CHAPTER III.

IMPLEMENTATION OF THE PILOT PROJECT

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3.1 Activity Areas of the Pilot Project

The Pilot Project has been based at the beneficiary area of Laclo Irrigation System. Among four components of the project, the activities of "Production Technologies of Rice" have been centered at the demonstration farm prepared for the Pilot Project. The land for the demonstration farm has been offered for the Project by a farmer, and its size is about two hectare. "Farm Mechanization" has been based at the warehouse constructed at the time of Mobile Brigade (MB), and conducted at the demonstration farm as well as the paddy fields of several farmers. The activities of "Irrigation Canal" have been centered in Inkero Secondary Canal, and "Water Management" has been conducted at the 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, and Its Implementation

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

1) JICA 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

The Pilot Project was implemented on the basis of the following schedule:

- Preparation stage : November 2002 – December 2002
- Commencement stage : January 2002 – March 2003
- Monitoring and evaluation stages : April 2003 – July 2003

3.3 Major Activities of the Pilot Project

According to the Plan of Operation (PO) of the Project, the progress of each activity and issues to be continuously followed are shown below:

3.3.1 Common Activities

0-1[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.
Progress	The planning workshop was conducted with the farmers from November 25 to 29, 2002. The details of the workshop are described in Annex C. The problems tree, objectives tree, the PDM and the PO have been prepared. The PDM and the PO (both attached in Chapter I) were reviewed by each Study Team and then completed through the discussion with the farmers.

0-2	The names of the farmers participating in the project are listed up, and the leaders are selected.
Progress	As a result of the planning workshop, the Pilot Project has been started with the following four components; 1) Production Technologies of Rice 2) Farm Mechanization 3) Irrigation Canal 4) Water Management The farmer-members participating to those components were to be selected from the whole area of Laclo Irrigation Scheme as the representatives from the respective areas. Concerning the implementation of "Production Technologies of Rice" and "Farm Mechanization", the participants of the workshop listed 36 farmers as the members. Those members were organized into three working groups, and the leaders of each group were selected at the same time. In the workshop, another farmers' group was set up for "Irrigation Canal" and "Water Management", and the total members were said to be between 43 and 60. However, it was later found to be the list of the land-owners attached to Inkero Canal, but not the farmers. The participants of the workshop should have had some intentions to do so. A new list was then prepared with the DAO, chiefs of the villages, and the president of the WUA in December 2002.
Progress	On January 25, 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 temporarily selected by the members. They have also become in charge of managing the renting system of agricultural machines to the members and non-members (see Annex F). Soon later, participation of "Haburas Manatuto" members to the project activities, in particular the training, was however 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

[1] This number corresponds to an activity number described in Plan of Operation (PO) (see Table 1.3-2)

	skills. It was felt by the Study Team that, at the current stage of development, 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 the farmers for the action. To improve the situation, an effort has been made to strengthen Haburas Manatuto by several means (see Annex F). On March 12, the new regulations were made. One of the regulations is that the members of an organization have some responsibilities at the same time they enjoy some benefits. Accordingly, 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. To strengthen and assess the capacities of the new officers, particularly regarding the management of the organization as well as the rental system of the farm machineries provided by the Study Team, some responsibilities were given to them. This was done in middle of March before the Study Team left the site for two and a half months. This was intended to see how well they could fulfill their tasks during the absence of the Study Team, and eventually to decide whether or not the ownership of the farm machineries could be given to them.
Issue	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 can be continuously given at the same time. In conclusion, at the end of the Pilot Project, (1) Haburas Manatuto should still be supported from outside, and (2) some incentives such as farm machineries, those linked with immediate benefits, should be used to strengthen the organizational capacity, i.e., the capacities of the officers and members, further more (see Annex F).
Progress	Concerning "Water Management", two organizations have been related to the Pilot Project. One is Water Users' Association (WUA) established by the UNOPS, and another one is water management group organized by the Pilot Project. The latter consists of four Marinos (traditional water tenders) and the leaders of all secondary canals, to be located under the WUA as the field implementers of water management in future (see Annex G). At the commencement of the Pilot Project, the WUA was not functional due mainly to poor capacity of its former president (see paragraph 3.3.5). The new officers were then elected by the farmers on April 25 with the support of UNOPS and JICA.
Issue	When the Study Team came back to the site in June, the new WUA was yet to be operational. It is expected that an advisory team will be soon organized to discuss the issues of water management and collection of water fee. If any decisions are made by the Study Team, the WUA will start its activities (see4-4). The organizational capacity should therefore still be observed, and of course, will need the support from outside for making sure the WUA becomes functional in water management and water fee collection.

