

# **Impact of Small Scale Irrigation Rehabilitation and Water Management under Dry-zone**

**Livelihood Support and Partnership Programme (DZLiSPP)**



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**Report Submitted to the DZLiSPP**

**Hector Kobbekaduwa Agrarian Research & Training Institute  
114, Wijerama Mawatha  
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## ABSTRACT

The main objective of this study is to evaluate the success of irrigation rehabilitation, operation and maintenance of irrigation schemes and water management package introduced by the Dry Zone Livelihood Support and Partnership programme (DZLiSPP) to promote more uptakes. Seven percent of the rehabilitated schemes (35) completed by end of 2010 were randomly selected for the evaluation. The total number of schemes selected for the study is 35.

According to findings, all the rehabilitated schemes are benefiting over 10 farmers except one sample scheme. Majority of the beneficiaries are owner operators of their land. Farming is the primary employment of the majority of the beneficiaries except in two schemes, but only about half of the sample schemes served as primary source of agricultural income for majority of the farmers. Upland farming and/or income earned from other irrigated schemes served as major source of income for remaining farmers. Land distribution and ownership issues are needed to be considered in the selection process of schemes for rehabilitation as such issues are evident in considerable number of schemes.

Beneficiaries have accepted and approved the participatory approach adopted in determining, prioritizing and ratifying the rehabilitation needs. Local knowledge and wisdom have been widely incorporated by the project staff in designing and constructing the project activities. However, the social mobilization part is relatively weak in the project, which was by and large limited to delivering tangible outputs of the project but not succeeded in achieving the planned outcome of sustainable O&M of the irrigation schemes through an empowered beneficiary organization. The project has failed to adopt suitable methodology to provide early orientation and consultation with district, divisional and local government officials and the communities of selected villages on project approach, other than obtaining approval for the selected sites from District and Divisional Agrarian Development committees to undertake rehabilitation. But it is important to build strong partnership linkage with line agency officers in order to ensure post project sustainable O&M and management turnover of scheme to line agency after rehabilitation.

The rehabilitation works undertaken in all the selected schemes are highly relevant and good in quality, though there are some design problems and construction defaults reported in some locations where contract was mostly undertaken by a third party. It is also important to have at least one or two beneficiaries of the given scheme in the office bearers/committee of the contracting FO in order to ensure the quality and transparency of the works done. One of the vital components mostly missed out by the project is integration of channel protection with the inclusion of demarcation of channel and tank bund reservations and planting of trees.

The strength of the FOs in majority of the areas were relatively weak and malfunctioning as per the indicators developed to measure the strength of FOs. Although there are traditional *Jalapalaka* in almost all the places, they seldom

received a honorarium for their services. Majority of the schemes have no system to collect 'salaries' or fee to cover the O&M cost. The application of paint and grease for gates and structures is not common in majority of the schemes except in a very few schemes where 'Jalapalaka' or farmer representative volunteering the job. Jungle clearing and de-silting undertaken by farmers is not at satisfactory levels. Therefore, there should be a sufficient provision in the project to strengthen the community institutions by providing guidance, skills and knowledge required for effective functioning.

Formation of scheme level Water User Group (WUG), is considered to be one of the novel aspects introduced by the project to act as the focal point for the planning and management of the scheme level activities, but they are mostly limited to name boards in most sample locations. Lack of integration of hardware and software development components from initial stage is a major factor attributed to poor performance of WUGs.

The main direct impacts of the rehabilitation are increased number of farmers, and increase of extent of cultivation, land productivity and total crop production. Due to the rehabilitation of small scale irrigation schemes, the annual extent of cultivation of the selected tanks/anicuts has increased by 306ac in 2010/11 compared to pre project situation (53% increases). The same is over 500% in 2011 *yala* season (extent increase from 39 ac to 240ac). The programme has resulted in an increase in total paddy produced from the selected irrigation schemes by 93% during *maha* season of 2010/11 and by 590% in *yala* 2011 compared to pre-project total average production (increased from 54,139 to 3,77,269 kg).

The rehabilitation of small irrigation tanks has brought significant impacts to the village water resources by increasing capacity of the tank, and improving groundwater level in most periods of the year. The increase of water levels in domestic wells has increased household domestic water security and reduced the hardship of water fetching. According to the results of economic appraisal of the project, the investment has generated enormous positive results. The rate of return is very high under anicut schemes, where relatively small investment has resulted huge increase in income.

Participatory development approach has addressed the real need of the rural people and has made them as strong partners in the project implementation. The project approach needs to incorporate more power for strengthening of rural institutional set up and mobilization of all stakeholders for sustainable post project management. The project must allocate necessary funds for the land survey at scheme level and make necessary demarcations for reservation areas. Attention should also be paid to the issues of land distribution and ownership. Water management package should be introduced and mobilize the farmers towards achieving the objectives from the initial step of the rehabilitation while institutionalizing the existing traditional and introduced practices and systems in water and infrastructure management.

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M.M.M. Aheeyar  
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## GLOSSARY

|                        |   |                                                                           |
|------------------------|---|---------------------------------------------------------------------------|
| <i>Grama Niladhari</i> | - | Village level government administrative officer                           |
| <i>Jalapalaka</i>      | - | Care taker of the irrigation scheme                                       |
| <i>Kurupanisa</i>      | - | Agricultural research and production assistant operating at village level |
| <i>Maha</i>            | - | Major cultivation season extending from October to March                  |
| <i>Salaaries</i>       | - | An honourarium paid to irrigation system caretaker                        |
| <i>Shramadana</i>      | - | Volunteer labour mobilization for self-help                               |
| <i>Yala</i>            | - | Minor cultivation season extending from April to September                |

## LIST OF ABBREVIATIONS

|         |   |                                                             |
|---------|---|-------------------------------------------------------------|
| ADC     | - | Agrarian Development Centre                                 |
| DS      | - | Divisional Secretariat                                      |
| DZLiSPP | - | Dry Zone Livelihood Support and Partnership programme       |
| FO      | - | Farmer Organization                                         |
| GN      | - | Grama Niladhari                                             |
| HARTI   | - | Hector Kobbekaduwa Agrarian research and Training Institute |
| OFC     | - | Other Field Crops                                           |
| O&M     | - | Operation and Maintenance                                   |
| PRA     | - | Participatory Rural Appraisal                               |
| TO      | - | Technical Officer                                           |
| WUGs    | - | Water User Groups                                           |

# CHAPTER ONE

## Introduction

### 1.1 Background

One of the primary problems faced by the dry zone farmers in Sri Lanka is scarcity of water during the most critical period of the year. They have often faced bad experiences in cultivating with the onset of rain and losing the crop due to poor rainfall during peak demand especially in *yala* seasons. Though there are large numbers of small tanks to harvest and store the seasonal rainfall, they are mostly silted and deteriorated, thus losing the total capacity to provide water for a full *yala* season and sometimes in *maha* season as well. Therefore, the issues such as low input agriculture and low productivity, seasonal and uncertain income, low cropping intensity and various other socio-economic issues are factors that influence the sustainability of minor irrigation systems.

Government interventions on minor irrigation rehabilitation started in early 1950's, but they were basically top down approaches with little or no involvement of farming community. As a result, these rehabilitated schemes were not adequately maintained by farmers and led to repeated pre-mature rehabilitation.

Rehabilitation of minor irrigation schemes is one of the major activities of the Dry Zone Livelihood Support and Partnership programme (DZLiSPP) implemented in all four districts viz; Kurunegala, Anuradhapura, Badulla and Moneragala. The rehabilitation programme of minor irrigation schemes was expected to enhance the income levels of around 15,000 families in these four districts through increased cropping intensity and increased yield levels.

### 1.2 Small irrigation Rehabilitation under DZLiSPP

Financial allocation for small irrigation rehabilitation is the second largest component (after community infrastructure development) in the DZLiSPP. The project was planned to complete rehabilitation of 500 small tanks and 250 small anicuts to benefit 6,600 ha and 10,200 farm families during the period 2008-2012. The number of schemes rehabilitated by the end of 2011 was 640 (340 tanks and 300 anicuts). It was expected to increase the effectiveness of the irrigated area of the *yala* season by about 30% after completion of rehabilitation. According to the appraisal report, the project had to adopt following criteria in selecting a tank/anicut for rehabilitation.

- i. The community had to express effective demand and consider rehabilitation a priority in the PRA
- ii. The tank is currently being used for irrigation and not abandoned
- iii. Priority had to be given to the schemes that had less than 10 ha of command area, but not less than 10 beneficiary farmers

- iv. Priority had to be given for schemes of multiple uses (irrigation, domestic use, agriculture, and livestock)
- v. The rehabilitation is feasible within the foreseen budget
- vi. The schemes selected should not have been rehabilitated during the last 8-10 years by other projects
- vii. All farmers in the command area should have permits or titles or can be helped to get these on a cost efficient manner
- viii. The potential users have established operation and maintenance (O&M) fund and have declared a policy of cost recovery for maintenance
- ix. Beneficiary contribution for the project should be not less than 10% of the total estimated cost

However, it appears that some of the above criteria such as tank currently being used for irrigation, and command area around 10 ha were not strictly followed in the tank selection process. Temporarily abandoned (less than five years) and permanently abandoned (more than five years) tanks/anicut were also selected for rehabilitation.

### **1.3 Major Component of the Project**

The rehabilitation package introduced by the project had several components;

#### **1. Institutional Development**

According to the project appraisal report, all the project beneficiaries will be assisted and trained to form a Water User Group (WUG) to empower them to undertake rehabilitation work and post project O&M (IFAD, 2005). The main activities of institutional development component are;

- i. Strengthening of village level organizations and formation of WUG
- ii. Establishing linkages with line agency officials
- iii. Training farmer representatives/general farmers on various aspects of organizational management, O&M, construction works related to rehabilitation, and water management

#### **2. System Rehabilitation**

Beneficiary community was expected to play a prominent role in the project in all stages of rehabilitation from planning, prioritizing rehabilitation needs, designing and implementing project works, while contributing not less than 10% of the total cost in cash or kind. The main components of the rehabilitation are;

- i. Identification of rehabilitation need; prioritization and ratification through farmer consultation
- ii. Capacity building of farmer groups for construction work – construction and quality control of earth bund, construction of structures and preparation of concrete mixtures
- iii. Mobilization of labour from the community for rehabilitation works
- iv. Provision of technical inputs from line agencies

**Table 1.1: Performance of Irrigation Rehabilitation by the End of 2011**

| District     | Rehabilitation type   |                        |                                          |
|--------------|-----------------------|------------------------|------------------------------------------|
|              | Normal rehabilitation | Abandoned last 5 years | Abandoned more than 5 years/ new schemes |
| Anuradhapura | 156                   | 1                      | 3                                        |
| Kurunegala   | 118                   | 10                     | 4                                        |
| Badulla      | 208                   | 4                      | 6                                        |
| Moneragala   | 91                    | 27                     | 20                                       |
| Total        | 573                   | 42                     | 33                                       |

**Table 1.2: Small Irrigation Rehabilitation-Progress by the End of December 2010**

| District     | No. of Tanks | No. of Anicuts | Total      |
|--------------|--------------|----------------|------------|
| Kurunegala   | 78           | 5              | 83         |
| Anuradhapura | 106          | 21             | 127        |
| Badulla      | 10           | 158            | 168        |
| Moneragala   | 69           | 54             | 123        |
| <b>Total</b> | <b>263</b>   | <b>238</b>     | <b>501</b> |

Source: Records maintained by the District offices

### 3. Water Management

The project had planned to implement a water management system at least for two seasons after rehabilitation to minimize the water scarcity conditions in minor irrigation system. The main components of the water management programme are;

- Introduction of an appropriate water delivery system
- Introduction of and adoption of water measurement device and provision of quantitative impression among farmers about the amount of water used
- Appointment of a “caretaker” and entrusting him to deal on gate operation, water distribution and conflict resolution in water sharing (if any)
- Payment of an honorarium (*salaaries*) for “caretaker” after each season

### 4. Sustainable O&M

As the small irrigation schemes are farmer managed systems, establishment of a mechanism for sustainable O&M is vital to ensure the expected benefits and avoid deterioration of infrastructure. The project implemented following strategies for sustainable O&M;

- Establishment of O&M fund at scheme level in a reputed bank
- Cost recovery arrangement to meet maintenance cost at farmers level
- Arrangement for labour mobilization for routine maintenance work

**Table 1.3: Performance of Water Management Programme Implementation by Project at the End of 2011<sup>1</sup>**

| District     | No. of schemes under programme | Sub groups/ WUGs formed | Care Taker appointed | Maintenance fund established | WM training conducted |
|--------------|--------------------------------|-------------------------|----------------------|------------------------------|-----------------------|
| Anuradhapura | 50                             | 50                      | 11                   | 11                           | 15                    |
| Kurunegala   | 143                            | 143                     | 45                   | 10                           | 71                    |
| Badulla      | 50                             | 41                      | 40                   | 8                            | 50                    |
| Moneragala   | 50                             | 10                      | 10                   | 10                           | 10                    |
| Total        | 293                            | 244                     | 106                  | 39                           | 146                   |

Source: Records maintained by the District project offices

<sup>1</sup>As water management programme was initiated in 2010; the table was prepared for end of 2011

## 5. Diversification of Agricultural Activities

The development of minor irrigation is expected to diversify the village agriculture and enhance household income with increased availability of water and groundwater recharge through increased cropping intensity, OFC cultivation in *yala* season, upland perennial crop cultivation, agriculture and livestock activities.

### 1.4 Objectives of the Evaluation

The major objective of this study is to evaluate the success of irrigation rehabilitation, operation and maintenance of irrigation schemes and introduce water management system by the programme to promote more uptakes.

The specific objectives of the study are;

- i. To assess the overall quality of rehabilitation work, cost effectiveness, fulfilling farmers' needs, and farmer participation in rehabilitation process
- ii. To assess impacts of rehabilitation of irrigation schemes on livelihoods of farmers
- iii. To examine the impacts of existing operation and maintenance (O&M) systems on sustainability of the irrigation schemes
- iv. To assess the success/impacts of water management system introduced by the project

## CHAPTER TWO

### Methodology

#### 2.1 Study Sites

Study sites were selected from the four project districts of Anuradhapura, Kurunegala, Badulla and Moneragala. The 501 schemes which were rehabilitated by the end of 2010 were used as the sample frame to allow some time period to show the impacts of the interventions. Seven percent of the rehabilitated schemes by the end of 2010 were chosen for the detail study. The sample was stratified and proportionately allocated based on population of district total of rehabilitated scheme. The distribution of sample among the districts is given in Table No. 2.2 to 2.5. The attention was paid to consider the type of small irrigation (anicut and small tanks) and status of pre rehabilitation condition [new (abandoned) and used schemes] in the selection. At least one tank from each district which has introduced the complete water management package (forming WUGs, appointing caretakers, establishing maintenance fund and conducting water management training) was selected within the given sample to study the performance and sustainability of water management programme.

**Table 2.1: Distribution of the Sample Between Districts**

| District     | No. of Schemes Rehabilitated | Sample Size |
|--------------|------------------------------|-------------|
| Kurunegala   | 83                           | 7           |
| Anuradhapura | 127                          | 9           |
| Badulla      | 164                          | 11          |
| Moneragala   | 123                          | 8           |
| <b>Total</b> | <b>466</b>                   | <b>35</b>   |

**Table 2.2: Sample Schemes –Kurunegala District**

| No. | Name of the Scheme       | Type of Scheme | Pre project status of the scheme | DS Division   | GN Division    |
|-----|--------------------------|----------------|----------------------------------|---------------|----------------|
| 01  | Dambu Gaha Wewa          | Tank           | Existing tank                    | Ambanpola     | Dambegahawewa  |
| 02  | Ambale Ihala Wewa        | Tank           | Existing tank                    | Rasnayakapura | Ambale         |
| 03  | Balagolla wewa           | Tank           | Existing tank                    | Polpithigama  | Ma eliya east  |
| 04  | Liyanagama Dammulla wewa | Tank           | Existing tank                    | Maho          | Liyanagama     |
| 05  | Bogaha Wewa              | Tank           | Existing tank                    | Galgamuwa     | Peddogama      |
| 06  | Galenbindunu wewa        | Tank           | Existing tank                    | Galgamuwa     | Ethiwetunugala |
| 07  | Ottukulama Ihala Wewa    | Tank           | Abandoned                        | Rasnayakapura | Ottukulama     |

**Table 2.3: Sample Schemes –Anuradhapura District**

| No. | Name of the Scheme             | Type of Scheme | Pre project status of the scheme | DS Division               | GN Division    |
|-----|--------------------------------|----------------|----------------------------------|---------------------------|----------------|
| 01  | Millagala wewa                 | Tank           | Abandoned                        | Kahatagasdigiliya         | Kelanikawewa   |
| 02  | Aluth wewa                     | Tank           | Existing tank                    | Rambewa                   | 97, Kendewa    |
| 03  | Siyambalagaswewa               | Tank           | Existing tank                    | Medawachchiya             | Railway Town   |
| 04  | Kirimetiya wewa                | Tank           | Existing tank                    | Palugas wewa              | 598, Madawala  |
| 05  | Nikawewewa Kuda wewa           | Tank           | Existing tank                    | Horowpothana              | Nikawewa       |
| 06  | Galkadawala wewa               | Tank           | Existing tank                    | Kebithigollawa            | Gonuhaddenawa  |
| 07  | Pahala Katugampolaya gama wewa | Tank           | New construction                 | Nuwaragam Palatha Central | Galpoththegama |
| 08  | Dunumandalawa wewa             | Tank           | Abandoned                        | Kahatagasdigiliya         | Kurukkura gama |
| 09  | Wevel ketiya Amuna             | Anicut         | Abandoned                        | Rambewa                   | Wevelketiya    |

**Table 2.4: Sample Schemes –Moneragala District**

| No. | Name of the Scheme      | Type of Scheme | Pre project status of the scheme | DS Division    | GN Division  |
|-----|-------------------------|----------------|----------------------------------|----------------|--------------|
| 01  | Dandenawela Anicut      | Anicut         | Existing                         | Madulla        | Pagura       |
| 02  | Bolhidagala wewa        | Tank           | Abandoned                        | Buttala        | Rahathangama |
| 03  | Nabadanara Anicut       | Anicut         | Abandoned                        | Siyambalanduwa | Kotiyagala   |
| 04  | Karakolagas pitiya wewa | Tank           | Existing tank                    | Siyambalanduwa | Kotiyagala   |
| 05  | Endurugal yaya ela      | Anicut         | New construction                 | Buttala        | Kukurampola  |
| 06  | Hinguregala wewa        | Tank           | Existing tank                    | Siyambalanduwa | Buddama      |
| 07  | Karambe ara wewa        | Tank           | Abandoned                        | Siyambalanduwa | Waragama     |
| 08  | Aswedduma wewa          | Tank           | Existing tank                    | Madulla        | Galbokka     |

**Table 2.5: Sample Schemes –Badulla District**

| No. | Name of the Scheme    | Type of Scheme | Pre project status of the scheme | DS Division     | GN Division    |
|-----|-----------------------|----------------|----------------------------------|-----------------|----------------|
| 01  | Bowalapitiya Anicut   | Anicut         | Existing                         | Riddeemaliyadda | Nagadeepa      |
| 02  | Gawarammana Anicut    | Anicut         | Existing                         | Welimada        | Gawarammana    |
| 03  | Karadamandiya Ela     | Anicut         | Existing                         | Meegahakiula    | Komarika       |
| 04  | Hiddakumburu Yaya Ela | Anicut         | Abandoned                        | Ella            | Walasbedda     |
| 05  | Nindagam Vihara Ela   | Anicut         | Existing                         | Lunugala        | Metigahathenna |
| 06  | Bathgoda Maha Ela     | Anicut         | Existing                         | Kandeketiya     | Dikkumbura     |
| 07  | Dangamuwa Pahala Ela  | Anicut         | Existing                         | Uva Paranagama  | Dangamuwa      |
| 08  | Bedde Arawa Anicut    | Anicut         | Existing                         | Bandarawela     | Beddearawa     |
| 09  | Mulathella Ela        | Anicut         | Abandoned                        | Haliela         | Warakadanda    |
| 10  | Jayaweera Anicut      | Anicut         | Existing                         | Bandarawela     | Diganathenna   |
| 11  | Mahakumbura Ela       | Anicut         | Existing                         | Haliela         | Anthuduawawela |

## 2.2 Data Collection Techniques and Data Analysis

The collection of information for the proposed impact evaluation study was through a series of following techniques.

