD), Ministry of Finance and Planning (MFP), Ministry of Rural Industrial Development (MRID) and Ministry of Power and Highways (MPH) are currently involved with the project. Various Departments/agencies/Institutions under these ministries have been entrusted with the implementation of overall work programme. The current involvement of these ministries and link agencies/Institutions and their responsibilities in the implementation programme is given in appendix 2.1.

2.3 Project Co-ordination and Management

The MADR has been the principal co-ordinating agency for the project. The preparation of consolidated annual budget for the project and allocation of the project funds among line agencies have become its major responsibilities. The National Project Co-ordination Committee (NPCC) consisted of secretaries of four major ministries, MADR, MPI, MLLD and MRID, Directors/Commissioners/Chairmen of other Departments and Agencies involved in the project implementation was set up with the commencement of the project in 1981. The major function of NPCC are to;

(a) provide guidelines for overall project execution,

(b) assist in co-ordination between participating line agencies,

(c) review the progress made in project implementation and

(d) take steps to speed up project implementation and resolve any problems which may arise during the course of project implementation. The NPCC usually meets at least quarterly or as often as required to carry out these tasks.

A Project Implementation Committee (PIC) was also set up at Anuradhapura in order to facilitate field level co-ordination and implementation of the project. This committee consists of District Minister (DM), Chairman of DDC, Government Agent and the heads of all the Department/Agencies functioning at the District level. The procedural, administrative, financial and the physical progress of the construction work, and also the problems faced by the Project Management Office (PMO) are discussed and resolved in monthly staff meetings of PIC held at the PMO.

2.4 Project Management Office (PMO)

Taking into account, the large number of agencies involved in the implementation of the project and the vital need to co-ordinate their activities, a Project Management Office was established in 1981 at Anuradhapura. This is headed by a full-time Project Director (PD) who is assisted by a Deputy Project Director (DPD) and also expatriate specialists on various subject areas such as civil engineering, agriculture and livestock. Preparation of project plans, implementation of those plans, preparation of consolidated accounts, co-ordination of inter-agency activities, progress monitoring and evaluation are among the major responsibilities and functions of the PMO. The Land Use Planning Unit (LUPU) which is responsible for preparing land use and land development plans and the Upland Development Unit (UDU) which is responsible for implementing land development programmes are also attached to the PMO[1].

2.5 Review of Project Progress and Achievements During 1981-86

2.5.1 Tank Rehabilitation, Development of Upland and Lowland

As already discussed in Section 2.1, tank rehabilitation component became the major component of the project under the mid course correction made in 1984[2]. It was estimated to rehabilitate 200 minor tanks (located in high priority areas[3]) during the project period.

---

1 Specially LUPU is responsible for preparing maps relating to topography, soils, present land use, land capability and ultimately the proposed land occupancy. The UDU is responsible for implementing the recommendations of LUPU. Thus, it solely responsible for carrying out the entire upland development activities like arranging the surveys, land marks, arranging and supervising the implementation of village roads, jungle clearance, land levelling, soil conservation, drainage, community grazing, catchment reforestation and community reforestation plans etc.

2 Mid course correction was made mainly due to the observed slow progress of project implementation during the initial two years from the project commencement in 1981.

3 The project area originally defind for the minor tank restoration has been demarcated and classified into high and low priority areas based on a classification suggested by the land use planning unit of the PMO. Accordingly, the 6 development blocks where about 200 minor tanks are located (see Map 1.1) were termed as high priority areas. These 200 tanks were identified as the tanks located outside the catchments of major tanks. Areas with the tanks mostly located in the catchments of major tanks or located in the reserved forest areas were considered as low priority areas.

The upstream development[1] downstream development[2] and upland development[3] are the major activities included in the tank rehabilitation programme. The DI and DAS are mainly responsible for undertaking upstream and downstream development works respectively, while the upland development works are undertaken by the LUPU and UDU.

By end of 1986, the restoration of 138 tanks had been completed successfully by the DI (PMO:1987). Of these 138 tanks, only about 83 were selected for the development of lowlands[4] and uplands[5]. During the 1981-86 period, the lowland development activities were completed only under 32 tanks. In the same period, development of upland allotments was also completed under another 32 tanks. However, these development activities were carried out haphazardly.

It should be noted that simultaneous development of lowland and highland works took place only under 19 tanks during this period. It was also observed that, overall constructions and development works had not been completed even in some of these tank settlements. For example, work such as construction of structures, main and field channels, land shaping, levelling and even forest clearing and stumpting (in some allotments) in Ambaga wewa-Kudawewa, Ittewewa, Gananketiya wewa, Timbalawa wewa, Ihala Attikulama wewa, Pahala Mawatha wewa settlements had not been completed at the time of the survey though the land development under these tank settlements were treated as completed by the PMO. Due to these incompleted work a substantial extent of lowland could not be utilized for paddy

---

1 Construction of tanks, bunds, spills, sluices etc. and the improvement of water storage and distribution capacity.

2 Surveying and planning for command area, of construction distributory, main channels and field channels, land levelling, drainage systems, hill removels and construction of field roads, culverts, regulators, turnouts etc.

3 Land surveying, land marking, jungle clearing, land levelling, soil conservation, drainage, community grazing, catchment reforestation and construction of roads.

4 Ther term 'lowland' has been used synonymously with the term 'paddy land'.

5 It has been reported that the balance 55 tanks do not generate required incremental area as per the norm.

cultivation although the water availability in these tanks was satisfactory. Likewise, upland allotments were not fully utilized for cultivation purposes due to similar problems. According to the PMO estimates, land development activities are to be completed under the balance 51 tanks by the end of 1987 at least to cover the 83 tanks selected for development under Phase I of the project. Taking into account, the progress achieved during past four years, the timely completion of this task would be a great challenge to implementing agencies. Therefore, it is imperative to identify the major reasons/problems which caused delays in land development activities and resolve those problems, if this task needs to be completed successfully.

Several reasons can be attributed to the slow and haphazard development of lowlands and uplands observed over the past few years. Inadequate technical staff such as surveyors, land use planners, technical assistants and cartographers etc. (for the timely completion of the surveying and the preparation of land use plans) can be listed as the first reason in this respect. Shortage of labour appears to be another significant reason for the slow progress of land development activities in many tank settlements. Towards enlisting beneficiary participation in development activities and providing additional cash income for their families, it was decided to use family labour for land development activities such as forest cutting and clearing, rooting and stumpting, construction of soil conservation bunds and farm roads etc. However, the availability of labour from beneficiary families was unsatisfactory and inadequate for the timely completion of land clearing and related works mainly due to lack of enthusiasm for work of this nature among the beneficiaries. In addition land disputes among development authorities and encroachers regarding land rights also caused considerable delays in development activities. It should also be mentioned that the communal unrest and terrorist violence which prevailed in the district since 1983 had adversely and critically affected the land development activities and the settlement of beneficiaries under several tanks located in the northern and eastern boundaries of the project area.

2.5.2 Agricultural Infrastructure

Land use planning, upland development works, provision of infrastructure for strengthening research and farm machinery facilities at Maha Illuppallama Research Centre and strengthening extension facilities in Anuradhapura district were stressed under this component.

(a) Land Use Planning and Upland Development

During 1981-86 period, land use planning was completed satisfactorily in 76 tank settlements. The engineering survey and preparation of BOPs on the balance seven tanks was to be completed by end of 1987. As shown in table 2.1, work activities such as timber extraction, selection of beneficiaries and land alienation etc. are to be completed in substantial number of tank settlements by the end of 1987 to reach the project target. It was reported that the problems regarding timber extraction has constrained the timely completion of land development works in most tank settlements. For example, the authorities responsible for upland development activities showed that upland development in 38 tanks was earmarked to be given on contract, out of which awards have been made in respect of 16 tanks. The remaining contracts could not be awarded because of the project stipulation that such contracts have to be given to the Rural Development Societies, which however, cannot handle work valued at over Rs.7,50,000. They also pointed out that splitting of works in order to accommodate the RDSs would lead to many practical problems in execution of contracts (Minutes of the Review Meeting held at MADR on 3.6.87). Therefore, it was necessary to change the present stipulation regarding the contract policy and adopt suitable system of awarding such contracts.

Table 2.1

Number of Tanks and Works to be Completed by the End of 1987

Item	In Lowland Area	In Upland Area
Number of tanks that require engineering surveys	2	5
Number of tanks where BOP to be completed	6	7
Number of tanks where selection of beneficiaries to be completed	14	-
Number of tanks requiring timber extraction	10	27
Number of tanks requiring land alienation	-	20
Total	32	59

Source: Implementation Programme for 1987, PMO, Anuradhapura.

(b) Drinking Water and Home Garden Programmes

The new items, construction of drinking water wells and development of home gardens were included in the upland development component in the project. The financial requirement was met from the savings under such components of land use planning and agricultural research and agricultural extension. As already discussed in section 2.6 the lack of drinking water has become a major constraint for beneficiaries of the newly developed lands. Taking into account, the urgency of providing drinking water facilities, a programme of constructing 210 wells in these settlements was prepared on the basis of providing one drinking water well per 25 families. The construction of 20 such wells was already completed under this programme by the end of 1986.

Consequently, while the problem of providing suitable drinking water may thereby ameliorated to a satisfactory level, farmers continue to express their dissatisfaction regarding the present ratio of one well for 25 families, mainly because of limited water availability. It appears that the provision of drinking water facilities has become an important strategy for motivating beneficiaries who were living outside the project to establish permanent houses on new allotments.

Development of home gardens around the houses constructed on these newly developed lands are of immense importance to beneficiary families in several ways. Firstly, it provides some of the consumption requirements of the farm family (seasonally or annually). Secondly, it provides additional cash income. Thirdly it helps to develop a micro environment around the farm houses.

Taking into account these benefits, a plan for developing home gardens in these new settlements has been prepared by the Maha-Illuppallama Research Centre. The home garden model developed by this centre includes the cultivation of various crops/trees such as coconut, king coconut, orange, teak, mango, jak, banana, lime and papaya. However, farmer initiating in developing their home gardens seems to be poor due to various problems such as lack of planting material and other inputs, extension advice, farmers interests and the understanding about its benefits etc. The implementation of the proposed home garden programme would enable the farmers to solve most of these problems and to motivate them to develop their own home gardens.