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.
Progress	The roles and responsibilities of major stakeholders were discussed in the workshop in November and summarized clearly in paper (see the Plan of Operations). The "Issues of Agreement" was then prepared and explained to the farmers in the meeting of December 2002. The "Issues of Agreement" was at first considered to be mutually signed in January 2003 between the Study Team and the farmers, but was decided not to do so because Haburas Manatuto had to be reorganized (see Annex F).
Issue	The farmers shared the costs of agricultural tools as agreed in the workshop. However, other parts of costs, particularly for the inputs (seeds, fertilizers) for rice cultivation at the demonstration farm, were not shared. The land-owner is the only one farmer who should share the costs with the Study Team since he would take all the harvests from the demonstration farm. Later, he was however insisting not to bear any costs.

3.3.2 Production Technologies of Rice

1.1 Demonstration Farm

1-1-1	The plan for the demonstration farm is discussed and prepared.
Progress	After the series of planning workshop held from November 25 to November 29, 2002, the Study Team tried to have a meeting with the farmers to explain and discuss the details of the demonstration farm. However the unstable security conditions caused by the demonstration and riot in Dili on December 4, 2002 hampered to have the meeting in Manatuto for a while. From December 9, 2002, field survey was restarted and the meeting was finally held on December 11, 2002. The number of participants was relatively small (about 12 farmers) because many farmers were busy cleaning the sediments in secondary canals in the morning and doing their own farming works in the afternoon. In the meeting, the idea for the demonstration farm, which was designed by the Study Team based on the problem and objective analysis results, was firstly presented and then discussed with the participants. In terms of paddy varieties used in the demonstration farm, the farmers agreed to use one improved variety (IR64) and recommended IKAN as a local variety. As for the fertilizer experiment, farmers suggested that the amount of nitrogen (N) application in one treatment should be reduced because they knew that more than 50 kg of nitrogen per hectare would harm the growth of paddy rice empirically. Based on their suggestion, the treatment design was revised from the original design (see Table 3.3-1).

	In terms of weeding and planting method experiments, farmers had no particular opinions or suggestions so the above two experiments were implemented in accordance with the original plan.

1-1-2	The demonstration farm is prepared.
Progress	During the planning workshop, one farmer kindly offered his farmlands as demonstration farm fields that are located within the beneficiary area of Inkero secondary canal. The participating farmers agreed to use the fields so the site of demonstration farm (approximately two hectares) was decided during the workshop. Because the demonstration farm were divided into two sites, namely right and left banks of Inkero secondary canal, the farms on the left bank (approx. 0.93 ha) were tentatively named as Site "A" and were mainly used for the experiments mentioned in 1-1-1. For the Site "A", allocation of each paddy plot to the treatment was decided together with the participating farmers and land-owner as shown in Figure 3.3-1. For the Site "A", allocation of each paddy plot to the treatment was decided together with the participating farmers and land-owner as shown in Figure 3.3-1.

1-1-3	Rice seeds are prepared.
Progress	The Study Team investigated the availability of the seeds of improved variety, IR64. On November 21, 2002, the Study Team purchased a bag of IR64 seeds (5 kg) from Maliana Pilot Agricultural Service Center (PASC). However the germination test of the seeds indicated that they were not possible to use for the Pilot Project since none of the seeds germinated. Later, by a consultant working for the PASC project, the Study Team was revealed that the seeds were imported for the 2000-01 cropping season from Surabaya, Indonesia, which meant that the seeds were already one-year old. On December 13, 2002, a bag of IR64 seeds (5 kg) was purchased from an agricultural material shop in Dili. It was also imported from Indonesia. The germination rate was not high enough to use (only 34 %), because they were also one-year old so they could not be used in the demonstration farm. On December 17, 2002, the Study Team asked a dealer in Dili to import certified IR64 rice seeds from Indonesia. When the Study Team asked the dealer when the seeds arrive in the beginning of January, he replied that the seeds would arrive around January 20, 2003. When we asked the store next time, he told us that a ship had a problem with customs so it would arrive later than the original schedule. Because the Study Team considered the dealer unreliable and wanted to obtain the seeds urgently, one more order to arrange the IR64 seeds through another shop was done on January 27, 2003. Finally the Study Team obtained the certified seeds of improved variety (IR64) on February 4, 2003 from the latter order.

	As for local variety (IKAN) seeds given by the land-owner of demonstration farm fields, the germination rate was relatively high enough to use, 93 percent.

1-1-4	Nursery beds are prepared.
Progress	On December 9, 2002, the starting date of nursery preparation was temporarily decided with the farmers, from January 20, 2003. However the farmers told that they could start nursery preparation earlier than that day if irrigation water would be available. Therefore the Study Team set the schedule of nursery preparation one week earlier, starting from January13, 2003, because the rehabilitation works by UNOPS would restart in May 2003, which meant that irrigation water would stop coming. However, the nursery preparation actually started on January 27, 2003 due to the delay of water distribution to each paddy field in the demonstration farm. The reason of the delay was caused by the rehabilitation work for the main canal lining near the intake of Inkero secondary canal on the main canal, in which many farmers participated. This rehabilitation work lasted from January 17 to 23, 2003, and during that period, no water flowed in the main canal since the main gate was closed. Works for nursery preparation were done in accordance with the following schedule.