- Review of existing documents and data bases- Comprehensive review of available project related documents and data base was 'conducted first to understand the project background, approach adopted and other key features of the intervention.
- Focus group discussions of beneficiaries- A detail focus group discussions (FGD) were conducted in all selected schemes using a check list to achieve the objectives of the evaluation. FGD were also conducted for the relevant officers attached to the district project offices.
- Semi structured interviews with key informants such as project engineers, technical officers, social mobilizers, Divisional Officers, ARPAs and Farmer representatives.
- Informal discussions were undertaken among farmers, farmer representatives, field officers of the project and grass root officials to triangulate the various issues which emerged in the evaluation.
- Direct field observations were made during the filed visits on quality of rehabilitation, current situation of the tank/anicut, existing problems and farmers' attitudes on maintenance of irrigation systems.

The different stakeholders of the project were interviewed during the study. They are;

- a. National programme coordinator and officials of project coordination unit
- b. Staff of district project management offices
- c. Line agency officials (Irrigation, Agriculture, and Agrarian)
- d. Grass root level officers (Grama Niladhari, Agriculture Research and Production Assistants)
- e. FO/WUG leaders and representatives
- f. Farmers

Descriptive statistics and project appraisal techniques were adopted for data analysis.

## CHAPTER THREE

### Approach of Intervention and Role of Farmers in Rehabilitation

#### 3.1 Socio Economic Features of the Selected Areas

The basic socio economic characteristics of the schemes shows that (Tables 3.1-3.4), all the rehabilitated schemes are benefiting over 10 farmers except one sample scheme in Moneragala District. The majority of the beneficiaries are owner operators of their land. About 86% of the schemes contain less than 30 farmers, but numbers of beneficiary farmers are comparatively higher under some of the anicut schemes in Badulla District. Land fragmentation is very high in Anicut schemes and has gone up to 0.062 ac in some of the anicut schemes. In small tank systems, the lowest reported land holdings were 0.25 ac. Most of the farmers are own 0.5 to 1 ac extent.

About 60-100 % of the beneficiaries primarily depend on farming, except Ottukulama Ihala wewa in Kurunegala district and Mahakumbura Ela in Badulla District, where all the farmers are mainly involved in hiring out of their labour. Although the farming is primary employment for majority of the beneficiaries, only 51% the rehabilitated schemes served as primary source of agricultural income for majority of the farmers. Rests of the farmers in other rehabilitated schemes depend on upland cultivation or income earned from other irrigation schemes as the major source of agricultural income. All the farmers in the rehabilitated schemes of Badulla District except Aswedduma wewa primarily depend on upland cultivation for their main portion of agricultural income. The rice produced from these schemes largely serves as the means of household food security.

Land distribution issues are evident in 14% of the selected schemes providing much more benefits to some selected families from the investment made. This needs more attention in selecting the small scale irrigation schemes for rehabilitation. For, instance, In Wevelketiya Amuna and Galkadawala tank in Anuradhapura district, 50% and 26 % of the total available land respectively are legally owned by single family, though there are informal fragmentations within the family members. Similar situation are observed in Ambale Ihala wewa and Dambugaha wewa in Kurunegala district and Karambe Ara wewa in Moneragala district.

Some schemes have been rehabilitated/newly constructed without resolving the land ownership issues where farmers have no legal ownership to land. For instance, Pahala Katugampola Yaya and Dunumandalawa schemes in Anuradhapura district are located in the middle of jungle, where farmers had been cultivating few acres of land using available limited water prior to IFAD intervention. However, after rehabilitation of the tanks, farmers have started asweddumization of new land, clearing forest and there is a tendency to continue new asweddumization as reported by farmers. There is no designed command area or survey plan for these

schemes as full surveying was not included in the project. A similar case study is described in Box I.

#### **Box I: Balancing the Land and Water Resources**

Nikawewa Kudawewa tank is located in Nikawewa Grama Niladhari Division of Horowpathana DS division. There were 22 farmers cultivated under the tank before the rehabilitation. The available water in the tank was sufficient to cultivate part of the command area only during *maha* seasons and no cultivation was done in *yala* seasons. However, after the rehabilitation with increased availability of water in the tank, farmers have expanded the area under cultivation through new asweddumization without considering hydrological features of the tank system. The extent of cultivation has been doubled (70 acres) while increasing the number of farmers up to 40. The situation has led to water scarcity to some extent in the latter part of *maha* seasons. This is an outcome of non demarcation of scheme command area, reservations areas for bund and channels and tank bed (water spread area) area by surveying the project area. Voluntary expansion of the command area while encroaching the reservations would lead to inefficiency in production and affect the sustainability of infrastructure.

**Table 3.1: Main Socio Economic Features of Selected Schemes – Anuradhapura District**

| Name of Scheme            | Land tenure<br>(% of farmers) |        |            | Primary<br>employment (% of<br>farmers) |        |                        | Land size distribution<br>(ac) |         |        | Main source of Agric.<br>Income (% of farmers) |                 |                   |
|---------------------------|-------------------------------|--------|------------|-----------------------------------------|--------|------------------------|--------------------------------|---------|--------|------------------------------------------------|-----------------|-------------------|
|                           | owner                         | tenant | encroached | Farming                                 | Labour | Salaried<br>employment | Mode                           | Highest | Lowest | Given<br>scheme                                | Other<br>scheme | Upland<br>farming |
| Nikawewa Kuda wewa        | 85                            | 15     | -          | 85                                      | -      | 15                     | 1.5                            | 6       | 0.25   | 15                                             | -               | 85                |
| Dunumandalawa             | -                             | -      | 100        | 100                                     | -      | -                      | 0.5-1                          | 2       | 0.5    | 27                                             | 73              | 0                 |
| Millagala wewa            | 100                           | -      | -          | 100                                     | -      | -                      | 0.5-1                          | 3       | 0.75   | 100                                            | -               | -                 |
| Pahala<br>Katugampalayaya | -                             | -      | 100        | 100                                     | -      | -                      | 2                              | 5       | 1      | 100                                            | -               | -                 |
| Aluth wewa                | 87                            | 13     | -          | 90                                      | -      | 10                     | 1                              | 4       | 0.25   | 17                                             | 83              | -                 |
| Wevelketiya amuna         | 63                            | 37     | -          | 73                                      | -      | 27                     | 0.5                            | 3.5     | 0.5    | 100                                            | -               | -                 |
| Galkadawala wewa)         | 100                           | -      | -          | 80                                      | 0      | 20                     | 2-2.5                          | 9       | 0.5    | 23                                             | 77              | -                 |
| Siyambalagas wewa         | 100                           | -      | -          | 95                                      | -      | 5                      | 1                              | 3       | 0.25   | 100                                            | -               | -                 |
| Kirimetiya wewa           | 100                           | -      | -          | 92                                      | -      | 8                      | 0.5                            | 2       | 0.35   | 100                                            | -               | -                 |

**Table 3.2: Main Socio-Economic Features of Selected Schemes – Kurunegala District**

| Name of Scheme           | Land tenure<br>(% of farmers) |        | Primary employment (% of farmers) |        |                     | Land size distribution (ac) |         |        | Main source of Agric. Income (% of farmers) |              |                |
|--------------------------|-------------------------------|--------|-----------------------------------|--------|---------------------|-----------------------------|---------|--------|---------------------------------------------|--------------|----------------|
|                          | owner                         | tenant | Farming                           | Labour | Salaried employment | Mode                        | Highest | Lowest | Given scheme                                | Other scheme | Upland farming |
| Ambale Ihala wewa        | 100                           | -      | 92                                | -      | 8                   | 0.5                         | 8       | 0.25   | 8                                           | 92           | -              |
| Ottukulama Ihala wewa    | 100                           | -      | -                                 | 100    | -                   | 0.5                         | 1       | 0.5    | 83                                          | 17           | -              |
| Balagollagama wewa       | 61                            | 39     | 83                                | -      | 17                  | 0.5                         | 2       | 0.5    | 44                                          | 56           | -              |
| Liyanagama Dammulla wewa | 100                           | -      | 100                               | -      | -                   | 0.5                         | 1.5     | 0.5    | 100                                         | -            | -              |
| Bogaha wewa              | 100                           | -      | 100                               | -      | -                   | 1                           | 1       | 0.5    | 100                                         | -            | -              |
| Galenbindunu wewa        | 100                           | -      | 100                               | -      | -                   | 0.75                        | 1       | 0.5    | 50                                          | -            | 50             |
| Dambu gaha wewa*         | 100*                          | -      | 63                                | -      | 37                  | 0.25                        | 2       | 0.25   | 37                                          | 63           | -              |

\* Cultivated under *Kattimaru* system

**Table 3.3: Main Socio-Economic Features of Selected Echemes – Badulla District**

| Name of Scheme        | Land tenure<br>(% of farmers) |        | Primary employment<br>( % of farmers) |        |                                         | Land size distribution<br>(ac) |         |        | Main source of Agric.<br>Income (% of farmers) |                 |                   |
|-----------------------|-------------------------------|--------|---------------------------------------|--------|-----------------------------------------|--------------------------------|---------|--------|------------------------------------------------|-----------------|-------------------|
|                       | owner                         | tenant | Farming                               | Labour | Salaried<br>Employment/self<br>employed | Mode                           | Highest | Lowest | Given<br>scheme                                | Other<br>scheme | Upland<br>farming |
| Bowalapitiya Anicut   | 100                           | -      | 93                                    | -      | 7                                       | 1                              | 3       | 1      | 7                                              | -               | 93                |
| Gawarammana Anicut    | 100                           | -      | 98                                    | -      | 2                                       | 0.5                            | 0.75    | 0.125  | 100                                            | -               | -                 |
| Karadamandiya Ela     | 67                            | 33     | 90                                    | -      | 10                                      | 0.5                            | 3       | 0.5    | 10                                             | 90              | -                 |
| Hiddakumburu Yaya Ela | 100                           | -      | 92                                    | -      | 8                                       | 0.5                            | 1       | 0.25   | 100                                            | -               | -                 |
| Nindagam Vihara Ela   | 83                            | 17     | 83                                    | -      | 17                                      | 0.25                           | 1.25    | 0.125  | -                                              | -               | 100               |
| Bathgoda Maha Ela     | 100                           | -      | 100                                   | -      | -                                       | 0.5                            | 1.5     | 0.25   | 100                                            | -               | -                 |
| Dangamuwa Pahala Ela  | 96                            | 4      | 94                                    | -      | 6                                       | 0.5                            | 1.25    | 0.1    | 76                                             | -               | 24                |
| Bedde Arawa Anicut    | 100                           | -      | 100                                   |        |                                         | 0.5                            | 1       | 0.125  | 100                                            | -               | -                 |
| Mulathella Ela        | 100                           | -      | 85                                    |        | 15                                      | 0.25                           | 1       | 0.062  | 100                                            | -               | -                 |
| Jayaweera Anicut      | 55                            | 45     | 85                                    | -      | 15                                      | 0.5                            | 1       | 0.125  | 100                                            | -               | -                 |
| Mahakumbura Ela       | 100                           | -      | -                                     | 38     | 72                                      | 0.25                           | 0.75    | 0.062  | -                                              | 100             | -                 |

### **3.2 Approach of Community Mobilization and Empowerment**

The requests for the rehabilitation had to come from the approval of Divisional Agricultural Committees (DACs). Tank selection for rehabilitation programme has been done through the PRA conducted by the consultants of the project. The district project staff has verified the PRA findings with direct observations and beneficiary consultations. Community meeting was conducted initially in selected areas to discuss the project approach and the role of beneficiaries in the rehabilitation process and willingness to contribute for rehabilitation. Final list of rehabilitation is made after the field visits adhering to IFAD selection criteria. In all areas, Priority list of rehabilitation needs were prepared considering the financial availability of the project based on pro rata cost and level of beneficiary contribution. Beneficiaries have accepted and approved the participatory approach adopted in determining the rehabilitation needs.

Farmers were initially made aware of the construction procedures, role to be played by farmers and the IFAD in the construction, method of financial disbursement and required skills for the successful rehabilitation. Selected farmer representatives of the FOs were given a residential training on construction skills prior to the rehabilitation. Social mobilizers and TOs have served as catalysts in mobilizing farmers towards the project. The catalysts were keen in mobilizing farmers in fulfilling committed works, coordinating field activities, arranging suppliers for machinery and materials and establishing linkages with ground level officers. However, the strengthening of rural organization on various aspects of organizational management, motivational techniques, leadership, social dynamics, book keeping, O&M, and communication skills were not conducted by the project. Therefore, social mobilization part is relatively weak in the project, which was by and large limited to delivering tangible outputs of the IFAD project. This is not sufficient to achieve the planned outcome of sustainable O&M of the irrigation schemes. The case study described in Box 2 indicates the weakness reported in the field on software aspects of IFAD interventions.

One social mobilizer had to cover large area (mostly three DS divisions) considering the number of irrigation schemes, social mobilization of other components of the IFAD project and remoteness of the selected villages. The mobilizers had to shift from one village to other village after completion of hardware activities completely disregarding the earlier village/activity. Therefore, it was difficult for them to do a continuous follow-up and mobilization in the rehabilitated schemes.

Insufficient number of social mobilizers was a hindrance in all locations in mobilizing line agency officials adequately towards the project. The project has to adopt suitable methodology to provide early orientation and consultation with district, divisional and local government officials in addition to the communities of selected villages on project approach though the project had discussion with the line agency officers and obtained approval from District and divisional Agrarian Development Committees. .

The changing mindset of the stakeholders and convincing them on the approach adopted by the project is indeed a great challenge in the dry zone context of past relief oriented and supply driven development interventions, as government officials, and civil organizations were by and large under influence of the service delivery development orientation adopted by almost all the organizations. However, it is important to make strong partnership linkage with line agency officers working at grass root levels and district level in order to ensure post project sustainable O&M and handing over of scheme to line agency after rehabilitation.

## **Box 2: Role of Social Mobilization**

Kurukkuragama is a remote, drier village located in Kahatagasdigiliya Divisional Secretary Division in Anuradhapura district. Dunumandalawa tank is a small tank in the village, which was in an abandoned condition prior to IFAD intervention. The tank is located in the middle of jungle without proper access road. The villagers have to walk through jungle about 1.5 km distance to reach the tank command area.

Although, the tank was identified through PRA and beneficiary consultation, the project has failed to reach required beneficiary participation for rehabilitation. The social mobilization process has not been sufficient to convince the people about the project and the anticipated outcomes. Therefore, beneficiary contribution was limited to few farmers. Three farmers who volunteered for the project had to work about 30 man days each and only 5 – 6 remaining farmers had mobilized their labour for 1–5 days. Lack of access road to the area is hindering cultivation of existing land and also asweddumization of new land. Currently 11 acres of land is used to cultivate during *maha* seasons. Farmers expressed that there is a large extent of government land in the area which need clearing of forest and asweddumization. The case indicates the requirement of systematic and location specific social mobilization.

Pahala Katugampolayaya tank is another success story of small tank rehabilitation, which is located in the jungle in the DS division of Nuwaragam Palatha central (NPC) in Anuradhapura District. The villagers are settled about 1.5 km away from the tank. The tank was newly constructed to harvest and store local water source (*ulpatha*) and rainfall. The available water was utilized by seven farmers to cultivate 28 acres of land before the intervention. The construction of tank has helped to expand the cultivation up to 55 acres of land by 29 farmers in *maha* seasons and possibility of *yala* cultivation in 15 acres. The current yield level is 150 bushels per acre. The storage of water in the tank has motivated farmers to develop a model upland farm in the upper reaches of the tank. About 10 ac land has been demarcated and electric fence was established to protect the farm from elephant damages. Two acres of land in the model farm is already developed and banana cultivation is currently undertaken. Aqua culture has been practiced in the tank and farmers are expecting a net income of Rs. 300,000 from the next fish harvest.

Considering the difficulties in accessing the tank and the cultivation area, the project has contributed to construct a gravel access road from the village to the tank with community participation. The construction of both the road and tank has motivated the farmers very much to initiate different livelihoods activities such as upland farming, and aquaculture. The village has also benefitted from Farmer Field School (FFS).

Both cases clearly indicate the possibility of receiving high output through convergence effect through multiple interventions in a location.

### 3.3 Role of Farmers in the Rehabilitation Process

Farmers have involved in all stages of rehabilitation starting from planning, designing, construction and finalization of project activities except in few locations (6% of the schemes) where political interferences dominated in selection of tank and awarding of rehabilitation contracts. Farmers have generally agreed with the rehabilitation process and method adopted in prioritizing rehabilitation needs and ratification. Local knowledge and wisdom has been widely incorporated by the project staff in designing and constructing the project activities. Farmers sketch the locations and form of proposed structures and design. For example, farmers' ideas have been obtained in placing and leveling the sluices and constructing spills. The farmers are also involved in deciding size of pipe outlets, number of pipe outlets and location of pipe outlets together with officers. Farmer representatives and the TOs then discuss the final design and construction requirements.

Farmers' commitment has been ensured at the beginning of the project by requesting them to mobilize their labour for jungle clearing and other initial preparatory works. On an average, 5-12 man days have been spent by each beneficiary for rehabilitation works for jungle clearing, cleaning of channels, arranging turf on tank bund, and providing non skilled works for construction works. In some schemes, the number of days worked by each farmer is over 20 days (Ex: Ambale Ihala Wewa in Kurunegala District). In most of the locations, one or two farmers have volunteered every day during the construction period to supervise the works performed by the contractor.

Labour contribution was made based on extent of land holdings of each farmer in some schemes, where farmers had to work for the project depending on the size of land holdings under the given scheme. However, in majority of the schemes farmers had mobilized their labour without considering the size of land ownership. Though free rider issues were reported in many places, it did not emerge as a serious problem in any of the locations as most of the farmers in small tank schemes are relatives and living peacefully respecting traditional value system.

There are cases where farmers' commitment has helped to perform more works than targeted. For instance, the original plan in Nindagam vihara ela anicut in Badulla District was to concrete lining of the irrigation channel for 207 m length, but farmers have successfully completed 225m length using the allocated budget. In some schemes of Badulla District, farmers have contributed in cash and kind for additional development works of the scheme which were not covered by the IFAD budget. Additional lengths of concrete lining have been conducted in Mulathella Ela, Karandamandiya Anicut, and Dangamuwa Pahala Anicut in Badulla District.

The rehabilitation contracts have been awarded to respective FOs of the rehabilitation scheme in 89% of the selected locations. It was reported in Karakolagasipitiya wewa in Moneragala district, where the particular FO has given the rehabilitation contract to a third party through sub contracting as the FO was not confident to under take the entrusted task. Box No. 3 illustrates another story of contracting rehabilitation works and some other related issues.

The research findings on the performance of construction contracts undertaken by the FOs indicate the importance of having at least one or two beneficiaries of the given scheme in the office bearers/committee of the contracting FO in order to ensure the quality and transparency of the works done.

### **3.4 Role of Project Staff in Rehabilitation**

The approach adopted by the project to implement the rehabilitation through the district and provincial level line departments during the first two years period has not succeeded and caused delays in implementation as the line agencies always have given priority to their own departmental works. Therefore, IFAD project has made a right decision to hire technical staff for timely implementation of the project components including irrigation rehabilitation. The project has hired district level engineers, technical officers and social mobilizers for project implementation.

Project staffs, especially Engineers and Technical Officers have played a committed role in all study areas without exception in fulfilling the rehabilitation needs, provision of timely and reliable services and achieving the target within the limited human and physical resources and time. In some locations, project staff has obtained additional financial allocations from the project to undertake the extra works. However, there is dissatisfaction on the level of services of social mobilizers in many locations.

#### **Box 3: Partnership of the Project Staff and Beneficiaries for Empowerment**

Endorugalyaya Anicut is a newly constructed scheme under the DzLipp in Buttala DS division in Moneragala district. The main source of water for the scheme is spill water which comes from Endorugala Yaya tank in the upper stream. As Endorugala Yaya tank is fed by a feeder canal, the tank has water up to spill level throughout the year. Majority of the farmers under the anicut, also have land under the Endorugala Yaya tank. However, FO of Endorugala Yaya tank opposed the construction of new anicut utilizing the spill water of their tank as it might create new water rights for the beneficiaries under the proposed scheme and possibility of future water conflicts. However, the project has succeeded in convincing the beneficiaries to implement the new project, but, FO of Endorugala Yaya tank was not willing to undertake the construction works. Therefore, construction agreement was signed between the project and another neighbouring FO belongs to Harambe Ara scheme.

