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## **ABBREVIATION AND GLOSSARIES**

### **1. Related Agencies**

ADB	: Asian Development Bank
AusAID	: Australian Agency for International Development
CARE, East Timor	: Cooperation Assistance and Relief Everywhere, East Timor
CIDA	: Canadian International Agricultural Research
CNRT	: National Council of Timorese Resistance
EU	: European Union
FAO	: Food and Agricultural Organization
GTZ	: German Technical Cooperation
IBRD	: International Bank for Reconstruction and Development
IMF	: International Monetary Fund
JICA	: Japan International Cooperation Agency
KUD	: Cooperative Unit of Desa
MAFF	: Ministry of Agriculture, Forestry and Fisheries
NGOs	: Non Governmental Organizations
OMT	: Timorese Women's Organization, under the Umbrella of CNRT
PASC	: Pilot Agricultural Services Center
UN	: United Nations
UNDP	: United Nations Development Programme
UNOPS	: United Nations Office for Project Services
USAID	: United States Agency for International Development
WB	: World Bank
WFP	: World Food Programme

### **2. Glossary**

ADO	: Agricultural Distinct Officer
ASTM	: American Society for Testing and Materials
API	: American Petroleum Institute
ARP	: Agricultural Rehabilitation Project by World Bank Trust Fund
MB	: Mobile Brigade
CEP	: Community Empowerment Project
CFET	: Consolidated Fund for East Timor
DACO	: District Agriculture Coordination Officer (Office)
DIO	: District Irrigation Officer
FY	: Financial Year
GDP	: Gross Domestic Product
GNP	: Gross National Product
HH, hh	: Households
OJT	: On the Job Training
Off-JT	: Off the Job Training
O&M	: Operation and Maintenance
PDM	: Project Design Matrix
PO	: Plan of Operation
TEFT	: Trust Fund for East Timor
UIRP	: Urgent Irrigation Rehabilitation Project
WUAs	: Water Users Associations
Suco	: Sub-District
Aldeia	: Village
Kelompok Tani	: Farmers' Group
Rencah	: Trampling by Buffaloes

### **3. Unit of Measurements**

mm	: millimeter
cm	: centimeter
m	: meter
km	: kilometer
sq.m	: square meter
sq.km	: square kilometer
ha	: hectare
lit	: liter
cu.m	: cubic meter
MCM	: million cubic meter
cu.m/day	: cubic meter per day
lit/sec	: liter per second
cu.m/sec	: cubic meter per second
ppm	: parts per million
pH	: potential of hydrogen
g	: gram
kg	: kilogram
t, ton	: metric ton
sec.	: second
min.	: minute
hr.	: hour
yr.	: year
ave.	: average
min.	: minimum
max.	: maximum
kcal	: kilocalories
kw	: kilowatt
kwh	: kilowatt-hour
%	: percent
No.	: number
°C	: degree centigrade
cap.	: capita
md	: man-day
pers.	: person
msl	: meters above mean sea level
N	: nitrogen
P	: phosphorus
K	: potassium
US\$	: US Dollar

## SUMMARY



# 1. Introduction

## 1.1 Background of the Pilot Project

The Mid-Term Integrated Agricultural Development Plan has been formulated during the Phase-I period (March 2001- July 2002), and submitted to the East Timor government by the Study Team in July 2002. The Plan emphasized the increase of rice production as well as upland crops such as maize for meeting the food demand of the country. The formulation of the Agricultural Development Plan was followed by the implementation of the Pilot Project emphasizing on the irrigated rice cultivation during the Phase-II period. The Pilot Project has taken the following issues into account:

- To verify the validity of the development plan,
- To transfer the technologies and build the capacities of the relevant agencies and staff as well as the farmers on irrigated rice cultivation, and
- To reflect the lessons learned from the Pilot Project on agricultural development in East Timor

The Pilot Project area was selected in the Inkeru secondary irrigation canal under the Lacro Irrigation System in Manatuto district being located in about 50 km far from the capital of Dili, considering the following conditions:

### Project Nature

Since the Pilot Project shall be implemented for less than one year, the Project should be consisted of the components, which are able to show immediate and positive results in the short-term. Although the Pilot Projects' periods are short, the activities involved in the Pilot Project should be continued even after the Pilot Project is over. For the continuation and sustainability of the Pilot Project, therefore: a) the possible funding sources should be identified, and b) the involvement of NGOs experienced in agricultural development and familiar with the project areas should be explored.

### Community Conditions

The following conditions were carefully checked in the candidate communities:

- The community people are not desperately struggling to obtain the basic human needs such as water and food. They should be able to afford to participate to the project activities.
- The communities were not seriously damaged or have recovered from the damage of 1999, physically and psychologically.
- The local leaders are identifiable and well respected by the community people.
- The community people are eager to improve their agriculture and willing to receive the projects.
- The community people have the intention to organize themselves into groups for the implementation of the projects, if not yet organized.
- There is no serious conflict on land ownership. The owners of the land can be clearly identified.

- The communities are located at or near the center of the region or area and easy to access so that the demonstration effects of the Pilot Projects can be expected.

The Pilot Project has been carried out based on the following schedule: preparation works from the middle of November 2002 to the end of December 2002 as a first stage of the Pilot Project, an actual implementation works from the beginning of January 2003 to the middle of March 2003 as a second stage, and finally monitoring and evaluation works from the middle of April 2003 to the beginning of July 2003 as a third stage, respectively.

This Completion Report summarizes the Study Team activities and observation results obtained through the implementation of the Pilot Project during the above-mentioned stages.

## **1.2 Project Approaches, Components/Activities and Implementation schedule**

The Pilot Project had two major concepts. One was “Participation”. The Project was highly participatory, and therefore required active participation and commitments of the farmers as well as the responsible officers at all stages of the project. Another concept was “Cost-Sharing”. The Project intended to introduce a cost-sharing system which requires the users to pay for what they are benefited.

Regarding project components of the Pilot Project, following four components have been identified through the workshops held in November 2002 with a participation of the related stakeholders of the Project:

- (1) **Production Technologies of Rice:** Through the on-farm experimentation, rice cultivation technologies suitable for the project area are found, and the farmers understand those technologies (The approaches of weeding, seeds, fertilizer and nursery were included).
- (2) **Farm Mechanization:** The farmers in the area understand the use and maintenance of farm machineries (power tillers, threshers and rice mills) (The approaches of draft power and threshing & milling were included).
- (3) **Irrigation Canal:** The farmers in the area understand how on-farm canals such as secondary and tertiary canals are designed and maintained (The approach of threshing & milling was included).
- (4) **Water Management:** The knowledge and practices of water management, including the WUA’s activities, is extended among the farmers (The approach of water management was included).

Note: The training approach was included in all components.

Project activities and implementation schedule of the Pilot Project are given in Project Design matrix (PDM) and Plan of Operation (PO), which have been prepared through the workshops mentioned above.



## 2. Present Situations around the Pilot Project Area

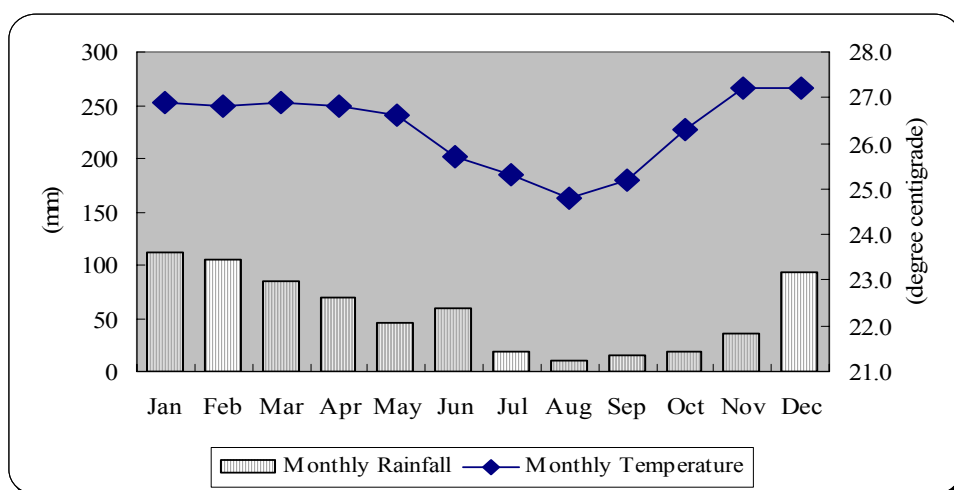
### 2.1 Location and Topography

Adjoining to Manatuto town, the Laclo Irrigation System, in which the Pilot Project is located, lies 50 km east of Dili city and is spread out on the downstream of the Laclo river, which flows into the north of Manatuto district, where lowland irrigated rice production is widely developed with a big potential to produce rice. The irrigation area of 660 ha in the System lies at the right bank of the Laclo river. Total households in the area are more than 350 farmers in four villages, namely, Ateas, Ailili, Sau and Maabat, all in Manatuto Sub-District

### 2.2 Climate and Hydrology

In Manatuto, annual rainfall records less than 700 mm. Rainy season normally starts in December and lasts until June, but monthly rainfall exceeds 100 mm only in January and February. About 60 percent of annual rainfall concentrates in four months, from December to March.

Figure 2.1-1 Climate Data in Manatuto



The Laclo Irrigation System diverts water from the Laclo river and conveys irrigation water to the farm land. The Laclo river being such major water resources for irrigation flows into the north of the Manatuto district, and pours into the Wetar Strait. Major dimension of Laclo river is as follows:

- Catchment area : 1,366 sq.km
- River length : 98 km
- Annual run-off : 268.8 million cu.m
- Minimum discharge : 3.73 cu.m/sec (November)

The Laclo Irrigation System covers 660 ha of paddy field that has not been irrigated since 1996, except for a part of the area irrigated since early 2001. Phase I rehabilitation works of the Urgent Irrigation Rehabilitation Project (UIRP) have been started in October 2001

by the UNOPS with the funding from the Japanese Government, and completed in October 2001. As the results, cropping areas during the rainy season in 2003 reach to 420 ha. Presently, Phase II rehabilitation works are under progress, and is expected to be completed by the October 2003.

### 2.3 Soil and Land Use

In general, soils in the beneficiary areas of Laclo Irrigation System are very silty because the irrigation water from the Laclo river contains a large amount of silt. During the Pilot Project implementation period, the Study Team took three soil samples for chemical analysis, to clarify the contents of nitrogen (N), phosphorus (P<sub>2</sub>O<sub>5</sub>) and potassium (K<sub>2</sub>O) in the soils from the demonstration plots. The chemical analysis of soil was requested to the Center for Soil and Agro-climate, Bogor, Indonesia. The analysis results are shown below.

#### Results of Soil Chemical Analysis

Sample	N (%)	P <sub>2</sub> O <sub>5</sub> (Olsen) (ppm)	P <sub>2</sub> O <sub>5</sub> (Bray1) (ppm)	K <sub>2</sub> O (Morgan) (ppm)
X	0.07	7.8	4.5	94.0
Y	0.07	6.1	3.8	94.1
Z	0.04	5.8	3.8	83.7

According to the soil analysis data, the soil nutrient conditions in the demonstration plots seem to be not fertile, rather poor.

As for land use in beneficiary areas of Laclo Irrigation System, the majority of fields are utilized for paddy cultivation. The results of “Household Survey, Laclo Irrigation System, Manatuto District” which was done by JICA-CARE in May/June 2003 through interviews of all members of the Water User Association indicate the cultivated area in this year amounts to 420 ha (225 %) in total while it was only 187 ha (100 %) in the year 2002. This more than double increase in cultivation area compared to the last year primarily results from the rehabilitation of the irrigation system by UNOPS, which enables to take irrigation water from Laclo river.

Some areas where irrigation water is not available due to its relatively high elevation, upland fields - mainly for maize - are observed but they are very few in the area.

### 2.4 Current Farming Practices of Rice Cultivation

Generally the farming practices are highly devoted to paddy cultivation except for backyard garden vegetables. In years with normal rainfall, people prepare their paddy fields from December. Transplanting follows the land preparation and harvesting starts in May and sometimes continues until August since some long duration varieties are still planted.

Regarding the varieties of paddy, there are at least eight varieties in the area, namely IR5, IR8, IR26, IR64, Java, Nippon, Barito and Ikan. Among them, one of local varieties, Barito, seems to be most common in the area. It is said that IR64 seeds were distributed by foreign donors/NGOs after the violent incident in 1999 as emergency assistance. Almost every

seed of paddy rice is self-kept or obtained from neighboring farmers and farmers do not purchase seeds because there are neither nursery shops nor experimental stations that provide certified seeds.

## **2.5 Agricultural Machineries for Paddy Cultivation in East Timor**

### Increase in Imported Rice

The trends of rice import deeply affect the necessity of mechanized rice farming and progress of farm mechanization. Immediately after the independence, the WFP carefully studied demand and supply balance of rice and received approximately 20 thousand ton of rice in 2000. However, in 2001 rice import increased to 27 thousand ton and reached to 32 thousand ton in January - June, 2003, which surely exceeds previous annual import volume with the cost of more than four million US dollars.

An important matter is a fall in the price of import rice, and average price of imported white rice is 0.131 US\$/kg during six months of 2003 (January - June), which is more competitive in comparison with local paddy price 0.100 US\$/kg when considering additional cost for milling, transport and handling.

### Stable Retail Rice Price

Although inflation in East Timor increases, retail rice price in June 2003 keeps the same level of the previous years at the commercial markets, namely 0.71 US\$/kg for local rice and 0.36 US\$/kg for imported rice. However, local rice is still more expensive than the imported one and rather difficult to get local rice through formal marketing channel.