Date	Work
Jan. 27	First plowing for nursery plot by hand-tractor
Jan. 28	First puddling for nursery plot by hand-tractor
Jan. 30	Second puddling for nursery plot by hand-tractor
Jan. 31	Soaking seeds of local variety (25 kg)
Feb. 1	Seeds preparation for germination (local variety)
Feb. 3	Seeding the germinated seeds in the nursery for local variety
Feb. 14	Soaking seeds of improved variety (30 kg)
Feb. 15	Seeds preparation for germination (improved variety)
Feb. 17	Seeding the germinated seeds in the nursery for improved variety

In the nursery bed of local variety, there were some damages twice. The first damage was found on February 13, 2003 because cattle or buffaloes ate some seedlings.

The second one was found on February 20, 2003 and many worms ate leaves. They looked like rice skipper (*Pernara guttata*). The second damage was more serious than the first one, and it seemed that about 30 percent of the seedlings got somehow damages. To ease the damages on seedlings, the seedlings were kept under water overnight to kill the worms.

For the improved variety, there had been no serious damages on seedlings during the nursery period.

1-1-5	Land preparation is done on time.

Progress

Land preparation was started from January 27, 2003. The work progress by each plot is shown below (see Figure 3.3-1).

Plot Name	Date	Work
Fertilizer-1	January 27	First plowing by a hand-tractor
	February 4	First puddling by a hand-tractor
	February 12	Second puddling by a hand-tractor
Fertilizer-2/ 3	January 28	First plowing by a hand-tractor
	February 8	First puddling by a hand-tractor
	February 11	Second puddling by a hand-tractor
Weeding-1	February 6	First plowing by a hand-tractor
	February 8	First puddling by a hand-tractor
	February 11	Second puddling by a hand-tractor
Weeding-2	January 28	First plowing by a hand-tractor
	February 4	First puddling by a hand-tractor
	February 11	Second puddling by a hand-tractor
	March 5	Third puddling by a hand-tractor for improved variety
Weeding-3	January 28	First plowing by a hand-tractor
	February 11	First puddling by a hand-tractor
	February 11	Second puddling by a hand-tractor
	March 5	Third puddling by a hand-tractor for improved variety
Planting-1	February 6	First plowing by a hand-tractor
	February 8	First puddling by a hand-tractor
	February 11	Second puddling by a hand-tractor
	March 5	Third puddling by a hand-tractor for improved variety
Planting-2	January 29	First plowing by a hand-tractor
	February 8	First puddling by a hand-tractor
	February 11	Second puddling by a hand-tractor
	March 5	Third puddling by a hand-tractor for improved variety
Planting-3	January 28,29	First plowing by a hand-tractor
	February 4	First puddling by a hand-tractor
	February 11	Second puddling by a hand-tractor
	March 5	Third puddling by a hand-tractor for improved variety

Issues

Land preparation for the experimental plots was done as early as possible since the two hand-tractors would be rent out to farmers' group members for their plowing and puddling activities on their own fields.

This caused the long time lag between second puddling and transplanting, particularly for improved variety, which made the topsoil hard for transplanting. Consequently one more puddling was necessary just before transplanting of improved variety in some plots.

	As for the participation of group member farmers, it had not been stable. Although farmers themselves made rules for works in the demonstration farm as shown below on January 25, 2003, very few farmers followed them. Tentative rules for group working a) For one group, two hours working per day and two days per week b) Work hours: AM 7:00 - AM 9:00 c) If some one takes absent four times, he would be eliminated. d) If some one wants to take leave, he needs to take permission. Sometimes many farmers participated (e.g. nine farmers on February 1,2003) but on other days, no farmers came to the fields. The participation of farmers was lowest in the end of February probably due to their own farming works in their fields.

1-1-6	Seedlings are transplanted in accordance with the experimental design.
Progress	Seedlings of local and improved varieties were transplanted in February and March 2003. The experimental design is shown in Table 3.3-1 and the plot allocation of each experiment is shown in Figure 3.3-1.

Variety	Plot Name	Date
Local	Fertilizer-1,2,3	Transplanted on February 27, 2003 (24 days old seedlings)
	Weeding -1,2,3	Transplanted on February 25, 2003 (22 days old seedlings)
	Planting method -1,2,3	Transplanted on February 26, 2003 (23 days old seedlings), Direct seeded on February 14
Improved	Fertilizer-1,2,3	Transplanted on March 7, 2003 (18 days old seedlings)
	Weeding -1,2,3	Transplanted on March 6 and 7, 2003 (17-18 days old seedlings)
	Planting method -1,2,3	Transplanted on March 5 and 6, 2003 (16-17 days old seedlings), Direct seeded on February 27

Issues

For the transplanting in a row, firstly the Study Team used a 25-cm interval line marker for spacing 25 cm x 25 cm. However the paddy field surface was often not flat, so it was hard to make line properly in some plots. Furthermore the farmers often can not distinguish the lines on the fields since they normally transplant seedlings as they walk backward, which erase the lines marked in advance. As a consequence, the Study Team adopted a rope with marks of 25-cm intervals instead of the line marker.