The beneficiaries have provided active participation and contribution for the project upto 20% of the total cost as the project was expected to provide remarkable economic gain to the beneficiaries. The project has invested money to construct the new anicut, a sluice gate and lining of 150m long channel. The project has used semi Hume pipes to line the channel instead of applying concrete as a mean of cost reduction. After completion of the project, a non-participated farmer realized the actual benefits of the project and wanted to engage in cultivation under the anicut. The beneficiary farmers have requested him to pay Rs.9000/= to the FO to cover the foregone labour cost of rehabilitation to be eligible to receive water from the anicut. He has finally paid the given amount and currently does cultivation under the scheme. Good cooperation of beneficiaries with project staff and innovative ideas yield superior empowerment of people economically, technically and institutionally.

### 3.5 Strength of the Existing Institutional Arrangement

Building stronger and supportive institutional structure at the village level is important to adopt participatory approaches and ensure long term sustainable operation and maintenance of rehabilitated irrigation infrastructure. However, this task has not been fully reflected in some areas, since some of the grass root level officers question and unhappy about the lack of their awareness in tank selection and political interferences encountered (ex; Hingurangala tank in Moneragala District, Balagollagama and Galenbindunu wewa in Kurunegala District). This outcome was indicated in the gap that existed between project officials and grass root level officers in many locations in project implementation and follow up activities.

One of the novel aspects introduced by the project is formation of scheme level Water User Group (WUG), where there is no separate FO for a given rehabilitated scheme. The WUGs were expected to act as the focal point for the planning and management of the scheme level activities. The institutional arrangement was planned in the situation of no institution or dormant state of intuitional arrangement in the villages. However, it was found that, the process of formation of WUGs have not completed in majority of rehabilitated schemes and WUGs already formed are limited to name boards in many locations. The process of forming WUGs has started in 2010 though rehabilitation of schemes has taken place since 2008 indicating the big time gap between hardware and software development. Therefore, the poor performance of already established WUGs is mainly attributed to weaknesses in mobilization process and the time lag existed between rehabilitation and institution building.

It was found that, in majority of the areas, FOs existed were handling two to three small tanks/anicuts. There are instances that no member from given rehabilitated scheme is to represent the office bearers of the FO. This was the case for 36-38% of the schemes in Moneragala and Badulla districts. The strength of the FOs in majority of the areas were relatively weak and malfunctioning as per the indicators developed to measure the strength of FOs as discussed in below. Although all farmers were members of the FOs, farmer meetings were limited to one or two seasonal meetings per year and general FO meetings were not conducted in most of the locations. Farmer participation for the meetings and other common activities rarely exceeds over 50%, despite the requirement of effective participation and cooperation of all farmers for a volunteer organization. FOs have not adopted a system to collect a routine fee from farmers to cover the O&M cost except few FOs in Badulla district, but there rate of collection is very low. The collection from members is limited to membership fee ranging from Rs 12-120 per year. The levels of fee collection for FOs are detailed in Table 3.4 to 3.7. Majority of the FOs do not collect any fee from their members and they are highly dependent on external sources for their activities. Therefore, proper book keeping and financial transparency is not well established. All the FOs studied submits their financial report at the Annual General Meetings or do not submit a financial report at all. Most of the farmers are not aware of the FO financial status. FO leaders are selected by consensus of all the farmers in all the places at the general meetings. However, the activeness of FO representatives highly

varies from scheme to scheme as the additional works shouldered by them are for the common interest without any incentives. The role played by the FO leaders in conflict resolution and coordinating with farmers and officers are highly appreciated by farmers.

The analysis clearly illustrates that, the strength of farmer institutions operating at ground level is very weak and mostly not functioning or at a dormant stage. Therefore, there should be a strong component to strengthen the community institutions by providing guidance, skills and knowledge required for effective functioning.

**Table 3.4: Collection of Various Fees for FOs- Anuradhapura District**

| Name of the Scheme        | Availability of Jalapalaka | Collection of Membership fee (Rs/Yr) | Collection of Maintenance fee | Collection of Salaries                                   |
|---------------------------|----------------------------|--------------------------------------|-------------------------------|----------------------------------------------------------|
| Millagala wewa            | Available                  | No                                   | No                            | No                                                       |
| Aluth wewa                | Available                  | 60                                   | No                            | ½ bu of paddy/season decided, but not firmly implemented |
| Siyambalagaswewa          | Available                  | 120                                  | No                            | No                                                       |
| Kirimetiya                | Available                  | 100                                  | No                            | No                                                       |
| Nikawewewa Kuda wewa      | Available                  | 60                                   | No                            | No                                                       |
| Galkadawala               | Available                  | No                                   | No                            | No                                                       |
| Pahala Katugampolaya gama | Available                  | No                                   | No                            | ½ bu of paddy/season                                     |
| Dunumandalawa             | Available                  | 60                                   | No                            | No                                                       |
| Wevel ketiya Amuna        | Available                  | 120                                  | No                            | ½ bu of paddy/year                                       |

**Table 3.5: Collection of Various Fees for FOs- Kurunegala District**

| Name of the Scheme    | Availability of Jalapalaka | Collection of Membership fee (Rs/Yr) | Collection of Maintenance fee (Rs) | Collection of Salaries |
|-----------------------|----------------------------|--------------------------------------|------------------------------------|------------------------|
| Dambu Gaha            | Available                  | No                                   | No                                 | No                     |
| Ambale Ihala Wewa     | Available                  | No                                   | No                                 | No                     |
| Balogolla wewa        | Available                  | No                                   | No                                 | ½ bu of paddy/year     |
| Dammulla wewa         | Available                  | No                                   | No                                 | No                     |
| Bogaha Wewa           |                            | 60                                   | No                                 | No                     |
| Galenbindunu wewa     | No                         | 100                                  | 150/ac/season                      | No                     |
| Ottukulama Ihala Wewa | Available                  | No                                   | No                                 | No                     |

**Table 3.6: Collection of Various Fees for FOs- Badulla District**

| Name of the Scheme    | Availability of <i>Jalapalaka</i> | Collection of Membership fee (Rs/yr) | Collection of Maintenance fee (Rs) | Collection of <i>Salaaries</i> (Rs/ac) |
|-----------------------|-----------------------------------|--------------------------------------|------------------------------------|----------------------------------------|
| Dangamuwa pahala Ela  | Available                         | 60                                   | 100/ac/season                      | No                                     |
| Mahakumbura Ela       | Available                         | 60                                   | No                                 | No                                     |
| Diganatenna           | Available                         |                                      | 50/ac/farmer/yr                    | 100/year                               |
| Mulathella ela        | No                                | 24                                   | 100/ farmer/yr                     | Decided annually                       |
| Karadamandiya Ela     | Available                         | 24                                   | 100/ac/season                      | No                                     |
| Bedde arawa Anicut    | No                                | 60                                   | 60/ac/season                       | No                                     |
| Bathgoda Maha Ela     | No                                | 60                                   | 100/ac/season                      | No                                     |
| Gavarmmana            | Available                         | 60                                   | 100/ac/season                      | No                                     |
| Bowalapitiya Anicut   | Available                         | 60                                   | No                                 | No                                     |
| Nindagam vihara Ela   | No                                | 120                                  | No                                 | No                                     |
| Hiddakumbura Yaya Ela | No                                | 120                                  | No                                 | No                                     |

**Table 3.7: Collection of Various Fees for FOs- Moneragala District**

| Name of the Scheme      | Availability of <i>Jalapalaka</i> | Collection of Membership fee (Rs/yr) | Collection of Maintenance fee (Rs) | Collection of <i>Salaaries</i> (Rs/ac) |
|-------------------------|-----------------------------------|--------------------------------------|------------------------------------|----------------------------------------|
| Karakolagas pitiya wewa | Available                         | 60                                   | No                                 | ½ bu/person                            |
| Bolhindagala Anicut     | Available                         | 120                                  | No                                 | No                                     |
| Aswedduma wewa          | Available                         | 15                                   | No                                 | ½ bu/ac/season                         |
| Dandenawela Anicut      | Available                         | 120                                  | No                                 | No                                     |
| Hinguregala wewa        | Available                         | 60                                   | No                                 | No                                     |
| Karambeara wewa         | Available                         | 180                                  | No                                 | No                                     |
| Nabadona ara Anicut     | Available                         | 60                                   | No                                 | No                                     |
| Edarugala yaya Anicut   | Available                         | 60                                   | No                                 | No                                     |

## CHAPTER FOUR

### Relevance and Quality of Rehabilitation Works Undertaken

#### 4.1 Types of Rehabilitation Works Conducted

The major rehabilitation works conducted by the project in small tanks and anicuts includes one or more of the following items depending on necessity.

- I Construction/improvement of earth dams of small tanks
- li Construction of concrete dams of anicuts
- lii Concrete lining of irrigation channels
- lv Repair or construction of sluices
- V Repair or new installment of sluice gates
- Vi Repair/construction of spill
- Vii Construction of drop structures
- Viii construction/digging of channels
- lx construction of access roads

Construction/improvement of earth dams, Repair or construction of sluices and gates and repair/construction of spill are the general rehabilitation activities conducted in most of the small tanks. The most common activity conducted in Anicut schemes is concrete lining of irrigation channels.

#### 4.2 Relevance of the Rehabilitation Works Implemented

The schemes selected for the rehabilitation are from remote villages and not rehabilitated during last 10 years. Most of the tanks selected were never touched by the government/NGO interventions and considered by farmers as the big boost for their livelihood.

The rehabilitation works undertaken in all the selected schemes are highly relevant and prioritized by the beneficiaries. Farmers' involvement in finalization of design and prioritizing requirements were reported in all locations. This is essential to enhance the sense of ownership and consequent responsibility of O&M of the structures after rehabilitation works are finalized. Rehabilitation and the improvements of the works are by and large conducted with the consent and according to requirement of farmers. Height of the bund and spill, location of the sluices and spill and size of the sluice gates are decided jointly with farmers and officers. However, there are some design problems reported in some locations where officers had to balance the financial availability and the farmer preferences (Box 4).

One of the vital components which was not paid serious attention by the project is integration of channel protection with the inclusion of demarcation of channel and tank bund reservations and planting of trees except in Pahala Katugampolayagama

tank in Anuradhapura district. It is relatively easier to convince farmers and commit them to demarcate land for channel reservation at the initial stage of rehabilitation. Zijlstra (1989) identified, soil erosion, landslide, flood and irregular maintenance as main causes of channel damage in upcountry areas. As siltation is one of the off site effects of soil erosion, up stream farmers are usually not keen on soil conservation and catchment management. Therefore awareness on on-site and off-site effects of soil erosion to farmers, strengthening of FOs at scheme level and integration of FOs at micro catchment level are important.

### **4.3 Quality of the Completed Works**

Quality of works accomplished by the project is highly praised by farmers in all areas except in very few incidences. One such case is discussed in Box 4. The quality of the works is also observed by the research team and they are of good standard. According to the farmers, use of machinery to improve the tank bund has been done for the first time in many locations. This was not practiced in similar types of rehabilitation in the neighbouring villages. Therefore, the strength of tank bunds renovated is very good. The quality of tank bunds was also indicated by non damaging of bunds by heavy rains. Flood situation in 2010 did not damage renovated bunds though number tanks were breached in the neighbouring areas. Soil tests were conducted prior to use of soil for the bund. Based on the test report, soil was taken either from tank bed or from other suitable areas, though the later incurred additional transport cost.

Construction defaults are neither visible nor reported in most areas, except in few locations where construction contracts were mostly given to third party other than local FO. For instance, the newly constructed tank bund in Higurugala tank in Moneragala district is not in a good shape as soil used for the bund is not properly compacted to an accepted level. Similarly, newly improved tank bund has eroded after heavy rain due to poor quality of construction in Karakolagaspitiya wewa in Moneragala district. However, FO has later invested its own money and labour to repair the bund. A crack was seen in the newly constructed sluice of Karambe Ara wewa in Siyambalanduwa DS division of Moneragala District. It was reported that, TO has stopped the payment of retention money until the repair of the crack is completed by the contractor. A crack is seen in the newly constructed concrete dam of Wevelketiya Amuna in Anuradhapura District. Drawback in designing of channel layout is causing water scarcities during dry periods in Bowalapitiya anicut in Badulla district. The problem emerged was, said to be due to blunder during the initial land survey. Improper sitting of sluice was observed in Liyanagama Dammulla tank in Kurunegala district as similar to case reported in Box 4.

The works carried out and the quality standard of the works are very much valued in terms of amount of investment made compared to similar types of rehabilitation works conducted in the past in other areas, as perceived by farmers.

#### **Box 4: Importance of Micro Catchment Hydrology**

Rehabilitation of Millagala wewa at Koan wewa Agrarian Development Centre area has brought tremendous benefits to the beneficiary community. Earlier abandoned tank was cultivated by only two farmers and the total extent cultivated 1.5 ac. The yield level before the project was 2590kg/ha. The rehabilitation of tank has helped to increase the extent of cultivation and productivity up to 25 ac and 5185 kg/ha respectively benefiting around 15 farmers.

However, there are few problems reported and observed in the field. Water seepage through some parts of the bund is visible, probably due to construction of bund during wet season as reported by farmers. One of the sluices constructed by the project is placed slightly at a higher elevation than required, obstructing water delivery during latter part of seasons for about six acre land. According to the farmers, sluice level determined in the initial survey was not suited to irrigate entire command area after leveling of new lands and asweddumization. Though farmers had requested to install a smaller gate, the proposal has not been accepted by the TO based on the existing irrigation circular specification of minimum size of slice to be not less than nine inches.

The most threatening aspect of the sustainability of the scheme is development of another upstream tank by another agency without constructing appropriate size of spill. This has caused large volume of spill water flowing towards Millagala tank beyond its capacity. Farmers are afraid of possibility of breaching of bund during heavy rains. The case describes the essence of beneficiary participation and local knowledge in rural development projects and importance of considering hydrological features of Micro catchment area.

#### **4.4 Present System of Operation and Maintenance**

Small tanks are traditionally farmer managed schemes and therefore all the O&M activities are the responsibility of farmers/FOs. The availability of line agency officers for management of small tank systems is less; especially the availability of support services is very poor for these kinds of remote schemes. *Jalapalaka* are mostly traditional in small tank/*anicut* systems and work on voluntary basis. They are hardly paid a honourarium for their services. For instance, in Moneragala district, only one sample scheme has the system of paying *salaries*, while it is not practiced at all in any of the sample schemes in Moneragala district. Contribution to *salaaries* collection is practiced in three sample schemes both in Anuradhapura (33%) and Kurunegala (42%) districts, but there is no regularity in collection in almost all the places.

A system to collect a separate fee to cover O&M cost of the scheme is not implemented in the sample small tank systems and majority of *anicut* systems including the schemes which have adopted new water management package. However, about 36% of schemes (*Anicuts*) in Badulla District have a system to collect O&M fee of Rs. 100 per acre per season from all cultivating farmers (*Gawarmmana Anicut*, *Jayaweera Anicut*, *Bathgoda Maha ela*, and *Mullatha ella Anicut*), but the rate of collection is very small.

Maintenance of tank bund and irrigation channels are conducted by farmers on *shramadhana* basis or divided among farmers based on extent of land under the scheme owned by each farmer for routine maintenance. This is mostly done prior to commencement of cultivation (Annex Figure 4.1). However, it was observed in the field that, clearing of tank bunds were not conducted in most places as witnessed by thick shrubs in the bunds (Annex Figure 4.2). The application of paint and grease for gates and structures is not common in majority of the schemes except in very few schemes where *Jalapalaka* or farmer representative voluntarily spend his money for greasing/oiling of gates whenever he feels necessary. No schemes made arrangement to apply anti corrosive paints for gates.

The study found that, the existing institutional arrangements and the routine activities scheduled for the management of small tank systems in the selected areas are generally not properly institutionalized. This issue needs to be adequately considered from the initial step of the rehabilitation in order to ensure the sustainable O&M.

#### **4.5 Performance of the Water Management Package Implemented by the IFAD**

The introduction of a water management package is one of the innovative aspects of IFAD's irrigation rehabilitation project. As the programme was initiated in late 2010, the progress of implementation fully or partially at the time of evaluation was about 29% of the total schemes rehabilitated by 2010. Therefore, it is too early to conduct a comprehensive evaluation of the programme to draw lessons. An attempt was made to document the preliminary experiences and lessons of the programme. The schemes selected for the study and their performance in adopting various components of the water management package are described in table 4.1.

The project has introduced all the components of the water management package in the selected schemes, but level of implementation varies. WUG have been formed formally, but they are dormant in 66% of the intervention areas as per table 4.1. Separate care takers for the given schemes were appointed in all the locations. In 66% of the selected schemes, caretakers do not function well, but salaries are not paid in any of the locations except in Pahala Katugampolayagama scheme in Anuradhapura District. Beneficiaries of some schemes are of the view that (example Galkadawala wewa in Anuradhapura District), separate WUG and caretaker are not necessary as the beneficiaries are members of the main FO and *Jalapalaka* of the main FO is adequate to manage the scheme. Some of the schemes highly depend on upstream tank for their water and they find it difficulty to determine their water management issues. One such case is described in Box No. 5.

**Table 4.1: Performance in Adoption of Water Management Package in the Selected Schemes**

| District     | Name of the scheme       | Formation of WUG              | Appointment of separate Caretaker | Payment of Salaries |
|--------------|--------------------------|-------------------------------|-----------------------------------|---------------------|
| Kurunegala   | Liyanagama Dammulla Wewa | Yes                           | Yes                               | No                  |
| Anuradhapura | Pahala Katugampolayagama | Yes                           | Yes                               | Yes                 |
|              | Galakadawala wewa        | Yes, not functioning          | Yes                               | No                  |
|              | Kirimetiya               | Yes, Not active               | Yes                               | No                  |
| Badulla      | Jayaweera anicut         | Yes, only leader is appointed | Yes, not functioning well         | No                  |
|              | Gawarammana Anicut       | Yes, not functioning          | Yes, but water management is weak | No                  |
|              | Mahakumburu ela          | yes                           | Yes, not started to function      | No                  |
|              | Karadamandiya anicut     | yes                           | Yes, not started to function      | No                  |
| Moneragala   | Aswedduma Tank           | Yes, not functioning          | Yes, not started to function      | No                  |
|              | Bolhindagala tank        | Yes, not functioning          | Yes, not started to function      | No                  |
|              | Dandinawella Anicut      | Yes, not functioning          | Yes, not started to function      | No                  |
|              | Endurugal Anicut         | Yes, not functioning          | Yes, not started to function      | No                  |

A separate O&M fund has been established in many locations using the retention money of the awarded contract to FO. In Kurunegala District, beneficiaries were mobilized to pay Rs. 1000 to FO fund prior to commencement of rehabilitation. The money has been deposited in a bank account. However, there is no growth in O&M fund as none of the organizations in the rehabilitated scheme has adopted a system to collect a fee for O&M fund.

The project has organized water management training for the WUG members to enhance their capacities in O&M and organizational management. The participants are satisfied with the content and method of training given. In some locations, no

member has attended the training (Ex: Galkadawala scheme in Anuradhapura district) and in some other locations, farmers and women who were available at the time of training have attended instead of regular WUG members.

The longer time gap between tangible outputs (hardware development) and social mobilization for sustainable O&M (software development) has been seen as a major hindrance to activities of introduced water management package. It has been a difficult task to mobilize the beneficiaries for a common cause who have benefitted from the project 2-3 years before. However, the water management package currently implemented in the new schemes of 2011 and 2012 integrating software and hardware components would provide better results.

#### **Box 5: Sharing Water Between Schemes and Effectiveness of Water Management Package**

Endurugal Yaya Anicut is a newly constructed scheme receiving spilled water. A carving was artificially made in the dimension of six inches depth and two feet long in the top portion of spill wall of the upstream tank to enable to release spill water during most part of the year. Therefore, water availability in the new scheme is highly dependent on release of water from the up stream tank. IFAD has introduced the water management package by establishing separate WUG, appointment of caretaker to look after the scheme and management of water and conducting water management training to the new *anicut* scheme. Although, the scheme has a separate caretaker appointed by the project, he does not have authority to control the gates. The gate operation is fully handled by 'Jalapalaka' of upstream tank, considering the sharing of water with new scheme. The scheme has no separate O&M fund and payment of *salaries* is not yet started.

The majority of the beneficiaries own 4 ½ acre extent of land under Pelwatta Sugar Plantation, including Chairman of WUG, which provide good source of income. Therefore, WUG chairman is not much interested on water management activities of the *anicut* scheme. Rest of the members of WUG do not have a clear understanding of their roles and responsibilities. Although water management training was conducted, participants were not able to express the major subjects discussed in the training programme, indicating their low level of commitment. The relevant beneficiaries have not participated in the training programme due to their involvement in sugar cane cultivation and high level of labour demand in the area.