(c) Progress of Civil Works Under Extension

The progress of civil works such as construction of farmer training centres, staff quarters for extension officers and administrators, listed under agricultural research and training was not encouraging. As shown in table 2.2 only 11 extension staff quarters (for KCSs, AII and SMOo) out of the proposed 33 were completed during 1981-86 period. Only 3 farmer training centres out of the proposed 10 were completed during the same period. As expected by the project, the housing problems of the field extension staff could not be solved satisfactorily due to delay in the construction works. It is reported that the effective steps have been taken by the extension authorities to avoid such delays and to complete all the construction works by the end of 1987 (PMO 1987).

Table 2.2

Progress of Civil Works Under Agricultural Extension

Sl. No.	Name of work	Total No.	Completed upto 1986	To be continued/ completed during 1987	Remarks
1.	KVSS qyarters Grade II	15	08	07	6 works are in progress and 1 re-tendered
2.	AI quarters, Grade III	10	01	06	8 works in progress. 1 re-tendered
3.	SMO quarters Grade III	08	02	06	All the 6 works are in progress
4.	A.D. Residence	01	01	-	Work Completed
5.	Vehicle	01	01	-	- do -
6.	Farmer's Traing Centres	10	03	07	4 are in progress. 3 re-tendered

Source : Implementation Programme for 1987, PMO, Anuradhapura.

(d) Agricultural Research

The project provides facilities for the development of research and extension demonstrations and for educating and training of farmers about the technologies to be adopted in the new settlements for optimum yields, and crops. However, the outcome of the research and demonstration activities in the new development blocks have not been assessed. MIRC is currently involved in the research and demonstration activities. Selection of crops suitable for various soil groups and micro-environments, finding out suitable management methods such as plants spacing, time planting, fertilizer levels, etc., introduction of different weed control methods for different crops, demonstration of sound soil conservation methods and introduction of multiple cropping systems which increases the productivity of uplands are the main objectives of the current research and domonstration programme of this centre. It is also reported that MIRC has developed imporved crop varieties and management techniques under the conservation farming programme models based on alley cropping (without the use of fertilizer). These research and demonstration programmes were tried out in the farmer's fields during 85/86 **Maha** season and 87 **Yala** season. However, the demonstration were reported to be unsuccessful mainly due to the long drawn drought that prevailed in the area.

According to the information given in Chapter 3 and 4, the adoption of improved farming practices and management practices by the farmers seems to be low. Under such circumstances it is of vital need to encourage the research and extension staff to disseminate new research findings and provide suitable extension advice to these beneficiary families.

2.5.3 Livestock Development

As mentioned earlier, 11.3% of the total project investment has been allocated to develop the livestock sector in the project area. This development programme includes the construction of physical infrastructure such as livestock training centre, veterinary service office, veterinary dispensaries, milk chilling centres, stud bull centres, and rural veterinary centres under the DAPH and NLDB. Compared to other components, the progress achieved in utilizing project funds and completion of construction works under livestock development programme seem to be satisfactory. As shown in table 2.3, about 70% of proposed veterinary dispensaries, milk chilling centres, stud bull centres, and rural veterinary centres, including a livestock training centre were completed by the end of 1986.

Table 2.3

Proposed Construction Works Under Livestock Development

S.I. No.	Name of building	Nos.	Completed	To be Continueed & Completed During '87	Physical Status
1.	Livestock training center, at Maha-Kandarawa, (The centre includes Administrative block, Lecture rooms, Labs, Hostels, Cafeteria, residential quarters, Sheds for Animal etc.	01	01	-	The complex was almost completed except some sheds etc.
2.	V.S. Office & Veterinary dispensaries	06	06	-	Completed. 5 already functioning
3.	Milk Chilling centres	05	03	-	1 at A'pura is nearing completion. 1 at Padaviya awarded.
4.	Stud Bull Centres	13	12	01	1 at Horowpathna is to be completed.
5.	Rural Vet. Centres	32	18	14	Out of balance works, 6 are in progress, 3 are to be taken up by D.A.P. & H and 5 by PMO.

Source : Implementation programme for 1987, PMO, Anuradhapura

The opening up of these centres in remote areas has resulted in strengthening the service facilities and extension facilities relating to livestock development activities. Through the establishment of new milk collecting centres/milk chilling centress, the daily milk collection and farmers' income could be increased remarkably. For example, at present farmers in the project area earn an average sum of Rs.1,00,000 per day on milk sales. The milk collection which was 0.7 million litres per year in 1981 has increased upto 3.5 million litres per year in 1985 (MADR: 1987).

The purchasing of machinery and equipment by both the DAPH and NLDB was also completed according to the scheduled programme. As a result, machinery and equipment requirements of these two institutions including the two livestock farms at Oyamaduwa and Parasangaswewa could be solved to a satisfactory level.

2.5.4 Agricultural Support Facilities

Construction of input stores, provision of ground water investigation facilities and credit facilities are the major aspects stressed under this component.

(a) Input Stores

As reported by DAS, the construction of the proposed 17 input stores was completed by the end of 1986, strengthening the fertilizer storage capacity in the areas where such facilities were not available prior to the project commencement.

(b) Ground Water Investigation

Ground water investigation was completed by the Water Resources Board at a cost of Rs.750,000 to examine the possibility of providing drinking water under the tube well programme. However, no attempt has been taken by the PMO, to introduce tube wells as a means of solving the drinking water problem in these settlements. The cost effectiveness and the time factor concerned with the construction of tube wells may be profitable and time saving than the construction of dug wells. Therefore, it would be worthwhile to follow up tube well programme with high priority.

(c) Farm Credit

Under the farm credit programme, it was expected to provide loans to project beneficiaries through the Bank of Ceylon and People's

Bank for purchasing 640 draught animals and implements, 160 two wheel tractors, 320 irrigation wells and pump sets and 2000 milk cows. Suitable beneficiaries were selected according to their credit worthyness and loan repayment capacity. The loan disbursements for various purposes upto the end of 1986 is given in table 2.4. The credit issues during this period were very low except in the case of two wheel tractors. According to Bank sources, majority of the beneficiaries could not obtain credit mainly because of the low credit worthyness and their inability to provide equity contributions.

Table 2.4

Progress of the Farm Credit Programme (1981-'86)

Item	Project targets (nos.)	Progress at the end of 1986	Balance at the end of 1986	Target for 1987
Draught animals and implements	640	-	640	101
2 wheel tractors and implements	160	38	122	52
Irrigation wells and pump sets	320	09	311	101
Dairy animals (milk cows)	2000	02	1998	320
Carts	*	-	-	101
Ploughs	*	-	-	101

Source : Implementation programme for 1987, PMO, Anuradhapura.

* Not itemized.

2.5.5 Rural Road Infrastructure

It was expected to construct new gravel roads to new settlements and to develop the existing tar and metal roads within the project blocks under this component. As shown in table 2.5, construction of

new roads and improvement of the existing roads have been completed satisfactorily. As a result, accessibility to these remote settlements and their linkage with outside areas could be improved.

Table 2.5

Progress of Rural Road Component (1981 - 86)

	Project target (miles)	Progress at the end of 1986 (miles)	Target for 1987 (miles)	Balance
1. Gravel roads to inaccessible village/villages /tanks	68	-	-	-
2. Gravel roads in flood prone areas	40	-	-	-
Total	108	76	32	-
3. Metal and tar roads to existing roads	66	54	10	2

Source: Implementation programme for 1987, PMO, Anuradhapura.

2.6 Settlement of Beneficiaries : Progress and Problems

Prior to the project commencement, most of the lands that belonged to the project development blocks remained as uninhabited jungles. These land resources had not been utilized for cultivation purposes in an intensive manner over several decades. Therefore, it has become a prior need to settle beneficiaries on these new land allotments if those are to be developed and cultivate intensively as expected by the project. However, the project planners did not consider this as an important aspect of the project in the initial years. Instead, priority was given to the land alienation programme. At the revision stage of the project (in 1984) the need for the settlers to reside on the

allotments had to be stressed by the project mainly because of the slow rate of taking up residence on the allotments by many farm families.

In comparison to the number of allotments distributed among beneficiaries, the number of farm families residing currently in the new allotments seems to be very low. For example, land has been alienated and handed over among 3416 and 3074 families under upland and lowland respectively by the end of 1986. But only 958 families (28%) were reported to be residing in the uplands, although the total number of upland allotments distributed was 3416. The distribution pattern of farm families under each tank selected for this study is given in table 2.6 for further information. Obviously, the selectees residing in these settlements are low and ranged between 50% to 18%, except in three settlements namely Gulupettawa, Ulukulama and Timbalawa where 70% of families are reported to be residing. Thus, unwillingness of beneficiaries to take up residence in these settlements has become one of the major constraints to the development of new land settlements. Why beneficiaries do not come to these new settlements? What prevents them from taking up residence? How can they be motivated to stay in the land? These are the questions that can be raised in respect of this situation.

Table 2.6

Number & Percentage of Beneficiaries Settled at Each Tank-Upto July 1986

Name of Tank	No. of beneficiaries received lands	Actual No. of beneficiaries settled upto July 1986	
		No.	%
1. Gulupetta Wewa	58	41	70.6
2. Ulukulama Wewa	65	48	73.8
3. Randoowa Wewa	26	11	42.3
4. Ambagaha Wewa-Kuda Wewa	40	12	30.0
5. Anduketiyawa Wewa	41	19	46.3
6. Ihalawewa	20	10	50.0
7. Ittewewa	52	18	34.6
8. Gananketiyawa Wewa	39	12	30.7
9. Timbalawa Wewa	40	28	70.0
10. Hempitigama Wewa	51	9	17.6
11. Ihala Attikulama Wewa	30	12	40.0
12. Pahalamawatha Wewa	42	11	26.1
Total	504	231	45.8

Source: PMO, Anuradhapura, 1986.

The present study reveals that majority of the beneficiaries who received land under the project did not come to their respective allotments of else showed reluctance to reside in the land mainly due to the following reasons.

(a) Lack of Infrastructural Facilities

Most of the tank settlers established under the project area located in under-developed remote areas and the accessibility and transport facilities to these settlements are poor. There is no adequate, physical and social infrastructural facilities such as roads, transport, market outlets, trading centres, health/clinic centres and schools etc. close to these new settlements, although they are essential needs of the beneficiaries. Project has not paid adequate attention to develop or provide such facilities and under such circumstances, majority of the beneficiaries showed unwillingness to reside in these settlements.