### Rice Post-Harvest Losses

Total rice post-harvest losses in East Timor are estimated at 46.4 percent, which was cleared by the field survey done by the Study Team. These post-harvest losses could be considered to be one of farm mechanization objectives.

### Rice Mill Industry around Pilot Project Area

Current rice milling industry in Manatuto was surveyed and it was proved that five rice millers operate their milling businesses, while one of them is out of operation due to a breakdown of the machine. Milling fee of rice is different ranging from 0.70 to 1.50 US\$ /bag-50kg.

Meanwhile, a community group in Manatuto "FOLSEM" plans to operate one set of Satake rice mill in August 2003 at Manatuto downtown under Community Empowerment Project sponsored by CIDA. On the other hand, a private firm, Centro Logistica Nacional de Timor-Leste (CLNTL) started its activity to purchase paddy from farmers to stabilize rice price and to manage the proper stock from the late 2002.

## **2.6 Water Users' Association and Other Farmers Groups**

In the past, the Water Users' Association (WUA) for the Laclo Irrigation System is said to have been functional since 1969, and became inactive when flood destroyed the system in 1996. By then, irrigation water was distributed under the control of Marinos, water tenders who are responsible for water tending at the main and secondary canal levels. Farmers using the same secondary canal cleaned the canal collectively by the call of the Marinos before water started flowing in. Through that process, the farmers had been organized, somehow in a relaxed mode.

The WUA consists of a central organizational unit with a set of officers (president, vice-president, secretary-treasurer and auditor). It is recommended by UNOPS that four village-based organizational sub-units (Ailili, Ateas, Maabat and Sau) be also established each with similar set of officers. The new WUA officers were elected by vote of the farmers on April 25, 2003.

Regarding the farmers' organizations seen in four villages in the Pilot Project area, several farmers and fishers in the same clan commonly organize themselves into a group to mutually help for agriculture and fishery activities. The activities vary group by group, which include cleaning of backyard garden for vegetable production, preparation of land for paddy and other crops, control of irrigation water, weeding and harvesting, transporting and marketing the products, etc. All of those groups are called as "Kelompok Tani".

The KUD system, the farmers' cooperative system that the Indonesian government introduced to East Timor in the past, cannot be seen any more. The system provided farmers with free seeds, fertilizer, and other necessary inputs for crop production, and purchased the products with the secured prices from the farmers. On the other hand, it could be said that this system lessened the significance of the traditional "Kelompok Tani" since the farmers tended to rely on the government assistance. As a result, the ties among the farmers may have been weakened.

## **2.7 Farm Household Economy**

According to the "Household Survey", there are 353 households in the Laclo Irrigation System: 264 households are landowners (75 %), and 89 households are tenants (25 %). And, also it is reported that the total cultivated area of rice in 2003 season is 420 ha, while that in 2002 season is 187 ha.

The average unit yield of rice in the last season is 2.0 ton/ha. The average annual cash income of a household is 262 US\$/year, and out of this an income of rice selling is 12 US\$/year (4.6 % of annual income) in the last season. Supposed unit yield in this season is same as the last one (2.0 ton/ha), the rice product per household will increase 1.4 ton/house. If a whole quantity will sell, the increase income of rice is going to be 110 US\$/house. In these conditions, annual income of a household becomes 372 US\$/year, and the income of rice selling is 122 US\$/year (33 % of annual income).

### **3. Implementation of Pilot Project**

#### **3.1 Activity Areas of the Pilot Project**

The Pilot Project has been based at the beneficiary area of Laclo Irrigation System. Activity area for the four components of the Pilot Project as follows:

- Production Technologies : Demonstration farm prepared for the Pilot Project (land was offered by a farmer, and its size is about two hectare)
- Farm Mechanization : Warehouse constructed at the time of Mobile Brigade (MB), and demonstration farm as well as the paddy fields of several farmers
- Irrigation Canal : Inkeru Secondary Canal
- Water Management : Meeting house of the Pilot Project as well as main and secondary canals of the Laclo Irrigation System

#### **3.2 Task Allocation and Organizational Set-up for the Pilot Project**

For the implementation of the Pilot Project, the necessary tasks are allocated to the major stakeholders as follows:

- 1) Study Team : Seven experts to be responsible for the project activities and technology transfer to the farmers in their respected fields, and contribution of part of the project costs as agreed
- 2) CARE : Three local experts to assist the Study Team
- 3) Farmers : Participation to the Project as the representatives of the areas and recipients of technology transfer, and contribution of free labor as agreed
- 4) MAFF : Coordination among the district office, the Study Team, and the relevant agencies
- 5) Manatuto District Office : Coordination among the relevant agencies at the district, WUA, farmers, and the Study Team
- 6) Ex-Mobile Brigade : One mechanic/operator of machinery to assist the Study Team

#### **3.3 Major Activities of the Pilot Project and Their Outcomes**

##### **1) Production Technologies of Rice**

For the components of production technologies of rice, farmlands (about 2.0 ha) within the beneficiary area of Inkeru Secondary Canal were used as demonstration farm, and three kinds of experiments – fertilizer experiment, planting method experiment and weeding experiment – were conducted. For each experiment, two varieties (one local variety, IKAN, provided by a local farmer and another improved variety, IR64, procured from Indonesia) were used. Summary of the experiment contents is shown below and both unit area sampling and yield component survey were carried out.

### Fertilizer Experiment

Treatment	Application Amount (kg/ha)			
	N		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
	Basal Dressing	Top Dressing		
None fertilizer (Control)	0	0	0	0
None nitrogen	0	0	30	30
N top dressing	0	30	0	0
N basal dressing	30	0	0	0
N Split dressing 1	20	10	0	0
N Split dressing 2	30	15	0	0
N Split dressing 3	40	20	0	0
Only organic fertilizer	0	0	0	0

Note: All seedlings were transplanted in a row and weeding was done.

### Planting Method Experiment

Three methods – random transplanting, transplanting in a row and direct seeding – were compared (No fertilizer was applied nor was weeding done).

### Weeding Experiment

The effect of weeding was evaluated (All seedlings were transplanted in a row but no fertilizer was applied).

During the Pilot Project period, the Study Team and local assistants cooperatively did farming works together with beneficial farmers. The farming schedule during the period was indicated below:

Variety	IKAN	IR64
Land preparation	Started from January 27, 2003	Started from January 27, 2003
Seeding	February 1	February 14
Transplanting	February 25-27	March 5-7
Harvesting	June 16-18	June 4-6
Remarks	<ul style="list-style-type: none"> <li>- Direct seeding was done on February 14.</li> <li>- Some pest damages in the nursery</li> <li>- Basal dressing was done at Transplanting.</li> <li>- Top dressing was done on April 29.</li> <li>- With a rope with marks of 25-cm, transplanted in a row.</li> </ul>	<ul style="list-style-type: none"> <li>- Direct seeding was done on February 27.</li> <li>- Basal dressing was done at transplanting.</li> <li>- Top dressing was done on April 16.</li> <li>- With a rope with marks of 25-cm, transplanted in a row.</li> </ul>

## 2) Farm Mechanization

Significant rolls of rice farm mechanization in East Timor are a) to reduce heavy farming works for small farmers occupying the majority of farmers, b) to improve exploitative system of traditional farming services, c) to realize the reduction of production cost by increasing agricultural labor productivity, d) to accelerate double cropping in accordance with increase of rice demand, and then e) to contribute to the food security in East Timor. In order to cope with these rolls, farm mechanization in the form of cooperative use of farm machinery among farmers is necessary. In the Pilot Project, hiring system of farm machineries managed by farmers group themselves and farming cultivation using farm machineries such as hand tractor, thresher and milling machine are planned and practiced are.

### Implementation of Farm Mechanization Training

Following farm mechanization trainings were implemented by the Study Team during early January 2003 to early July 2003 in the Pilot Project. Namely, a) farm mechanization at demonstration farm, b) collection of technical data on labor productivity, c) training of operation and repair, d) practical farm mechanization by farmers and e) implementation of farm machinery hiring system, and f) procurement of required machinery, equipment and materials.

### Implementation of Training for Farm Machinery Operation and Maintenance

Operation and maintenance training for two sets of hand tractors (equipped with plow, rotor harrow, leveler, paddy wheel and trailer), which were rented from Manatuto District Agricultural Office, two units of threshers and one unit of rice milling machine newly purchased by the Study Team were carried out to farmers. Participants on these trainings were nine farmers for hand tractors, four farmers for threshers and rice milling unit. Repair training was done only for replacing damaged parts of all the hand tractors donated under Mobile Brigade (MB)<sup>1</sup> program. Workshops including cutting and welding were executed by mechanic of the former MB team.

### Contract Land Preparation, Threshing and Milling

In accordance with the agreement between “Haburas Manatuto and contract farmer”, following contract farming were implemented on the basis of “cost-sharing” system.

#### - Contract Land Preparation

Three categorized rates were employed, i.e. A: 30.00 US\$/ha full provision with operator and fuel, B: 23.00 US\$/ha partial provision with fuel and without operator and C: 8.00 US\$/ha with no provision both of operator and fuel. Total 22 farmers including five non-members participated into hiring system. It could be identified 49.25 US\$/ha was necessary to secure sustainability of the system on the basis of “cost-recovery” and understood by member farmers at general meeting.

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<sup>1</sup> Urgent the reconstruction, development and support projects for the development and welfare of East Timor, Mobile Brigade was established with a lot of farm machineries tractors and hand tillers donated by JICA, Norway and Makau.

- Contract Threshing  
Short period during June 16 to July 5, 2003, contract threshing was done by four farmers including one non-member at the cost-recovery fee of 0.196 US\$/sack – paddy 35kg, which was accepted by farmers at general meeting.
- Contract Milling  
In early July, 2003, it was still early to mill paddy since mid season for farmers to re-separate threshed paddy and to dry them, and to mill small quantity of paddy only for a few weeks self-consumption. Contract milling was done only by a farmer at cost-recovery rate of 0.014 US\$/kg-white rice, which was previously accepted by farmers at general meeting.

#### Supply of Spare Parts

Issue of “hard to get spare parts” is the matter of arrangement and experiences of procedure, channel and receivable period under the Pilot Project were transferred to the leader of the Haburas Manatuto and the related District Officers.

### **3) Irrigation Canal**

Main irrigation canal to cover the Pilot Project area is Inkeru secondary canal, which is branching off from the Laelo main irrigation canal with irrigation areas of 45 ha. However, due to heavy sediment soil in the secondary canal and also no well maintenance of on-farm facilities such as division boxes, an adequate water distribution from the secondary canal could not be undertaken at present, leading to severe water shortage problems especially at the downstream reaches of the area. Under the situations, in order to solve the problems, improvement of the Inkeru irrigation canal and training for operation and maintenance of these facilities were done under the participation of related farmers.

#### Survey of Inkeru Secondary Canal and Canal Design

Longitudinal and cross sectional survey works for formulating the improvement plan of Inkeru secondary canal was done as follows:

- Duration : Nov.30 to Dec. 7, 2002
- Items of survey : Longitudinal and Cross Section Survey
- Length of survey : L= 983 m
- Interval of Cross Section : @40 m, total 27 sections
- Working Staff : One surveyor and two assistants hired by Study Team

On the basis of survey results, canal design for improvement the secondary canal was done applying the following UIRP dimensions:

- Irrigated area : 45 ha
- Unit water demand : 5.05 liter/sec/ha
- Design discharge : 0.23 cu.m/sec



## Improvement of Canal and Training on Operation and Maintenance

Excavation and hauling works of the sediment soils in the Inkeru secondary canal were undertaken by farmers themselves with an assistance given by the Study Team. Necessary equipment and tools to do excavation works were procured by the Study Team, and supplied to the farmers group with a condition of cost-sharing basis through mutual discussions between the Study Team and farmers group. In the courses of above works, local staff are also participated.

Farmers normally maintain their secondary canals before the starting time of cropping season. Since it is difficult to prevent sedimentation in the secondary canal perfectly, routine/periodic maintenance work such as de-silting was required for the maintenance of secondary canals and on-farm facilities. Therefore, The Study Team did the necessary trainings on operation and maintenance works of the irrigation facilities to the farmers group.

### **4) Farmers Organization and Water Management**

The farmers members participating to the Pilot Project components were selected from the whole area of Laclo Irrigation System. Concerning the “Production Technologies of Rice” and “Farm Mechanization”, 36 farmers were at first listed up as the members. Those members were organized into three working groups, and the leaders of each group were selected.

In January 2003, the organization called “Haburas Manatuto” was established for coordinating between the Study Team and three working groups. The coordinator and the assistant coordinator were then temporarily selected by the members. They also became responsible for managing the renting system of agricultural machines to the farmers.

However, participation of “Haburas Manatuto” members to the project activities, in particular the training, was quite low. It seemed that the interest of the members was only to rent a tractor at cheap rate, but not learn the new production skills. It was felt by the Study Team that the farmers are easily fascinated by immediate benefits, which hinders them in getting things in perspective. Training, with which they cannot see the impacts in the short term, may not be able to motivate them for the action.

In addition, it was unfortunate that a farmer considered as a leader gradually turned out to be seeking as much personal benefits as possible. His various behaviors in the Pilot Project could by no means have him respected by the members. He as a leader failed to mobilize the farmer members into the training. There was also the problem that the tractors were not well maintained and frequently broken down. The reasons were that i) the unskilled farmers operated the machines carelessly, and ii) the coordinator did not understand well his responsibilities in maintenance.

To improve those situations, the new regulations were made in March 2003. One of the main purposes was to make the farmers understand that the members of an organization have some responsibilities at the same time they enjoy some benefits. According to the regulations, the new officers (manager, assistant manager, accountant and auditor) were selected by vote of the members. The members were also reviewed, allowing only those who understand and agree the regulations.