## CHAPTER FIVE

### Effects and Impacts of Irrigation Rehabilitation on rural livelihoods

#### 5.1 Impacts on Agricultural Production and Farm Income

The main impacts of the rehabilitation of small tanks are increase of extent of cultivation, land productivity and total crop production. Paddy is the only crop in all the selected schemes in *maha* seasons, but OFC cultivation is in progress in selected schemes of Moneragala and Badulla during *yala* seasons. About 63% of the schemes in Moneragala District perform OFC cultivation in part of the command area in *yala* seasons. In Badulla District, OFC cultivation is practiced in 90% of the schemes in full or part of the command area during *yala* seasons (Table 5.1). The cultivated crop has been changed from vegetable to maize cultivation after rehabilitation in Bathgoda Maha ela and Beddearawa Anicut in Badulla district considering the higher income from maize cultivation. Annex Table 5.1 to 5.4 indicates the changes taken place in extent of cultivation both by season and annual extent cultivated. Mid season cultivation is taking place in three schemes in Badulla District, but extent has increased by 25-60% after rehabilitation. It was not possible to undertake *yala* cultivation before rehabilitation in any of the selected schemes of Anuradhapura and Kurunegala Districts. But rehabilitation has helped to perform *yala* cultivation in part of the command area in one of the selected schemes in Anuradhapura District. About 71% of the selected schemes were able to cultivate full or part of the command area during *yala* season in Kurunegala district. In Moneragala District, only 12.5% of the sample schemes (one sample scheme) did any *yala* cultivation prior to rehabilitation, but it has increased to 100% of the schemes after rehabilitation. There is a 57% increase in *yala* extent cultivation among the sample schemes in Badulla District due to rehabilitation compared to pre project situation.

Due to the rehabilitation of small scale irrigation schemes the annual extent of cultivation of the selected tanks/anicut has increased by 78% in 2010/11 compared to pre project situation. The same is over 500% in 2011 *yala* season. The changes in cropping intensity due to rehabilitation are illustrated in figure 5.1 - 5.4

The increased availability of water due to rehabilitation has helped the beneficiaries to expand the cultivation and reduce the crop losses due to water scarcities. Table 5.2 to 5.5 describes the pattern of the changes taken place in water availability for crop cultivation and consequent changes in cropping pattern in the selected schemes. All the schemes were able to cultivate full command area of *paddy* cultivation in *maha* seasons due to rehabilitation.

**Table 5.1: Cultivation of Other Field Crops in Rehabilitated Schemes**

| District   | Name of the Scheme    | Main OFC Cultivated |
|------------|-----------------------|---------------------|
| Badulla    | Bowalapitiya Anicut   | Cowpea              |
|            | Gawarammana Anicut    | Maize               |
|            | Karadamandiya Ela     | Maize               |
|            | Hiddakumburu Yaya Ela | Maize               |
|            | Nindagam Vihara Ela   | Maize               |
|            | Bathgoda Maha Ela     | Maize               |
|            | Dangamuwa Pahala Ela  | Maize               |
|            | Bedde Arawa Anicut    | Maize               |
|            | Mulathella Ela        | Maize               |
|            | Jayaweera Anicut      | Maize               |
|            | Dandenawela Anicut    | Cowpea              |
|            | Bolhidagala wewa      | Maize               |
| Moneragala | Hinguregala wewa      | Sweet Melon         |
|            | Karambe ara wewa      | Maize               |
|            | Aswedduma wewa        | Maize               |

**Figure 5.1: Changes in Cropping Intensity- Anuradhapura District**

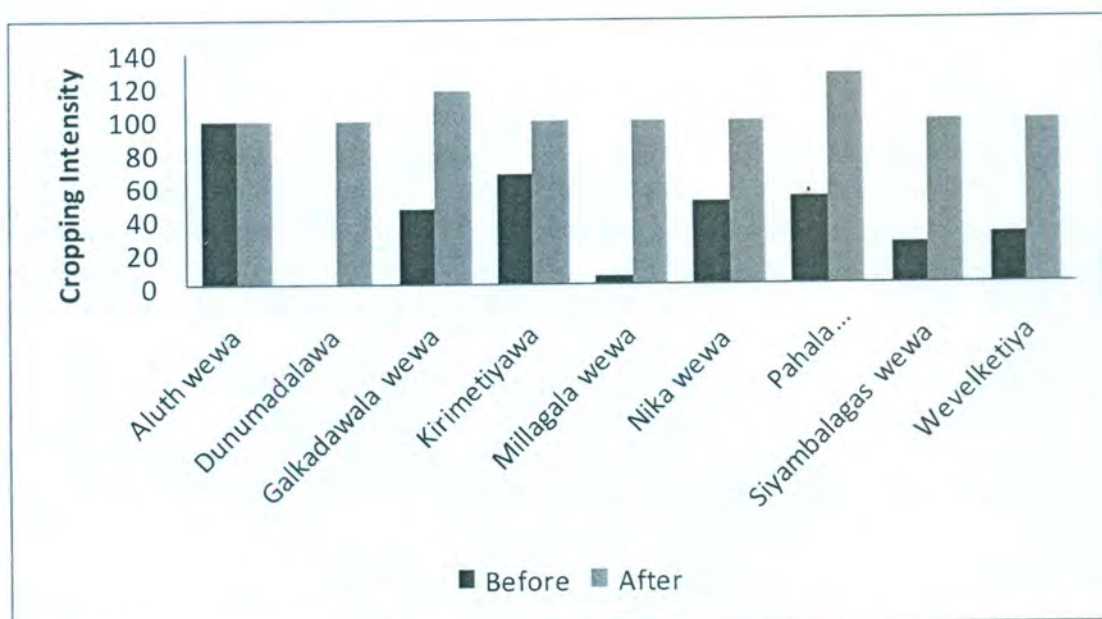


Figure 5.2: Changes in Cropping Intensity- Kurunegala District

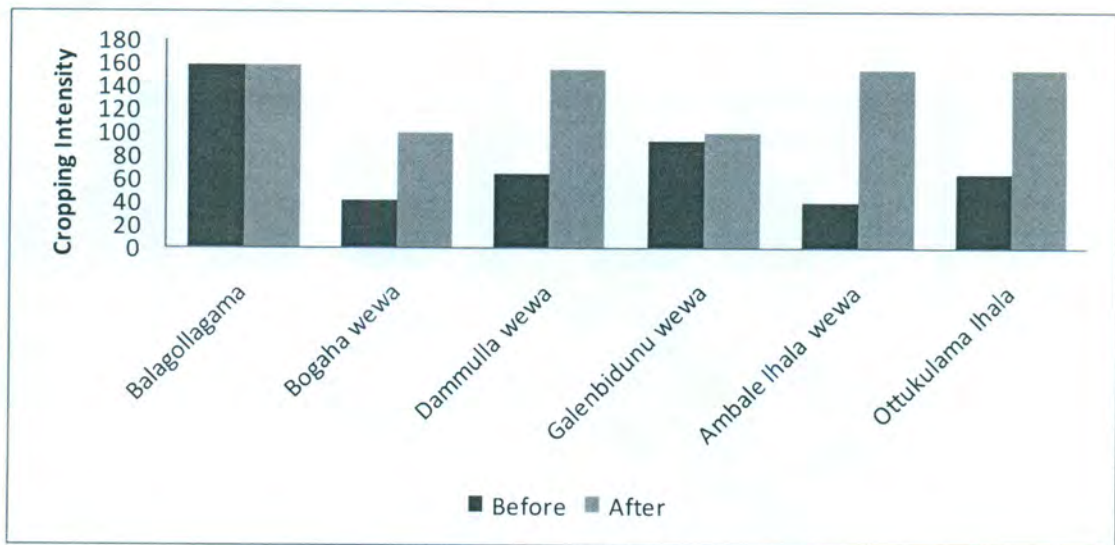


Figure 5.3: Changes in Cropping Intensity- Badulla District

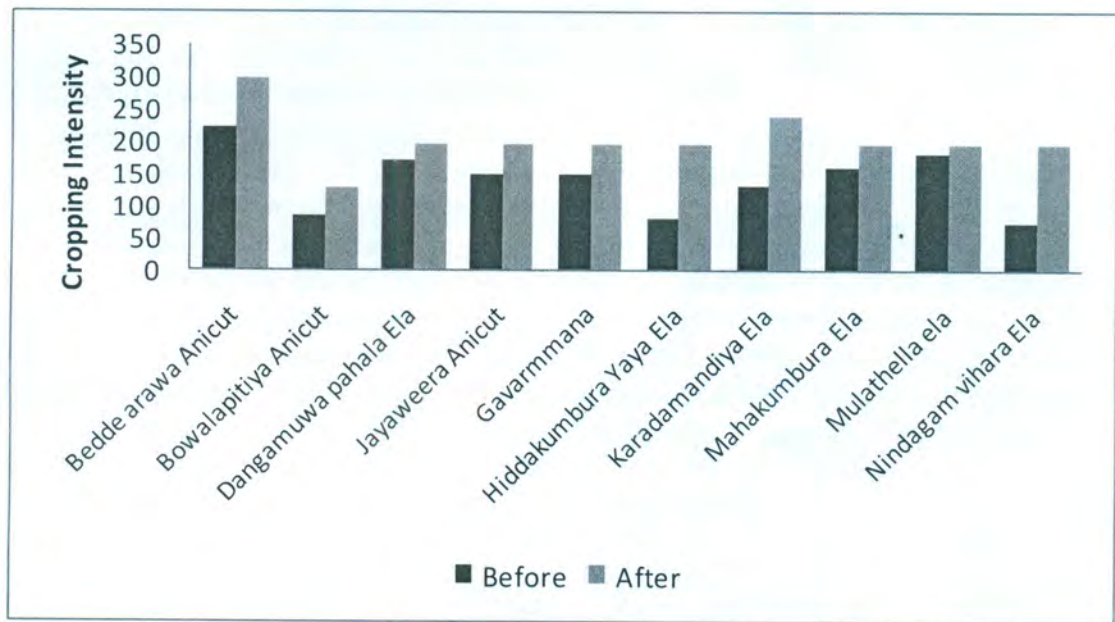
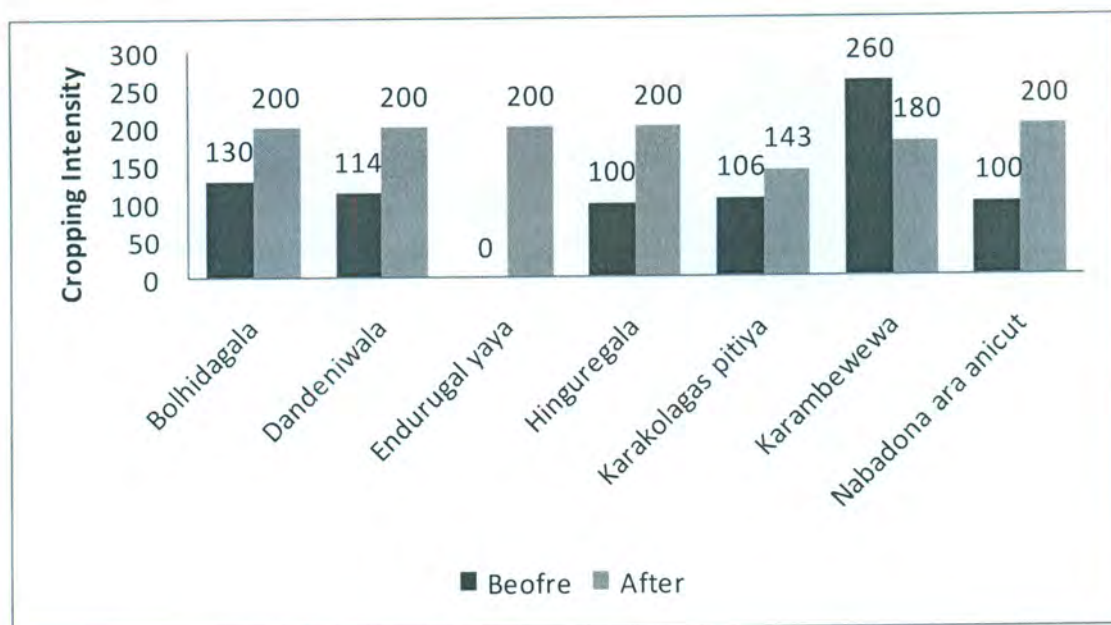


**Figure 5.4: Changes in Cropping Intensity- Moneragala District**



The changes in extent of cultivation by seasons and annum in the project districts based on sample schemes is illustrated in figure 5.5. According to the figure, the extent of cultivation has increased both in *maha* and *yala* in all the districts due to rehabilitation. Figure 5.6 to 5.9 indicates the percentage increase in annual extent of cultivation compared to pre project situation. The annual increase of extent cultivated in Anuradhapura District varies from 0 - 300% excluding the schemes which were abandoned earlier (Millagala wewa and Dunumadalawa), while this is 0-560% in Kurunegala District among the sample schemes. The increase is over 100% for 70 % of the already functioning schemes which were rehabilitated in both Kurunegala and Anuradhapura districts, but this is true for 50% of the schemes in Moneragala district. Overall total annual extent cultivated in the selected schemes has increased from 617 ac in pre project situation to 929 ac in year 2010/11, which is around 50% increase in annual cultivated extent.

**Table 5.2: Water Availability for Cultivation in Anuradhapura District**

| <b>Name of Scheme</b>    | <b>Water Availability before</b>                      | <b>Water availability after</b>                                                              | <b>Changes in water availability</b> |
|--------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------|
| Aluth wewa               | Sufficient for partial extent of paddy in <i>maha</i> | Sufficient for full extent paddy in <i>maha</i>                                              | increased                            |
| Kirimetiya               | Sufficient for partial extent of paddy in <i>maha</i> | Sufficient for full extent paddy in <i>maha</i>                                              | Increased                            |
| Millagala wewa*          | Sufficient for partial extent of paddy in <i>maha</i> | Sufficient for full extent paddy in <i>maha</i>                                              | Increased                            |
| Nukawewa kuda wewa       | Sufficient for partial extent of paddy in <i>maha</i> | Sufficient for full extent paddy in <i>maha</i>                                              | Increased                            |
| Siyambala wewa           | Sufficient for partial extent of paddy in <i>maha</i> | Sufficient for full extent paddy in <i>maha</i>                                              | increased                            |
| Wevelketiya Anicut*      | Sufficient for partial extent of paddy in <i>maha</i> | Sufficient for full extent paddy in <i>maha</i>                                              | increased                            |
| Dunumadalawa*            | No cultivation (New scheme)                           | Sufficient for full extent paddy in <i>maha</i>                                              | Highly Increased                     |
| Galkadawala              | Sufficient for partial extent of paddy in <i>maha</i> | Sufficient for full extent paddy in <i>maha</i> & OFC in part of <i>yala</i>                 | Highly Increased                     |
| Pahala Katugampola yaya* | Sufficient for partial extent paddy in <i>maha</i>    | Sufficient for full extent paddy in <i>maha</i> & part of <i>yala</i> and upland cultivation | Highly Increased                     |

**Table 5.3: Water Availability for Cultivation in Kurunegala District**

| <b>Name of Scheme</b>   | <b>Water Availability before</b>                            | <b>Water availability after</b>                          | <b>Changes in water availability</b> |
|-------------------------|-------------------------------------------------------------|----------------------------------------------------------|--------------------------------------|
| Balogollagama wewa      | Paddy in partial extent <i>maha</i> and Part of <i>yala</i> | Paddy in full extent <i>maha</i> and Part of <i>yala</i> | Slightly increased                   |
| Galenbindunuwewa        | Paddy in partial extent of <i>maha</i>                      | Full extent Paddy in <i>maha</i>                         | Increased                            |
| Dambugaha wewa          | Paddy in partial extent of <i>maha</i>                      | Full extent Paddy in <i>maha</i> and part of <i>yala</i> | Highly increased                     |
| Ambale Ihala wewa       | Paddy in Partial extent of <i>maha</i>                      | Full extent Paddy in <i>maha</i> and Part of <i>yala</i> | Highly increased                     |
| Ottukulam Ihala wewa    | Paddy in Partial extent of <i>maha</i>                      | Full extent Paddy in <i>maha</i> and Part of <i>yala</i> | Highly increased                     |
| Liyanagama Dammullawewa | Paddy in Partial extent of <i>maha</i>                      | Full extent Paddy in <i>maha</i> and Part of <i>yala</i> | Highly increased                     |
| Bogahawewa              | Paddy in Partial extent of <i>maha</i>                      | Full extent Paddy in <i>maha</i>                         | Highly increased                     |

**Table 5.4: Water Availability for Cultivation in Badulla District**

| <b>Name of Scheme</b> | <b>Water Availability before</b>                                      | <b>Water availability after</b>                                              | <b>Changes in water availability</b> |
|-----------------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------|
| Dangamuwa pahala Ela  | Sufficient for full extent paddy in both season                       | Sufficient for full extent paddy in both season                              | Slightly increased                   |
| Mahakumbura Ela       | Sufficient for full extent paddy in both season                       | Sufficient for full extent paddy in both season                              | Slightly increased                   |
| Diganatenna           | Sufficient for full extent paddy in <i>maha</i> & OFC in <i>yala</i>  | Sufficient for full extent paddy in <i>maha</i> & OFC in <i>yala</i>         | Slightly increased                   |
| Mulathella ela        | Sufficient for full extent paddy in <i>maha</i> & OFC in <i>yala</i>  | Sufficient for full extent paddy in <i>maha</i> & OFC in <i>yala</i>         | Slightly increased                   |
| Karadamandiya Ela     | Sufficient for paddy in <i>maha</i> & OFC in Yala                     | Sufficient for full extent paddy in <i>maha</i> & OFC in Yala                | Slightly increased                   |
| Bedde arawa Anicut    | Sufficient for full extent paddy in part of both seasons              | Sufficient for full extent paddy in <i>maha</i> & OFC in <i>yala</i>         | Slightly increased                   |
| Bathgoda Maha Ela     | Sufficient for full extent paddy in <i>maha</i> & part of <i>yala</i> | Sufficient for full extent paddy in both seasons                             | Increased                            |
| Gavarmmana            | Sufficient for paddy in <i>maha</i> & part of <i>yala</i>             | Sufficient for full extent paddy in both season                              | Increased                            |
| Bowalapitiya Anicut   | Sufficient for paddy in part of <i>maha</i>                           | Sufficient for full extent paddy in <i>maha</i> & OFC in part of <i>yala</i> | Increased                            |
| Nindagam vihara Ela   | Sufficient for partial extent of paddy in <i>maha</i>                 | Sufficient for full extent paddy in <i>maha</i> & OFC in part of <i>yala</i> | Increased                            |
| Hiddakumbura Yaya Ela | Sufficient for full extent paddy in <i>maha</i>                       | Sufficient for full extent paddy in both season                              | Highly Increased                     |

Table 5.5: Water Availability for Cultivation in Moneragala District

| Name of Scheme          | Water Availability before                                             | Water availability after                                                        | Changes in water availability |
|-------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------|
| Karakolagas pitiya wewa | Sufficient for full extent paddy in <i>maha</i> & part of <i>yala</i> | Sufficient for full extent paddy in <i>maha</i> & partial extent in <i>yala</i> | Slightly increased            |
| Bolhindagala Anicut     | Sufficient for full extent paddy in <i>maha</i> & OFC in <i>yala</i>  | Sufficient for full extent paddy in both season                                 | Increased                     |
| Aswedduma wewa          | Sufficient for full extent paddy in <i>maha</i>                       | Sufficient for full extent paddy in <i>maha</i> & OFC in part of <i>yala</i>    | Increased                     |
| Dandenawela Anicut      | Sufficient for full extent paddy in <i>maha</i>                       | Sufficient for full extent paddy in <i>maha</i> & OFC in part of <i>yala</i>    | Increased                     |
| Hinguregala wewa        | Sufficient for full extent paddy in <i>maha</i>                       | Sufficient for full extent paddy in <i>maha</i> & OFC in part of <i>yala</i>    | Increased                     |
| Karambeara wewa         | Sufficient for partial extent of paddy in <i>maha</i>                 | Sufficient for full extent paddy in <i>maha</i> & part of <i>yala</i>           | Increased                     |
| Nabadona ara Anicut     | Sufficient for partial extent of paddy in <i>maha</i>                 | Sufficient for partial extent of paddy in both seasons                          | Increased                     |
| Edarugala yaya Anicut   | No cultivation (New scheme)                                           | Sufficient for full extent paddy in both seasons                                | Highly increased              |