(b) Non Availability of Water for Drinking and Other Domestic Purposes

Settlers currently residing in these settlements obtain water from wells and the tanks for drinking and other domestic uses. However, the number of dug wells available in tank settlements is limited to one or two wells. However, the water availability is not a problem for settlers during the wet season, although it becomes a serious problem during the dry season (usually four to five months long) when the wells and tanks dry-up or water gets polluted. This problem could be solved through the construction of deep wells in each farm holding. But at the initial development stage, beneficiaries alone cannot construct such deep wells mainly because of high cost involved and shortage of labour. Although the project intended to provide water facilities through the agro-wells under farm credit and tube wells under ground water component, these programmes have not been implemented successfully due to various reasons (see section 2.5.4 C). Thus, providing drinking water to these settlements remain as an unsolved problem and this has resulted in discouraging settlers from taking up residence in the new allotments.

(c) Ownership of Land and Other Assets

According to the selection criteria given in the project appraisal report, landless **chena** cultivators, farmers who own less than 0.4 ha. of paddy land but depend on **chena** cultivation and landless labourers were expected to be selected as project beneficiaries. It was observed however, that persons like land owners, traders, businessmen and even

contractors who are not eligible according to the above criteria have also been given land in these settlements. This has happened mainly because of the influence of political authority in the selection of beneficiaries. Majority of these persons owned permanent housing facilities and other fixed assets elsewhere. They are mainly engaged in off-farm activities and usually employ hired labourers to cultivate their land. It was observed that the number of farm holdings alienated to these "well to do persons" was fairly high, but most of these land allotments still remain unoccupied. It is unlikely for them to come to their new allotments leaving aside their fixed assets and permanent residential facilities in the original areas.

(d) Lack of Housing Facilities

Lack of housing facilities and non-availability of building materials are also attributed as an important reason for the prevention of beneficiaries from taking up residence in the allotments. The housing condition of many settlements was very poor, and most of the farm families were living in temporary huts (see sec. 4.2). The income position of beneficiaries who expressed willingness to settle down on the new lands is also unsatisfactory, and they are unable even to purchase necessary building materials such as wood, cadjan, etc. The non-availability of wood was attributed as a serious problem by many of them. Felling of trees without permission was made illegal under the recent government laws. Therefore, the beneficiaries could not use forest resources to obtain wood even to construct temporary huts. The PMO has recently attempted to solve this problem through the provision of required wood lots to the beneficiaries residing in some tank settlements like Randoowa Wewa. But the problem still remains unsolved in other settlements.

(e) Fear of Elephants

Protection of crops and shelters from wild elephants was also cited as a serious problem by the farmers presently settled in the settlements such as Hempitigama, Ambagaha Wewa-Kudawewa, Phala Mawatha Wewa and Timbalawa Wewa located in thick jungle areas where wild elephants are abaundant. Permanent fences around farm holdings in these settlements were not constructed properly (due to lack of fencing material such as barbed wire). Hence, the elephants can easily enter the farms and destroy crops and shelter. Heavy income losses due to frequent elephant attacks were reported and these incidence have created risks and a feeling of uncertainity among settlers. This situation also prevented many farm families from taking up residence especially in the above tank settlements.

CHAPTER THREE

DEMOGRAPHIC AND SOCIO ECONOMIC CHARACTERISTICS OF PROJECT BENEFICIARIES

3.1 General

This chapter deals with an analysis of the presnet demographic and socio economic characteristics of project beneficiaries based on the information gathered from a sample of 119 farm families currently residing in twelve tank settlements selected for this survey. The total population in the sample is 643 persons comprising of 353 males and 290 females. The discussion mainly focussed on the following aspects.

- composition of farm households (age structure, literacy and educational attainments)
- labour force, employment and income
- general availability, sanitation, ownership of household items and farm equipments
- land ownership

This analysis also aims at providing information base for ex-post evaluation of the project impact on beneficiaries and to examine their present living conditions that may have certain implications for both project beneficiaries and its benefit monitoring.

3.2 Demographic Characteristics

3.2.1 Composition of Farm Households

The average size of a household for all the tank settlements is 5.4, a little higher than the national average of 5.2 (Central Bank of Ceylon: 1984). However, there are some tanks where family sizes are ranged between 4-6.3. For example, the average family size of

Ambagaha Wewa - Kuda Wewa and Anduketiyawa Wewa is 4, while the family size of Ulukulama and Ihalawewa is about 6.

The availability of family labour seems to be an acute problem in the settlements where small family sizes are reported.

3.2.2 Age Structure

As shown in Appendix Table 3.1, youthful population is predominant in the study settlements. Fifty three percent of the total population accounts for the age category of under 14 years while about 46% of the population belongs to the work force aged 15-64 years. Only 1% of the population accounts for the age category of over 65 years. The analysis of age structure further indicates that seventy five percent of the household heads (direct beneficiaries) belongs to the mature age group of 30-65 years and old age group of over 66 years. The balance 25% of household heads belongs to the age group of 18-30 years. The current dependency ratio in these settlements is estimated at 1.1.7.

3.2.3 Literacy and Education

Although the project area is located in an under-developed district, the literacy rate and educational attainments of the settler families seems to be satisfactory. The literacy rate of the study population is 94%, while it is 92% only for the household heads. Both those ratios are very high compared to the national literacy rate of 86.5% reported for 1981.

The educational status of the beneficiaries is given in table 3.1. It reveals that 92% of the population has achieved primary and secondary education upto G.C.E.(O/L). The household heads, who are the decision-makers of these farming communities has achieved the same level of education. Hence, they could be exposed to any agricultural innovations with positive results.

3.2.4 Activity Status

Distribution of the sampel population according to activities are summarized in table 3.2. It reveals that only 30% of the population are engaged in productive employment, although the total work force is reported to be 46%. Unemployment has not emerged as an important problem in these settlements because majority of the family members belongs to the young age group of under 14 years. However,

it is likely to become an acute problem in these project localities in future, since no alternative employment opportunities are available for the second generation within or outside the project.

Table 3.1

Educational Status of the Sample Population

(5 years and over) by Sex

Level of Education	Male %	Female %	Total %
No schooling	3.58	8.0	5.67
Primary grades (1-5)	73.12	64.40	69.09
Grade 6 to G.C.E. (O/L)	20.07	25.20	22.50
Passed G.C.E. (O/L)	3.23	2.00	2.65
Passed G.C.E. (A/L)	-	-	-
Degree, diploma,- Undergraduates or higher	-	0.40	0.18
Total	100.00	100.00	100.00

Source: ARTI, Survey Data, 1986.

Table 3.2

Distribution of Sample Population According to Activities

Activity	Number	Percentage
Employed	100	29.55
Student	231	35.90
Employed Children	5	0.78
Unemployed and expect employment	21	3.27
Unemployment and not expect employment	66	10.26
Other	127	19.75
Not reported	3	0.47
Total	643	100.00

Source: ARTI, Survey Data, 1986.

The crude activity rate[1] and net activity rate[2] which indicates that the labour force participation is 43.2% and 93.8% respectively. Economic dependency ratio[3] is estimated to be 238.4 percent.

3.3 Employment and Income

3.3.1 Occupational Pattern

Even prior to the project commencement, majority of the employed population belonging to the settler families worked as agricultural labourers, mainly in the major and minor colonization schemes located closely to these development blocks. Substantial number of employed also worked as casual labourers for their day-to-day living under private contractors and departments such as Irrigation, Agrarian Services, Roads and Highways, involves in local level construction, rehabilitation or development activities. In addition Agriculture was also reported as an important occupation by coniderable number of settlers, although the ownership of land among these families was not very high. The number occupied in self-employments and government/private sector employments was not much significant.

Alienation of land under the project resulted in increasing beneficiary dependence on agriculture and changing the occupational pattern among employees including household heads who are the direct beneficiaries of the project. Those changes are presented in Appendix Table 3.2.

---

1 Crude activity rate = $\frac{\text{Employed + Unemployed}}{\text{Total in the sample}} \times 100$

2 Net activity rate = $\frac{\text{Employed + Unemployed}}{\text{Sample population between 15 - 64 years}} \times 100$

3 Economic dependency = $\frac{\text{Student + Unemployed + Others}^{*}}{\text{Total Employed}} \times 100$

* includes housewives, discouraged workers (those not looking for employment), retired persons, disabled, those too young or too old to work.

Table 3.3

Number and Percentage of Household Heads According to Main Occupation

Occupation	Pre-project		Project	
	No.	%	No.	%
Agricultural operators	62	52.1	102	85.7
Agricultural labourers	37	31.1	7	5.9
Non-agricultural labourers	7	6.0	1	0.8
Self employment	4	3.3	4	3.4
Skilled labour	6	5.0	1	0.8
Government/private sector employment	3	2.5	4	3.4
Total	119	100.0	119	100.0

Source: ARTI, Survey Data, 1986.

The present occupational pattern of the household heads is given in table 3.3. It reveals that 86% of the household heads become agricultural operators under the project, although it was only 52% prior to the project. The agricultural and non-agricultural labour was the main occupation for about 37% of household heads prior to the commencement of the project. But only about 7% of household heads reported this as their main occupation. However, agricultural and non-agricultural labour is still important as a secondary occupation and source of off-farm income for about 54% of farm families.

3.3.2 Household Income

The farm and off farm incomes seem to be the main sources income for many farm families. Hence, the total income of family members, derived from various employments and other off farm activities, the estimated cash value of the total agricultural output, the value of livestock production as well as the value of food subsidies

distributed among these families were taken into account in calculating the household income given in table 3.4. It reveals that the annual and monthly average income of a household is Rs.15,264/= and Rs.1,272/= respectively. The present household earnings in majority of the tank settlements are close to this average, except in the case of two settlements namely Ihalawewa, and Ithewewa. The average household incomes of these two tanks are very low being about Rs.890/= and Rs.720/= per month respectively. These income levels are very close to the poverty line of Rs.700/=, currently used by the government in determining the poorest group of households under the food subsidy (food stamp) programme. However, the household incomes in other settlments are much higher than the pre-project household income (see table 3.5).

Table 3.4

Average Monthly and Annual Income Per Household

Name of Tank	Average monthly income (Rs.)	Average annual income (Rs.)	Per Capita monthly income (Rs.)
Gulupettewa Wewa	1,454.6	17,455.7	259.8
Ulukkulama Wewa	1,298.7	15,584.5	206.1
Randuwa Wewa	1,277.4	15,329.0	220.2
Ambagahawewa-Kuda Wewa	1,268.3	15,219.5	269.9
Anduketiyawa Wewa	1,504.6	18,054.8	376.2
Ehala Wewa	890.2	10,682.0	141.3
Ittewewa	722.7	8,672.2	144.5
Gananketiya Wewa	1,224.9	14,686.4	244.8
Timbalawa Wewa	1,278.6	15,342.7	220.4
Henpitigama Wewa	1,322.0	15,863.7	244.8
Ehala Attikulama Wewa	1,282.7	15,392.9	246.7
Pahala Mawatha Wewa	1,745.4	20,944.4	306.2
Overall Average	1.271.9	15,263.8	235.5

Source: ARTI, Survey Data, 1986.