Some management tasks were given to the new officers in mid. March 2003. It was just before the Study Team left the site temporarily for two and a half months. It was intended to see how well they could fulfill their tasks, during the absence of the Study Team, particularly regarding the management of the organization as well as the rental system of the farm machineries, and eventually to decide whether or not the ownership of the farm machineries could be given to them later.

When the Study Team came back to the site in June 2003, their management capacity was assessed at 60 to 70 percent. This indicates positively that the farm machineries could be given to them or allowed to use by them if proper guidance and supervision are continuously given at the same time.

### **3.4 Monitoring and Evaluation of the Pilot Project**

#### **1) Relevance**

- Has the project purpose accorded with needs of the farmers?

Attendance of original farmers who had agreed the activities in the workshop became smaller and smaller day-by-day. At the end of February 2003, only few farmers activated, partially, so participants have been changed, drastically in the beginning of March. The new farmers explained the absence by some reasons, which showed that their decisions to attend the activities was accorded to their ideal but it was not practicable things, they could do, actually.

#### **2) Effectiveness**

- Has the project purpose been achieved?

Though all farmers who attended the each activity evaluated that this project was useful for improving their farming capacities, direct beneficiaries of main activities were limited to the 16 members of Haburas Manatuto and other about 6 participants since the target group was focused on the new farmers group.

#### **3) Efficiency**

- Have the activities of Production Technologies of Rice implemented, efficiently?

All participants of this activity learned the merits and demerits of local/improved variety through the activities, and also, adequately understood the positive effect of row transplanting and the effect of weeding. It was shown to the farmers that 30 kg/ha of nitrogen application was effective to increase the produce of improved variety, IR64 since the difference of produces in the experiment of fertilizer application was recognized, and fertilizer should not be applied for the local variety, IKAN in the existing condition since the effect of fertilizer was not found.

- Have the activities of Farm Mechanization implemented, efficiently?

The training of a hand tractor was conducted for four days for nine farmers, the training of a thresher was conducted for three days for 11 farmers, and the one of a rice mill was

implemented for three days for five farmers, which were adequate days for the participants to learn the operation of each machine because all participants came to be able to do basic operation of the machines, but they were not enough for the maintenances as lack of time. The labor productivity increased 8-fold through using of a hand tractor, as compared with Rencah, and 23-fold by a thresher as compared with threshing by foot. The plan of the hiring system of a hand tractor, thresher and rice mill was prepared, but The reducing of broken rice ratio was not succeeded during the field survey, and it was almost half, which was as same as existing the ratio.

- Have the activities of Irrigation Canal implemented, efficiently?

The schedule for the maintenance of the branch canals was prepared in December 2002, and the renovation and cleaning was implemented by free labor of the farmers. The measurement was conducted by a central officer and some his staff under supervision by the expert of construction supervision. The drawings were showed to the farmers, who renovated them using the drawings. Cultivated land of this season became 2.2-fold of the last season. The renovation of the branch canals contributed to the expansion of the irrigated areas.

- Have the activities of Water Management implemented, efficiently?

Water management group, which consisted of former president of WUA, chiefs of villages, leaders of all secondary canals and Marinos, was organized in January 2003, and the trainings for water management were conducted to the group for three times during in January and February. WUA has planned to begin the collection of the water fees after this harvest season. The recommendation for the improvement of the O&M Manual has finalized in this report.

#### **4) Impact**

- Will the farmers apply the new skills to rice cultivation in the next season?

Following number of farmers among 20 participants of the monitoring/evaluation workshop planed to apply the new skills, which they learned through the implementation of the Pilot Project, to rice cultivation in the next season: Namely, land preparation by a hand tractor (20 farmers), transplanting using a rope (5 farmers), weeding by a weeder (5 farmers), threshing by a thresher (20 farmers), milling by a rice mill (20 farmers), respectively.

#### **5) Sustainability**

- Will Haburas Manatuto continue their activities?

Haburas Manatuto has a proper written regulation, a leader, who has high leadership compared with other members, and a treasurer, who can keep the books. Therefore their activities will continue if they will be able to keep using the farm machines, and prevent a misappropriation in their finance management.

## **4. Conclusion and Recommendations**

This chapter deals with the problems and issues identified through the implementation of the Pilot Project, the countermeasures to those problems, the outcomes and necessary follow-ups of the Pilot Project, and the suggestions and recommendations for reflecting its experiences on the Agricultural Development Plan in East Timor. The Pilot Project was planned and implemented in a limited periods and areas. It should therefore be noted that those suggestions and recommendations be applied to other areas taking the characteristics of the Pilot Project into consideration.

### **4.1 Implementation of the Pilot Project**

#### **1) Problems and Countermeasures Identified through the Implementation of the Pilot Project**

Current agricultural problems, which have been cleared through the implementation of the Pilot Project, are examined in terms of a) implementation capabilities of government administration, NGO, and farmers organization, and b) paddy rice cultivation and experimental results. The results of examination are tabulated in Table S-1.

#### **2) Outcomes of the Pilot Project and Future Projection**

##### **a) Paddy Rice Cultivation and Experimental Results**

The paddy rice experimental cultivation for one local and improved varieties in the Pilot Project put more emphasis on the effects of treatments within the same variety (fertilizer application, weeding and planting methods) rather than variety differences. Furthermore the experiment was done in one field with small size within the Laclo Irrigation System, so it needs to pay attention to extend the obtained results to other areas.

##### Fertilizer Experiment

According to the data of unit area sampling, chemical fertilizer application was effective to increase the yield of the improved variety (IR64) but not for the local variety, IKAN. The yield level of IR64 increased by nitrogen application but the amount of nitrogen applied (30, 45 and 60 kg-N/ha) did not affect the yield level, significantly. The difference of application time (30 kg-N/ha of basal dressing, 30 kg-N/ha of top dressing and split dressing of 30 kg-N/ha) did not affect the yield level of IR64 nor IKAN.

With the yield component survey, six different data (unit yield, number of grains per panicle, number of panicles per hill, weight of 1000-grain, ripened grain ratio and plant height) were measured or calculated, but there were no significant differences by fertilizer treatments except for plant height data.

Table-1 Problems Identified through the Implementation of the Pilot Project and Their Countermeasures

Items	Problems	Causes	Countermeasures
<p>1. Implementation Capability of Government Administration</p>	<ul style="list-style-type: none"> <li>- Low participation of MAFF and District Agricultural Coordination Office (DACO) to the Pilot Project</li> <li>- Unmatured district government organizations</li> <li>- Government activities relying on donor's support</li> </ul>	<p>Absolute shortages of government staff and allocated budgets to MAFF and DACO</p> <p>No establishment of horizontal relation among related agencies in Manatuto district</p> <p>Shortages of staff and budgets mentioned above, and fragile framework and individual capacity of central and local staff</p>	<p>Requests of staff and budgets for MAFF and DACO by MAFF</p> <p>Organizational arrangement and countermeasures by MAFF and Manatuto District Office</p> <p>Enhancement of capacity building for MAFF and local staff</p>
<p>2. Implementation Capability of NGOs</p>	<ul style="list-style-type: none"> <li>- Low motivation as an expert and low diligence</li> </ul>	<p>Limited qualified NGOs staff and lack of experience of them</p>	<p>Evaluation of NGOs and consecutive support for the NGOs capability by donors</p>
<p>3. Implementation Capability of Farmer's Organization</p>	<ul style="list-style-type: none"> <li>- Limited leaders with adequate capability for organizing the farmers</li> <li>- Hard implementation of the Pilot Project under participatory approaches</li> <li>- High costs required for land preparation and post-harvest works</li> <li>- Low skill for farm machinery operation and maintenance technology of farmers</li> </ul>	<p>Prevalence of top-down policy undertaken by Indonesian regimen and historical background for structuring village organization</p> <p>No familiar with participatory project</p> <p>Implementation by traditional land preparation by means of Rencah, and awareness of inaccurate land-holding by farmers</p> <p>Low-level of farm machinery operation and techniques for land preparation, threshing, milling works, etc., and lack of farmers consciousness for marinating these farm machineries</p>	<p>Finding out and capacity building-up the motivated and qualified leader for the promotion of collective works</p> <p>Considerations to motivate farmers willingness for collective works, for instance exhibition of immediate benefits as incentives, and presentation of cleared roles among stakeholders</p> <p>Introduction of partial farm mechanization systems for land preparation, threshing, milling works, etc. and accurate measurement for his own landholding</p> <p>Promotion of mechanized farming for land preparation, threshing, milling works, etc., implementation of necessary training to farmers for repairing and marinating farm machineries. Furthermore, establishment of procurement channel for spar parts</p>
<p>4. Paddy Rice Cultivation Techniques</p>	<ul style="list-style-type: none"> <li>- Mix-up of different paddy varieties seeds</li> <li>- Low availability of agricultural inputs</li> </ul>	<p>Inappropriate post-harvest procedures and mixed transplanting in nursery bed</p> <p>Uneasy procurement of agricultural inputs such as seeds, fertilizers, pesticides in rural areas, and expensive price of them</p>	<p>Extension of appropriate post-harvest handling procedures, and necessity to let know all seedlings should be taken out from the nursery before transplanting seeds</p> <p>Agricultural inputs are not manufactured in East Timor, same situation will be continued in future. In order to purchase these agricultural inputs with economical prices, collective purchases should be promoted. Furthermore, manure application such as animal dung to paddy cultivation should be examined and promoted.</p>

### Planting Method

Based on the unit area sampling data, direct seeding (P3) significantly decrease the yield levels of both IR64 and IKAN and the degree of decrease is larger for IR64 than IKAN.

The yield difference between random transplanting (P1) and transplanting in a row (P2) was not clear for both IR64 and IKAN. Because P2 needs more labor inputs than P1 (about double working time when measured in the Pilot Project), P2 has a few incentives for farmers with this experimental result. However, weeding can be done easily with a weeder in the plot of P2 while only manual weeding is applicable in the plot of P1. This means that the labor inputs for weeding are less in case of P2 than P1 if weeders are available. Therefore the effects of weeding should comprehensively consider together with weed management.

### Weeding

According to the unit area sampling data, the yield level of IR64 significantly decreased without weeding. The data of IR64 for yield component survey did not show significant differences except for plant height. As for the long culm variety, IKAN, weeding did not show any important differences in the yield level of unit area sampling and the various data of yield component survey, which in turn suggests that IKAN is relatively competitive to weeds.

From the above results, important notices for paddy cultivation in the Laclo Irrigation System could be summarized as shown below.

### Fertilizer Application

Since IR64 is more sensitive to chemical fertilizer application and the application could increase the yield level, chemical fertilizer application - particularly nitrogen - is considered to be effective to improve IR64 productivity. However, it is desirable to do more experiments or researches to clarify the optimum application amounts and time for nitrogen, phosphorus and potassium fertilizer, and the characteristics of soil nutrient conditions.

### Planting Method

It is considered that direct seeding would result in low yield level. Therefore transplanting method is desirable unless severe labor shortage for transplanting occurs. To do weeding properly with hand-push weeders, seedlings should be planted in a row but conventional random transplanting is enough to practice manual weeding. Around the Pilot Project site, it was often observed that farmers transplanted very big seedlings. Proper nursery period for transplanting (commonly around three weeks after seeding) should be extended.

### Weeding

As for the short culm variety, IR64, the degree of yield decrease seems to be more serious if weeding is not practiced, and weeding on proper time is desirable (Some experiments

in Japan indicate that the paddy yield decreases 8-57 % without herbicide application and does to 18-55 % without intertillage).

b) Farm Machinery

A lot of farm machines have been donated by foreign donors to East Timor under emergency and humanitarian assistances to increase agricultural production and to improve the shortage of agricultural labor. Because improvement of the labor productivity and reduction of the cost through introduction of farm machines were demonstrated in the pilot project, it is expected to accelerate the farm mechanization to increase agricultural productivity for food security and self-reliance in East Timor with its limited human power.

Considering the results of the survey of the Pilot Project, less than 10 thousand hectare can be cultivated only by these tractors donated in the Mobile Brigade Program under the urgent reconstruction, development and support projects for the development and welfare of East Timor. However, the selected models were unsuitable to meet farming conditions in East Timor. In addition, experienced operators of farm machinery, proper repair and maintenance technology and facilities, effective management organization, maintenance and management budget are insufficient. As a result, these machines can not be utilized effectively and correctly for increasing labor productivity. Under such situations, it is recommended to establish a farm machinery training and hiring center and introduce adequate machinery for increasing agricultural production by cultivation of fallow land and double cropping.

c) Transfer and Management of Materials Procured by the Study Team

During the implementation of the Pilot Project, following farming tools, equipment, and machines were rent from District Agricultural Coordination Office (DACO) and/or procured by the Study Team. Regarding the transfer of these materials, the Study Team made discussion with relevant agencies such as JICA East Timor Office, MAFF, District Agricultural Coordination Office, Haburas Manatuto Farmers Group, etc. before the Study Team was terminated at the beginning of July 2003. As a result, following policies were decided:

- Kubota Power Tillers  
Two units of Kubota power tillers (tractor) were rent out to the Haburas Manatuto Farmers Group from District Agricultural Coordination Office (DACO) when land preparation started. Regarding these power tillers, the Study Team requested to DACO to give high priority for using the power tillers to the Haburas Manatuto Farmers Group for the next season.
- Farming Tools and Meeting House  
Farming tools such as shovels, katana, toes, aiswak, and chairs were purchased by the Study Team during the study period. These farming tools were transferred to the Haburas Manatuto Farmers Group at the beginning of July 2003 by the Study Team. Furthermore, a meeting house, which was used for group meeting, storage for production materials and equipments, etc. was built by the Study Team. This meeting house was also transferred to the Haburas Manatuto Farmers Group.
- Spare Parts for Kubota Power Tiller  
The Study Team procured some sets of spare parts for Kubota power tillers, and stored

them in the ex-Mobile Brigade storage. The Study Team transferred these spare parts to District Agricultural Coordination Offices of Mantuto and Baucau at the termination of the Pilot Project. Regarding the management of these spare parts, the Study Team proposed a spare part utilization system after discussion with relevant government agencies at central and district levels, JICA East Timor Office, representatives of farmers group, and ex-Mobile Brigade staff, etc.