Figure 5.5: Changes in Extent of Cultivation by District

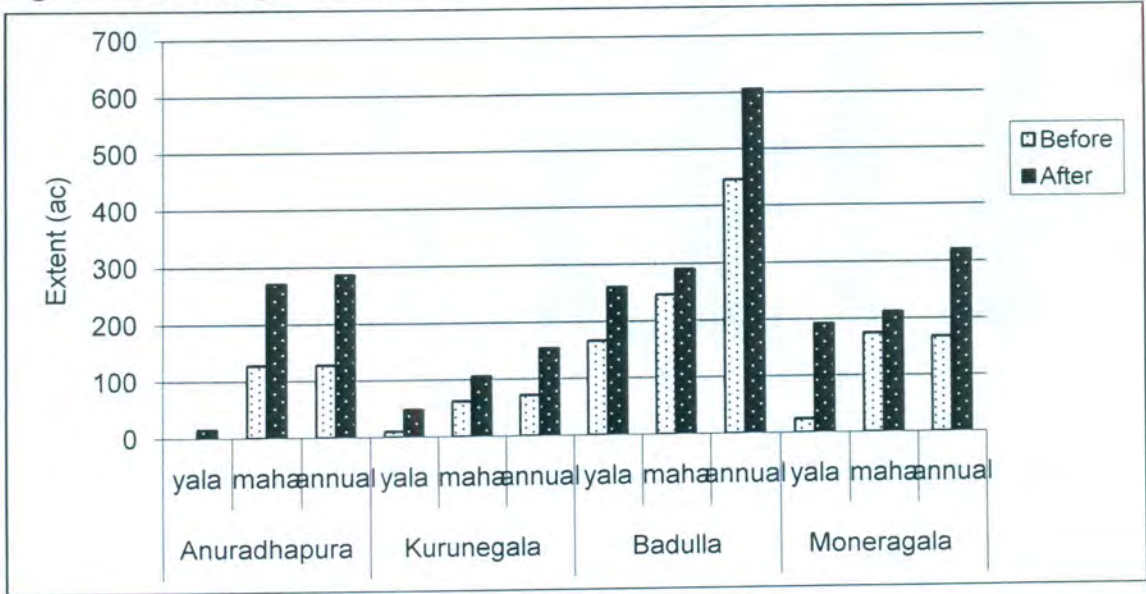


**Figure 5.6: Percentage Increase in Annual Extent of Cultivation, 2011/12 – Anuradhapura District**

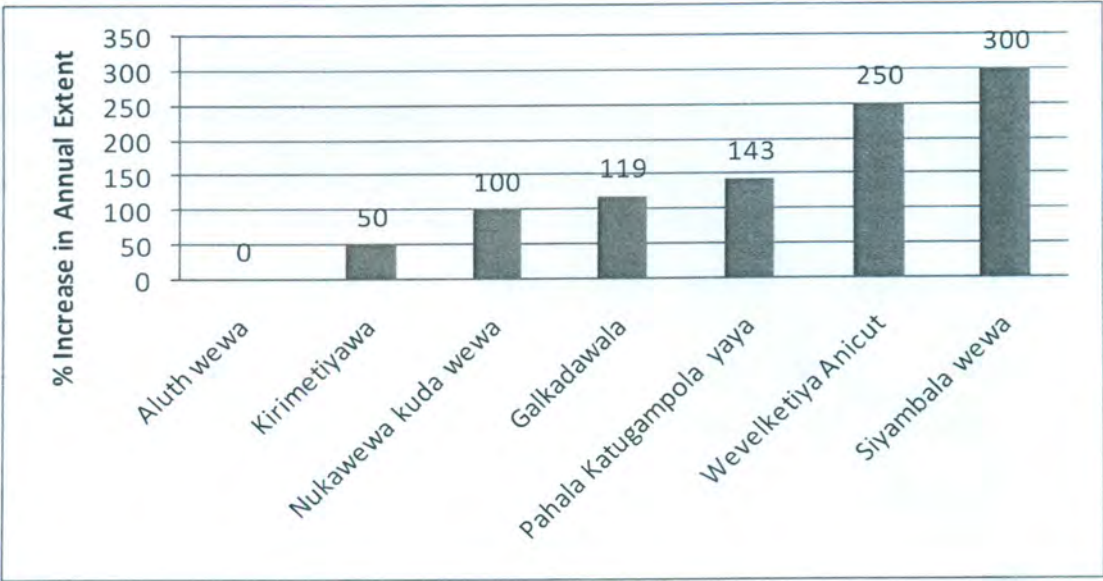


**Figure 5.7: Percentage Increase in Annual Extent of Cultivation, 2011/12 – Kurunegala District**

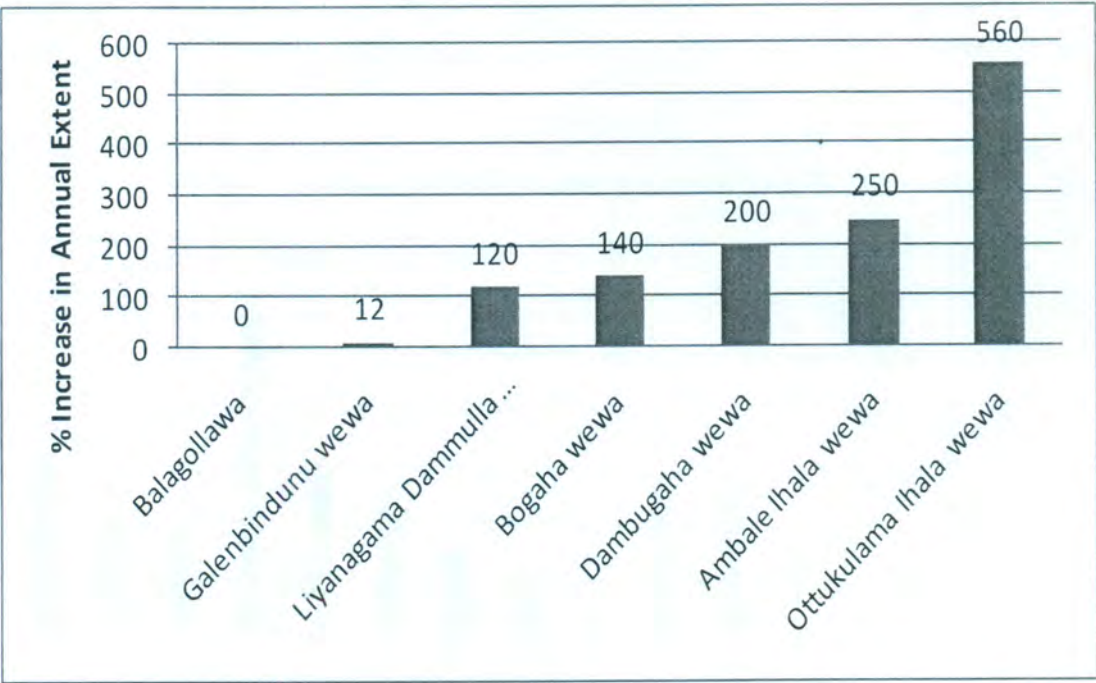


**Figure 5.8: Percentage Increase in Annual Extent of Cultivation, 2011/12 – Badulla District**

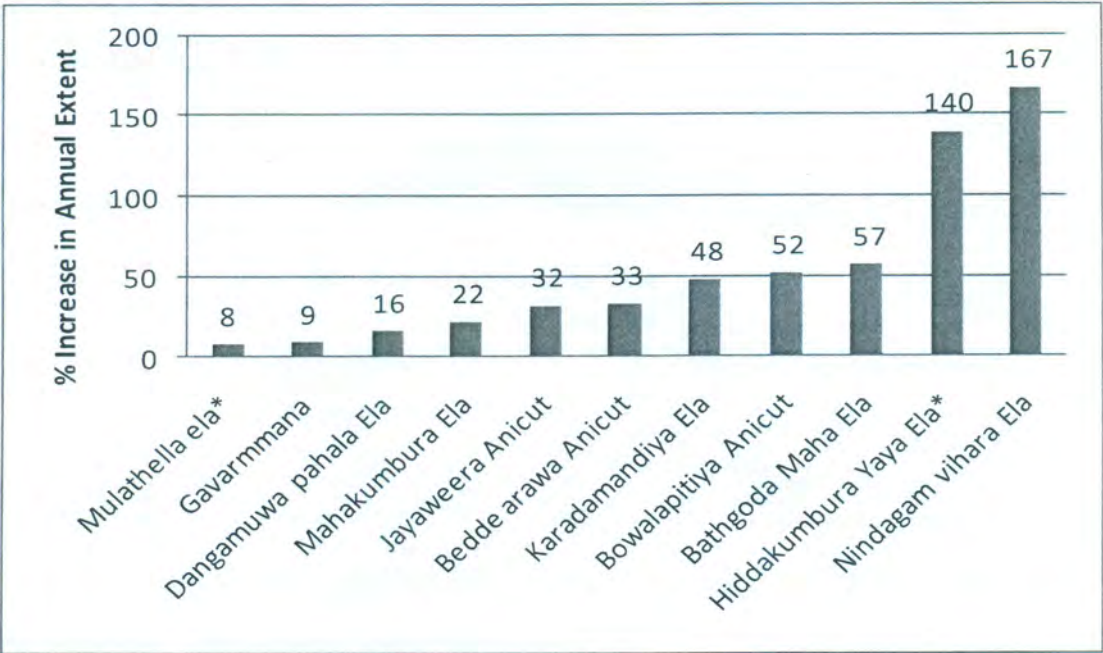
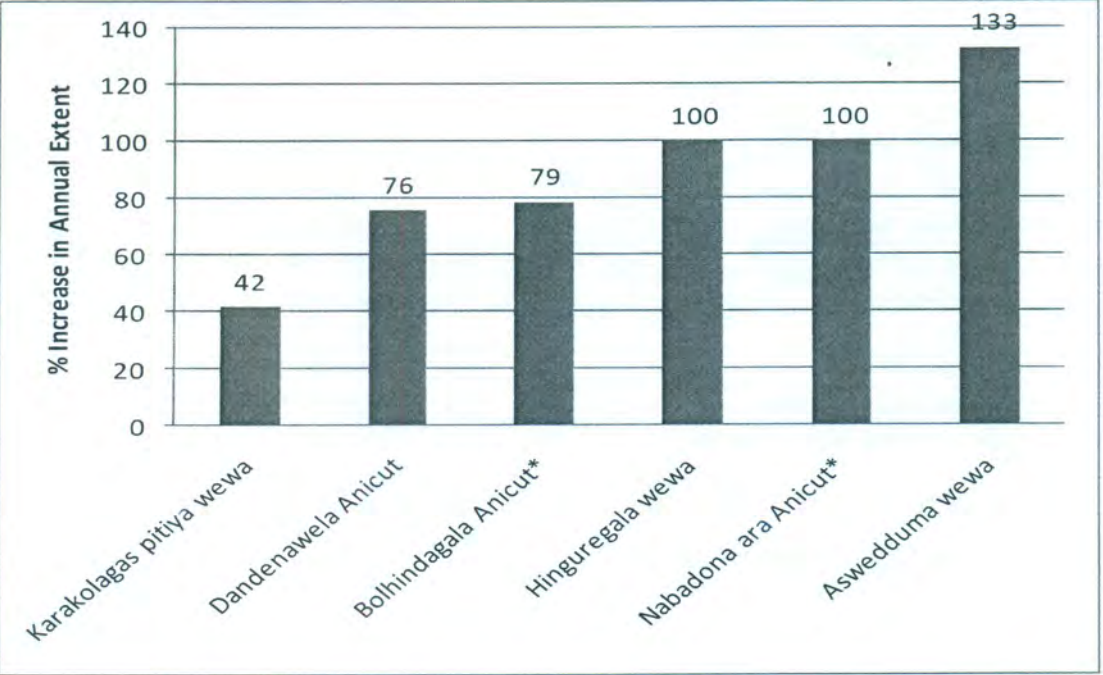


**Figure 5.9: Percentage Increase in Annual Extent of Cultivation, 2011/12 – Moneragala District**



The rehabilitation of tanks and anicuts has increased the number of cultivating farmers while expanding the extent of cultivation in majority of the schemes (Table 5.6). This has caused the reduction in land size available per beneficiary in some schemes. For example, In Pahalakatugampolayagama scheme in Anuradhapura District *maha* cultivated extent has increased from 28ac to 53 ac, but number of farmers has increased from seven to 29. Therefore, average cultivated extent per beneficiary has been reduced from 4ac to 1.8ac.

**Table 5.6: Change in Number of Beneficiary Farmers by Scheme**

| Scheme                       | No. of farmers |            | Scheme                     | No. of farmers |            |
|------------------------------|----------------|------------|----------------------------|----------------|------------|
|                              | Before         | After      |                            | Before         | After      |
| <b>Anuradhapura District</b> |                |            | <b>Badulla District</b>    |                |            |
| Millagala wewa               | 0              | 15         | Bowalapitiya Anicut        | 8              | 15         |
| Aluth wewa                   | 15             | 15         | Gawarammana Anicut         | 63             | 63         |
| Siyambalagaswewa             | 5              | 20         | Karadamandiya Ela          | 21             | 21         |
| Kirimetiya wewa              | 16             | 25         | Hiddakumburu Yaya Ela      | 6              | 12         |
| Nikawewewa Kuda wewa         | 22             | 40         | Nindagam Vihara Ela        | 24             | 30         |
| Galkadawala wewa             | 27             | 30         | Bathgoda Maha Ela          | 24             | 24         |
| Pahala Katugampolayagama     | 7              | 29         | Dangamuwa Pahala Ela       | 85             | 85         |
| Dunumadalawa wewa            | 0              | 11         | Bedde Arawa Anicut         | 28             | 28         |
| Wevel ketiya Amuna           | 7              | 11         | Mulathella Ela             | 65             | 65         |
|                              |                |            | Jayaweera Anicut           | 20             | 20         |
|                              |                |            | Mahakumbura Ela            | 52             | 52         |
| <b>Sub Total</b>             | <b>99</b>      | <b>196</b> | <b>Sub Total</b>           | <b>396</b>     | <b>415</b> |
| <b>Kurunegala District</b>   |                |            | <b>Moneragala District</b> |                |            |
| Dambu Gaha Wewa              | 16             | 16         | Dandenawela Anicut         | 15             | 20         |
| Ambale Ihala Wewa            | 5              | 12         | Bolhidagala wewa           | 28             | 28         |
| Balagolla wewa               | 23             | 23         | Nabadanara Anicut          | 18             | 18         |
| Liyanagama Dammulla wewa     | 15             | 23         | Karakolagas pitiya wewa    | 25             | 25         |
| Bogaha Wewa                  | 5              | 12         | Endurugal yaya ela         | 0              | 21         |
| Galenbindunu wewa            | 8              | 16         | Hinguregala wewa           | 21             | 21         |
| Ottukulama Ihala Wewa        | 5              | 12         | Karambe ara wewa           | 2              | 7          |
|                              |                |            | Asweddduma wewa            | 14             | 19         |
| <b>Sub Total</b>             | <b>77</b>      | <b>114</b> | <b>Sub Total</b>           | <b>123</b>     | <b>159</b> |

Source: Authors' Survey Data, 2012

**Figure 5.10: Changes in Number of Farmers by District**



The increased availability of water for cultivation not only has helped to increase the extent of cultivation, but also enhanced yield. The reported yield increase has been achieved by reduced crop losses and increased use of cash inputs for cultivation in the context of reduced risk of crop failures with assured water supply. Figure 5.11 - 5.14 indicates the changes achieved in yield levels per acre of cultivated extent in *maha* seasons among the selected schemes excluding the new/abandoned schemes developed. All the selected schemes have shown an improvement in yield levels obtained other than few schemes in Badulla district and one scheme in Moneragala district.

The programme has resulted in an increase in total paddy produced under the selected irrigation schemes from 8,92,400 kg during *maha* season (pre project average total production) to 17,25,410 kg in 2010/11 *maha* season (93% increase). The total paddy production in *yala* season has increased from 54,139kg in pre project average total production to 3,77,269 kg in *yala* 2011 which is 590% increase.

**Table No. 5.7: Changes in Paddy Yield- Before Vs After (Yala Season)**

| District     | Scheme                   | Maha Yied              |                       | Yala yield             |                       |
|--------------|--------------------------|------------------------|-----------------------|------------------------|-----------------------|
|              |                          | Before project (Kg/ac) | After project (Kg/ac) | Before project (Kg/ac) | After project (Kg/ac) |
| Anuradhapura | Aluth wewa               | 1050                   | 2100                  | 0                      | 0                     |
|              | Dunumandalwa wewa        | 0                      | 2100                  | 0                      | 0                     |
|              | Galkadawala wewa         | 630                    | 840                   | 0                      | 0                     |
|              | Kirimetiya wewa          | 1470                   | 2100                  | 0                      | 0                     |
|              | Millagala wewa           | 788                    | 2100                  | 0                      | 0                     |
|              | Nikawewewa Kuda wewa     | 1250                   | 1750                  | 0                      | 0                     |
|              | Pahal Katugampolya gama  | 3150                   | 3150                  | 0                      | 2640                  |
|              | Siyambalagaswewa         | 1890                   | 2520                  | 0                      | 0                     |
|              | Wevel ketiya Amuna       | 840                    | 1755                  | 0                      | 0                     |
| Kurunegala   | Bakmee wewa              | 1430                   | 1430                  | 0                      | 1720                  |
|              | Balagolla wewa           | 1240                   | 1750                  | 1240                   | 1750                  |
|              | Liyanagama Dammulla wewa | 1760                   | 2640                  | 0                      | 2640                  |
|              | Ambale Ihala Wewa        | 1540                   | 2200                  | 0                      | 2200                  |
|              | Ottukulama Ihala Wewa    | 1340                   | 1565                  | 0                      | 1565                  |
| Badulla      | Bathgoda Maha Ela        | 731                    | 1505                  | 731                    | 1505                  |
|              | Bedde arawa              | 2150                   | 2150                  | 0                      | 0                     |
|              | Bowalapitiya Anicut      | 645                    | 1720                  | 0                      | 0                     |
|              | Dangamuwa pahala         |                        |                       |                        | 0                     |
|              | Jayaweera Anicut         | 645                    | 1935                  | 0                      | 0                     |
|              | Gawarammana anicut       | 1462                   | 1720                  | 0                      | 0                     |
|              | Hiddakumbura yaya        | 1290                   | 1290                  | 0                      | 0                     |
|              | Karadamandiya ela        | 1720                   | 2580                  | 0                      | 2580                  |
|              | Mahakumbura Ela          | 1720                   | 1720                  | 0                      | 1720                  |
|              | Mulathella Ela           | 1720                   | 1720                  | 0                      | 0                     |
|              | Nindagam vihara          | 1548                   | 1892                  | 0                      | 1720                  |
| Moneragala   | Aswedduma wewa           | 968                    | 1719                  | 0                      | 1500                  |
|              | Bolhindagala Anicut      | 1505                   | 2365                  | 0                      | 1398                  |
|              | Dandenawela Anicut       | 860                    | 1505                  | 0                      | 1290                  |
|              | Endarugal yaya           | 0                      | 1750                  | 0                      | 1000                  |
|              | Hinguregala wewa         | 1290                   | 1398                  | 0                      | 0                     |
|              | Karambe wewa             | 400                    | 400                   | 0                      | 0                     |
|              | Karakolagas pitiya wewa  | 1950                   | 2160                  | 2100                   | 3600                  |
|              | Nabadanara Anicut        | 1200                   | 2100                  | 0                      | 1650                  |