Per capita income levels given in column 3 of table 3.4 could also be utilized in analysing the distribution of household income among individuals of beneficiary families. It is seen that the percapita income levels of these tank settlements are very low and range between Rs.140/= - 375/=. Per capita daily income range between Rs.4.60-12.50, and this represents low level of living standards of the project beneficiaries and their dependants.

Table 3.5
Average Annual Household Income by Income Sources (Rs.)

	Pre-Project		Project	
	Average income per household Rs.	%	Average income Per Household Rs.	%
Paddy farming	1,077	10.8	1.008	6.6
Highland crops (including chena)	4,084	41.1	4,829	31.6
Animal husbandry	- *	- *	115	0.8
Off-farm employment **	4,059	41.0	4,448	29.1
Income from the project (from employment in the project and from World Food Aid +)	-	-	4,039	26.5
Food Stamps	545	5.5	576	3.8
Other	162	1.6	249	1.6
Total	9,927	100.0	15, 264	100.0

Note: * Includes in the 'other' category

** Salaried employment, agricultural and non agricultural labour and self-employment

\+ Estimated cash value

Source: ARTI, Survey Data, 1986.

3.3.3 Source and Composition of Household Income

The pre-project and present income sources of the settler families and the relative importance of each income source in household income is given in table 3.5. It shows that agriculture (paddy farming and highland cultivation) has become the main income source of these families and accounts for 38% of the present family income. Even prior to the project commencement, agriculture formed the main source of income accounting for about 52% of the total family income. However, in comparative terms the present agricultural income of the families are not much satisfactory. Heavy crop losses under utilization of lowland and highland and poor crop yields can be attributed as the main reasons for the poor farm income. This situation resulted further in increasing settlers' dependency on off farm employments. According to the income figures presented in table 3.5, off farm employments have become the second important income source accounting for about 29% of the total household income.

As mentioned earlier (see Chapter 2) the project allowed beneficiaries to work as paid labourers under the project in view of providing supplementary income for their families, especially during initial years of taking residence in their respective allotments, in addition to the food subsidies distributed among these families. These two sources together accounted for 27% of the total family income.

However, remarkable difference in the household income could be observed, although the size of the agricultural holdings distributed among these families are equal. This may be mainly due to the variations of agricultural output, yield levels, crop varieties grown, area cultivated, crop losses and selling prices etc. As shown in table 3.6, monthly incoms of 65% of settler families ranged between Rs.1000-2000. Monthly incomes of another 30% of families are below Rs.1000/= Majority of them belong to the poorest category whose monthly incomes is reported to be below the poverty line of Rs.800/=.

3.4 The General Condition of Living

3.4.1 Housing Condition

The quality of housing and the facilities available can be considered as an important indicator which shows the living condition and standard of the farm families residing in these settlements. Generally, the quality of housing is determined by the quality of building materials used in construction, while the facilities are determined by the indicators such as floor area, number of rooms per house, occupancy rate

and availability of household items etc. Using these criteria, an attempt was made to assess the housing condition and the facilities available in these farm houses.

Table 3.6

Number and Percentage of Households According to income Categories

Monthly Income (Rs.)	Household No.	Household %
Less than 500	8	6.7
501 - 1000	27	22.7
1001 - 1500	48	40.3
1501 - 2000	29	24.4
2001 - 2500	4	3.4
2501 - 3500	2	1.7
3501 - 4500	-	-
Above 4500	1	0.8

Source: ARTI, Survey Data, 1986.

According to the above criteria used in analysing the quality of housing, there are no permanent houses constructed by using durable building materials such as tiles, bricks, cement etc. (see table 3.7). Majority of houses, 76% can be categorised as 'semi permanent' and the balance 24% as temporary houses/huts. Almost all these temporary houses/huts have been constructed poorly by using cadjan or straw only to cover roofs and many of them do not have plastered walls or properly constructed floors. The size of floor area and the number of rooms available in these houses further show their poor condition. For example, the floor area of about 38% of houses is less than 150 sq.feet, while the floor area of 74% of the houses is less than 250 feet. (see appendix table 3.3). The average occupancy rate is reported to be 5.4 persons per housing unit. Some degree of overcrowding appears to be present in these settlements because 50% of house does not have separate living rooms (see appendix table 3.4).

Table 3.7

Number and Percentage of Houses According to their Condition

Condition	Number of Houses	Percentage
Permanent	0	0.00
Semi-Permanent	91	76.47
Temporary	28	23.53
All Types	119	100.00

* Permanent
- Tiles/Asbestos/Metal sheets as roof
- Cement blocks/Stone blocks/Bricks/Cabook as walls
- Cement as floor

Semi Permanent
- Cadjan/Palmyrah/Straw as roof
- Clay/Mud as walls
- Clay/Mud/Cowdung as floor

Temporary
- Cadjan/Straw as roof
- Cadjan or uncovered walls
- Clay/Mud as floor

Source : ARTI, Survey Data, 1986.

3.4.2 Ownership of Household Items

The ownership of household items generally indicates the economic condition and social standard of rural households. It is a well known fact that many dry-zone farmers purchase various household items such as radios, petromax lamps, wall clocks, sewing machines, bicycles etc. in the event of excess income during harvesting seasons. However, purchasing of these items as well as their present ownership among these settlers seem to be very low (see appendix table 3.5) and this indicates the poor living condition of settler families.

The survey reveals that almost all the households possessed basic agricultural implements such as mammoties and knives which are commonly used in land preparation, weeding and forest cutting. But very few households owned other implements such as ploughs, sprayers and water pumps. Only 2% of households owned two-wheel and four wheel tractors.

3.4.3 Water Availability for Domestic Use

The deep wells are reported as the main source of water for drinking and other domestic purposes for about 73% of farm families. However, only about, 23% of these families own wells whereas the others (50%) depend on neighbouring wells. As shown in table 3.8, about 10% and 11% of farm families respectively obtain water from the village tank and tube wells. Few farm families (6%) use river water or stream water.

Table 3.8

Number and Percentage of Farmers According to Water Source

Source	Farmers	
	No.	%
Own well	27	22.7
Neighbour's well	60	50.4
Tank	12	10.1
River/Stream	7	5.9
Tube well	13	10.9
Total	119	100.0

Source: ARTI, Survey Data, 1986.

The availability of water for drinking and other purposes appears to be satisfactory during rainy season. But it becomes a serious problem, particularly during the dry season as the majority of wells, tanks and other water sources go dry or water becomes polluted. Bathing, washing and providing water for animals such as cattle and buffaloes also become an acute problem for many farm families. During dry seasons, water is obtained from wells or other sources which are located far away (sometimes one or two miles away) from the respective farm holdings. Some farm families were reported to have abandoned their farm holdings mainly due to the difficulties in obtaining

domestic water. On the other hand, shortage of water has acted as a major constraint to a considerable number of farm families in taking up residence on new allotments. Although the domestic water problem could be solved to a satisfactory extent through the construction of deep wells and tube wells, it has been constrained by the shortage of family labour and lack of capital among settler families. Therefore, it needs project assistance to construct deep wells/irrigation wells and tube wells in these settlements.

3.5 Land Ownership and Tenure

Although the landlessness was considered the major criterion in selecting allottees under the project, cultivation of paddy and upland crops in their own or unowned land located outside the project was reported by about 25% of farm families currently residing in these settlements. Of these total, 18% of farmers cultivate paddy in major/ minor irrigation schemes located close to these settlements and under rainfed conditions. The operational size of these paddy holdings ranged between 1-2 acres (see table 3.9). Forty two percent of the paddy lands were owned by these operators. The balance belonged to encroached crown land and leased lands. Upland crop cultivation was reported by 8.4% of farmers. Fifty eight percent of these highland allotments belongs to them, while the balance was encroached crown lands. Both the paddy and highland crop cultivation provide additional income for the farm families. The survey reveals that 94% settler families had received 4 acre holdings including 3 acres of highland and 1 acre of paddy land under project. The farm sizes of the balance 6% of settler families ranged between 1.50-3 acres. The utilization of these lands for paddy and other crop cultivation are discussed in Chapter Four and Five.

Table 3.9

Percentage of Farmers Reporting Ownership of Land Outside the Project

Type of Land	Farmers reporting %	Extent according to ownership (acres) Owned*	Unowned**	Average Size of operational holdings (acres)
Paddy under major scheme	1.7	0.5	1.5	1.0
Paddy under minor scheme	11.8	4.6	10.0	1.0
Paddy under rainfed	4.2	3.0	8.0	2.2
Highland+	8.4	6.0	3.0	0.9

\+ including chena

* singly owned and jointly owned

** including L.D.O. encroached crown land and rented/leased in lands

Source : ARTI, Survey Data, 1986.

CHAPTER FOUR

PADDY CULTIVATION

4.1 General

Inadequate rainfall and the limited availability of irrigation facilities were the major constraints to increase paddy production and lowland cropping intensity in the project area, despite the fact that there were large extents of cultivable land in relation to the population density. The rehabilitation of tanks implemented under the project aimed at increasing both paddy production and cropping intensity through the development of minor irrigation systems and the introduction of better water management practices. By the end of 1986, about 3074 lowland allotments located within the project development blocks had been distributed among settlers on the basis of one acre per family. But the majority of these lowlands had not been utilized for pdddy cultivation mainly due to incompleteness of tank rehabilitation activities and land development activities such as clearing, levelling, construction of bunds and field channels.

The paddy cultivation activities even in the rehabilitated tank settlements during past cropping seasons seemed to be unsatisfactory in terms of cultivated area, adoption of improved crop husbandry practices and crop yields. As shown in Table 4.1, paddy cultivation in 1985/86 **Maha** season was reported only in 7 tank settlements out of the 12 tanks selected for this survey. The cultivated area even under these tanks was reported to be very low being about 36% of the total lowland extent. The balance area (64%) had not been utilized for paddy cultivation, mainly because of the shortage of water and the incompleteness of land development activities. Same constraints were attributed by the farmers residing in five other tank settlements namely Ambagaha Wewa, Kuda Wewa, Gananketiyawa Wewa, Timbalawa Wewa, Ihala Attikulama and Pahala Mawatha Wewa - for not cultivating paddy in 1985/86 **Maha** crop season.