As for the planting method experiment, transplanting in a row with the planting rope and random transplanting were compared in terms of labor requirement. The result showed that the transplanting in a row (42.1 man-day/ha) requires 93 % more labor than random transplanting (21.8 man-day/ha).

Certainly direct seeding was the least labor intensive method since it neither

	needs seedling picking up nor transplanting. Based on the observation in the field, broadcasting seeds took 1.3 man-day/ha (94 percent less than random transplanting). For the fertilizer experiment, three to four seedlings per hill were transplanted for the local variety. However it was observed that some of the seedlings transplanted were dead later (probably due to i) inappropriate water management, and ii) weak seedlings because transplanting was done three days after seedlings picking up) so it needed supplemental transplanting on March 7, 8 and 10, 2003. Also the number of plants per hill was changed to 5-6 plants, common number of transplanting, for the improved variety transplanting.

1-1-7	Fertilizers are applied in accordance with the experimental design.
Progress	Basically fertilizers were supposed to apply only in the plots for fertilizer experiments. Fertilizers were measured and arranged in advance. They were broadcasted and mixed with the surface soil in the small sections of paddy fields concerned one day before the transplanting date or on the day of transplanting. The experiment design for both local and improved variety is shown in Table 3.3-1. Natural fertilizer was prepared on February 14, 2003 together with farmers. Materials were animal dung, paddy rice straw, rice husks and solution with microorganisms, which was obtained by a local assistant. They were mixed together and kept under a blue tent sheet for decomposition and then broadcasted in the sections of fertilizer experiment. Apart from the fertilizer experiments using small sections, some amounts of fertilizers were used in the several plots prepared by a hand-tractor in Demonstration Farm Site "B" as indicated below and in Figure 3.3-2.

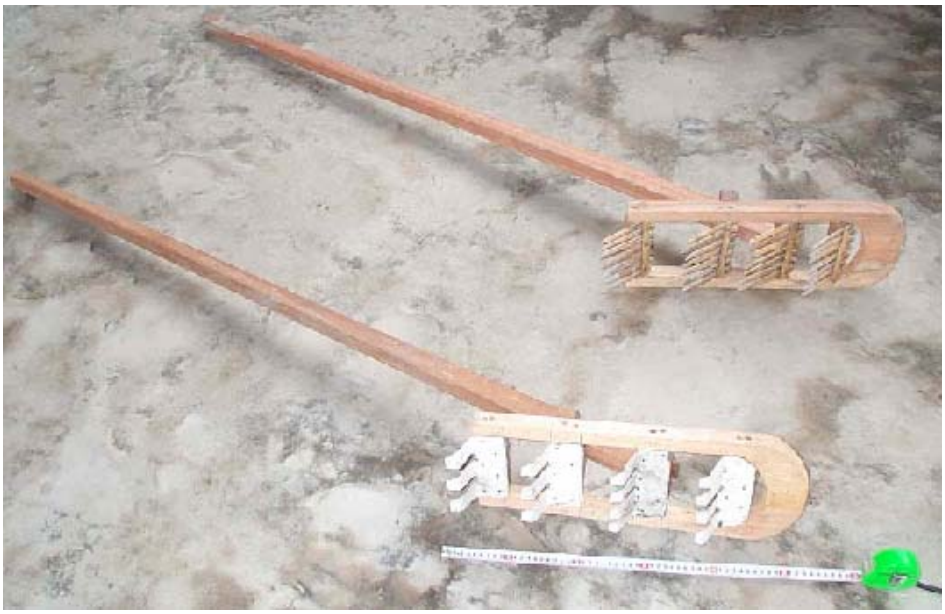
(unit: kg/ha)

Plot	Basal-N	Top-N	P_2O_5	K_2O
B-9	0	0	0	0
B-6&7	0	0	30	30
B-4	20	10	30	30
B-5	40	20	30	30
B-1	60	30	30	30

Top dressing of nitrogen was applied by a local assistant of the Study Team since there were no Study Team members in Manatuto in this period. The fertilizer application date was instructed to the assistant in advance from the estimation date of panicle initiation stage (approximately 30 days before heading). Actual application was done as indicated below.

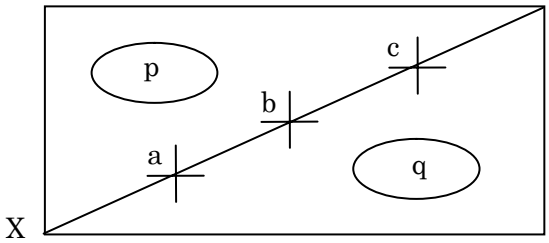
Variety	Plot Name	Date
Local	Fertilizer-1,2,3	April 29, 2003 (85 days after seeding and 62 days after transplanting)
Improved	Fertilizer-1,2,3	April 16, 2003 (58 days after seeding and 41 days after transplanting)

	Also in Site "B", top dressing of nitrogen was done on May 6,2003.
Issues	The Study Team observed that one farmer near the experimental plots applied urea to their nursery beds. According to the farmer, urea makes the soil of nursery bed soft and consequently it becomes easy to pick up the seedlings. He stated that urea has no nutritional effects for the growth of the seedlings. As this case indicated clearly, the farmers around the project site generally do not have correct knowledge on fertilizer.