**Figure 5.12: Percentage Increase in Paddy Yield during Maha 2011/12 - Kurunegala District**

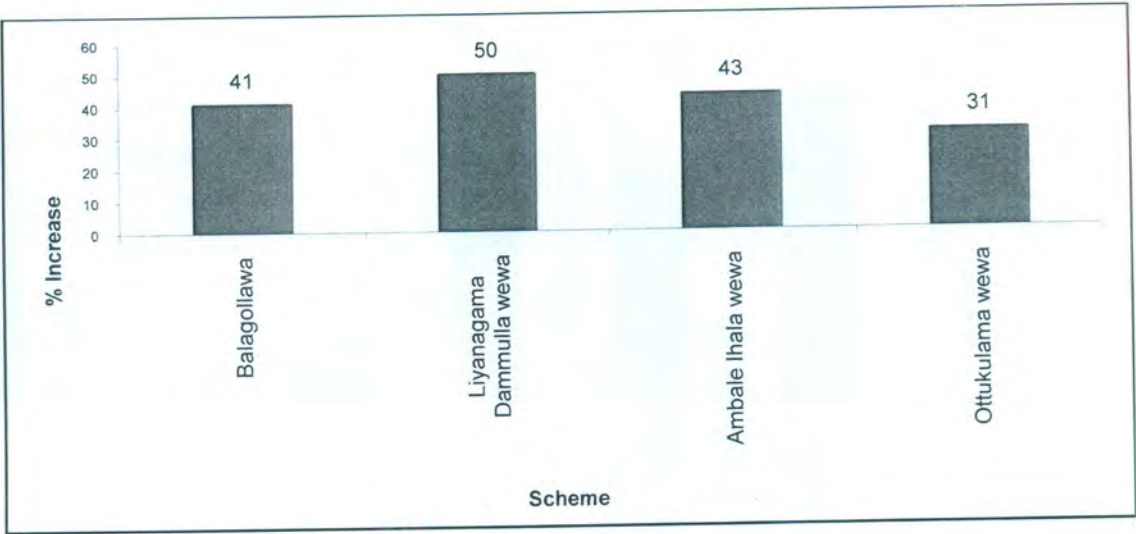


**Figure 5.13: Percentage Increase in Paddy Yield during Maha 2011/12 - Badulla District**

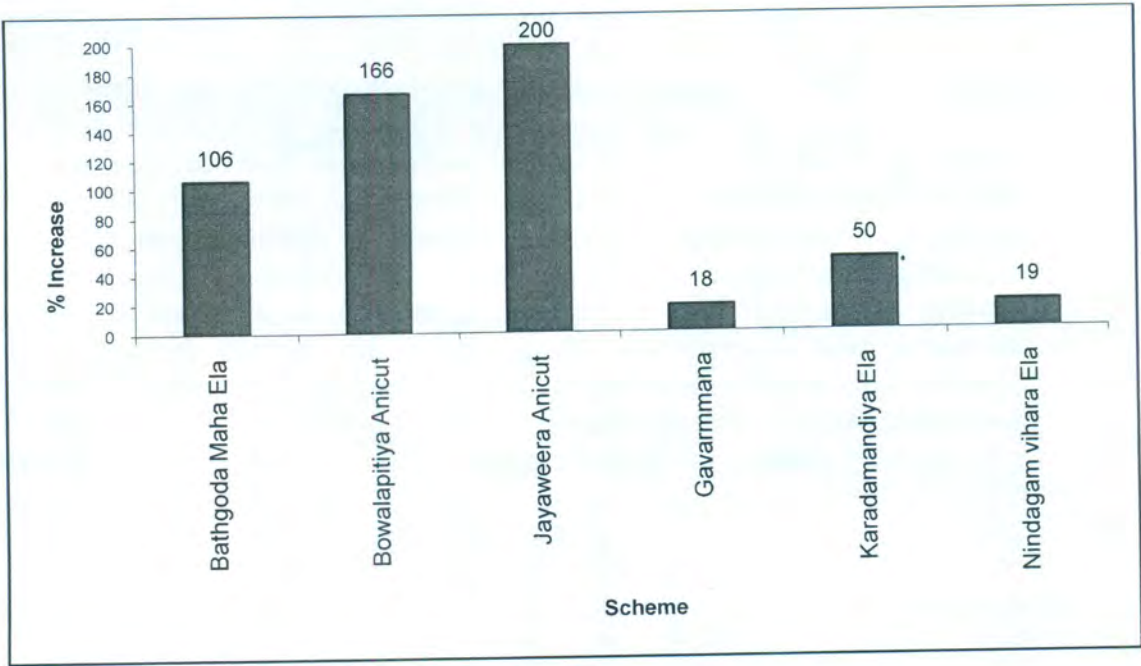
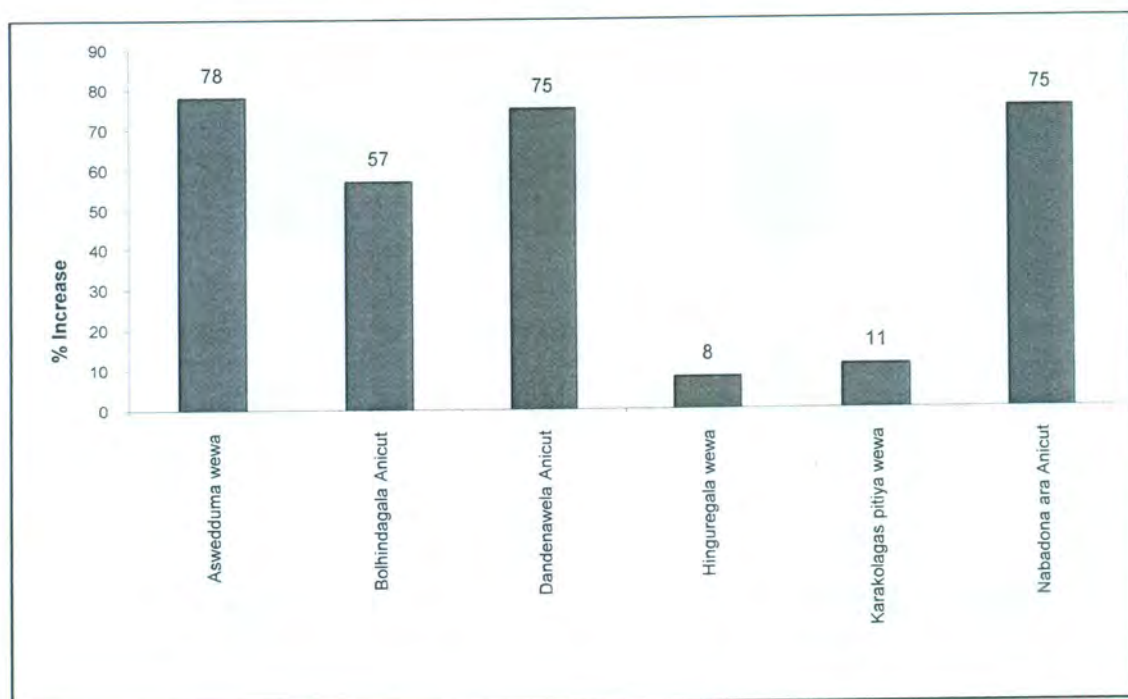


**Figure 5.14: Percentage Increase in Paddy Yield during Maha 2011/12 - Moneragala District**



Increase in extent of cultivation and/or enhanced yield provides higher return to the farmers. Figures 5.15 – 5.22 illustrate the changes in farmer profits before and after rehabilitation without impute cost. The analysis was made to show the return per acre of land cultivated and return per farmer. The reason for the low return per farmer in Pahala Katugampolayagama compared of pre-project situation is decrease of average land extent available per farmer form 4.2 ac to 1.9 ac. The increased number of farmers from seven (before project) to 29 (after the project), but increasing land extend form 28 ac to 53 ac. Similar situation is shown in Galenbindunu wewa in Kurunegala District. Reduced per farmer income shown in Jayaweera anicut in Badulla District is due to shift form OFC cultivation to paddy cultivation by majority of the farmers after rehabilitation with increased availability of water.

**Figure 5.15: Annual Average Return from Paddy Cultivation Per Farmer (Excluding Imputed Cost) - Anuradhapura District**