- Farm Machinery such as Threshing and Milling Machineries

The Study Team procured two units of threshing machines and one unit of milling machine before harvesting of the paddy, and actual operations of the machine were done in the beginning of 2003 under the proposed rental system. Before the termination of the Study, transfer policy of the machines was also discussed with relevant government agencies mentioned above. As a result, the Study Team tentatively transferred the machines to the JICA East Timor Office, and the Office would finally make discussion with MAFF. At the explanation meeting on the Draft Completion Report held on July 8, 2003 at the MAFF, these farm machines were transferred to the MAFF.

d) Case Studies of Annual Household Income

If unit yield of paddy increases 0.5 ton/ha compared with the present yield of 2.0 ton/ha, rice produce will increase by 0.65 ton/house. If the whole increase amount is sold, annual income per household will increase by US\$ 65, which is equivalent to 17 percent of the total income of a mod. The annual household income by rice sales amounts to US\$ 187.

If a half area of the field is cultivated twice a year with the present yield level, rice produce will increase by 1.3 ton/house. If the whole increased amount of rice is sold, annual income per household will increase by US\$ 130. The annual household income of rice sales amounts to US\$ 252.

The farmers should aim to earn over US\$ 100 of rice sales per year. If rice marketing succeeds, unit yield reaches 2.5 ton/ha, and a half of own field is doubled cropped, a farmer will be able to earn more than US\$ 300 by rice sales.

e) Prospect for Progress of Double Cropping of Rice

To get money through double cropping of rice, members of Haburas Manatuto have a plan to sell their product to sub-districts in mountain area, where people cannot cultivate paddy rice. People living there sometimes come to a market in Manatuto to buy rice with a rental track. If the members succeed to market rice, this enhances their motivations for cultivation and double-cropped area increases more rapidly.

For farmers who cannot afford labor or material for the second cropping, it is one option to rent their paddy field to their relatives who have no paddy field. Member farmer commented that it is possible to rent out their field even to others if they make a contract in advance. Promotion of double cropping fields is not only good for the efficient use of the irrigation system but also useful to reduce damage by insects, birds and rats because growth of paddy tends to be uniform in time.



### 3) Necessary Activities to Follow-up the Pilot Project

#### a) Haburas Manatuto Farmers Group

During the Pilot Project period, Haburas Manatuto was established with the farmers as an organization to coordinate the Study Team and the member farmers to conduct various project activities. Haburas Manatuto is active now and expected to continue and expand the project activities for long term, particularly renting the farm machines to its members and non-members as business, and eventually become a self-reliant farmers' group.

Now, it is important that the authorities concerned, particularly by the district office, support Haburas Manatuto to enable them to continue their business smoothly. At present, its organizational capacity has been assessed at 60 to 70 percent of satisfaction level (see Annex F for the details), and therefore continuous supports to the Haburas Manatuto are still required considering the following issues, so that its capacity may be raised enough for standing on its own foot:

- i) The current officers should stay in the same position for one year and fulfill their responsibilities as stated in paper.
- ii) Haburas Manatuto is open to any farmers in Laelo Irrigation System, but the farmers should understand there are obligations as well as the benefits, and agree to follow the regulations to become the members.
- iii) The financial transparency should be assured for the collected money and its expenditures. The money should be deposited in a safe place.
- iv) The properties such as the threshers, rice mill machines, meeting house, etc. should be used equitably by the members, and maintained in a good condition at any time.
- v) The payment for renting the machines should be made in cash by all farmers as soon as possible. This will be possible since irrigation is resumed from this year.
- vi) The business plan should be made for using the machines as well as the collected money efficiently and making profits for Haburas Manatuto.
- vii) Relations among the members should carefully be watched. The farmers tend to criticize and antagonize each other, particularly when they see possible immediate benefits. Unnecessary conflicts should be avoided.

#### b) Water Users Association (WUA)

In the Laelo Irrigation System, a water users' group had existed since 1969 and was functional until 1996 when floods destroyed the System. The UNOPS reactivated the group as the WUA in 2001 when it started the rehabilitation works of the System, and the president and other officers were selected. In April 2003, new president and other officers were elected, and under new organization, an advisory team, composed of the chiefs of the villages, the traditional

leaders and the representatives of all secondary canals, is to be organized soon for discussing the issues of water management and collection of water fee.

Regarding water management for the Lacro Irrigation System, at least three issues should be considered: a) water distribution in wet and dry seasons: b) maintenance of canals and structures (cleaning and repair): and c) collection of water fee necessary for O&M.

Current conditions and actions to be taken by the authorities concerned for each issue are shown below (see Annex G for more details):

### Water Distribution

#### Current Conditions

1. Four Marinos are traditionally responsible for water distribution at the main canal.
2. Water volume is quite sufficient in wet season.
3. Few farmers traditionally cultivated rice in dry season.

#### Actions to be taken

1. There is already a traditional way to distribute water in dry season – no urgent action is needed except training Marinos for gate control to avoid over-flow of water.
2. There should be a market or other incentives for the farmers to cultivate rice in dry season. It is not yet known to what extent the farmers are motivated for making a profit – no urgent action is needed.

### Maintenance of Canals and Structures (cleaning and repair)

#### Current Conditions

1. Huge volume of sands and silts are flowing into canals.
2. The farmers are traditionally organized for cleaning main and secondary canals by the Marinos.

#### Actions to be taken

1. Regular cleaning of the canals is important. If by manual, the farmers are traditionally mobilized to clean it. - No urgent action is needed.
2. However, if cleaning by machine, training for machine operation and maintenance is needed as they are not accustomed to.

### Collection of Water Fee for the O&M

#### Current Conditions

1. There is no budget source for the O&M of the System, because of no collection of water fee from farmers.
2. Farmers traditionally pay water fee to the Marinos in form of paddy.

#### Actions to be taken

1. Water fee should be collected from the farmers for making sure O&M is done. All the farmers using the System should understand and agree to pay water fee. Awareness building is necessary.
2. The suitable system to collect water fee should be established. Collection should be started as early as possible.
3. Training on financial and other management should be provided to the WUA officers.

The most urgent matter is the collection of water fee from the farmers using the Irrigation System. The authorities concerned should take strong actions for this since the farmers themselves may not feel its urgency and therefore may not take actions by themselves. Top-down actions rather than bottom-up one are necessary for this issue.

## **4.2 Reflections to the Agricultural Development Plan in East Timor**

During the Indonesian Time, farmers in East Timor were said to be oppressed, e.g. they were prohibited to have a meeting without permission, by the-then-government. On the other hand, seeds and fertilizers were given to the farmers free or at cheap rates, and also their harvests were purchased at the fixed rates. It can be said that the farmers were well protected by the government. After the independence, however, the farmers cannot expect such protections any more since the resources of the country as well as the government at present are severely limited. Moreover, the farmers are facing more difficulties since imported and cheap rice is now penetrating into the markets.

The Study Team therefore considers that agriculture in East Timor should be directed for realizing at the earliest time such situations as “the farmers become independent” and then “they become able to maintain the same or enjoy better living standards than they could in the Indonesian Time”. In the Agricultural Development Plan, it should be clear what is needed and what roles the outsiders have for making those happen. The following considers those issues from the view points of rice production technologies and organizing farmers.

### **1) Production Technology of Rice**

#### **a) Agronomic Research**

It seems that so many local paddy rice varieties are cultivated in East Timor, but there are no research organizations to collect fundamental knowledge of their ecosystems. Without the accumulation of basic knowledge on native paddy rice varieties, the improvement of paddy rice cultivation technology makes progress very slowly. Therefore it is recommended to take following actions at national level.

- To accelerate the research on various rice ecosystems and local technologies in the country, it is necessary to establish a research center for paddy rice.
- In the center, research on appropriate production technologies and varieties of paddy rice according to local environments should be immediately commenced.

#### **b) Multiplication and Dissemination of Certified Seeds**

As observed in Manatuto, mixed paddy rice seeds are widely cultivated in paddy fields. Because there are no seed multiplication centers within the country, it is inevitable to import certified seeds from abroad to disseminate good quality seeds. To distribute good quality seeds all over the country, it is suggested to take following measures at national level.

- To make certified seeds available domestically, it is necessary to launch a rice seeds multiplication center which produces certified seeds to farmers.

- To deliver certified seeds all over the country, it is necessary to establish seeds dissemination system either commercially or publicly.

### c) Agricultural Inputs

To make agricultural inputs more available in East Timor, several measures can be taken by the government side. For instance, if the government reduce/remove import duties for agricultural inputs, the prices of the inputs become cheaper. Also time-limited subsidies for agricultural inputs are one of options to spread these inputs in the country. Although subsidies are not currently common in the world economy, it is worth considering under the present food security conditions in East Timor (needs to import its staple food, rice, from abroad to feed the people).

Not only by importing products, government should investigate the possibility of development of domestic manufacturing industries for these inputs in the long term. Although the development of agricultural chemicals industry needs some term because it needs expansion of related industries, the development of fertilizer industry is easier if raw materials are available domestically or imported cheaply.

Moreover the utilization of natural fertilizer made from local materials should be promoted. At present, very few farmers use locally available materials such as animal dung and paddy husks. Although the effects of organic fertilizer (e.g. farmyard manure) are not remarkable as compared to chemical fertilizer, it helps to improve physical conditions of soil and to supply some nutrients that are taken away in the form of grains into the soil.

## 2) Farm Machinery

It will be necessary to accelerate the farm mechanization to increase agricultural productivity for food security and self-reliance in East Timor within the limited human power. To cope with these requirements, it is recommended to establish the farm machinery training and hiring center aiming at effective utilization of many useable farm machineries donated by foreign donors to the East Timor under the emergency and humanitarian assistances. Proposed sites are four stations: Dilim western, central and eastern regions. These requirements are proved by the implementation of the Pilot Project, in which rental systems of farm machinery could be managed independently under the sustainable situations.

Although major activities of the farm machinery training and hiring center are given below, mechanical works targeted in the immediate future are: a) preparation of nursery bed, b) cultivation/puddling, c) disease and pest control, d) threshing by machine with higher separation /cleaning capacity, e) milling for marketable and competitive quality rice against imported rice, f) transport and marketing, etc.

### Major Activities

- To hold workshops with front line extension offers and leading farmers
- To promote capacity building
- To consolidate training, hiring machinery and support facilities (post- harvest equipment and facilities such as rice mill, dryer, warehouse) to support reconstruction of farm

- produce marketing channel,
- To train repair technology
- To inspect and improve the quality and performance of the machinery introduced, for example to reduce the additional cost and labor required for cleaning paddy after threshing.

### 3) Necessary Steps for Capacity Building and Organizing the Farmers

Regarding the necessary steps for capacity building and organizing farmers, the following considerations, which were obtained through the experiences in the Pilot Project, should duly be paid:

**AT FIRST, START ACTIVITIES BY TOP DOWN NOT BOTTOM UP, BY USING IMMEDIATE BENEFITS OF THE FARMERS AS AN INCENTIVE**

As it was recommended in the Development Plan prepared by the Study Team, social preparation is still considered important and should be implemented at the early stage in organizing the farmers. However, only this will have quite limited impacts on building the capacities of the farmers. The farmers look at very immediate benefits, and this is the incentive for which they can be motivated to work. It is therefore recommended that the farmers at first be motivated to move forwards with immediate benefits such as money or other tangibles. For example, any kinds of training will pay some money to the farmers if they attend. They at the same time are given obligations to achieve certain level of comprehension or technical levels at the end, or otherwise less money will be paid. Through this way, they start participating training, and making an effort to build their capacities intentionally or unintentionally. In conclusion, it can be said that the modality of supports should be changed from bottom up to top down, at first with using incentives to motivate the farmers. It should not be expected, from the beginning of the project, that the farmers are already willing to raise their own capacities or have long term thinking for their future.

**WATCH CAREFULLY WHETHER OR NOT A PERSON CAN BE A REAL LEADER, PARTICULARLY WHEN HANDLING MONEY**

A leader should be a person respected by other people, and a person deal with things fairly. It should carefully be watched whether or not a person considered a leader can be really the leader, particularly in transaction of money. In an organization, the officers have many opportunities to be involved in transaction of public money, and it clearly shows to what extent they have the capacity to be the leaders. It should be considered that a project starts with small amount of money if a farmer leader is involved in transaction of money. The project can gradually be expanded as the character and capacity of the leader are enhanced. The farmers organization can become strong only with such leader.

**FOR HAVING THE FARMERS EQUIP WITH THE SENSE OF OWNERSHIP, PARTICIPATORY APPROACH IS NOT MUCH EFFECTIVE, AND THEREFORE STRONG ACTIONS FROM OUTSIDE IS NEEDED.**

To assure sustainability of project activities, it is recommended that the following issues be incorporated in the project from its onset:

- Do not give indications to the farmers that a project is given to them, but explain the farmers that there are responsibilities and rights (benefits), and only those fulfill the responsibilities can enjoy the benefits of project.
- An organization should be started with simple and clear rules. Do not try to decide many things at once. Unfortunately, the agreement has not been important traditionally for the farmers, and this mentality should be somehow changed through the project.
- For keeping the interests of the farmers on project, incorporate in the project the activities which can show within the short time the immediate benefits for the farmers. Do not expect the farmers' enthusiasm, but pull out their willingness with the incentives (immediate benefits).
- The supports of the government as well as NGOs to the farmers cannot be much expected since their resources and capacities are quite poor. Therefore, while their capacities should be more strengthened, donors should assist projects for long term. Or else, it should be considered projects can continuously show whatever incentives to the farmers.