The cultivation of paddy or other subsidiary food crops in the lowland during **Yala** season also seems to be unsuccessful in almost

all the tank settlements. Inadequate **Yala** rainfall and lack of storage water in the tanks were major constraints in cultivating the second crop in the **Yala** season.

Table 4.1
Cultivated Area and Paddy Yield
(**Maha** 1985/86 and 1986 **Yala** Seasons)

Name of Tank	Maha 1985/86		Yala 1986		
	Percentage of Farmers reporting pady cultivation	Percentage of paddy extent	Percentage of farmers reporting paddy cultivation	Percentage of paddy extent	Average paddy yield **Maha** 1985/86 (Bu/ac)
Gulupettawa Wewa	90.0	90.0	70.0	17.5	68.2
Ulukulama Wewa	100.0	95.0	0	0	59.4
Randoowa Wewa	100.0	88.0	0	0	72.0
Ambagaha Wewa-Kudawewa	0	0	10.0	5.0	0
Anduketiyawa Wewa	30.0	30.0	30.0	6.0	31.7
Ihala Wewa	10.0	10.0	0	0	24.0
Ittewewa	77.7	77.0	0	0	12.6
Gananketiyawa Wewa	0	-	0	0	0
Timbalawa Wewa	0	-	0	0	0
Hempitigama Wewa	33.3	33.3	33.3	22.2	37.0
Ihala Attikulama Wewa	0	0	0	0	-
Pahala Mawatha Wewa	0	0	0	0	-

4.2 Paddy Cultivation Practices

4.2.1 Land Preparation

The time of commencement and completion of land preparation activities in these settlements for the **Maha** paddy crop mainly depend on factors such as the reliability of **Maha** rainfall and the availability of tank water. The availability of farm power also seems to be an important factor in this respect, as the farmers depend mainly on outside farm power for the preparation of land. Most of the farmers (89%) who reported cultivation of paddy in **Maha** season had commenced land preparation activities only after the first few **Maha** rains. These farmers usually delay their land preparation activities until the onset of **Maha** rain to avoid risk of crop failure. About 11% of the farmers, however, are reported to be utilizing tank water for land preparation.

Majority of farmers (64%) used buffaloes for polughing their paddy fields. These farmers preferred to use buffalo draught power mainly because of the low hiring charges. The number of farmers who owned draught power was negligible and therefore, they were entirely dependent on outside sources. Some of these farmers reported difficulties in hiring out draught animals due to limited supply and therefore resulting in staggering of cultivation. Use of the two wheel tractors and four wheel tractors for ploughing was also reported by 16% and 9% of farmers respectively, while human labour was reported by 11% of farmers (Table 4.2).

Table 4.2

Source of Farm Power - Percentage Distribution of Farmers

Power Source	Farmers	
	No.	%
Buffaloes	28	63.6
Two wheel tractors	7	15.9
Four wheel tractors	4	9.1
Human	5	11.4

Source : ARTI, Survey Data, 1986.

4.2.2 Use of Improved Rice Varieties

As shown in Table 4.3, the use of improved seed mostly BG varieties is widespread among the settlers. About 74.4% of farmers used 3-3 1/2 month duration varieties, while 20.9% of farmers used 4-4 1/2 months duration varieties. However, the suitability of latter seed varieties need further investigation as water becomes a limiting factor in most of these new tank settlements.

Table 4.3

Percentage of Farmers According to Use of Paddy Varieties (**Maha** 1985/86)

Paddy Variety	Farmers No.	Farmers %
3 Months Duration		
BG 276-5	7	16.27
BG 276-6	2	4.65
BG 34-8.	16	37.20
	25	58.12
3 1/2 Months Duration		
BG 94-1	4	9.30
BG 94-2	1	2.33
BG 34-6	2	4.66
	7	16.29
4-4 1/2 Months Duration		
BG 400-1	4	9.30
BG 90-2	3	6.98
BG 11-11	2	4.65
	9	20.93
Unidentified	2	4.66
Total	43	100.00

Source : ARTI, Survey Data, 1986.

There was a tendency among most farmers to use their own paddy seeds or the seeds borrowed from neighbouring villagers or relatives. However, as shown in Table 4.4, only about 9% of farmers used their own seeds, while about 70% of farmers used seed paddy borrowed from neighbouring farmers. Only about 18% of farmers reported using the seed paddy purchased from government paddy stores. Many farmers did not purchase seed from government stores mainly because of the high prices. Non-availability of seed paddy at the right time and the difficulties in transporting seeds from the stores which is located far away from these settlements were other reasons for not purchasing seed from government sources.

Table 4.4

Number and Percentage of Farmers Classified According to the Seed Supply Sources

Sources	Farmers	
	No.	%
Own seed	4	9.1
Government store	8	18.2
Neighbouring villagers/relatives	31	70.4
Not reported	1	2.3
Total	44	100.0

Source: ARTI, Survey Data, 1986.

4.2.3 Crop Establishment

Broadcasting was the most common method of crop establishment in almost all these tank settlements. This method had been practiced by about 98% of farmers in 1985/86 **Maha** season. Mud sowing was done by majority of these farmers (75%) to avoid risk of crop losses. However, rest of the farmers (23%) reported dry sowing. Transplanting was reported by only one farmer. Shortage of water was attributed as the major constraint to practice transplanting in these settlements, although it is widely practiced in major irrigation schemes located in the vicinity of these minor tanks.

4.2.4 Fertilizer Application

Although the use of high yielding paddy varieties seemed to be widely spread among these settlers, the application of fertilizer was not much satisfactory in comparison to the recommended quantities and number of applications. As shown in table 4.5, only about 40% of farmers reported application of basal fertilizer at the time of sowing. The basal fertilizer (NPK mixture) quantities applied by these farmers were very low being about 18Kg/acre or 25% of the recommended dosage. The application of urea, a nitrogen containing fertilizer was reported by about 84% of farmers, while the use of T.D.M. fertilizer was reported by 68% of farmers. The high cost of fertilizer was attributed as the major reason for the poor use of fertilizer by considerable number of farmers. Shortage of water was also cited as a major constraint to the timely application of fertilizer. Thirty nine percent of farmers did not use fertilizer mainly because of the high fertility of the virgin soil.

Table 4.5

Number and Percentage of Farmers According to the Method of Using Fertilizer

Type of Fertilizer	Farmers No.	Reporting %	Average Quantity used (Kg/ac)
Basal NPK mixture	10	40.0	18.4
Top dressing (Urea)	21	84.0	38.0
Top dressing (TDM)	17	68.0	31.0

Source: ARTI, Survey Data, 1986.

4.2.5 Weed and Pest Control

Most of the farmers (70%) practiced weed control in their paddy fields. Majority of those farmers (61%) used weedicides for weed control. Hand weeding was reported by about 39% of farmers. The manual method was not popular among the farmers because it was very much labour intensive.

The diseases and pests control methods were widely adopted by many paddy growers. They (93%) mainly used chemicals for the control of disease/pests. However, the balance of farmers had not used any method to control disease or pests.

4.3 Paddy Yield

As shown in Table 4.1, the paddy yields in these tank settlements ranged between 12-72 bushels per acre during 1985/86 **Maha** season. Majority of the paddy farmers in Anduketiyawa Wewa, Ihalawewa, Hempitigama Wewa and Ittewewa were realising a yield of less than 37 bushels per acre and these yield levels were extremely low in comparision to the district average of 88 bushels per acre reported for 1985/86 **Maha** crop season (Dept. of Census and Statistics, 1986). Heavy crop losses due to water shortage, especially during the maturing stage of the crop, low application of fertilizer and poor crop management etc. could be attributed as the major reasons for the poor paddy yield in these settlements. However, the paddy growers in Gulupettawa, Ulukkulama and Randoowa tank settlements were realising relatively high yields ranging between 59-72 bushels per acre. High water storage capacity of these three tanks, availability of storage tank water during crop growing and maturing stage and efficient use of tank water could be shown as the major favourable factors for the successful paddy cultivation and higher yield in these tank settlements. The application of fertilizer and the adoption of other crop management practices by the majority of farmers under assured supply of tank water, were also considered as other contributory factors in this respect.

4.4 Crop Losses

Substantial number of paddy growers reported losses of paddy crop in 1985/86 **Maha** season. These crop losses were critically high when compared with gross sown area. For example, 50.5% of the total sown area under these minor tanks was reported to be subject to serious crop losses during 1985/86 **Maha** season. As shown in table 4.6, the crop losses in Gulupetthawa wewa, Ulukkulama wewa, Ihala wewa, Ittewewa and Hempitigama wewa were higher than the average and ranged between 50-87% of the gross sown area under each tank. Inadequate rainfall and shortage of tank water to irrigate lowlands were reported as the contributory factors for the crop losses. Salinity of the soil was also cited as another reason for crop losses by about 20-30% of paddy growers in Gulupetthawa Wewa and Randoowa Wewa but this was not significant in the case of other tanks.

Table 4.6

Area Sown, Harvested and Area with Crop Losses **Maha** 1985/86

Name of Tank	Area Sown (acres)	Area Harvested (acres)	Area with crop (acres)	Losses %
Gulupetthawa Wewa	9.0	4.0	5.0	55.0
Ulukulama Wewa	9.5	4.4	5.1	53.6
Randoowa Wewa	8.7	7.0	1.7	19.5
Ambagaha Wewa - Kuda Wewa	-	-	-	-
Anduketiyawa Wewa	3.0	3.0	0	0
Ehala Wewa	1.0	0.5	0.5	50.0
Ittewewa	7.0	0.9	6.1	87.1
Gananketiya Wewa	-	-	-	-
Timbalawa Wewa	-	-	-	-
Henpitigama Wewa	3.0	1.0	2.0	66.6
Ehala Attikulama Wewa	-	-	-	-
Pahala Mawatha Wewa	-	-	-	-
Total	41.2	20.8	20.4	50.5

Source : ARTI, Survey Data, 1986.

4.5 Cost and Returns to Paddy Production

The cost component of paddy production has two major categories namely variable cost and fixed cost. The variable cost involves the cost of material inputs, labour and other items which decrease with the scale of farming operations. The fixed costs denote those which are independent of the scale of farming operations such as land rent, capital cost of tractor etc. For this analysis, only the operation costs of paddy production were taken into accout. The cost of various inputs

were obtained from respective farmers who utilized those inputs. The family, hired and exchange labour were costed using the market price prevailing in the respective areas. Same method was adopted to calculate the value of farm level paddy production.