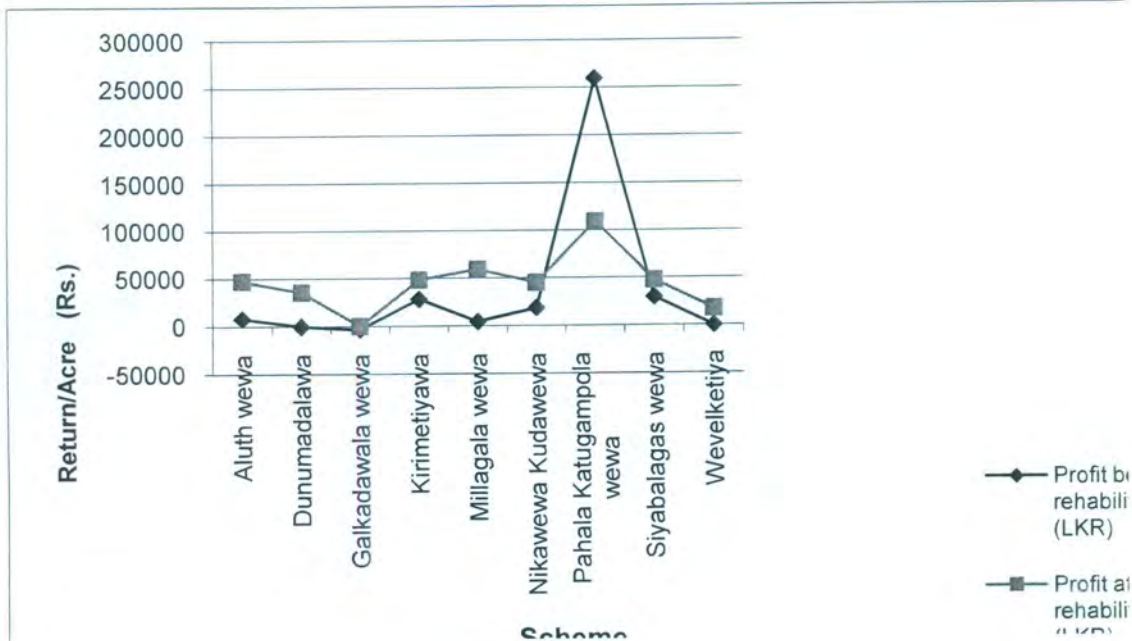


**Figure 5.16: Annual Average Return from Paddy Cultivation Per Farmer (Excluding Imputed Cost) - Kurunegala District**

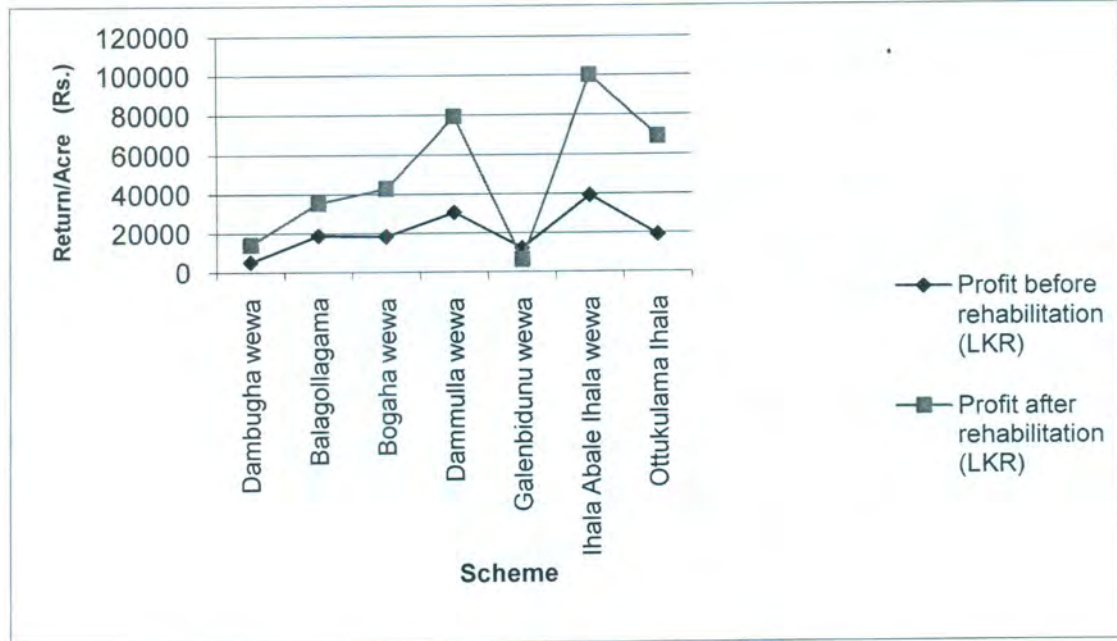


**Figure 5.17: Annual Average Return from Paddy Cultivation Per Farmer (Excluding Imputed Cost) – Badulla District**

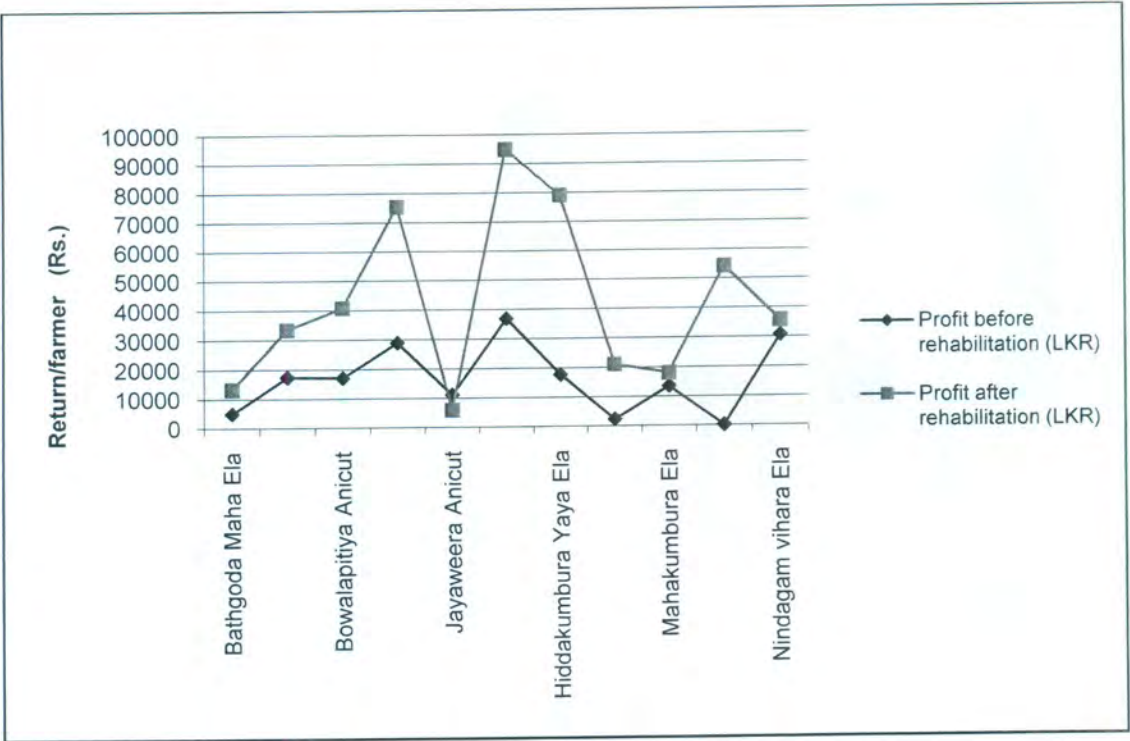


**Figure 5.18: Annual Average Return from Paddy Cultivation Per Farmer (Excluding Imputed Cost) – Moneragala District**

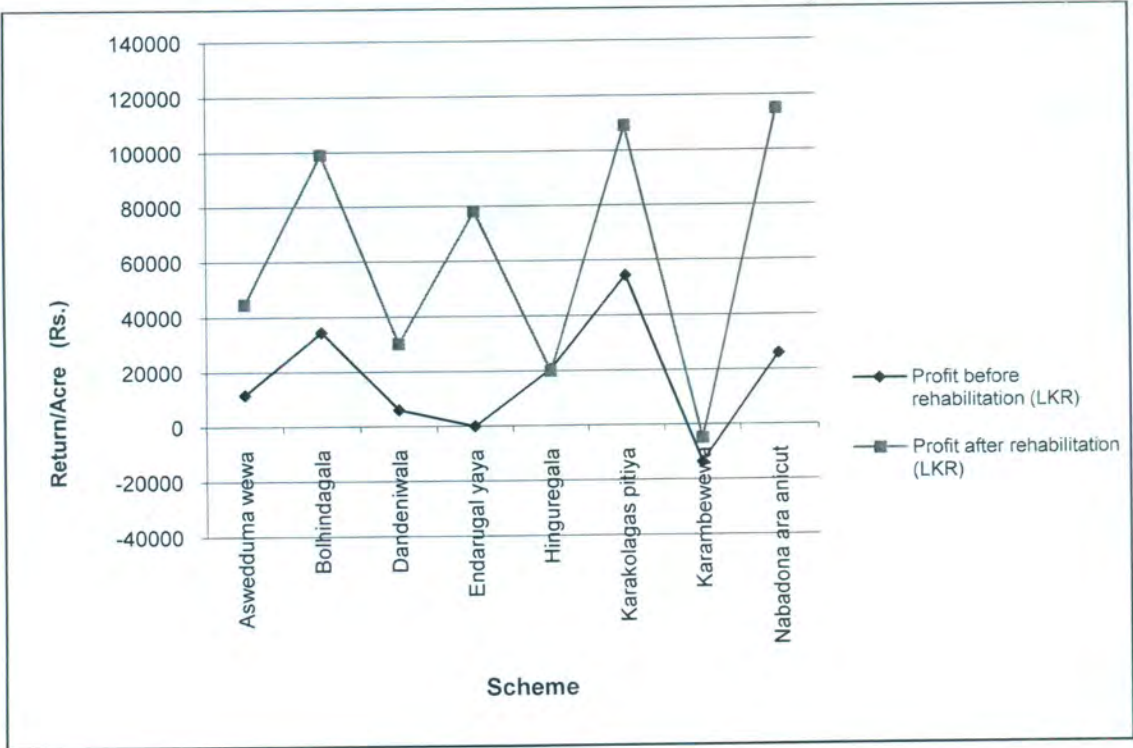


**Figure 5.19: Annual Average Return from Paddy Cultivation Per Acre (Excluding Imputed Cost) - Anuradhapura District**

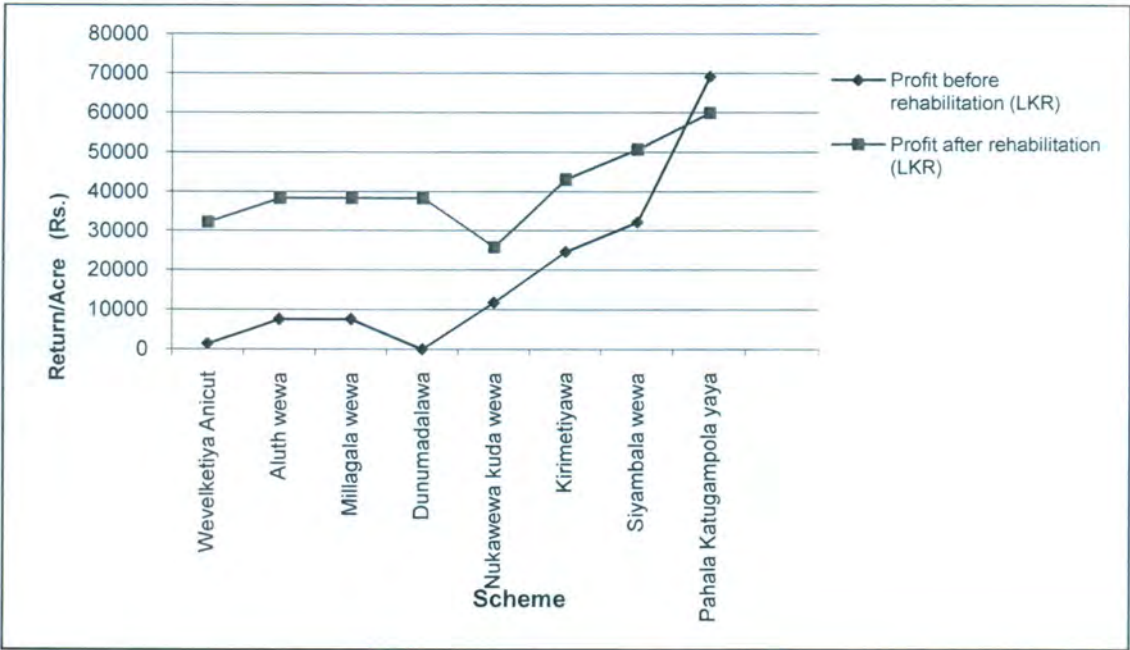


**Figure 5.20: Annual Average Return from Paddy Cultivation Per Acre (Excluding Imputed Cost) - Kurunegala District**

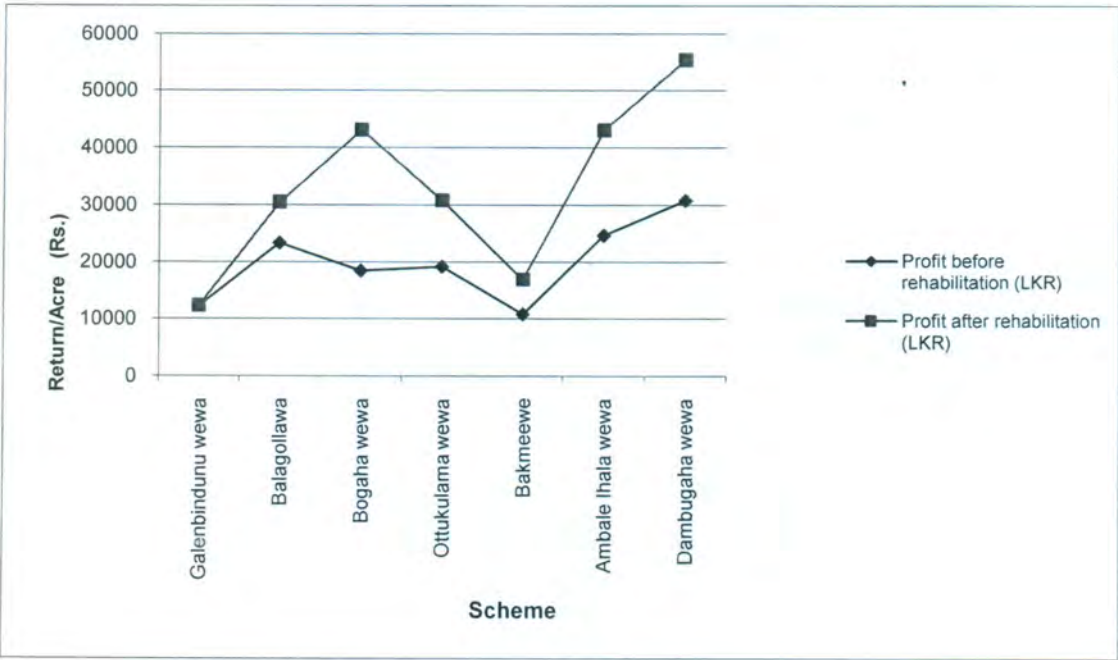


**Figure 5.21: Annual Average Return from Paddy Cultivation Per Acre (Excluding Imputed Cost) - Badulla District**

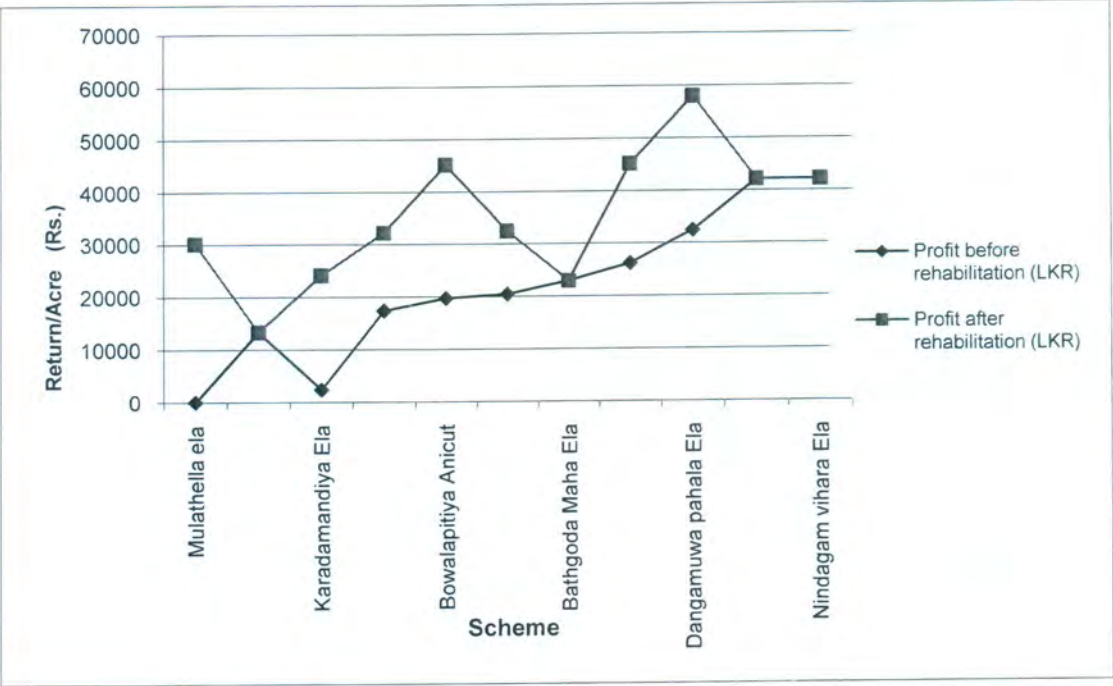
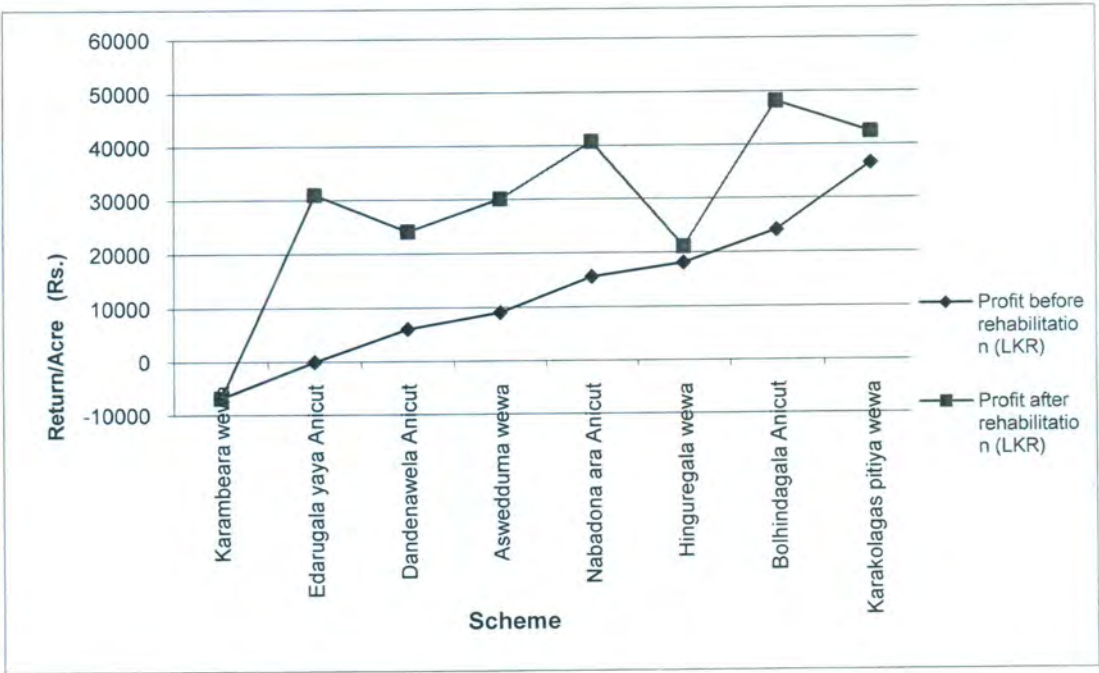


**Figure 5.22: Annual Average Return from Paddy Cultivation Per Acre (Excluding Imputed Cost) - Moneragala District**



## **5.2 Impacts on Village Water Resources**

The rehabilitation of small irrigation tanks has brought significant impacts to the village water resources by increasing capacity of the tank and storage of water during most parts of the year. The impacts are highly visible and reported in the places where irrigation schemes closer to the settlement areas. The ground water level has risen considerably as indicated by availability of water in agro wells and domestic wells in most periods of the year. The yield level of upland and lowland perennial crops such as coconut, mango, orange and lime and various other crops has increased and provided a more greenish and cooler environment. The increase of water levels in domestic wells has increased household domestic water security and reduced the hardship of water fetching during dry months.

Most of the small irrigation schemes are used for bathing and washing cloths by the villagers. It was reported that, the number of people using the rehabilitated schemes for bathing has increased. The project has constructed bathing spots in several rehabilitated schemes to facilitate convenient bathing especially for women and children and also for washing cloths. There are schemes which are not used for domestic uses or bathing by the people

## **5.3 Impacts on Other Livelihood Activities**

The rehabilitation of tanks has tremendously reduced the hardships incurred in the past in managing irrigation water due to poor infrastructure during water scarcities. The people had to use sand bags to control water flow through the damaged structures spending their valuable labour. The improvements made in sluices, gates, bunds and other structures have helped the beneficiaries to utilize their labour for other livelihood activities.

A number of tanks have been used to systematic aquaculture which provide significant income to the both beneficiaries and the beneficiary organizations. For example, the income earned from fish harvest in 2011 in Pahala katugampolayagama was Rs. 72,000 and they expect a net income of Rs 350,000 in 2012. Similarly, in Ottukulama lhala wewa, the fish harvest in 2012 was 450kg. The FO has sold the fish to villagers at the reduced price of Rs. 150/kg.

There are number of people had started brick manufacturing during off seasons using tank water. The income earned from upland cultivation by pumping of tank water and increased water availability in agro wells has increased.

## **5.4 Other Social Impacts**

Increased availability of water at household level has enhanced the welfare of the people especially women and children. The reduced time spent for water fetching mostly by women and children has made their tasks easy and has also helped to

utilize their saved time for income earning opportunities like homegardening. This further helps them to devote more time on welfare of children.

## CHAPTER SIX

### Economic Analysis of Small-scale Irrigation Investment

#### 6.1 Estimation of Project Costs and Benefits

##### Cost Component:

1. Capital cost of scheme rehabilitation borne by the project
2. Project management/overhead cost of rehabilitation
3. Value of community contribution for rehabilitation
4. Cost of incremental crop production including family labour
5. Cost of fertilizer subsidy for incremental extent of cultivation
6. Cost of scheme operation and maintenance

##### Benefits:

1. Market value of annual incremental crop production

##### Assumptions:

1. Life cycle of the rehabilitated scheme is 10 years
2. Cropping pattern of year 2010/11 is assumed to prevail until 2020/21
3. The discount rate was taken as 7% as stipulated by Central Bank in 2012.
4. Market value of paddy production was converted to economic value by using the conversion factor for agricultural products (See annex-6.1: conversion factors)
5. Cost of operation and maintenance was estimated at 0.05% of the total project cost per year
6. Market rate of the fertilizer prices was taken as per Fertilizer Secretariat of Colombo
7. Fertilizer recommendations given by the Department of Agriculture on district basis were considered for calculation of fertilizer cost.
8. The extended environmental benefits of small irrigation rehabilitation such as benefit of flood risk reduction and the increased groundwater table and related environmental benefits were omitted in the analysis due to lack of data.

#### 6.2 Results of Economic Analysis

Net Present Value (NPV) is discounted net value of returns generated by the project during the project lifetime which is an indicator of how much value the investment has added to the country. NPV compares the value of a Rupee today to the value of that same Rupee in the future, taking inflation and returns into account. If the NPV of a prospective project is positive, it should be accepted. Economic Internal rate of Return (EIRR) of an investment is the annualized effective compounded return rate that can be earned on the invested capital. EIRR indicates the financial attractiveness / viability of capital intensive projects or investments.

Results of the economic analysis under different scenarios are described in table 6.1 to 6.3. The results of the analysis based on individual schemes are shown in Annex 6.2- 6.5. Over all, the investment has generated positive results under all scenarios. IRR has exceeded the cost of capital under all scenarios. The rate of return is highest under anicut schemes, where relatively small investment has resulted enormous increase in income. This is further validated by district wise analysis (Table 6.1) by yielding higher return in Badulla district, followed by Moneragala District where large numbers of the schemes are anicuts.

Out of the 35 selected schemes, ten schemes show negative or undetermined EIRR and negative NPV. The schemes which are rehabilitated in initial stages of the project (2007/2008) are mostly not generating economic returns, because of the higher management cost compared to the total programme cost. Another reason for negative return is failure to improve the production after rehabilitation.

**Table 6.1: Results of Economic Analysis by Districts**

| District     | Benefit- cost ratio | NPV (Rs Million) | IRR |
|--------------|---------------------|------------------|-----|
| Anuradhapura | 1.27                | 14.16            | 18% |
| Kurunegala   | 1.71                | 9.80             | 32% |
| Badulla      | 1.62                | 27.7             | 62% |
| Moneragala   | 1.73                | 30.71            | 43% |

**Table 6.2: Results of Economic Analysis – Tank Vs Anicuts**

|        | Benefit- cost ratio | NPV (Rs Million) | IRR |
|--------|---------------------|------------------|-----|
| Anicut | 1.69                | 44.79            | 80% |
| Tank   | 1.42                | 37.50            | 24% |

**Table 6.3: Results of Economic Analysis – Existing Vs Abandoned/ Newly Constructed Scheme**

|                                 | Benefit- cost ratio | NPV (Rs Million) | IRR |
|---------------------------------|---------------------|------------------|-----|
| Existing                        | 1.50                | 51.82            | 44% |
| Abandoned and Newly constructed | 1.61                | 30.47            | 45% |

## CHAPTER SEVEN

### Conclusions and Recommendations

#### 7.1 Major Findings

1. Schemes selected are mostly remote, small scale, non rehabilitated during last 10 years
2. Beneficiaries are small scale operators, primarily farmers who depend on multiple irrigation schemes for their livelihoods
3. The rehabilitation works in all the selected schemes are highly relevant and rehabilitation works are prioritized by the beneficiaries
4. Land distribution or ownership issues exist in 20% of the selected schemes, which need to be considered before selection of schemes for rehabilitation.
5. Strength of farmer institutions operating at ground level is very weak and mostly defunct or at a dormant stage
6. Institutional arrangements and the routine activities scheduled for the management of small tank systems in the selected areas are generally not properly institutionalized
7. Social mobilization part is relatively weak, which was by and large limited to delivering tangible outputs. The mobilization conducted is not sufficient to achieve the planned outcome of sustainable O&M of the irrigation schemes
8. Strengthening of FOs on various aspects of organizational management, motivational techniques, leadership, social dynamics, book keeping, are needed in almost all the schemes
9. As changing mindset of the stakeholders and convincing them was a challenging task, area demarcated for a catalyst is larger and not easy to engage full scale mobilization process.
10. Beneficiaries have accepted and approved the participatory approach adopted by the project
11. Performance of construction contracts undertaken by the FOs indicate the importance of having at least one or two beneficiaries of the given scheme to be in the office bearers/committee of the contracting FO
12. Project staffs, especially Engineers and Technical Officers have played a committed role in the rehabilitation
13. Some grass root level officers are not happy about the lack of their awareness/involvement in tank selection and political interferences taken place in the selection process

14. The process of forming WUGs has started only in 2010 indicating the big time gap between hardware and software development. The time gap in social mobilizations for sustainable O&M has been seen as a major hindrance in performing activities of water management package. It has been a difficult task to mobilize the beneficiaries for a common cause who have benefitted from the project 2-3 years before
15. The works carried out and the quality of the works are cost effective compared to similar types of rehabilitation works conducted elsewhere
16. Compared to the pre project situation, extent cultivated has increased up to 78% based on 2010/11 *maha* data and over 500% in 2011 *yala*, while increasing *maha* yield by over 40% in 16 schemes out of 23 rehabilitated existing schemes. Paddy production has increased by 50% in 2010.11 *maha* and 410% in 2011 *yala*.
17. Return to the investment is very high and positive as shown in the economic analysis, though some of the schemes are not profitable in terms of economic appraisal.

## 7.2 Conclusions

1. Investment made on small scale irrigation rehabilitation has made positive impacts on increasing farm level income, and household food security.
2. Participatory development approach has addressed the real needs of the rural people and has made them strong partners in the project implementation
3. Software and hardware aspects development should be integrated from the beginning of the project
4. Consultation, orientation and linkages between the project and line agency officers should be strengthened in all stages of the development.
5. Integrated development has convergence effects and results high return to the investment.

## 7.3 Recommendations

1. Awareness on on-site and off-site effects of soil erosion, strengthening of FOs at scheme level and integration of FOs at micro catchment level are important, especially in sloppy land areas of Badulla District
2. The project must allocate necessary funds for the land survey at scheme level and to make necessary demarcations for reservation areas
3. Attention should be paid to the issues of land distribution and ownership at scheme level
4. Role of social mobilizers should be broadened in order to strengthen the institutional set up

5. The current development formula of the project must be altered to accommodate more weight to social mobilization component to strengthen the community institutions by providing guidance, skills and knowledge required for their effective functioning. There should be more rooms for the line agency officers to be partnered with the project activities such as institutional strengthening and supervisory role of construction works which would provide incentive to take care the expected post project responsibilities of the agency.
6. The project approach needs to incorporate more power for strengthening of rural institutional set up and social mobilization for sustainable post project management
7. The project has to adopt suitable methodology to provide early orientation and consultation for all stakeholders on project approach and roles and responsibilities of line agencies during the project and also in post project period.
8. It is important to have few beneficiary farmers as office bearers of contracting FO or some authority for them to monitor the contract works
9. Traditional and introduced practices and systems in water and infrastructure management should be institutionalized appropriately
10. Water management package should be introduced and mobilize the farmers towards achieving the objectives from the initial step of the rehabilitation

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**Annex Figure 4.1: Well Maintained Bunds of Some Rehabilitated Small Tanks in Anuradhapura District**



**Annex Figure 4.2: Poorly Maintained Bunds of Some Rehabilitated Small Tanks in Anuradhapura District**



**Annex Table 5.1: Changes in Extent of Cultivation by Season -Anuradhapura District (in Acres)**

| Scheme                   | Number of farmers | Cultivated extent in <i>yala</i> 2011 |           | Cultivated extent in <i>maha</i> 2010/11 |            | Annual extent cultivated |            | Annual incremental extent (%) |
|--------------------------|-------------------|---------------------------------------|-----------|------------------------------------------|------------|--------------------------|------------|-------------------------------|
|                          |                   | Before                                | After     | Before                                   | After      | Before                   | After      |                               |
| Aluth wewa               | 15                | 0                                     | 0         | 20                                       | 20         | 20                       | 20         | 0                             |
| Dunumadalawa*            | 11                | 0                                     | 0         | 0                                        | 11         | 0                        | 11         | -                             |
| Galkadawala              | 30                | 0                                     | 0         | 16                                       | 35         | 16                       | 35         | 119                           |
| Kirimetiyawa             | 25                | 0                                     | 0         | 20                                       | 30         | 20                       | 30         | 50                            |
| Millagala wewa*          | 15                | 0                                     | 0         | 0                                        | 25         | 0                        | 25         | -                             |
| Nukawewa kuda wewa       | 40                | 0                                     | 0         | 35                                       | 70         | 35                       | 70         | 100                           |
| Pahala Katugampola yaya* | 29                | 0                                     | 15        | 28                                       | 53         | 28                       | 68         | 143                           |
| Siyambala wewa           | 20                | 0                                     | 0         | 5                                        | 20         | 5                        | 20         | 300                           |
| Wevelketiya Anicut*      | 11                | 0                                     | 0         | 2                                        | 7          | 2                        | 7          | 250                           |
| <b>Total</b>             |                   | <b>0</b>                              | <b>15</b> | <b>126</b>                               | <b>271</b> | <b>126</b>               | <b>286</b> | <b>127</b>                    |

**Annex Table 5.2: Changes in Extent of Cultivation by Season -Kurunegala District(in Acres)**

| Scheme                   | Number of farmers | Cultivated extent in yala 2011 |           | Cultivated extent in <i>maha</i> 2010/11 |            | Annual extent cultivated |            | Annual incremental extent (%) |
|--------------------------|-------------------|--------------------------------|-----------|------------------------------------------|------------|--------------------------|------------|-------------------------------|
|                          |                   | Before                         | After     | Before                                   | After      | Before                   | After      |                               |
| Dambugaha wewa           | 16                | 0                              | 3         | 4                                        | 9          | 4                        | 12         | 200                           |
| Balagollawa              | 23                | 10                             | 10        | 17                                       | 17         | 27                       | 27         | 0                             |
| Bogaha wewa              | 12                | 0                              | 0         | 5                                        | 12         | 5                        | 12         | 140                           |
| Liyanagama Dammulla wewa | 23                | 0                              | 10        | 15                                       | 23         | 15                       | 33         | 120                           |
| Galenbindunu wewa        | 16                | 0                              | 0         | 8                                        | 9          | 8                        | 9          | 12                            |
| Ambale Ihala wewa        | 12                | 0                              | 10        | 8                                        | 18         | 8                        | 28         | 250                           |
| Ottukulama Ihala wewa*   | 12                | 0                              | 15        | 5                                        | 18         | 5                        | 33         | 560                           |
| <b>Total</b>             |                   | <b>10</b>                      | <b>48</b> | <b>62</b>                                | <b>106</b> | <b>72</b>                | <b>154</b> | <b>113</b>                    |