#### **4) Donor's Supports to the MAFF Activities for Agricultural Extension Services**

In the Minimum-Scale Development, which has been described in the Development Plan Report, agricultural extension and supporting services to farmers were stated as a one of the urgent and prerequisite activities of the MAFF. However, under the current severe situations of the MAFF limited budgets allocated to agricultural sector and absolute shortage of staff, it is considered to be difficult for the MAFF to implement these activities effectively and timely. Therefore, the MAFF should request to the related donors to make support these agricultural extension and supporting services for farmers. Furthermore, from the view point of long-term development in case of the Full-Scale Development, program for capacity building-up for the targets of government staff, NGOs, farmers representatives should be formulated by the MAFF.

#### **5) Implementation of Agricultural and Rural Development Projects**

According to the obtained information, production of rainfed maize and paddy decreased due to two-year consecutive drought, and as a result rice importation in 2003 is drastically increased.

In case of the Minimum-Scale Development described in the Development Plan Report, supply and demand analyses for the development scenario during target period of 2007 were made. For an increase in rice production, 22 irrigation schemes (2,450 ha in total), which are categorized into the non-functional irrigation scheme with lightly to medium-damaged of irrigation facilities, were recommended to be rehabilitated with an assistances of related foreign donors. Out of these irrigation schemes, the World Bank is currently rehabilitating four schemes. Other seven schemes would be rehabilitated until the end of the year 2002 under TFET budget. On the other hand, for an increase in maize production, which is main staple food in East Timor, production increase was recommended to be realized by an increase in unit yield and the improvement of post-harvest losses.

Out of these recommendations, especially regarding an increase in rice production, possibility to achieve a planned unit yield of rice of 2.5-3.0 ton/ha, which was set-up in the Development Plan was verified through the implementation of the Pilot Project. Furthermore, by the implementation of rehabilitation works of irrigation facilities in the Laolo Irrigation System, farmers presented their willingness to expand cultivation areas utilizing diverted irrigation water (cropping area in 2003 is 420 ha, while it was 187 ha in 2002, out of total areas of 660 ha.)

Under the situations, it could be recommended that rehabilitation works of current non-functional irrigation schemes with lightly to medium-damaged of irrigation facilities are effective measures to cope with the solution for shortages of the staple foods in the country. In the project planning of the rehabilitation works for irrigation systems, comprehensive agricultural and rural development plans should be formulated considering the components of watershed conservation and management, irrigation water management, land-use and crop cultivation, establishment and strengthening of farmers groups, etc.

To meet the requirements for the agricultural and rural development in the country, the MAFF should promote more rehabilitation projects for irrigation schemes with the assistances given by the related donors.

## **CHAPTER I. IDENTIFICATION OF THE PILOT PROJECT**





## **CHAPTER I. IDENTIFICATION OF THE PILOT PROJECT**

### **1.1 Background of the Pilot Project**

The Mid-Term Integrated Agricultural Development Plan has been formulated during the Phase-I period, and the Plan emphasized the increase of rice production as well as upland crops such as maize for meeting the food demand of the country. The formulation of the Agricultural Development Plan was followed by the implementation of the Pilot Project emphasizing on the irrigated rice cultivation during the Phase-II period. The Pilot Project has taken the following issues into account:

- To verify the validity of the development plan,
- To transfer the technologies and build the capacities of the relevant agencies and staff as well as the farmers on irrigated rice cultivation, and
- To reflect the lessons learned from the Pilot Project on agricultural development in East Timor

In order to commence the Pilot Project, preparation works have been carried out by JICA Study Team from the middle of November 2002 to the end of December 2002 in Laclo Irrigation System in Manatuto as a first stage of the Pilot Project, in collaboration with MAFF, Manatuto district office, representative farmer's group, CARE, etc.

As a second stage followed by the preparation works mentioned above, an actual implementation of the Pilot Project was done from the beginning of January 2003 to the middle of March 2003. And, as a monitoring and evaluation stage of the Pilot Project, a third step of field works for the Pilot Project was done from the middle of April 2003 to the beginning of July 2003.

This Completion Report summarizes the Study Team activities and observation results obtained through the implementation of the Pilot Project during the above-mentioned stages.

### **1.2 Selection of the Pilot Project Site**

The Pilot Project area was selected in the Inkeru secondary irrigation canal under the Laclo Irrigation System, considering the following conditions:

#### Project Nature

Since the Pilot Project shall be implemented for less than one year, the Project should be consisted of the components, which are able to show immediate and positive results in the short-term.

Although the Pilot Projects' periods are short, the activities involved in the Project

should be continued even after the Pilot Project is over. For the continuation and sustainability of the Pilot Project, therefore: a) the possible funding sources should be identified, and b) the involvement of NGOs experienced in agricultural development and familiar with the project areas should be explored.

### Community Conditions

The following conditions were carefully checked in the candidate communities:

- The community people are not desperately struggling to obtain the basic human needs such as water and food. They should be able to afford to participate to the project activities.
- The communities were not seriously damaged or have recovered from the damage of 1999, physically and psychologically.
- The local leaders are identifiable and well respected by the community people.
- The community people are eager to improve their agriculture and willing to receive the projects.
- The community people have the intention to organize themselves into groups for the implementation of the projects, if not yet organized.
- There is no serious conflict on land ownership. The owners of the land can be clearly identified.
- The communities are located at or near the center of the region or area and easy to access so that the demonstration effects of the Pilot Projects can be expected.

## **1.3 Framework and Implementation Schedule of the Project**

### **1.3.1 Main Objectives**

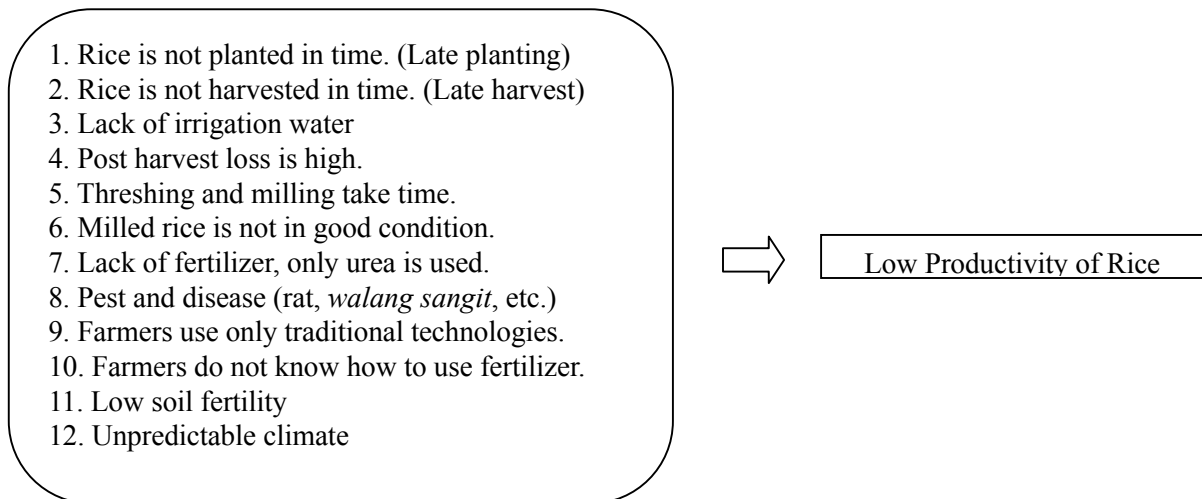
The Pilot Project was implemented as part of human resources development, main subject of this Study, and its main objective was to raise the capacities of the farmers necessary for rice production and management of relevant farmers' organizations. The intension of the Pilot Project was to lay the foundation for the farmers to become able to alleviate their problems in future based on the experience of the Pilot Project. It was therefore repeatedly emphasized to the participating farmers that the Pilot Project was not intending to give them things away since they could be used only for a short time, but rather to strengthen their abilities, which could last for a long time.

### **1.3.2 Project Concepts**

The Pilot Project had two major concepts. One was "Participation". The Project was highly participatory, and therefore required active participation and commitments of the farmers as well as the responsible officers at all stages of the project. Another concept was "Cost-Sharing". The Project intended to introduce a cost-sharing system which requires the users to pay for what they are benefited.

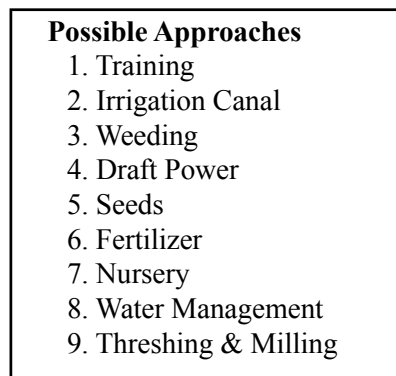
### 1.3.3 Identified Problems in the Area

According to the results of the planning workshop with the farmers in the project area, their most serious concern was identified as “low productivity of rice”. The low productivity was considered to be caused directly by the following problems (refer to the problems tree in Annex C) :



### 1.3.4 Project Approaches

To tackle these problems, the possible approaches of the Pproject were identified and classified into the following nine groups (refer to the objectives tree in Annex C) :



To take care as many problems of the farmers as possible and contribute to the project’s objective of their capacity building, all of the above approaches were included in the project plan, integrating them into the following four components:

- (1) **Production Technologies of Rice:** Through the on-farm experimentation, rice cultivation technologies suitable for the project area are found, and the farmers understand those

technologies (The approaches of weeding, seeds, fertilizer and nursery were included).

- (2) **Farm Mechanization:** The farmers in the area understand the use and maintenance of farm machineries (power tillers, threshers and rice mills) (The approaches of draft power and threshing & milling were included).
- (3) **Irrigation Canal:** The farmers in the area understand how on-farm canals such as secondary and tertiary canals are designed and maintained (The approach of threshing & milling was included).
- (4) **Water Management:** The knowledge and practices of water management, including the WUA's activities, is extended among the farmers (The approach of water management was included).

Note: The training approach was included in all components.

### **1.3.5 Project Targets**

The project activities were concentrated on one of the secondary canals called Inkeru, and a demonstration farm was established along it.

It is expected that the knowledge and skills provided to the farmers by the Pilot Project be gradually extended to other farmers in the project area. All the farmers in Laclo Irrigation System are therefore considered as the project beneficiaries. To provide the necessary trainings efficiently, the participating farmers were selected from various areas of Laclo Irrigation System as the representatives of each area as well as the direct targets of the project. The participating farmers differed depending on the project components.

### **1.3.6 Project Activities**

The details of the project activities plan are shown in Table 1.3-1 as the Project Design Matrix (PDM). This PDM was prepared based on the discussion with the farmers.

### **1.3.7 Implementation Schedule**

The implementation schedule of the Pilot Project is shown in Table 1.3-2 (Plan of Operations). The implementation period was for nine months from November 2002 to July 2003, namely the 2002-03 rainy seasons. Since irrigation water was expected to be available from early January 2003 according to the UNOPS's construction schedule, the project's activities were brought to the full-scale from January 2003, and completed at the beginning of July 2003.

**Table 1.3-1 Project Design Matrix (PDM)**

Name of the Project : Pilot Project for Irrigated Rice Production  
 Target Area : Lacro Irrigation System, Manatuto District  
 Target Group : Farmers located in Lacro Irrigation System  
 Project Period : November 2002 to July 2003 (9 months)

Project Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p><b>Overall Goal</b> Productivity of rice in the target area is improved.</p>	Rice production in the area increases to 3.0 tons/season.	Village Survey	<ul style="list-style-type: none"> <li>- The current government is stable.</li> </ul>
<p><b>Project Purpose</b> The capacities of the farmers in the area for rice production and management of farmers' groups are enhanced.</p>	The average scores in "Self Assessment of Capacities" are improved in more than half of the target farmers.	Self Assessment of Capacities	<ul style="list-style-type: none"> <li>- The supply-demand balance and market price of rice are not significantly fluctuating.</li> <li>- The purchase prices of agricultural inputs do not sharply increase.</li> <li>- After the Pilot Project, the support to the farmers in the area continues by a project.</li> </ul>
<p><b>Outputs</b> 1. <b>Production Technologies of Rice:</b> Through the on-farm experimentation, rice cultivation technologies are found to suit the area, and the farmers understand them.</p>	<p>1-1. More than half of the participating farmers understand both the merits and demerits of local/improved rice varieties.                      1-2. The appropriate fertilizer application levels for the varieties used are identified.                      1-3. More than half of the participating farmers adequately understand the positive effects of weeding and row transplanting.</p>	Baseline survey Monitoring survey Evaluation survey	<ul style="list-style-type: none"> <li>- The participating farmers to the project extend the knowledge and skills obtained through the project to other farmers in their responsible areas.</li> </ul>