The total cost and the cost of production by input items are shown in Table 4.7. It is evident that cost of labour which comprises of 51.1% of the total cost become the single largest cost item in paddy production. Farm power is the second important cost item which accounts for 17% of the total cost. This includes cost of buffaloes and tractors hired mainly for land preparation. Cost of seed paddy accounts for about 10.6% of the total cost. The cost of fertilizer seem to be low compared to the actural cost of the recommended dosage. This indicates the poor fertilizer application for paddy cultivation in these minor tanks. The total unit cost accounts for Rs.1907.12/acre.

The gross and net income derived from paddy cultivation is given in Table 4.8 under each tank settlement. It shows that the per acre paddy incomes of a paddy farmer in Gulupettawa, Ulukulama and Randoowa tank settlements are relatively higher and range between Rs.2070/= to 2900/= per acre. However, the paddy incomes are reported to be very low in other tank settlements. Therefore, low yield and heavy crop losses can be accounted as the major reasons for the low paddy income of these settlements.

Table 4.7
Itemized Cost of Paddy Production (Maha 1985/86)

Input	Cost per Acre (Rs)	% of Total
Cost of Production		
Tractors	155.40	8.1
Buffaloes	172.72	9.0
Seed Paddy	203.08	10.6
Fertilizer	157.58	8.3
Agro-chemicals	95.07	4.9
Sprayers	27.83	1.5
Threshing	88.73	4.7
Transport and other cost for implements	32.38	1.7
Labour cost	974.33	51.1
Total Cost	1907.12	100.0

Source : ARTI, Survey Data, 1986.

Table 4.8

Returns to Paddy Production (**Maha** 1985/86)

Name of Tank	Yield/acre (bushels)	Gross income/ acre (Rupees)*	Net income/ acre (Rupees)**
Gulupettawa Wewa	68.2	4569.40	2662.28
Ulukulama Wewa	59.4	3979.80	2072.68
Randoowa Wewa	72.0	4824.00	2916.88
Amagaha Wewa Kuda Wewa	-	-	-
Anduketiyawa Wewa	31.7	2123.90	216.78
Ihala Wewa	24.0	1608.00	-299.12
Ittewewa	12.6	844.20	-1062.92
Gananketiyawa Wewa	-	-	-
Timbalawa Wewa	-	-	-
Hempitigama Wewa	37.0	2479.00	571.88
Ihala Attikulama Wewa	-	-	-
Pahala Mawatha Wewa	-	-	-

* Average yield (given in column I) multiplied by the average farm gate price of a bushel of paddy.

** The difference between gross income (given in column II and the average production cost of Rs.1907.12/acre (given in Table 4.7)

Source : ARTI, Survey Data, 1986.

4.6 Lowland Cropping Intensity

The lowland cropping intensity in the project area was very low being about 103% by the time of project commencement in 1981. According to the project investment plan, it is expected to increase lowland cropping intensity upto 110 in the first year, 123 in the second year and 190 in the 10th year through the assured supply of irrigation water to the lowland developed under the project and the introduction of improved crop husbandry practices and water management practices. According to the project targets, the lowland cropping intensity in the project development block should be around 155% by the forth project year which covers 1985/86 **Maha** season and 1986 **Yala** season (see appendix table 5.1). However, as seen in table 4.9, annual cropping intensities in those minor tanks were extremely low and well below the expected target as well as the district average reported for same crop year.

Table 4.9
Lowland Cropping Intensity 1985/86 Maha and 1986 Yala

Name of Tank	Maha 85/86 (%)	Lowland Yala 86 (%)	Annual (%)
Gulupettawa Wewa	90.0	17.5	107.5
Ulukkulma Wewa	95.0	-	95.0
Randoowa Wewa	88.0	-	88.0
Ambagaha Wewa-Kuda Wewa	0	5.0	5.0
Anduketiyawa Wewa	30.0	6.0	36.0
Ehala Wewa	10.0	0	10.0
Ittewewa	77.7	0	77.7
Gananketiyawa Wewa	-	-	-
Timbalawa Wewa	-	-	-
Henpitigama Wewa	33.3	22.2	55.5
Ehala Attikulama Wewa	-	-	-
Pahala Mawatha Wewa	-	-	-

Source : ARTI, Survey Data, 1986.

It should be noted that the cropping intensities in Anduketiyawa Wewa, Ihala Wewa and Hempitigama wewa during 1985/86 **Maha** season were also very low and ranged between 10-33%, while it ranged between 77-90% in other four tanks namely Gulupetta Wewa, Ulukulama Wewa, Randoowa Wewa and Ittewewa where **Maha** paddy cultivation was reported. The greatest decrease in the lowland cropping intensity from **Maha** to **Yala** season was also recorded from the three tank settlements of Gulupettawa Wewa, Anduketiyawa Wewa and Hempitigama Wewa where **Yala** cultivation was reported. In the Gulupettawa settlement, the **Yala** cropping intensity seemed to be decreased from 90.0% - 17.5%, while it has decreased from 30.0% - 6.0% in the case of Anduketiyawa settlements.

The cropping intensity in a given area depend on several factors such as environmental, technological, institutional, economic and management factos etc. (Wickremasekera, 1984). However, inadequate rainfall, shortage of irrigation water and incompleteness of lowland development activities seemed to be the major constraints in increasing the cropping intensity in most of these tank settlements.

CHAPTER FIVE

Highland Cultivation and Livestock Production

5.1 General

As envisaged in the project plan, the distribution of highland allotments among project beneficiaries was started with the project commencement in 1981. The proposed highland development programme includes the provision of infrastructural facilities, tillage facilities for land preparation, supply of inputs like seeds, fertilizers, chemicals and the strengthening of extension and research facilities etc. in view of improving land intensification and developing permanent farming systems in the project area. By the end of 1986, approximately 10248 acres of highland located adjoining to the rehabilitated minor tanks and been alienated among 3416 beneficiary families on the basis of 3 acre highland allotment per family. This Chapter examines the utilization of these highland allotments for crop production and other purposes such as livestock development etc. by the new settler families.

5.2 Land Use and Cropping Pattern

Prior to the project commencement, most of the highland coming under the project development areas remained as underutilized forest reserves. Substantial extents of these forest land were being utilized extensively for **Chena** cultivation by the farmers who were living in adjoining villages. Land rotation, non-use of soil conservation measures, non-adoption of improved crop husbandry practices or management practices, low yield and productivity were the main features of these **Chena** system although it provided sustainable economy to the farmers involved in it. Various crops such as cereals, pulses, starch crops, oil crops and vegetables were grown in these **Chenas** mainly to satisfy their subsistance food needs. The distribution of highland allotment among beneficiary families and the creation of human settlements under the project resulted in eliminating land rotation based traditional **Chena** system from the area. Continuous utilization of land resources for crop production becomes the main feature of the new land use pattern.

The utilization of highland for the cultivation of crops during **Maha** 1985/86 and 1986 **Yala** seasons is given in Table 5.1. It shows that 65-100% of the total highland extent distributed among beneficiaries have been utilized for the cultivation of highland crops during **Maha** season. About 70-85% of the highland extent have also been utilized for cultivation purposes even during the **Yala** season in spite of the limited rainfall.

Table 5.1

Cultivated Extent During **Maha** 1985/86 and **Yala** 1986

Name of Tank	Total highland extent (acres)	Maha 1985/86		Yala 1986	
		Cultivated extent (acres)	% of total extent	Cultivated extent (acres)	% of total extent
Gulupettawa Wewa	30.0	28.0	93.3	24.50	81.6
Ulukulama Wewa	30.0	30.0	100.0	26.0	86.6
Randoowa Wewa	30.0	25.5	85.0	24.0	80.0
Ambagaha Wewa-Kuda Wewa	30.0	27.0	90.0	21.25	70.8
Anduketiyawa Wewa	30.0	26.75	89.0	13.50	45.0
Ihala Wewa	30.0	24.50	82.0	20.60	72.0
Itte Wewa	21.0	3.25	15.4	-	-
Gananketiyawa Wewa	30.0	28.0	93.3	22.75	75.8
Timbalawa Wewa	30.0	25.0	83.3	3.25	10.8
Hempitigama Wewa	27.0	23.0	85.2	22.0	81.5
Ihala Attikulama Wewa	30.0	30.0	100.0	26.50	88.3
Pahala Mawatha Wewa	30.0	19.50	65.0	18.50	61.7
All Tanks	348.0	290.50	83.4	222.85	64.0

Source : ARTI Data, 1986.

Wide variety of crops were reported to be grown in the highland allotments during the **Maha** season. Cowpea, Green gram, Black gram, Maize, Kurakkan, Gingelly, Chillies, Vegetables, Upland Paddy, Manioc (Cassava) were among those crops grown by the majority of farmers. However, remarkable differences could be observed in the utilization of land for these crops. As shown in Table 5.2, larger extent had been utilized by most farmers to grow cash crops such as maize, cowpea, chillie etc. in view of maximizing their cash earnings. The area cultivated under those three cash crops were 26.6%, 23.3% and 16.1% respectively. Other crops and vegetables were grown mainly for their consumption needs.

Table 5.2

Area Cultivated Under Various Crops

Crops	Cultivated Extent **Maha** 1985/86		Cultivated Extent **Yala** 1988	
	Acres	%	Acres	%
Cowpea	67.20	23.1	5.75	2.6
Green Gram	17.05	5.9	2.0	1.0
Maize	77.40	26.6	-	-
Gingelly	0.50	0.2	201.25	90.3
Black Gram	28.40	9.8	1.0	0.4
Vegetables	15.10	5.2	1.0	0.4
Chillies	46.66	16.1	3.50	1.6
Kurakkan	16.00	5.5	-	-
Mix Crops	5.50	1.8	-	-
Paddy (upland)	3.75	1.3	-	-
Others	16.44	5.6	2.75	1.2

Source : ARTI Survey Data, 1986.

Compared to the 1985/86 **Maha** crop season, the crop varieties grown and the extent cultivated under each crop during 1986 **Yala** season was not much satisfactory in almost all these tank settlements. Inadequate rainfall was cited as the major limiting factor for successful cultivation of highland crops during this season. However, majority

of the farmers reported cultivation of Gingelly - the short-aged and drought tolerant crop - as the main **Yala** crop. As shown in Table 5.2, about 90% of the total extent cultivated during 1986 **Yala** season had been devoted for the cultivation of Gingelly. Only a few farmers had grown other crops such as cowpea, green gram, black gram and vegetables etc. in their highland allotments.