1-1-8	Weeding is done in accordance with the experimental design.
Progress	The Study Team prepared two hand-push type single-line weeders through a local carpenter as shown below. The Study Team got an idea for these weeders from the Japanese farming tools.  Also the Study Team found a rotary type weeder in Natarbora, Manatuto District (owned by a NGO, ETADEP) but it seemed less effective than the hand-push type and it was not extended in Natarbora according to the staff of the NGO. 
Issues	When the Study Team came to Manatuto in the middle of April 2003 to monitor the progress of the Project, a trial of the hand-push type single-line weeder was made.

	The trial revealed that a) large weeds were difficult to eradicate with the hand-push weeder because they were rooted deeply into the soil and b) shallow water depth was suitable for using the hand-push weeder since the wooden weeder that floats on water-weeds grasses by scratching the soil surface. Although the Study Team asked the land-owner and local assistants to do weeding periodically with the above attentions, it was done only once on April 15, 2003. The record of weeding indicated that the hand-push weeder took 15 minutes for one half of the with-weeding plot (IR64 Replication 1), while manual weeding for another half took 30 minutes.

1-1-9	Paddy is harvested.
Progress	Harvesting of improved variety (IR64) started on June 4, 2003, 91 days after transplanting. The Study Team estimated the harvesting time in the middle of June (about 100 days after transplanting and 115 days after seeding) so the paddies in the experimental cultivation plots had grown and been matured more rapidly than expected. The samples for data collection of improved variety were harvested between June 4 and 6, 2003. Because the Study Team came to Manatuto on June 13, 2003, the samples were collected by local assistants under the guidance of a JICA expert dispatched to MAFF. The remaining paddies were harvested by the land-owner after the sample collection. Harvesting of local variety (IKAN), was started from June 16, 2003. Samples of local variety were collected during June 16 and 18, 2003 by the Study Team and local assistants. After that, the remaining paddies were harvested by the land-owner. Basically the samples were collected according to the following procedures. (1) Yield Component Survey Following data are necessary to estimate paddy yield. - Number of hills per square meter (A) - Number of panicles per hill (B) - Number of grains per panicle (C) - Moisture content (D) - Weight of 1,000-grain (E) Converted paddy yield per hectare with 14 percent of moisture content can be calculated as shown below by applying the collected data. Paddy yield (kg/ha) = A x B x C x E x (100 – D)/(100 – 14) x 10

	1) Select three parts for sampling in one treatment plot  Sampling points are located on a diagonal line. Point (a) is located 1/4 from the edge X, point (b) is 1/2, and point (c) is 3/4. 2) Harvest ten paddy hills and select five reasonable ones At each point, harvest 10 paddy hills and select moderate and reasonable five hills for further analysis. 3) Dry the selected paddy hills and keep them in a safe place Cut panicles and put into an envelope by each hill. After drying, the panicles would be used for further analysis. (2) Yield Survey by Unit Area Sampling Paddy within four square meters (4 sq.m) should be harvested from two points (p and q) and dried. Converted paddy yield per hectare with 14 percent of moisture content can be estimated after the works of threshing, weighing and moisture content measurement. 1) Select two reasonable grown parts for sampling in one treatment plot Sampling points (p and q) are indicated in the figure above. Set a four square meters area (2m x 2 m) with sticks and string. 2) Harvest all the paddy hills within one sampling area Harvest all the paddy hills inside the square. After drying and threshing, the grains harvested from four square meters are weighed and the moisture contents are measured.

1-1-10	Data are collected after the harvesting.
Progress	After collection of samples of improved and local varieties, they were dried and used for data measurement. For the data measurement of yield component survey and yield survey by unit area sampling, data sheets are attached in Annex E. The summary of measurement items are shown below.

	Yield Component Survey (A) No. of total panicle of the 15 hills (B) No. of total empty grains of the 15 hills (C) Weight of all the ripened grains of the 15 hills (g) (D) Weight of three samples of 500-grain (g) (E) Moisture content of the three samples (%) From the three data of D, number of grains of 10-gram (F) can be estimated with the following formula. (F) (grains / 10-gram) = 1,500 / (D1 + D2 + D3) x 10 From the data above, (G) number of all the grains of the 15 hills, (H) number of grains per panicle, (I) ripened grain ratio and (J) weight of 1000-grain can be calculated as shown below. (G) (grains) = C / 10 x F (H) (grains / panicle) = (G + B) / A (I) (%) = G / (G + B) x 100 (J) (g) = (D1 + D2 + D3) / 1500 x 1000 All the data of improved and local varieties were measured from June 19 to 26, 2003. For the yield survey by unit area sampling, collected samples were dried. Empty grains were excluded and only ripened grains were selected by wind. Then the weight of ripened grains and moisture contents were measured. The summary of measurement is shown below. Yield Survey by Unit Area Sampling (K) Weight of sample grains from four square meter (kg / 4 m^2) (L) Moisture content (%) From the data above, (M) yield per hectare can be estimated with the following formula. (M) (kg / ha) = K x 10,000 / 4 x (100 – L) / (100 – 14) All the measurement was finished in June 26, 2003. Other data such as plant height and number of hills per square meter were also measured until June 28, 2003.