<p><b>2. Farm Mechanization:</b> The farmers in the area understand the use and maintenance of farm machineries (power tillers, threshers and rice mills)</p>	<p>2-1. The labor productivity is increased by not less than 40% through partial farm mechanization (land preparation, threshing and milling).  2-2. The trainings on farm mechanization (operation and repair) are conducted in total of ? days.  2-3. At least 9 farmers can operate the machineries by themselves for plowing, threshing and milling.  2-4. The plan of the hiring system of farm machinery is prepared through the analysis of its possibilities.  2-5. The rate of broken rice is reduced by 60 % of the present rate to help local marketing of rice in Manatuto.  3-1. The on-farm maintenance schedule is prepared.  3-2. The farmers provide labor free of charge to renovate and clean the canal in total of ? persons and ? days.  3-3. The trainings on canal design are conducted in total of ? days.  3-4. The irrigated areas are expanded to ? ha by improving the canals.</p>	<p>Baseline survey  Monitoring survey  Evaluation survey</p>	
<p><b>3. Irrigation Canal:</b> The farmers in the area understand how on-farm canals such as secondary and tertiary canals are designed, renovated and maintained.</p>	<p>4-1. The water management schedule is prepared (including the rule of water fee collection &amp; use)  4-2. The training program for better water management is prepared (awareness campaign for the farmers, water management, and accounting and financial management)  4-3. The trainings on water management are conducted in total of ? days.  4-4. After the harvest, the water fees are collected from the farmers.  4-5. The list of suggestions to the UNOPS is prepared for the improvement of the O&amp;M Manual prepared by the UNOPS.  4-6. ?% of the farmers positively assess that available irrigation water increases through the cooperation among the neighboring farmers, compared with the period in and before 1996.</p>	<p>Baseline survey  Monitoring survey  Evaluation survey</p>	
<p><b>4. Water Management:</b> The knowledge and practices of water management, including the WUA's operations, is extended among the farmers.</p>		<p>Baseline survey  Monitoring survey  Evaluation survey</p>	

<p><b>Activities (Common Activities)</b></p> <p>0-1 Through the workshop, the problems and needs of the farmers are discussed and identified with the farmers, and the approach and implementation plan of the Pilot Project are formulated.</p> <p>0-2 The names of the farmers participating in the project are listed up, and the leaders are selected.</p> <p>0-3 The roles and responsibilities among the farmers, the district officers, JICA Study Team, and NGO (CARE) are made clear for the project implementation.</p> <p>0-4 The baseline surveys are conducted.</p> <p>0-5 A house for training and storing inputs and other materials is constructed.</p> <p>0-6 The project progress is monitored, reviewed and, if necessary, the implementation plan is adjusted.</p> <p>0-7 The project performance is evaluated.</p> <p><b>(Specific Activities)</b></p> <p><b>1. Production Technologies of Rice</b></p> <p>1-1 Demonstration Farm</p> <p>1-1-1 The plan for the demonstration farm is discussed and prepared.</p> <p>1-1-2 The demonstration farm is prepared.</p> <p>1-1-3 Rice seeds are prepared.</p> <p>1-1-4 Nursery beds are prepared.</p> <p>1-1-5 Land preparation is done on time.</p> <p>1-1-6 Seedlings are transplanted in accordance with the experimental design.</p> <p>1-1-7 Fertilizers are applied in accordance with the experimental design.</p> <p>1-1-8 Weeding is done in accordance with the experimental design.</p> <p>1-1-9 Paddy is harvested.</p> <p>1-1-10 Data are collected after the harvest.</p>	<p><b>Inputs</b></p> <p><b>1. Japanese side</b></p> <ul style="list-style-type: none"> <li>- JICA Study Team – seven experts</li> <li>- Employment of local experts (NGO) – three experts from CARE and one expert from ex-Mobile Brigade</li> <li>- Costs and Materials – as listed</li> <li>- C/P training in Japan</li> </ul> <p><b>2. East Timor’s side</b></p> <p>(1) Central government</p> <ul style="list-style-type: none"> <li>- Nominated staff in MAFF for coordinating activities among the relevant agencies, JICA Study Team, etc.</li> </ul> <p>(2) District government of Manatuto</p> <ul style="list-style-type: none"> <li>- Nominated staff in Manatuto District and Sub-District governments for coordinating activities among the relevant local agencies, the WUA, farmers, JICA Study Team, etc.</li> <li>- Technical assistance for canal improvement by the District Irrigation Officer</li> <li>- Office space for JICA Study Team</li> </ul> <p>(3) WUA and Farmers</p> <ul style="list-style-type: none"> <li>- Participation to the project as the representatives of the areas</li> <li>- Labor as agreed</li> <li>- Part of the project cost as agreed (cost-sharing)</li> </ul>	<ul style="list-style-type: none"> <li>- Serious flood and draught do not occur in the area.</li> <li>- Serious damages from diseases, insects and rats do not occur in the area.</li> </ul>
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<p>1-2 Study Tour</p> <p>1-2-1 The plan for the study tours is discussed and prepared.</p> <p>1-2-2 The study tours are conducted.</p>	<p><b>2. Farm Mechanization</b></p> <p>2-1 The training plan for farm mechanization is discussed and prepared.</p> <p>2-2 Training of power tiller operation and trouble shooting is conducted.</p> <p>2-3 Training of thresher operation and trouble shooting is conducted.</p> <p>2-4 Training of rice mill operation and trouble shooting is conducted.</p> <p>2-5 Plowing, threshing and milling are conducted under the contract with the farmers.</p> <p>2-6 The plan of the hiring system of farm machineries is discussed and prepared with the DAO.</p> <p>2-7 Technical and economic data are collected.</p> <p>2-8 The impact is analyzed on easing the peak of labor requirement during the period between harvesting and the coming land preparation.</p> <p>2-9 Labor productivities of traditional and mechanized farming are analyzed.</p> <p><b>3. Irrigation Canal</b></p> <p>3-1 The longitudinal and cross section surveys are done on the selected secondary canal.</p> <p>3-2 The canal design is done.</p> <p>3-3 The schedule for on-farm maintenance is discussed and prepared.</p> <p>3-4 Maintenance works (including canal cleaning) are done.</p>
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<p><b>4. Water Management</b></p> <p>4-1 The current water management practices and WUA's functions are discussed with the farmers and WUA leaders.</p> <p>4-2 The training plan for water management is discussed and prepared.</p> <p>4-3 The schedule for water management is discussed and prepared.</p> <p>4-4 The water fee collection and use are discussed, and the rule is made.</p> <p>4-5 The training of water management is conducted through rice production period.</p> <p>4-6 If possible, the water fee is collected after harvest.</p> <p>4-7 The O&amp;M Manual prepared by the UNOPS is reviewed and commented.</p>	<p><b>Preconditions</b></p> <ul style="list-style-type: none"> <li>- The farmers in the area agree to implement the Pilot Project.</li> <li>- The rehabilitation works of UNOPS are completed as scheduled so that irrigation is started from January 1, 2003.</li> <li>- The security condition of the area is maintained.</li> <li>- The power tillers are available for the project from the Mobile Brigade.</li> </ul>
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Table 1.3-2 Plan of Operation (PO) for the Pilot Project

Activities	Expected Results	Schedule										Responsible Person(s), Group	Inputs			Necessary Conditions	
		2002		2003							Personnel		Goods/Materials	Funds			
		11	12	1	2	3	4	5	6	7							
<b>Activities (Common Activities)</b>																	
0-1	Through the workshop, the problems and needs of the farmers are discussed and identified with the farmers, and the approach and implementation plan of the pilot project are formulated.		■										Okabe (JICA)	JICA Study Team (ST) Representative farmers WUA leaders MAFF Officers (Central) District officers CARE(NGO)			
0-2	The names of the farmers participating in the project are listed up, and the leaders are selected.		■										Sebastiano de Carvalho (farmer)	Representative farmers			
0-3	The roles and responsibilities among the farmers, the district officers, JICA Study Team, and NGO (CARE) are made clear for the project implementation.		■										Takeuchi (JICA)	JICA ST Representative farmers WUA leaders MAFF Officers (Central) District officers CARE			
0-4	The socioeconomic survey is conducted.		■										Natsuda (JICA)				
0-5	A house for training and storing inputs and other materials is constructed.		■										Ieizumi (JICA)	Sebastiano de Carvalho Representative farmers	Materials (J) Land (Sebastiano) Labor (F)		
0-6	The project progress is monitored, reviewed and, if necessary, the implementation plan is adjusted.					■				■			Takeuchi (JICA)	JICA ST Representative farmers WUA leaders MAFF Officers (Central) District officers CARE			
0-7	The project performance is evaluated.												Takeuchi (JICA)	- ditto -			
<b>(Specific Activities)</b>																	
<b>1. Production Technologies of Rice</b>																	
1-1	Demonstration Farm												Iizuka (JICA) Caitano (CARE) Sebastiao de Carvalho (farmer) Mario Oto (farmer) Luis Fernandes (farmer)	The initial targets are 35 farmers, divided into 3 groups (as listed)			
1-1-1	The plan for the demonstration farm is discussed and prepared.		■												Training materials (J)		
1-1-2	The demonstration farm is prepared.		■												Land (Sebastiano)		
1-1-3	Rice seeds are prepared.			■											IR 64 (J) Local varieties (F)	Cost sharing of IR 64 bet. J and F	
1-1-4	Nursery beds are prepared.				■										Labor (F)		
1-1-5	Land preparation is done on time.				■										Labor (F)		

Activities	Expected Results	Schedule										Responsible Person(s), Group	Inputs			Necessary Conditions
		2002		2003							Personnel		Goods/Materials	Funds		
		11	12	1	2	3	4	5	6	7						
1- 1- 6 Seedlings are transplanted in accordance with the experimental design.	Transplanting is completed.				■							Iizuka (JICA) Caitano (CARE) Sebastiao de Carvalho (farmer) Mario Oto (farmer) Luis Fernandes (farmer)	The initial targets are 35 farmers, divided into 3 groups (as listed)	Labor (F)		
1- 1- 7 Fertilizers are applied in accordance with the experimental design.	Fertilizers are applied according to the plan.				■	■								Fertilizers (J)	Cost sharing of fertilizers bet. J and F	
1- 1- 8 Weeding is done in accordance with the experimental design.	Weeding is done according to the plan.					■	■							Labor (F)		
1- 1- 9 Paddy is harvested.														Labor (F)		
1- 1- 10 Data are collected after the harvest.																
1- 2 Study Tour												Iizuka (JICA) Caitano (CARE) Sebastiao de Carvalho (farmer) Mario Oto (farmer) Luis Fernandes (farmer)	The participants of the study tours are 100 in total. (20 people x 5 times)			
1- 2- 1 The plan for the study tours is discussed and prepared.			■													
1- 2- 2 The study tours are conducted.	Study tours are conducted once a month (ave.).			■								Study tours including transportation and lunch (J)				
<b>2. Farm mechanization</b>												Tamura (JICA) Adalberto (CARE) Sebastiao de Carvalho (farmer) Mario Oto (farmer) Luis Fernandes (farmer)	The initial targets are 35 farmers, divided into 3 groups (as listed)			
2- 1 The training plan for farm mechanization is discussed and prepared.	The plan is prepared.		■											Training materials (J)		
2- 2 Training of power tiller operation and trouble shooting is conducted.	The training is conducted.			■										2 tractors, thresher, mobile rice mill (J) Fuel, spare parts (J) Operators (J)	Cost sharing of fuel bet. J and F	After the project, two tractors will be returned to MB. Thresher and rice mill are handed over to the reliable groups, or the district office.
2- 3 Training of thresher operation and trouble shooting is conducted.	The training is conducted.					■										
2- 4 Training of rice mill operation and trouble shooting is conducted.	The training is conducted.									■						
2- 5 Plowing, threshing and milling are conducted under the contract with the farmers.	Rental fees of farm machineries are collected.			■												
2- 6 The plan of the hiring system of farm machineries is discussed and prepared with the DAO.	The plan is prepared.			■												
2- 7 Technical and economic data is collected.	The data is collected.			■												
2- 8 The impact is analyzed on easing the peak of labor requirement during the period between harvesting and the coming land preparation.	The analysis report is prepared.															
2- 9 Labor productivities of traditional and mechanized farming are analyzed.	The analysis report is prepared.											■				

Activities	Expected Results	Schedule										Responsible Person(s), Group	Inputs			Necessary Conditions
		2002		2003							Personnel		Goods/Materials	Funds		
		11	12	1	2	3	4	5	6	7						
<b>3. Irrigation Canal</b>												Ieizumi/Takeuchi (JICA) Thomas (CARE) Sebastiao de Carvalho (farmer) Mario Oto (farmer) Luis Fernandes (farmer)	The initial targets are 25 farmers in the area (as listed).			
3-1	The longitudinal and cross section surveys are done on the selected secondary canal.	The survey of Inkeru canal (secondary canal) is done.	■													
3-2	The canal design is done.	The design is done.	■													
3-3	The schedule for on- farm maintenance is discussed and prepared.	The schedule is prepared.	■													
3-4	Maintenance works (including canal cleaning) are done.	Inkeru canal is cleaned and maintained according to the design.		▨										Cement for D/B, Shovel (30), Hoe (35), Aiswak (35), Machete (35) by J, Labor (F)	Cost shring - Farmers share the costs of Hoe (18) and Aiswak (50% and stick)	
<b>4. Water Management</b>												Okabe (JICA) Thomas (CARE) Sebastiao de Carvalho (farmer) Mario Oto (farmer) Luis Fernandes (farmer)	(1) The initial targets are 43 to 60 farmers for on-farm water management. (as listed)  (2) The targets are the WUA officers, marinos, leaders of all secondary canals for water management. (as listed)			
4-1	The current water management practices and WUA's functions are discussed with the farmers and WUA leaders.	The key issues to be tackled by the project are identified.		▨												
4-2	The training plan for water management is discussed and prepared.	The plan is prepared.		▨							Training materials (J)					
4-3	The schedule for water management is discussed and prepared.	The schedule is prepared.			▨											
4-4	The water fee collection and use are discussed, and the rule is made.	The rule is made.		▨												
4-5	The training of water management is conducted through rice production period.	The training is conducted.			▨									Labor (F)		
4-6	If possible, the water fee is collected after harvest.	Water fee is collected.								■				Water fee (F)		
4-7	The O&M Manual prepared by the UNOPS is reviewed with the farmers and commented for its improvement.	The list of suggestions to the UNOPS is prepared.			▨											