5.3 Land Preparation and Crop Establishment

Most of the farmers started initial land clearing activities such as cutting trees, clearing and burning of weeds etc. prior to the commencement of the **Maha** rains. They had started land preparation activities only after the first few rains. About 85% of the farmers reported tilling of land and the adoption of various soil conservation measures such as construction of bunds, drains etc. prior to the establishment of **Maha** crops. The broadcasting of seeds was reported as the common method of crop establishment by the majority of farmers.

5.4 Fertilizer Application

As in the case of paddy, the application of fertilizer for highland crops seems to be unsatisfactory both in terms of the number of farmers and the quantity applied per acre. During 1985/86 **Maha** season, only about 31% of farmers had applied fertilizer for their highland crops. Almost all these farmers had used chemical fertilizers. Several reasons given by other farmers for not using fertilizers for their highland crops are indicated in Table 5.3. Existing high fertility of the virgin soils did not call for high use of artificial fertilizer and because of this reason most farmers (70.7%) had not applied artificial fertilizers for their highland crops. High cost of fertilizer was attributed as the second important reason in this context.

Table 5.3

Number and Percentage of Farmers According to the Reasons for Not Using Fertilizer for Highland Crops

Reason	Farmers No.	%
Soil fertility is satisfactory	98	70.7
High cost of fertilizer	28	34.1
Non-availability at the required time	4	4.9
No purchasing centres closely	1	1.2
Not reported	8	9.3

Source : ARTI, Survey Data, 1986.

5.5 Crop Yield

The average yield obtained by the sample farmers who cultivated highland crops during **Maha** 1985/86 and 1986 **Yala** are given in Table 5.4. It shows that the yield obtained from **Maha** crops (except maize and gingelly) are very low compared to the district average reported for the same crop season. The highland crops grown in this part of the project area mainly depend on several factors such as the availability of rain water, levels of fertilizer application, levels of weed and pest control, soil types, methods of planting and plant density and seed varieties etc. The availability of rain water - the crucial factor seemed to be satisfactory during 1985/86 **Maha** season for a successful crop yield. Therefore, other factors such as poor fertilizer application, poor weed and pest control, non-adoption of proper planting methods and plant densities are judged to the major reasons for the poor yield performance in **Maha**. Inadequate rainfall is listed as the major reason for poor crop production and yields in the 1986 **Yala** season.

Table 5.4

Crop	Maha 1985/86		Yala 1986	
	Average yield reported for selected 12 tanks	Average district yield	Average yield reported for selected 12 tanks	Average district yield
	lb/ac	lb/ac	lb/ac	lb/ac
Cowpea	320	959	105	1233
Green gram	260	773	60	723
Maize	1535	1384	0	1227
Gingelly	1014	527	137	579
Black gram	370	1007	55	1188
Vegetables	413	-	165	-
Chillies	269	1961	50	1952
Kurakkan	352	530	0	714
Mix crop	39	-	0	-
Paddy (upland)	388	-	0	-
Others	794	-	484	-

Source: ARTI Survey Data, 1986. The Dept. of Census & Statistics.

5.6 Highland Cropping Intensity

The highland cropping intensity in the Anuradhapura district was reported to be very low being about 70% by the time of the commencement of the project in 1981 (ADB: 1980). The reported intensity of utilization of highland located in the project development areas was much lower than the district average. As shown in appendix table 5.1, the project expected to increase highland cropping intensity upto 80%, 135% and 160% by the first, fifth and tenth project year respectively. In view of assessing the achievements, actual cropping intensities realized by the farmers who cultivated highland crops in the fourth project year (which covers 1985/86 **Maha** and 1986 **Yala** season) were collected during the field surveys related to the present study. These cropping intensity data are given in Table 5.5.

Table 5.5
Highland Cropping Intensity (%)
(1985/86 **Maha** and 1986 **Yala** seasons)

Name of Tank	**Maha** 85/86	**Yala** 1986	Annual
Gulupettawa Wewa	93.3	81.6	174.9
Ulukulama Wewa	100.0	86.6	186.6
Randoowa Wewa	85.0	80.0	165.8
Ambagaha Wewa - Kuda Wewa	90.9	70.8	160.8
Anduketiyawa Wewa	89.2	45.0	134.2
Ehala Wewa	82.0	45.8	127.8
Itte Wewa	15.4	13.3	28.7
Gananketiya Wewa	93.3	75.8	169.1
Timbalawa Wewa	83.3	10.8	94.1
Henpitigama Wewa	85.2	81.5	166.7
Ehala Attikulama Wewa	100.0	88.3	188.3
Pahala Mawatha Wewa	65.0	61.7	126.7

Source : ARTI, Survey Data, 1986.

The cropping intensity of most tank settlements are much higher than the expected cropping of 125% in the fourth project year. It should be noted that highland cropping intensities in seven tank settlements have exceeded even the targets projected for the 10th project year. From the project point of view, these increases in the highland cropping intensity can be considered as an achievement. Heavy expansion of asweddumized land (cultivable land) under the project and increased utilization of these highland allotments for double cropping as seen in Table 5.5 can be attributed as the major reasons for the increased cropping intensity. Successful **Maha** rain, suitability of the soils, farmers interest in cultivating highland crops in the **Yala** season, even under the uncertain rainfall etc. are among other factors positively affected the increased cropping intensity. However, it reveals that the cropping intensities in some tank settlements such as Ittewewa, Timbalawa Wewa etc. are relatively low when these figures compare with the project targets. Apparently, incompleteness of land clearing and preparation activities, poor utilization of highland for the cultivation of **Yala** crops, incompleteness of settling farmers on their respective allotments etc. are seemed to be acted as major constraints to increase the cropping intensities in these few tanks.

Generally, increased cropping intensity should result in increasing agricultural output in the respective settlements. But the production levels in almost all these tank settlements are very low inspite of the increased cropping intensity. Widespread crop failure due to inadequate rain water specially during the latter part of the **Maha** season and most part of the **Yala** season can be attributed as the common cause for poor crop production. Devastation of crops by animals such as wild elephants, wild boar, cattle, etc. are also reported by the majority of farmers as the chief cause for crop losses and poor crop production.

5.7 Livestock Production

The livestock development activities and the animal husbandry management practices in the project area was considered poor even prior to the commencement of the project. However, considerable number of beneficiaries currently residing in the new settlements reported their experience in maintaining livestock before they received land under the project. As shown in Table 5.6, cattle and buffaloes were the predominant animals kept by most of these farmers.

The project expected to develop further the livestock sector in the project area and also to encourage livestock rearing among the project beneficiaries in view of increasing farm income and providing

nutritional requirement of those farm families. However, the maintaining of livestock seems to be very poor and unsuccessful in almost all the tank settlements. As shown in Table 5.6, only a few farmers currently maintain animals and this can be considered as a discouraging trend compared to the pre-project situation.

Table 5.6
Number and Percentage of Farmers Maintaining Livestock

Type of Animal	Pre-Project		Under the Project	
	No.	%	No.	%
Cattle	26	22	5	4
Buffalo	30	17	2	2
Poultry	13	11	12	10
Pig	13	11	0	0
Goat	10	8	4	3
Other	6	5	0	0

Source : ARTI, Survey Data, 1986.

Most of the farmers have not taken up permanent residence in their respective farm holdings and continue to commute from their home villages. This has served to be the major constraint in developing the livestock sector in the new settlements. Nonavailability of water and animal fodder especially during the dry season are also cited as important problems by the majority of settlers. Some of the settlers expressed their inability to purchase animals (especially cattle and buffalo) due to their poor economy and this reason also can be attributed to the poor condition of the livestock sector in these settlements.

CHAPTER SIX

Conclusions and Policy Recommendations

The main objective of ADZAP was to establish technically viable and economically attractive farming systems by combining rainfed and irrigated farming in selected localities in the Anuradhapura district. The project included infrastructural development and the provision of facilities and services for improving agricultural production in the area.

During the period of implementation of the project, about 138 abandoned minor irrigation systems were restored. Around 12000 acres of land - both lowland and highland - were alienated among landless families who were resettled under minor irrigation systems. Elimination of the land rotation based **Chena** system and the development of agricultural and infrastructural support service such as the provision inputs, improving road network etc. are among the other positive effects of the project.

The study revealed that the development of lowland and upland adjacent to many of the minor tanks restored under the project was not upto expectations. Land settlement under the project and the implementation of other project component was behind schedule and very much below the initial targets. Due to these drawbacks the project was unable to achieve its overall objectives of establishing viable farming systems.

Although data collection for this study was confined to 12 tank settlements rehabilitated under project, field observations, discussions and interviews with key informants provided us with sufficient data for a much broader assessment of the project's progress. Details of the problems and constraints have already been discussed in the preceding chapters. Some of the more important policy implications relating to various aspects of the project and some policy recommendations which may be useful for the authorities in redirecting or redesigning similar projects are highlighted below.

6.1 Project Planning and Management

The successful implementation of this type of innovative rural development projects heavily depends on factors such as realistic planning, the efficiency of the management system responsible for proper and timely decision-making, the close co-ordination among various agencies involved in the project implementation and developing an effective monitoring and evaluation system. The impression of the researcher is that the issues concerning social, institutional, organizational and managerial aspects as well as the economic and technical feasibility of the project have been lightly dealt within the planning process. This has resulted in difficulties in plan implementation. As far as the ADZAP management system is concerned, it did not take appropriate and correct decision in time. Moreover, the monitoring and evaluation system was poor, and there was no effective co-ordination among implementing agencies. Therefore, it is imperative to study planning process and management system of this project in order to identify the weakness relating to these aspects.

6.2 Selection of Tanks

According to the stipulated technical criteria, tanks with a water storage capacity of not less than 8 acre feet per hectare or command area had been selected for rehabilitation under the project. However, water storage and saving capacity of most of the tanks rehabilitated were reported to be inadequate even to irrigate the **Maha** paddy crop. This may be due to the small size of the tank, poor water inflow or over losses of water etc. Therefore, detailed surveys and studies should be undertaken to determine the appropriate size of tanks to be rehabilitated.

From the point of view of the beneficiaries, rehabilitation of tanks have been undertaken in areas where the catchment area is inadequate. In the dry-zone environment, catchments are crucial for the supply of water to minor as well as major tanks. Therefore, more attention should be paid to rehabilitate tanks which have an adequate catchment-area and to develop the catchments where it is inadequate.