1.2 Study Tour

1-2-1	The plan for the study tour is discussed and prepared.
Progress	The Study Team visited Baucau a couple of times to learn about the system of contract plowing with tractors. The system was started in 2002, and considered there should be something the Manatuto farmers got interested.

	The plan for going to Baucau was then explained and discussed with Haburas Manatuto members. Although another study tour plan was considered, there seemed no agriculture-advanced areas in East Timor suitable as the study tour sites for the Pilot Project. The Study Team therefore decided not to continue the study tour.

1-2-2	The study tours are conducted.
Progress	The study tour to Baucau was conducted on March 6, 2003. The number of the participants was 15 from Haburas Manatuto. In Baucau, the DAO briefed the participants on the system of contract plowing, and then all of them moved to the meeting place in the village called Tequinomata. The sub-district coordinator, the district staff and about 20 farmers in four groups received the participants there. The current conditions and problems of the system were explained by Baucau side, and the both sides exchanged the views. After returned to Manatuto, all the participants discussed the outcomes of the tour with the Study Team in the same evening. The majority of the participants mentioned that the explanations given there were not very much relevant and interesting to them. The main topic was the problems that they are facing, but not the way the system is being operated. The Study Team and some participants however observed the study tour useful since there was various new information that the farmers were able to learn. The following is the examples: - The Baucau farmers have been organized in the big scale and start paying a fee for the use of tractor. - They are suffering from the lack of spare parts, which gives Manatuto farmers a caution for the use and maintenance of the tractors. - There are many farmers who are motivated to work hard in Baucau. - Manatuto farmers understood that soil conditions are different between Baucau (soft) and Manatuto (hard), and they should use tractors more carefully. Based on the experience, the Study Team considers the following be necessary if a study tour is conducted. - More in-depth survey and discussion are needed in advance with the officers and farmers at the target site, and it should be made clear what issues should be focused in the study tour. - More in-depth discussion and preparation are needed in advance with the expected participants, and it should be made sure what issues they want to learn.

3.3.3 Farm Mechanization

2-1	Training plan for farm mechanization is discussed and prepared.
Progress	The training plan for farm mechanization was prepared as follows: 1) Management Organization Manatuto District Agricultural Office (DAO) as a legal successor of the Mobile Brigade (MB) was planned to be a leader to assist and to conduct farmers' group in cooperation with two staffs (one from the former MB machinery operators trained by JICA expert and the other from local staff of CARE for handling and repair of the related machinery) under close lead and assistance of JICA Study Team. However, no participation from District Office. 2) Overall Schedule An actual implementation period of the Pilot Project was six months from early January, 2003 to early July, 2003 and each program of a) farm mechanization at demonstration farm, b) training of operation and repair, c) works by farmers themselves and d) contract farming were scheduled to fulfill the targets as; a) Cultivation of nursery bed : 0.1 ha by Rencah, 0.1 ha by hand tractor and total 0.2 ha, b) Cultivation of field : 1.0 ha by Rencah, 1.0 ha by hand tractor and total 2.0 ha, c) Training farmers : total three groups and 35 farmers, d) Practical operation by farmers : three representative farmers per group and total nine farmers, e) Hiring trial : land cultivation 10 farmers and 15 ha, threshing 15 farmers and 22 ha, and milling 20 farmers and four tons intake paddy. 3) Arrangement of Machinery and Support Equipment a) Hand Tractor Two units of hand tractors provided with plow, rotor harrow, leveler, paddy wheel and trailer : MB as an official institution was dismissed in May, 2002. Two units of those Siam Kubota Hand Tractors might be hired, which were kept at Manatuto MB pool without missing. Together with unknown spare parts at where, what contents and how much quantity, and who is the person in charge, official approval of utilization had been requested to MAFF. If possible, those spare parts broken during MB program should be imported from the manufacturer, Siam Kubota Industry Co., Ltd. for smooth and continuous operations like as:

Parts No.	Parts Name	Quantity
Hand Tractor Model SKP 131		
1. 62735-66110	Main clutch V-belt #78	2 pcs
2. 62735-42890	Accelerator lever	1 pc