J: JICA Study Team, F: Farmers  
D/B: Division Box

**CHAPTER II.**  
**PRESENT SITUATIONS AROUND THE PILOT**  
**PROJECT AREA**



## CHAPTER II. PRESENT SITUATIONS AROUND THE PILOT PROJECT AREA

### 2.1 Location and Topography

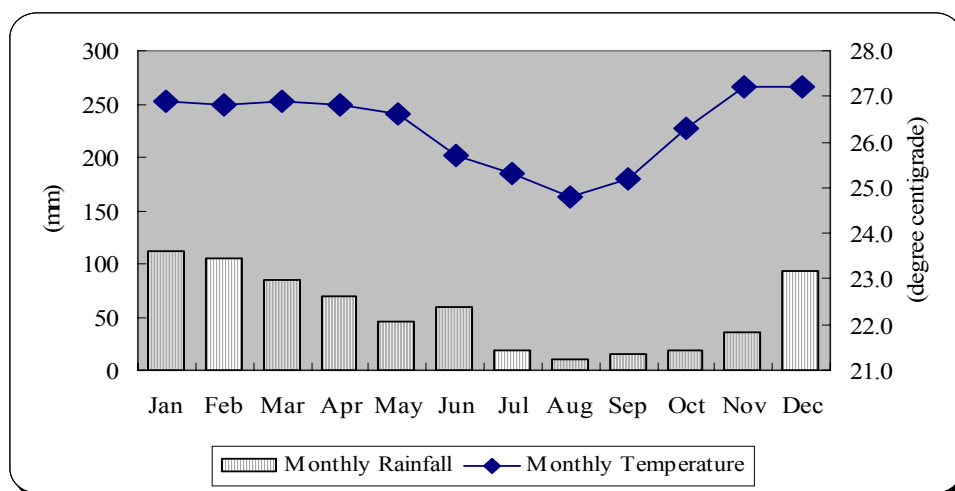
Adjoining to Manatuto town, the Laclo Irrigation System lies 50 km east of Dili city and is located on the downstream of the Laclo river, which flows into the north of Manatuto district, where lowland irrigated rice production is widely spread with a big potential to produce rice. The irrigation area of 660 ha in the System lies at the right bank of the Laclo river. Total households in the area are more than 350 farmers in four villages, namely, Ateas, Ailili, Sau and Maabat, all in Manatuto Sub-District

### 2.2 Climate and Hydrology

#### 2.2.1 Climate

In Manatuto, annual rainfall records less than 700 mm. Rainy season normally starts in December and lasts until June, but monthly rainfall exceeds 100 mm only in January and February. About 60 percent of annual rainfall concentrates in four months, from December to March.

Figure 2.1-1 Climate Data in Manatuto



#### 2.2.2 Hydrology

The Pilot Project site is the area covered by the Laclo Irrigation System located in Manatuto Sub-District, Manatuto District. The Laclo Irrigation System diverts water from the Laclo river and conveys irrigation water to the farm land. Major dimension of Laclo river is as follows:

- Catchment area : 1,366 sq.km
- River length : 98 km
- Annual run-off : 268.8 million cu.m

The Irrigation Ssystem covers 660 ha of paddy field that has not been irrigated since 1996, except for a part of the area irrigated since early 2001. In 1996, floods destroyed the siphon crossing the main branch of the Sumasse river and the overhead flume crossing its secondary branch. In October 2000, temporary diversion of irrigation water from the Sumasse river was available through the construction of an emergency canal implemented under the Phase I of the Urgent Irrigation Rehabilitation Project (UIRP). The Phase I works of the UIRP have been implemented in October 2001 by the UNOPS with the funding from the Japanese Government.

The design stage of the Phase II of the UIRP was then completed, which covers the design of a new siphon and appurtenant structures that cross the water from the Laclo river under the branches of the Sumasse river. Construction of the Phase II major works was done from the mid-year through the end of 2002. The Laclo Irrigation System, from the Laclo river Intake to its commanding farmlands, has been fully functional since January 2003. Construction of the remaining works of the Phase II was started and is expected to be completed by the end of October 2003.

According to the analysis of available minimum run-off discharges of the Laclo river<sup>1</sup>, discharge of 3.73 cu.m/sec is estimated during the dry season from July to November.

### 2.3 Soil and Land Use

In general, soils in the beneficiary areas of Laclo Irrigation System are very silty because the irrigation water from the Laclo river contains a large amount of silt. Although the on-going rehabilitation works of the Laclo Irrigation System by UNOPS constructed a temporary settling basin, it seems that the basin is full of accumulated silt. Accordingly much silt is flowing into paddy fields and is deposited in each paddy field.

During the Pilot Project implementation period, the Study Team took three soil samples for chemical analysis. It was done to clarify the contents of nitrogen (N), phosphorus (P<sub>2</sub>O<sub>5</sub>) and potassium (K<sub>2</sub>O) in the soils from the demonstration plots. Because the chemical analysis for soil samples was not possible here in East Timor (there are no laboratories), the analysis was requested to the Center for Soil and Agro-climate, Bogor, Indonesia. The analysis results are shown below.

Table 2.3-1 Results of Soil Chemical Analysis

Sample	N (%)	P <sub>2</sub> O <sub>5</sub> (Olsen) (ppm)	P <sub>2</sub> O <sub>5</sub> (Bray1) (ppm)	K <sub>2</sub> O (Morgan) (ppm)
X	0.07	7.8	4.5	94.0
Y	0.07	6.1	3.8	94.1
Z	0.04	5.8	3.8	83.7

Source: JICA Study Team

<sup>1</sup> "Detailed Design Report" of UNOPS-UIRP prepared by UNTAET in December 2001

According to the soil analysis data, the soil nutrient conditions in the demonstration plots seem to be not fertile, rather poor. Also it could be stated that the nutrient conditions seem to be richer in the plots near a secondary canal than the plots far from a secondary canal since the three plots (X, Y and Z) are located in a row from a secondary canal.

As for land use in beneficiary areas of Laclo Irrigation System, the majority of fields are utilized for paddy cultivation. The results of “Household Survey, Laclo Irrigation System, Manatuto District” which was done by JICA-CARE in May/June 2003 through interviews of all members of the Water User Association indicate the cultivated area in this year amounts to 420 ha (225 %) in total while it was only 187 ha (100 %) in the year 2002. This more than double increase in cultivation area compared to the last year primarily results from the rehabilitation of the irrigation system by UNOPS, which enables to take irrigation water from the Laclo river.

In some areas where irrigation water is not available due to high elevation, upland fields - mainly for maize - are observed but they are very few in the area. Although many farmers live in the center of Manatuto town, some of them live near their paddy fields. They often cultivate vegetables around their houses but the production is mainly for home consumption.

## 2.4 Farming Practices and Production

After the 1996 flood of the Sumasse river, which destroyed irrigation facilities of the Laclo Irrigation System, farmers in the area struggled to produce paddy rice with scarce irrigation water. Therefore many paddy fields had not been cultivated for about seven years (1996-2002). This year, irrigation water from the Laclo river is available for the first time in eight years and the areas for paddy cultivation drastically increased as stated in the paragraph 2.3.

Generally the farming practices are highly devoted to paddy cultivation except for backyard garden vegetables. In years with normal rainfall, people prepare their paddy fields from December. Transplanting follows the land preparation and harvesting starts in May and sometimes continues until August since some long duration varieties are planted. Cropping patterns are slightly different before and after the 1996 flood. Examples of the cropping patterns are shown below.

Figure 2.4-1 Cropping Patterns in the Laclo Irrigation System

Month	1	2	3	4	5	6	7	8	9	10	11	12
Paddy Rice (Before 1996)												
Land Preparation	■											
Transplanting	■											
Harvesting					■	■						
Paddy Rice (after 1996)												
Land Preparation	■	■	■									
Transplanting		■	■	■								
											■	■
											■	■



Month	1	2	3	4	5	6	7	8	9	10	11	12
Harvesting					■	■	■	■				
Maize						■	■	■				
Vegetables (onion, lettuce, garlic, mustard, etc.)							■	■	■	■		

Source: Field Interview Survey, JICA Study Team

Before the post-referendum violent incident in 1999, land preparation was commonly done with the specific method with a herd of buffaloes, namely “Rencah”. Under the Rencah system, a herd of buffaloes is forced to trample the soil by walking in circles in the paddy field and three times of Rencah are commonly practiced before transplanting. However, many buffaloes were killed during the violent incident in 1999, which severely decreased the number of buffaloes. Thus many farmers have had difficulties to operate land preparation since 1999.

There are many paddy varieties cultivated in the area. Based on the survey done by the Study Team, there are at least eight varieties in the area, namely IR5, IR8, IR26, IR64, Java, Nippon, Barito and Ikan. Because the release of IR8 (1966) and IR5 (1968) was more than 30 years ago, they may not be original breeds. Among them, one of local varieties, Barito, seems to be most common in the area. It is said that IR64 seeds were distributed by foreign donors/NGOs after the violent incident in 1999 as emergency assistance. Almost every seed of paddy rice is self-kept or obtained from neighboring farmers and farmers do not purchase seeds because there are neither nursery shops nor experimental stations that provide certified seeds.

According to the results of “Household Survey, Lacro Irrigation System, Manatuto District” as mentioned previously, it was proved that very few farmers (5 %) in the area use chemical/natural fertilizer and pesticides. In addition, labor inputs seem to be relatively fewer than the paddy cultivation systems in other Asian countries. For instance, manual weeding is practically the only one weeding method in the area but farmers normally do not do it frequently. Although random transplanting is widely practiced, direct seeding is also practiced. Based on field interviewing, farmers do direct seeding in case they do not have enough labor forces for transplanting.

It is quite common for farmers in Manatuto to perform traditional ceremonies before major farming works. For instance, the Study Team observed that some kind of traditional ceremony is necessary before starting Rencah, harvesting and threshing works. In general, farmers do not proceed to the next farming work until the ceremony concerned finishes. In addition to such traditional ceremony, Study Team observed the following traditional customs through the implementation of the Pilot Project:

- Pulling of seeding, transplanting, harvesting works, etc. are mainly done by women.
- Land preparation, water management works etc., on the other hand, are mainly done by men.
- Many farmers are familiar with various government supports just same as legacy of Indonesia time; for example operation and maintenance of irrigation facilities, marketing of agricultural production, daily allowance for attendance of workshop, etc.

## 2.5 Agricultural Machinery and Draft Animal Power

### 2.5.1 Trends of Rice Importation

Significant diffusion of rice farm mechanization in East Timor enables to release small farmers from heavy labor, to break exploitation system of traditional farming services (Rencah land preparation, contract mechanical threshing and milling), to realize the reduction of production cost by increasing agricultural labor productivity, and to accelerate double cropping in accordance with increase of rice demand. Thus it contributes to improve the food security in East Timor.

Recent trends of rice import deeply affect the necessity of mechanized rice farming and progress of farm mechanization. Immediately after the independence, the WFP carefully studied the demand and supply balance of rice and received approximately 20 thousand tons of rice in 2000. However, in 2001 rice import increased to 27 thousand tons and reached to 32 thousand tons in January - June, 2003. The rice import in 2003 surely exceeds the previous year's annual import volume with the cost of more than four million US dollars.

Rice demand is stronger and it is necessary to reconstruct the destroyed market for agricultural produce and to improve the present informal marketing channel (barter trade among relatives and or neighboring). In addition, it needs to promote post-harvest mechanization to keep the quality competitiveness of local rice against imported one. Import volume is concentrated during March and April. An important matter is a fall in the price of import rice, and average price of imported white rice is 0.131 US\$/kg during six months of 2003 (January - June), which is more competitive in comparison with local paddy price 0.100 US\$/kg when considering additional cost for milling, transport and handling. Major exporters to East Timor are Indonesia, Thailand through Singapore, Vietnam and Australia. The Pilot Project indicates production cost of machinery could be remarkably reduced as compared to that of traditional farming and rapid farm mechanization is required for securing self-reliance by small-scale farmers, the majority in East Timor

Table 2.5.1 Trends of Rice Import

Year	Commercial (A)			WFP (B)		(C)=(A)+(B) Total (ton)
	Volume (ton)	Amount (US\$)	Average Unit Value (US\$/kg)	Volume (ton)	Amount (US\$)	
1999	0	0	0	8,520.80	n.a.	8,520.80
2000	5,318.66	993,357	0.187	14,880.00	n.a.	20,198.66
2001	25,083.26	6,339,347	0.253	2,030.00	n.a.	27,113.26
1) 2002	-	-	-	-	-	-
2) 2003	31,843.58	4,176,474	0.131	0	0	31,843.58

Note:

ton = metric ton, WFP = United Nations World Food Program, 1) missing of original statistics, 2) January ~ June, US\$ based on C.I.F./Dili, n.a. = not available

Source: "Rice Importation" by Border Control Office & National Statistics Office, Ministry of Planning & Finance, WFP "Shipments Received in East Timor"

## 2.5.2 Retail Rice Price

Although inflation rate in East Timor increase retail rice price in 2003 keeps the same level of the previous years at commercial markets. However, local rice is still more expensive than the imported one and rather difficult to get local rice through formal marketing channel (see Table H.1 in Annex H).

## 2.5.3 Current Population of Farm Machinery in East Timor

There are no particular signs for increase of farm machinery and equipment. As described in Table H.2, H.3, H.4 and H.5 in Annex H, current number of major farm machinery in East Timor is roughly estimated as 85-unit of 4-wheel tractor, 520-unit of 2-wheel or hand tractor, 160-unit of thresher, 600-unit of sprayer and 339-unit of rice mill. On the other hand, "Household Survey, Laolo Irrigation System, Manatuto District" done by JICA-CARE, reports that there are no trucks, milling machines, nor hand tractors while there are three units of thresher.