6.3 Selection of Beneficiaries

Conforming to project stipulations, the majority of the beneficiaries currently residing in the settlements have been selected from the landless people living in adjacent **Purana**(ancestral) villages or settlement schemes. However, several cases were found where land had been alienated to people who owned land and other assets outside the project and to persons engaged in trading or other enterprises. As discussed

in Chapter Two, these well-to-do persons have not shown any interest to reside in the new land allotments. As a result, most of the land holdings distributed among these persons remained undeveloped. From the project point of view, the alienation of land among these persons hve become a constraint in achieving the development objectives of the project. Therefore, land alienation among such persons should not be encouraged.

6.4 Settlement of Beneficiaries

The slow rate of taking up residence in the new allotments by the majority of the beneficiaries has become a major drawback to the development of the new settlements. The reasons attributed for this are (a) non-availability of water for drinking and other domestic uses (b) non-availability of building material (c) lack of financial assistance for house construction (d) lack of transport facilities (e) inadequate health and schooling facilities and (f) lack of protection from wild animals. Motivating these beneficiaries to reside in, the respective settlements should be given high priority if the programme is to succeed. In this context the following recommendations are made:

a. The project should construct sufficient number of deep wells, tube wells or provide pipe born water to each tank settlement at the very begining of the development activities.

b. The project authorities should provide building materials (especially wood) or else allow beneficiaries to utilize certain amount of trees/ wood from the forest clearings to put up their houses. Some financial assistance should also be provide for house construction.

c. Other community facilities such as health, schooling etc. should be provided.

d. The settlers should be given barbed wire to construct fences around their holdings. This is particularly important for those residing in the tank settlements where crop losses and destruction of houses were reported due to the wild animals.

6.5 Water Management

The success of paddy cultivation in terms of double cropping and the increasing cropping intensity heavily depends on the effective implementation of the proposed water management programme. However, the study found that such water management programme or establishment of proposed water management pilot schemes had not been implemented successfully. This is due to reason such as incomplete upstream

and downstream development activities, insufficient water in the tanks, slow progress of settlement of beneficiary etc. The poor level of water management was resulted in low paddy output, poor cropping intensity and poor co-operation among farmers in sharing tank water. These factors illustrate the urgent need for the implementation of the proposed water management programme.

6.6 Animal Husbandry

The animal husbandry programme, especially livestock production in the new settlements was found to be extremely unsatisfactory, although it was expected to develop as one of the major component of the new farming system. During the past few years, project activities had been mainly foucssed on the completion of physical construction works relating to the livestock sector. However, the project has failed to distribute milk cows among beneficiaries or to implement the fodder development programme as scheduled.

There is a great potential in the area for livestock development, particularly because of the availability of adequate land and the farmer's willingness to engage in livestock farming. Therefore, the project should encourage beneficiaries to develop livestock production through the implementation of the fodder development programme and by providing milk cows to the settlers. The extension services should also be strengthened.

6.7 Agricultural Credit

The programme include the provision of loans for the purchase of draught animals and implements, two-wheeled tractors, dairy animals, carts and construction of irrigation wells etc. However, the credit disbursed as well as their effect in boosting agricultural production seemed to be extremely unsatisfactory. From the banks point of view, the fact that the farmers have not taken permanent residence is one reason for their unwillingness to extend credit facilities. In addition, poor loan repayment capacity of the farmers as well as their credit worthyness are among the other major reasons for the poor performance of the credit programme. From the farmers point of view, the rigid terms laid down by the lending institutions prevented them from taking loans although there was a big demand for such loans. These observations point to the need for; (a) re-appraising the present credit system and (b) introducing a more flexible credit system for the majority of settlers.

6.8 Research and Extension

The level of adoption of improved cultivation practices and management techniques and the farmers awareness of such techniques seemed to be very poor. However, both these aspects are very important in establishing a stabilized farming system in an area where shifting cultivation was practised extensively. Therefore, research and extension activities should be undertaken to develop suitable crop mix, and to improve cultivation and management practices for the farmers in the project area and to disseminate such information to the farmers.

REFERENCES

ADB (1980), Appraisal of Anuradhapura Dry Zone Agricultural Project in Sri Lanka.

ADB (1980), Anuradhapura Dry Zone Agricultural Project, Bench Mark Survey, Bombay.

Department of Census and Statistics (1986), Extent and Production Figures for 1986.

Department of Census and Statistics (1986), Census of Population 1981.

MADR (1984), Anuradhapura Dry Zone Agricultural Project, Sri Lnaka; (revised) July-August 1984.

PMO (1987), Implementation Programme for 1987.

Wickramasekara, P. (1984), An Analysis of Cropping Intensities in the Paddy Sector of Sri Lanka, Sri Lanka Journal of Agrarian Studies, Vol. 5 No. 1, 1984.

Appendix Table 1.1

Average Monthly Rainfall and Number of Rainy Days Per Month at Anuradhapura (Mahailluppallama) from 1931-60, 1960-78 and 1981-85

	1931 - 1960		1969 - 1978		1981 - 1985	
	Rainfall (m.m.)	Rainy days	Rainfall (m.m.)	Rainy days	Rainfall (m.m.)	Rainy days
January	123	12	40	07	94	06
February	53	06	35	03	184	10
March	99	07	61	06	136	07
April	187	13	150	15	110	11
May	99	08	96	06	112	09
June	13	04	06	02	18	05
July	32	03	30	04	54	05
August	47	05	40	04	25	03
September	69	05	51	04	106	08
October	233	16	274	17	173	13
November	248	19	226	17	240	16
December	242	17	218	18	246	18
Total	1,445	115	1,227	103	1,498	111

Source : Department of Meteorology, Colombo.

Appendix Table 2.1

Project Components, Sub-Components and Implementing Agencies

Project Components	Sub-Components	Administrative Responsibility	
		Ministry	Department/Agency
i. Rehabilitation of Minor Tanks	Jungle clearance in bund areas and command areas. Bund restoration, water distribution and drainage, spills and sluices hydraulic structure, water management pilot schemes and demonstration	Ministry of Lands and Land Development	Irrigation Department for upstream work Department of Agrarian Services for downstream work
ii. Agricultural Infrastructure	Land use planning and soil conservation permanent Upland farming community forest for firewood and animal fodder production, agricultural extension.	Agricultural Development and Research	Department of Agriculture Project Management Office, and the Farming Systems Research Unit of Maha Illuppallama Research Centre
iii. Agricultural support Services	Strengthening of Agrarian Services Centres	Agricultural Development and Research	Department of Agrarian Services
iv. Livestock Development	Establishment of Livestock Training Centres, Rehabilitation of Veterinary Centres, Artificial Insemination Services, Strengthening of Stud Bull Centres, Establishment of Milk Chilling Centres, Construction of Feed Mixing Plant, Strengthening of Livestock Farms, Fodder Development programme	Ministry of Rural Industrial Development	Department of Animal Production and Health National Livestock Development Board, Department of Animal Production and Health
v. Rural Road Infrastructure	Construction of new gravel, Rehabilitation of main service roads	Ministry of Power and Highways	Department of Highways

Source : MADR, 1984.

Appendisx Table 3.1

Percentage Distribution of Members of the Household by Age and Sex

Age Group	Male	Female	Total
0 - 4	17.85	9.31	14.00
5 - 9	22.38	24.14	23.17
10 - 14	14.45	18.28	16.17
15 - 19	7.93	6.55	7.31
20 - 24	4.25	5.86	4.98
25 - 29	5.95	12.41	8.87
30 - 34	8.50	9.66	9.02
35 - 39	5.95	6.21	6.07
40 - 44	3.68	1.38	2.64
45 - 49	4.53	2.07	3.42
50 - 54	1.70	2.07	1.87
55 - 59	0.85	1.03	0.93
60 - 64	0.85	0.69	0.78
65 - over	1.13	0.35	0.78
Total	100.00	100.00	100.00

Source : ARTI Survey Data, 1986.

Appendix Table 3.2

Employed Population According to Main Occupation and by Sex

Main Occupation	Male	Female	Total
Agricultural Operator	80.54	92.00	83.00
Agricultural Labourer	10.74	4.00	9.05
Non-agricultural Labourer	2.69	0.00	2.01
Self-employment	2.69	2.00	2.51
Skilled Labourers	0.67	0.00	0.50
Salaried employment (State sector)	2.69	0.00	2.01
Salaried employment (Private sector)	0.00	2.00	0.50
Others	0.00	0.00	0.00
Total	100.00	100.00	100.00

Source : ARTI Survey Data, 1988.

Appendix Table 3.3

Number and Percentage of Houses According to Floor Area

Floor area sq. feet	No.	%
1 - 150	45	37.8
151 - 250	43	36.1
251 - 500	28	23.5
501 - 750	2	1.7
751 -1000	0	0
Above 1000	1	0.9
Total	119	100.0

Source : ARTI, Survey Data, 1986.

Appendix Table 3.4

Number and Percentage of Houses According to Living Rooms

No. of Rooms	Houses No.	%
1	59	49.58
2	44	36.98
3	12	10.08
4	4	3.36
5 & over	0	0

Source : ARTI, Survey Data, 1986.

Appendix Table 3.5

Percentage of Households Possessing Household Items, Agricultural Implements and Transport Facilities

Item	Households %
Household items	
Wrist-watch	43.7
Wall Clock	2.5
Torch	94.9
Petromax Lamp	12.6
Radio	52.9
Cassette Recorder	1.6
Sewing Machines	6.7
Kerosene Cooker	0
Wardrobes	3.3
Set of Furniture	4.2
T.V. Set	1.6
Agricultural Implements	
Mammoty	100.0
Plough (wooden)	8.4
Plough (iron)	0.8
Sprayers	5.0
Dusters	0.0
Tractors (2 wheel)	1.6
Tractors (4 wheel)	0.8
Water Pumps	2.5
Transport Items	
Carts	2.5
Bicycles	61.3
Motor Bicycles	0.8
Cars	0
Lorries	0

Source : ARTI, Survey Data, 1986.

Appendix Table 5.1

Year-wise Cropping Intensity Targets

Project Year	Cropping Intensity (%)	
	Lowland	Upland
0	103	-
1	110	80
2	123	87
3	141	110
4	155	125
5	168	135
6	174	145
7	180	155
8	185	160
9	190	160
10	190	160

Source : MADR 1984, p.84.