**Annex Table 5.3: Changes in Extent of Cultivation by Season -Badulla District (in Acres)**

| Scheme                 | Number of farmers | Cultivated extent in <i>yala</i> 2011 |            | Cultivated extent in <i>maha</i> 2010/11 |            | Cultivated extent in mid season |           | Annual extent cultivated |            | Annual incremental extent (%) |
|------------------------|-------------------|---------------------------------------|------------|------------------------------------------|------------|---------------------------------|-----------|--------------------------|------------|-------------------------------|
|                        |                   | Before                                | After      | Before                                   | After      | Before                          | After     | Before                   | After      |                               |
| Bathgoda Maha Ela      | 24                | 9                                     | 18         | 14                                       | 18         |                                 |           | 23                       | 36         | 57                            |
| Bedde arawa Anicut     | 28                | 9                                     | 12         | 9                                        | 12         | 9                               | 12        | 27                       | 36         | 33                            |
| Bowalapitiya Anicut    | 15                | 0                                     | 8          | 23                                       | 27         |                                 |           | 23                       | 35         | 52                            |
| Dangamuwa pahala Ela   | 85                | 62                                    | 72         | 62                                       | 72         |                                 |           | 124                      | 144        | 16                            |
| Jayaweera Anicut       | 20                | 19                                    | 25         | 19                                       | 25         | 19                              | 25        | 57                       | 75         | 32                            |
| Gavarmmana             | 63                | 20                                    | 30         | 25                                       | 30         |                                 |           | 55                       | 60         | 9                             |
| Hiddakumbura Yaya Ela* | 12                | 0                                     | 18         | 15                                       | 18         |                                 |           | 15                       | 36         | 140                           |
| Karadamandiya Ela      | 21                | 6                                     | 8          | 19                                       | 19         | 6                               | 19        | 31                       | 46         | 48                            |
| Mahakumbura Ela        | 52                | 18                                    | 22         | 18                                       | 22         |                                 |           | 36                       | 44         | 22                            |
| Mulathella ela*        | 65                | 23                                    | 27         | 27                                       | 27         |                                 |           | 50                       | 54         | 8                             |
| Nindagam vihara Ela    | 30                | 0                                     | 20         | 15                                       | 20         |                                 |           | 15                       | 40         | 167                           |
| <b>Total</b>           |                   | <b>166</b>                            | <b>260</b> | <b>246</b>                               | <b>290</b> | <b>34</b>                       | <b>56</b> | <b>446</b>               | <b>606</b> | <b>36</b>                     |

**Annex Table 5.4: Changes in Extent of Cultivation by Season Moneragala District**

| Scheme                  | Number of farmers | Cultivated extent in <i>yala 2011</i> |            | Cultivated extent in <i>maha 2010/11</i> |            | Annual extent cultivated |            | Annual incremental extent (%) |
|-------------------------|-------------------|---------------------------------------|------------|------------------------------------------|------------|--------------------------|------------|-------------------------------|
|                         |                   | Before                                | After      | Before                                   | After      | Before                   | After      |                               |
| Aswedduma wewa          | 19                | 0                                     | 21         | 18                                       | 21         | 18                       | 42         | 133                           |
| Bolhindagala Anicut*    | 28                | 12                                    | 40         | 40                                       | 40         | 52                       | 80         | 79                            |
| Dandenawela Anicut      | 20                | 10                                    | 22         | 15                                       | 22         | 25                       | 44         | 76                            |
| Edarugala yaya Anicut*  | 21                | 0                                     | 40         | 0                                        | 40         | 0                        | 80         |                               |
| Hinguregala wewa        | 21                | 0                                     | 24         | 24                                       | 24         | 24                       | 48         | 100                           |
| Karakolagas pitiya wewa | 25                | 0                                     | 15         | 35                                       | 35         | 35                       | 50         | 42                            |
| Karambeara wewa*        | 7                 | 0                                     | 5          | 0                                        | 13         | 0                        | 13         | -                             |
| Nabadona ara Anicut*    | 18                | 0                                     | 30         | 30                                       | 30         | 30                       | 60         | 100                           |
| <b>Total</b>            |                   | <b>22</b>                             | <b>197</b> | <b>162</b>                               | <b>225</b> | <b>184</b>               | <b>422</b> | <b>129</b>                    |
|                         |                   |                                       |            |                                          |            |                          |            |                               |

**Annex Table 5.5: Annual Average Return from Paddy Cultivation Per Acre  
(Excluding Imputed Cost)**

| District     | Scheme                   | Average return per Acre in Rs. (Excluding imputed cost)-Before Rehabilitation | Average return per Acre in Rs. (Excluding imputed cost)-After Rehabilitation |
|--------------|--------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Anuradhapura | Millagala wewa           | 6133                                                                          | 35,533                                                                       |
|              | Aluth wewa               | 6133                                                                          | 35,533                                                                       |
|              | Siyambalagaswewa         | 29,653                                                                        | 47,293                                                                       |
|              | Kirimetiya wewa          | 22,626                                                                        | 40,266                                                                       |
|              | Nikawewewa Kuda wewa     | 11,733                                                                        | 25,733                                                                       |
|              | Galkadawala wewa         | -5627                                                                         | 253                                                                          |
|              | Pahala Katugampolayagama | 64,933                                                                        | 22,513                                                                       |
|              | Dunumadalawa wewa        | 0                                                                             | 35,533                                                                       |
|              | Wevel ketiya Amuna       | 253                                                                           | 29,653                                                                       |
| Kurunegala   | Dambu Gaha Wewa          | 30,746                                                                        | 55,386                                                                       |
|              | Ambale Ihala Wewa        | 24,586                                                                        | 43,066                                                                       |
|              | Balagolla wewa           | 23,326                                                                        | 30,466                                                                       |
|              | Liyanagama Dammulla wewa | 30,746                                                                        | 55,386                                                                       |
|              | Bogaha Wewa              | 18,426                                                                        | 43,066                                                                       |
|              | Galenbindunu wewa        | 12,266                                                                        | 12,266                                                                       |
|              | Ottukulama Ihala Wewa    | 19,126                                                                        | 25,286                                                                       |
| Badulla      | Bowalapitiya Anicut      | 19,746                                                                        | 45,266                                                                       |
|              | Gawarammana Anicut       | 26,184                                                                        | 45,266                                                                       |
|              | Karadamandiya Ela        | 2,468                                                                         | 24,140                                                                       |
|              | Hiddakumburu Yaya Ela    | 20,471                                                                        | 32,506                                                                       |
|              | Nindagam Vihara Ela      | 42,200                                                                        | 42,200                                                                       |
|              | Bathgoda Maha Ela        | 22,936                                                                        | 22,936                                                                       |
|              | Dangamuwa Pahala Ela     | 32,506                                                                        | 58,026                                                                       |
|              | Bedde Arawa Anicut       | 17,426                                                                        | 32,216                                                                       |
|              | Mulathella Ela           | 61                                                                            | 30,460                                                                       |
|              | Jayaweera Anicut         | 13,366                                                                        | 13,366                                                                       |
|              | Mahakumbura Ela          | 42,200                                                                        | 42,200                                                                       |
| Moneragala   | Dandenawela Anicut       | 6080                                                                          | 24,140                                                                       |
|              | Bolhidagala wewa         | 24,140                                                                        | 48,220                                                                       |
|              | Nabadanara Anicut        | 15,600                                                                        | 40,800                                                                       |
|              | Karakolagas pitiya wewa  | 36,600                                                                        | 42,480                                                                       |
|              | Endurugal yaya ela       | 0                                                                             | 31,000                                                                       |
|              | Hinguregala wewa         | 18,120                                                                        | 21,130                                                                       |
|              | Karambe ara wewa         | -6800                                                                         | -6800                                                                        |
|              | Aswedduma wewa           | 9,090                                                                         | 30,133                                                                       |

**Annex Table 6.1: Incremental Net Cash Flow of Selected Schemes- Anuradhapura District**

| Item                                                 | 2011     | 2012    | 2013    | 2014    | 2015    | 2016    | 2017    | 2018    | 2019    | 2020    |
|------------------------------------------------------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| <b>Cash Outflow</b>                                  |          |         |         |         |         |         |         |         |         |         |
| Incremental Cost of Paddy Production (LKR)           | 4634886  | 4331382 | 4048210 | 3783388 | 3535923 | 3304327 | 3088105 | 2886265 | 2697319 | 2520771 |
| Incremental Cost of OFC Production (LKR)             | 223333   | 208708  | 195063  | 182303  | 170379  | 159219  | 148801  | 139075  | 129970  | 121463  |
| Total Project Cost (LKR)                             | 6552808  |         |         |         |         |         |         |         |         |         |
| Community Contribution (LKR)                         | 809375   |         |         |         |         |         |         |         |         |         |
| Cost of Project Management (LKR)                     | 736218   |         |         |         |         |         |         |         |         |         |
| Subsidy on Incremental Quantity of Fertilizers (LKR) | 1186117  | 1108447 | 1035981 | 968210  | 904881  | 845613  | 790279  | 738626  | 690273  | 645092  |
|                                                      |          |         |         |         |         |         |         |         |         |         |
| Incremental Gross Outflow (LKR)                      | 14142738 | 5648538 | 5279255 | 4933902 | 4611183 | 4309161 | 4027186 | 3763967 | 3517563 | 3287327 |
|                                                      |          |         |         |         |         |         |         |         |         |         |
| <b>Cash Inflow</b>                                   |          |         |         |         |         |         |         |         |         |         |
| Incremental Gross Income (LKR)                       | 8782501  | 8207400 | 7670827 | 7169024 | 6700110 | 6261267 | 5851555 | 5469094 | 5111066 | 4776530 |
| <b>Incremental Net Cash Flow</b>                     | -5360237 | 2558861 | 2391571 | 2235122 | 2088926 | 1952106 | 1824368 | 1705126 | 1593502 | 1489202 |

**Annex Table 6.2: Incremental Net Cash Flow of Selected Schemes- Badulla District**

| Item                                                 | 2011     | 2012    | 2013    | 2014    | 2015    | 2016    | 2017    | 2018    | 2019    | 2020    |
|------------------------------------------------------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| <b>Cash Outflow</b>                                  |          |         |         |         |         |         |         |         |         |         |
| Incremental Cost of Paddy Production (LKR)           | 836373   | 781605  | 730506  | 682719  | 638063  | 596271  | 557254  | 520831  | 486736  | 454877  |
| Incremental Cost of OFC Production (LKR)             | 4505125  | 4210118 | 3934874 | 3677466 | 3436929 | 3211817 | 3001649 | 2805460 | 2621803 | 2450198 |
| Total Project Cost (LKR)                             | 4580987  |         |         |         |         |         |         |         |         |         |
| Community Contribution (LKR)                         | 503762   |         |         |         |         |         |         |         |         |         |
| Cost of Project Management (LKR)                     | 508475   |         |         |         |         |         |         |         |         |         |
| Subsidy on Incremental Quantity of Fertilizers (LKR) | 842011   | 786874  | 735431  | 687321  | 642365  | 600291  | 561010  | 524342  | 490017  | 457944  |
|                                                      |          |         |         |         |         |         |         |         |         |         |
| Incremental Gross Outflow (LKR)                      | 1177673  | 5778598 | 5400813 | 5047507 | 4717358 | 4408381 | 4119914 | 3850634 | 3598557 | 3363020 |
| -                                                    |          |         |         |         |         |         |         |         |         |         |
| <b>Cash Inflow</b>                                   |          |         |         |         |         |         |         |         |         |         |
| Incremental Gross Income (LKR)                       | 10687399 | 998756  | 933460  | 8723964 | 8153344 | 7619317 | 7120740 | 6655325 | 6219641 | 5812545 |
| <b>Incremental Net Cash Flow</b>                     | -1089336 | 4208962 | 3933794 | 3676457 | 3435986 | 3210936 | 3000825 | 2804690 | 2621084 | 2449525 |

**Annex Table 6.3: Incremental Net Cash Flow of Selected Schemes- Kurunegala District**

| Item                                                 | 2011     | 2012    | 2013    | 2014    | 2015    | 2016    | 2017    | 2018    | 2019    | 2020    |
|------------------------------------------------------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| <b>Cash Outflow</b>                                  |          |         |         |         |         |         |         |         |         |         |
| Incremental Cost of Paddy Production (LKR)           | 1108210  | 1035641 | 967935  | 904615  | 845446  | 790071  | 738372  | 690111  | 644934  | 602721  |
| Incremental Cost of OFC Production (LKR)             | 0        | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       | 0       |
| Total Project Cost (LKR)                             | 2921053  |         |         |         |         |         |         |         |         |         |
| Community Contribution (LKR)                         | 375466   |         |         |         |         |         |         |         |         |         |
| Cost of Project Management (LKR)                     | 329652   |         |         |         |         |         |         |         |         |         |
| Subsidy on Incremental Quantity of Fertilizers (LKR) | 572918   | 535402  | 500399  | 467665  | 437075  | 408448  | 381721  | 356771  | 333416  | 311592  |
|                                                      |          |         |         |         |         |         |         |         |         |         |
| Incremental Gross Outflow (LKR)                      | 5307301  | 1571044 | 1468334 | 1372280 | 1282522 | 1198519 | 1120093 | 1046883 | 978350  | 914314  |
|                                                      |          |         |         |         |         |         |         |         |         |         |
| <b>Cash Inflow</b>                                   |          |         |         |         |         |         |         |         |         |         |
| Incremental Gross Income (LKR)                       | 3133554  | 2928361 | 2736914 | 2557873 | 2390567 | 2233990 | 2087806 | 1951346 | 1823603 | 1704243 |
| <b>Incremental Net Cash Flow</b>                     | -2173747 | 1357316 | 1268579 | 1185592 | 1108045 | 1035470 | 967713  | 904463  | 845253  | 789928  |

**Annex Table 6.4: Incremental Net Cash Flow of Selected Schemes- Moneragala District**

| Item                                                 | 2011     | 2012       | 2013    | 2014    | 2015     | 2016       | 2017    | 2018    | 2019    | 2020    |
|------------------------------------------------------|----------|------------|---------|---------|----------|------------|---------|---------|---------|---------|
| <b>Cash Outflow</b>                                  |          |            |         |         |          |            |         |         |         |         |
| Incremental Cost of Paddy Production (LKR)           | 2863807  | 2676278    | 2501311 | 2337683 | 21847796 | 2041680    | 1908081 | 1783368 | 1666622 | 1557536 |
| Incremental Cost of OFC Production (LKR)             | 496644   | 464122     | 433780  | 405403  | 378886   | 354070     | 330901  | 309273  | 289027  | 270109  |
| Total Project Cost (LKR)                             | 6860405  |            |         |         |          |            |         |         |         |         |
| Community Contribution (LKR)                         | 762062   |            |         |         |          |            |         |         |         |         |
| Cost of Project Management (LKR)                     | 762246   |            |         |         |          |            |         |         |         |         |
| Subsidy on Incremental Quantity of Fertilizers (LKR) | 1694227  | 1583285    | 1479775 | 1382972 | 1292515  | 1207858    | 1128820 | 1055040 | 985973  | 921438  |
|                                                      |          |            |         |         |          |            |         |         |         |         |
| Incremental Gross Outflow (LKR)                      | 13439394 | 4723686    | 4414867 | 4126059 | 3856181  | 3603609    | 3367803 | 3147682 | 2941622 | 2749083 |
|                                                      |          |            |         |         |          |            |         |         |         |         |
| <b>Cash Inflow</b>                                   |          |            |         |         |          |            |         |         |         |         |
| Incremental Gross Income (LKR)                       | 9707780  | 9072089.98 | 8478986 | 7924315 | 7405999  | 6920922.32 | 6468044 | 6045290 | 5649541 | 5279761 |
| <b>Incremental Net Cash Flow</b>                     | -3731614 | 4348403    | 4064119 | 3798256 | 3549818  | 3317312    | 3100241 | 2897607 | 2707919 | 2530677 |

### Annex Table 6.5: Conversion Factors Used for the Conversion of Market Values into Economic Values

|                                 |       |
|---------------------------------|-------|
| Investment conversion factor    | 0.096 |
| Agricultural conversion factor  | 0.785 |
| Scarce labour conversion factor | 0.78  |

### Annex Table 6.6: Results of Economic Analysis – Anuradhapura District

| Name of the scheme      | Dis cost | Dis Benefit | Benefit cost ratio | NPV (Rs Million) | IRR        |
|-------------------------|----------|-------------|--------------------|------------------|------------|
| Nikawewa kuda wewa      | 9413199  | 14030857    | 1.490551           | 4.62             | 49%        |
| Dunumadalawa            | 4104309  | 4115718     | 1.00278            | 0.011            | Indefinite |
| Millagala wewa          | 7166689  | 9073287     | 1.266036           | 1.90             | 11%        |
| Pahala Katugampola yaya | 10173736 | 14351562    | 1.410648           | 4.17             | 54%        |
| Aluth wewa              | 4310617  | 3741561     | 0.867988           | -0.57            | None       |
| Wevelketiya Anicut      | 1454141  | 1889489     | 1.299385           | 0.43             | 10%        |
| Galkadawala wewa        | 7162140  | 5514358     | 0.769932           | -1.65            | None       |
| Siyambala wewa          | 4646272  | 7296046     | 1.570301           | 2.65             | 36%        |
| Kirimetiya              | 3409818  | 5986499     | 1.755665           | 2.57             | 39%        |

### Annex Table 6.7: Results of Economic Analysis – Moneragala District

| Name of the scheme      | Dis cost | Dis Benefit | Benefit cost ratio | NPV (Rs Million) | IRR        |
|-------------------------|----------|-------------|--------------------|------------------|------------|
| Aswedduma wewa          | 5491579  | 8347483     | 1.520052           | 2.85             | 32%        |
| Karambeara wewa         | 1300045  | 61750       | 0.047498           | -1.23            | None       |
| Hinguregala wewa        | 6880920  | 6909949     | 1.004219           | 0.029            | Indefinite |
| Dandenawela Anicut      | 3973411  | 6080242     | 1.530232           | 2.11             | 28%        |
| Bolhindagala Anicut     | 6546889  | 13940002    | 2.129256           | 7.39             | 63%        |
| Karakolagas pitiya wewa | 3886138  | 8822493     | 2.270247           | 4.93             | 37%        |
| Nabadanara              | 4161485  | 11809636    | 2.837841           | 7.64             | 152%       |
| Edarugala yaya Anicut   | 9996995  | 16981176    | 1.698628           | 6.98             | 96%        |

Annex Table 6.8: Results of Economic Analysis – Kurunegala District

| Name of the scheme       | Dis cost | Dis Benefit | Benefit cost ratio | NPV (Rs Million) | IRR  |
|--------------------------|----------|-------------|--------------------|------------------|------|
| Ambale Ihala wewa        | 2589108  | 7607567     | 2.938297           | 5.01             | 155% |
| Ottukulama wewa          | 37618067 | 6934495     | 1.843395           | 3.17             | 63%  |
| Balagollawa              | 669281   | 2125735     | 3.176146           | 1.45             | 41%  |
| Liyanagama Dammulla wewa | 2869020  | 2125735     | 0.740927           | -0.74            | None |
| Bogaha wewa              | 1722807  | 3056612     | 1.774204           | 1.33             | 21%  |
| Galenbindunu wewa        | 905503   | 84906       | 0.093767           | -0.820           | None |
| Dambugaha wewa           | 1225828  | 1613212     | 1.316018           | 3.87             | 10%  |

Annex Table 6.9: Results of Economic Analysis – Badulla District

| Name of the scheme    | Dis cost | Dis Benefit | Benefit cost ratio | NPV (Rs Million) | IRR        |
|-----------------------|----------|-------------|--------------------|------------------|------------|
| Nindagam vihara Ela   | 6096465  | 8547133     | 1.401982           | 2.45             | 49%        |
| Bowalapitiya Anicut   | 1986489  | 7288934     | 3.669255           | 5.30             | 224%       |
| Karadamandiya Ela     | 8268211  | 13417821    | 1.62282            | 5.15             | 86%        |
| Bathgoda Maha Ela     | 5130691  | 6282572     | 1.224508           | 1.15             | 5%         |
| Mahakumbura Ela       | 1235319  | 2124191     | 1.719549           | 8.88             | 46%        |
| Mulathella ela        | 1077763  | 1062095     | 0.985463           | -0.015           | None       |
| Gavarmmana            | 3562397  | 18431005    | 5.173765           | 1.48             | 434%       |
| Hiddakumbura Yaya Ela | 5218806  | 5396309     | 1.034012           | 0.17             | Indefinite |
| Dangamuwa pahala Ela  | 4203513  | 5985093     | 1.423831           | 1.78             | 48%        |
| Bedde Arawa Anicut    | 3147586  | 3395155     | 1.078653           | 0.24             | Indefinite |
| Digantenna Anicut     | 4615419  | 8775254     | 1.901291           | 4.159            | 74%        |