## 2.5.4 Rice Post-Harvest Losses

Total rice post-harvest losses in East Timor are estimated at 46.4 percent as shown below through field survey done by the Study Team, of which reduction is one of farm mechanization objectives:

Table 2.5.2 Rice Post-Harvest Losses of Paddy in East Timor

Rice Farming Services	Post-Harvest Losses (%)	Remarks
Harvesting	2.0	Shattering loss
Drying on the field & levee	0.5	
Threshing	2.0	Manual & partially by machine
Drying after threshing	0.1	
Milling	40.0	60 % recovery
Storage	1.8	
Total	46.4	

Source : Estimation by JICA Study Team

## 2.5.5 Draft Animal Power of Buffaloes

Based on the above-mentioned JICA-CARE report, numbers of animals being raised in the Laolo Irrigation System including the Pilot Project area are 1,916 chickens, 604 pigs, 1,219 sheep, 812 goats, 21 cows and 1,262 buffaloes (total 62 households, average four heads/household and 24 households holding over 20 heads available to work as Rencah).

Buffaloes are traditionally utilized as animal power for land preparation called as “Rencah” in East Timor, which requires at least four working days per hectare. Average tilling depth measured is shallow, eight-centimeter. As “Rencah” requires some traditional ceremony before entering into service, it is deeply rooted in socio-cultural-economical tradition of the present rural system. Under the system small farmers generally pay rather expensive contract fee ranging from a half to 1/3 of harvest, which in turn causes the rich (owner of buffaloes) become richer and the poor (small farmer requesting contract Rencah) become poorer.

All 22 farmers who joined a farmers group for hiring system of the Pilot Project benefited from the reduction of land preparation expenditures by machinery, and it is hard for them to think about that they will return to the Rencah system. Now, around the Laelo Irrigation System, hand tractors towing trailers are commonly seen and it is unpredictable that developing animal drawn equipment will be successful. Furthermore, a) buffaloes are raised as a part of eminent property as a movable property, b) accordingly farmers do not prefer to utilize them as draft animals, c) it is necessary to develop animal drawn equipment newly (In the present situation, no horses or cows draw cart, newly development of most suitable equipment for local soil conditions is required in consideration of the danger of straight utilization of imported equipment), d) it is necessary to start training in younger stage to utilize as draft animal, e) it needs strengthening of veterinary system for management of good health, f) it needs provision of feed to meet workload during dry season, g) it needs to improve higher death rate of buffaloes served for Rencah, h) it needs to evaluate failure of extension efforts to introduce animal drawn equipment by the Indonesian Government and NGO during the 1980s, i) farmers do not welcome draft animal. Moreover, there will be cumulative effects from the above a) ~ i). Development and extension of animal drawn equipment is not easy, so that whether it is appropriate or not is unclear under the current situations, increase of rice import.

### **2.5.6 Rice Mill Industry around Pilot Project Area**

During the study period, rice milling industry in Manatuto was surveyed and it was proved that five rice millers operate their milling businesses while one of them is out of operation due to a breakdown of the machine. Milling fee of rice is different ranging from 0.70 US\$/bag-50kg to 1.50 US\$/bag-50kg, which suggests that the acceptable milling fee could be set in the harvest season under the Pilot Project.

Meanwhile, a community group in Manatuto, “FOLSEM”, plans to operate one set of Satake rice mill (one-pass type SB10D driven by Yanmar Diesel engine 18 ~ 23 Hp TS230R) in August 2003 at Manatuto downtown under Community Empowerment Project sponsored by CIDA. On the other hand, a private firm, Centro Logistica Nacional de Timor-Leste (CLNTL), started its activity to purchase paddy from farmers to stabilize rice price and to manage proper stock from the late 2002. At present, it installed a rice mill in Mariana, Bobonaro District and dealt 250-ton white rice per year. It also plans to deal the same volume in Manatuto. However, it has no rice milling facilities in Manatuto and the Study Team advised it to negotiate the possibility of using a rice milling unit introduced under the Pilot Project with a farmers group, “Haburas Manatuto”. This surely support farmers for their studies on marketing and accesses to

market, and brings earnings to them by increase of operation efficiency.

If the rice milling unit introduced under the Pilot Project is equipped with separation function, it may become a typical rural industry. It is expected that the Government will rehabilitate the formal marketing channel of agricultural produce to moderate urban population increase by the migration from rural areas, unemployment, delay of rural development, to activate farming, and to increase employment and food security.

## **2.6 Water Users' Association and Other Farmers Groups**

In the past, the Water Users' Association (WUA) for the Lacro Irrigation System is said to have been functional since 1969, and became inactive when flood destroyed the system in 1996. By then, irrigation water was distributed under the control of Marinos, water tenders who are responsible for water tending at the main and secondary canal levels. The status of the Marino has been inherited from fathers to their sons, and they were paid in the form of paddy rice by the farmers receiving water from the canals. The activities of Marinos were basically to convene and agree on water distribution with other Marinos in the system, and coordinate the farmers' activities accordingly. For example, the farmers using the same secondary canal cleaned the canal collectively by the call of the Marinos before water started flowing in. Through that process, the farmers had been organized, somehow in a relaxed mode.

The WUA has recently been reorganized and reactivated through the Phase I of the UIRP. The WUA consists of a central organizational unit with a set of officers (president, vice-president, secretary-treasurer and auditor). It is recommended by UNOPS that four village-based organizational sub-units be also established each with similar set of officers. The chief of the WUA was the chief of the village in the past, and the position was rotated annually from one of the four villages to another. To assure the consistency of the System's operation, the new WUA is now considered as a permanent organization with the officers, to be elected by the farmers and work for the limited terms. The new WUA officers were elected by vote of the farmers on April 25, 2003.

Table 2.6-1 shows the forms of the administration in the villages where the Lacro Irrigation System covers, namely Ailili, Ateas, Maabat and Sau. The chiefs of those villages, commonly with a couple of the assistants officially administer the villages. The chiefs of the villages were either selected by the community people or nominated by the CNRT, if not elected in the Indonesian regime. As it can be seen in the case of Sau village, the community people do not always support the chiefs, particularly if not selected by them. It should be noted that those most influential to the villagers are sometimes not the chiefs but the traditional leaders where the Liurai and elders in the community informally administer the villages.

According to the interview to the chief<sup>2</sup> of Dato village in Manatuto district, there is a elders' council through which 10 elders give him necessary advice for village administration. In the village, all the important matters are brought to the Liurai, who actually make a decision with the elders. If serious problem occurs which elders cannot solve, the case is brought to the district offices or police.

Table 2.6-2 shows the farmers' organizations seen in four villages in the Pilot Project area. Several farmermen and fishers in the same clan commonly organize themselves into a group to mutually help for agriculture and fishery activities. The activities vary group by group, which include cleaning of backyard garden for vegetable production, preparation of land for paddy and other crops, control of irrigation water, weeding and harvesting, transporting and marketing the products, etc. Some farmers interviewed harvest and store paddy together, and the stored paddy is consumed after they prepare the group's land or in case some of them fall in short of food. Farmers also organize themselves for taking care of their livestock collectively when grazing it. All of those groups mentioned above are called as "Kelumpok Tani".

It was also seen in the Pilot Project area that three fishermen in the same clan form a group, and each of them provides a boat, an engine and a fishing net respectively to make a complete set for fishing. They share the catch equally. This is one of the remaining forms of the organizations from the Indonesian regime.

The KUD system, the farmers' cooperative system that the Indonesian government introduced to East Timor in the past, cannot be seen any more. The system provided farmers with free seeds, fertilizer, and other necessary inputs for crop production, and purchased the products with the secured prices from the farmers. On the other hand, it could be said that this system lessened the significance of the traditional "Kelumpok Tani" since the farmers tended to rely on the government assistance. As a result, the ties among the farmers may have been weakened.

## **2.7 Farm Household Economy**

### **2.7.1 Severe Situation of Household Economy**

At the beginning of the Pilot Project implementation in December 2002, the Study Team executed a socio-economic survey in order to grasp the current situation of farm household economy in the Laclo Irrigation System. A result of the survey shows that an average annual income, excluding self-consumption, is 776 US\$/house, but the median is only 360 US\$/house, which means small number of farmers who earn much more income pull the average higher. In fact, the maximum is 6,000 US\$/house (17-fold of the median), while the minimum is 65 US\$/house (one sixth of median).

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<sup>2</sup> He was elected by the CNRT as the chief in 1999. He had been the secretary of the village by then for 19 years.

According to the “Household Survey” , there are 353 households in the Lacro Irrigation System. 264 households are landowners (75 %), and 89 households are tenants (25 %). The tenants have no their fields.

### **2.7.2 Model of Average Household**

The Household Survey, which surveyed almost all household and their paddy field (323 households & 420 ha) in the Lacro Irrigation System (353 households & 453 ha), reports that the total cultivated area of rice in this season is 420 ha (1.3 ha/house), and the area in the last season is 187 ha (0.58 ha/house). The unit yield in the last season is 2.0 ton/ha. The average annual cash income of a household is 262 US\$/year, and income of rice selling is 12 US\$/year (4.6 %) in the last season.

According to the Socio-economic Survey, which surveyed 41 sampled households (57 ha), monthly average purchase of milled rice in the last season is 14 kg/house (0.17 ton/year), which is equal to 0.31 ton/year in paddy (conversion rate : 55 %).

Suppose unit yield in this season is same as the last one (2.0 ton/ha), the rice production per household will increase 1.4 ton/house ( (1.3 ha/house – 0.58 ha/house) x 2.0 ton/ha). If a surplus after deduction of the lack of self-consumption is sold (1.4 ton/house – 0.31ton/house), the income from rice sales will be 110 US\$/house (1.1 ton/house x 100 US\$/ton). In these conditions, annual income of a household becomes 372 US\$/year, and the income of rice selling is 122 US\$/year (33 %). These figures are applied as the model of average household for the following analysis in Chapter IV.

Table 2.6-1 Village Administration Form in the Pilot Project Area

Village	No. of Sub-Village (Aldeia)	No. of Sub-Aldeia	Head	Members	Establishment and Selection of the Members	Other Information
Ailili	3	7	Chief of village	Secretary 1 Staff 3 (to help the secretary, in the past)	The chief of the village had been the secretary for 20 years, and became the chief 1.5 years ago. The three staff were chosen by CNRT, but they do not exist any more.	The head of sub-aldeia should take care of land property and political issues in the area.
Ateas	4	-	Chief of village	Secretary 1	The chief of the village has been the secretary since 1975.	
Maabat	2		Chief of village	Secretary 1 Staff 3 (finance, development, society)	This structure was formed by the DFO in Indonesian time. The head and members were selected by the community people.	Each of the two aldeias in this village have own chief and assistant (assistant = the chief of the sub-aldeia)
Sau	2	12	Chief of village	Secretary 2 Staff 3 (development, socio culture, civil administration)	This structure was set up by CNRT. The father of the chief of the village was the Liurai, and the current chief was selected by Ketwas Adat. This was finally agreed by CNRT, but the people do not support him as the chief.	The village representatives are the following 5 people: 1. The person from the previous monarchy 2. Traditional chief (Ketwas Adat) 3. Representative from OJT 4. Representative from OMT 5. Representative from church

Source: Interview with the chiefs of the villages in August 2001



Table 2.6-2 Farmers' Groups in the Villages of the Pilot Project Area

Village	Form	Description
Ailili	Farmers' groups	There are three groups, and the average number of the members are 20. The farmers prepare land and harvest together in the irrigation area. They also grow maize outside of the irrigation area in the rainy season.
	Irrigators association	The chief of the village is the leader currently. This role rotates among the four villages.
	Fishers' groups	There are five groups with the average number of three.
	Elders' councils	There are three elders in the council (=advisers' group) at village level, six elders at aldeia level (two each in three aldeias), and 14 elders at sub-aldeia level (two each in seven sub-aldeias)
	Women groups (OMT)	Activities are sewing, weaving, basket making and traditional clay-pan and pot
Ateas	Elders' councils	There are four elders.
	Fishers' groups	There are 30 groups in the village, and the average number of the fishers is four to five. A fisher said he owns a boat, and borrows an engine and fishing net. He shares the catches with the owners of engine and net.
	Youth leaders (OJT)	They used to plant paddy.
	OMT	Activities are sewing and clay-pan making.
Maabat	Farmers' groups	There are seven groups in the village. The average number of the members is four. The activities are to plant and harvest paddy together. No activities for vegetables. They have currently no activities because of the irrigation problem This has been existing since previous time. The structure has not changed, but only the number of the members has increased. The chief of the village is the top of the irrigators association and responsible for water distribution. Every farmer pays the se
	Irrigators association	
	OMT	In Indonesian time, women's groups were called PKK. They had the same activities but different members from the OMT.
Sau	Farmers' groups	The group of the farmers said they organize a group for paddy production. The number of the member is 10.
	Irrigators association	They plant, harvest and market paddy together. They also control water and clean canals.
	Fisher's groups	One fisher said five people in the same house uses a boat. Three owners (the interviewee as the owner of the boat and owners of engine and fishing net) share the catch equally.
	Hand tractor group	There is 1 group for using the hand tractor given by JICA (for land preparation. The tractor cultivates 0.5 ha, and the farmer pays for fuel only).
	OMT	The activities are sawing training, weaving
	Traditional family group	There are five members to produce ceramic pans. The women group used to have the oven for the pan production, but it was burnt. Today they collect wood and buffalo manure instead.

Note: The above organizations are the ones mentioned by the chiefs of the villages and other people when interviewed. There would be other types of the organizations in the communities.

(surveyed in August 2001)