Diesel Engine Model ET80		
3. 15231-43580	Filter cup	1 pc
4. 15231-43560	Filter element	1 pc
5. 14911-02310	Cylinder liner	1 pc
6. 14911-21110	Piston	1 pc
7. 14911-21050	Piston ring assembly	1 pc

b) Thresher

Two units of Indonesian made threshers driven by 2-cycle gasoline engines should be ordered locally at Dili in early January 2003, which might be imported from Surabaya, Indonesia through the selected dealer since out of stock at Dili dealers now in December 2002. The procurement would be completed before the end of March 2003.

c) Rice Milling Unit

One unit of Japanese rice mill coupled with a diesel engine is procured through a dealer in Dili instead of procurement of imitation model to get continuous assistance for developing milling industry in East Timor together with enough consumable spare parts like as rubber rolls.

d) Measuring Tools and Accessories

Measuring tools and accessories were provided including stop watch, 100 m tape ruler, 10 kg desktop scale, 100 kg platform scale, hygro-thermometer, moisture meter, mess cylinder, 50 kg vinyl sack and etc.

e) Fuel and Engine Oil

1,800 liter diesel fuel and engine oil were procured at a time to show for farmers enjoyable the quantity discount by group bulky dealing (group purchase of diesel fuel in fully compliance with ASTM & API specifications was 0.465 US$/lit consisting of 0.415 US$/lit plus transport fee to Manatuto 0.05 US$/lit while 0.52 US$/lit by individual purchase). They were stored at MB warehouse in Manatuto. Gasoline fuel for threshers was procured in small volume by plastic tank at the time when required because its consumption is small and accident should be avoided.

4) Preparation of Materials Required

a) Materials for Training

Operation manuals for hand tractor together with mounted diesel engine, thresher with gasoline engine and rice milling unit with diesel engine together with tachometer and thermohygrometer were prepared after translating into Indonesian language, of which language is familiar with farmers in the Pilot Project area and least technical terms in Tetum language. Parts list and other materials translated into Indonesian were also prepared. Table H.23 to Table H.30 in Annex H can be referred.

b) Field Inspection Data

Field inspection data in Indonesian language were provided which were mostly used at demonstration farm for comparing labor productivity efficiency and

performance between traditional method and mechanized system as shown in Table H.24 – TableH.31 in Annex H.

c) Hiring

Studying the results being experienced in the MB, it is the most important how to keep the book together with capacity of managing staffs. "Machinery Hiring Record" was provided starting from measuring area to be covered (area declared by farmer himself is generally not correct), distance from machinery pool to the contract farmer, fuel and oil consumption used and respective hours and minutes required to issuance date of farmer's contract payment, all of which should be filled clearly when accepting machinery hiring offers from farmers for field cultivation, threshing and milling to eliminate such defects as well as possible that 64.7 lit/ha was resulted during MB operation against 25-30 lit/ha under normal operation as fuel consumption.

5) Demonstration Farm

a) Major Purposes

The major purposes of farm mechanization at demonstration farm are:

- To show the practical farm mechanization to farmers to be worked by professional operators, and

- To collect the basic data required for planning and designing farm mechanization from now on, which is the first trial in East Timor even though there are estimated or rough figures, for example the time required for a hectare tilling and puddling, and fuel and oil consumption per hectare by hand tractor equipped with plow, rotor harrow and leveler, volume of paddy available to be threshed per a hour and its fuel/oil consumption by Indonesian made thresher, and milling capacity including post-harvest loss, all of which are compared with data collected from traditional method.

b) Area and Size of Demonstration Farm

Area of demonstration farm, where belongs to leader of farmers' group "A", was measured by each plot both in field "A" and "B". Field "A" and "B" are 0.93 ha and 1.04 ha respectively and total 1.97 ha. In demonstration farm, there are 15 and 37 plots divided by levees respective in small field "A" and "B" and are surely not suitable for farm mechanization, which may reduce mechanization efficiency. During the next decade, such fields divided into small plots may be rehabilitated to be in a reasonable size for higher efficient mechanization in accordance with irrigation improvement. Seedbeds are planned at two plots in field "A", one of which is cultivated by traditional method and the other is by hand tractor with plow, rotor harrow and leveler. Field "A" is basically farmed by traditional method and field "B" is by partially mechanized farming including only tilling, puddling, threshing and milling.

c) Data Collection by Plot

All data prepared previously in format shall be recorded by plot notwithstanding big or small and finally analyzed by a hectare.

Issues	1) Concentration on Farmers Training Unfortunately participation of front line extension officers to the Pilot Project could not be expected since anyone was not recruited and nominated by MAFF and so this component should be concentrated on farmers in the Pilot Project area (total three groups and 35 farmers consisting of Group "A" with 11 farmers, Group "B" with 12 farmers and Group "C" with 12 farmers). In accordance with re-organization of this farmers' group, namely the establishment of Haburas Manatuto, group members became to be 22 farmers at the moment.

2-2	Training of power tiller and trouble-shooting are conducted.
2-3	Training of thresher operation and trouble-shooting are conducted.
Progress	Following to the training plan proposed during the preparation stage, which was implemented from November 2002 to December 2002, training to the members of farmers' groups under the Pilot Project were carried out during previous stage. 1) Management Organization Less participation of Manatuto District Office and related departments in MAFF in Dili caused strong request to them to assist the Study Team. Under the situations, therefore, managements of training were carried out by the three local staffs in total, a machinery expert and two assistants (mechanic of the former MB and CARE expert) 2) Overall Schedule Practical implementation including preparation and training was done from the beginning of January to the middle of March 2003. 3) Arrangement of Machinery and Measuring Tools to be used a) Hand Tractor and Spare Parts Two sets of hand tractors equipped with plow, rotor harrow, leveler, paddy wheel and trailer were hired officially from MAFF, which were Siam Kubota Hand Tractors being used and kept at Manatuto under Mobile Brigade (MB) Program. Necessary spare parts were found out and transported from MAFF warehouse in Dili to Manatuto MB premise, before starting the train. Regarding the spare parts, reference is made to Tabke H.6 in Annex H b) Thresher Two units of Indonesian made threshers (model : Agrindo TPA 1000) driven by 2-cycle gasoline engines (model GX160) were delivered to Manatuto MB storage by the Study Team from local supplier at Dili in early February, 2003, which were imported from Agrindo in Surabaya, Indonesia. c) Rice Milling Unit One unit of mobile one-pass rice mill (Satake SB 10D) coupled with a diesel engine (Ratna R220H) was procured through the dealer in Dili together with a lot of consumable spare parts including rubber rolls early June, 2003 and immediately transported to MB storage at Manatuto by the Study Team and then installed and operated for test run. When farmers are

ready to bring their paddy into milling plot, contract milling is continuously served together with collecting the basic information on milling capacity, recovery, fuel consumption and workers required.

d) Measuring Tools and Accessories
Measuring tools and accessories were prepared before starting training such as stop watch, 100 m tape ruler, thermo-hygrometer, hand digital tachometer, grain moisture tester, platform scale, top pan scale, fuel measuring tool, funnel, fuel tank, vinyl sheet, rice sack, fuel pump and handy tool set as detailed in Table H.22 in Annex H.

e) Fuel and Oil
1,800 liter diesel fuel in meet with ASTM and API specifications, and 20 liter engine oil (SAE #40) were procured and delivered on the basis of 0.47 US$/lit CIF Manatuto. Also 40 liter gasoline fuel and 10 liter engine oil (SAE #50) were prepared for supporting initial contract services by farmers' group. They are kept at MB storage at Manatuto. Separate fuel consumption records both for diesel and gasoline fuel were made and provided at workshop for good book keeping together with painted numbering of 10 fuel drums.

f) Spare Parts, Workshop and Repair
Spare parts and repair materials such as four pieces of main drive V-belts, four pieces of paddy wheel fixing bolts/nuts and welding rods were purchased at Manatuto and Dili for emergency repair. Booking records of spare parts as listed in Table H.10 in Annex H were provided at workshop in Manatuto for good management. All tractors were broken down during operation of the MB program. Available spare parts were handed over to the Manatuto District Agricultural Office (DAO) and also to Baucau DAO for good maintenance of Siam Kubota tractors donated by JICA. Then after, the tractors were repaired by the former MB mechanic at Manatuto, and also in Baucau with the support by GTZ and his sub-contracted workshop because of no mechanics in Baucau. Consumable parts as main clutch V-belt, accelerator lever and paddy wheel fixing bolt/nut for hand tractor, and filter cup, filter element, cylinder liner and piston for engine were frequently required to maintain the tractors.

4) Preparation of Materials required

a) Training
Operation manuals for hand tractor together with primary power diesel engine, thresher with 2-cycle gasoline engine and mobile rice mill were prepared. Also parts list for hand tractor with engine and rice mill with engine were prepared. These manuals and parts lists were translated in Indonesian language which are familiar with farmers in the Pilot Project area, instead of Tetum language because of least technical terms as attached in Table H.24 - Table H.31 in Annex H. Parts list for thresher is still waited being sent from the manufacturer.

b) Field Inspection Format
Field inspection formats to acknowledge machinery capacity and performance, and labor productivity by use of tractor, thresher and rice mill as time and fuel consumption per hour or hectare were prepared in Indonesian language especially for periodical adjustment of hiring charges.

5) Operation Training of Tractor and Thresher

a) Tractor

One-day operation trainings of tractor were undertaken two times to the representatives of the farmers' group "B" on January 27 and joint group "A" and "C" on January 29, 2003. Training consisted of indoor orientation of principal knowledge and continuous outdoor practice. Total participants were nine farmers (five farmers from "B" and four farmers jointed both from "A" and "C"). "Certificate for Participation for Hand Tractor Operation Training" was awarded to all participants.

b) Thresher

Four member farmers participated into practical training of thresher successfully at demonstration farm on June 18, 2003.

2-5	Plowing and threshing were conducted under the contract with farmers.
2-6	Plan of the hiring system of farm machineries is discussed and prepared with the DAO

Progress

1) Contract for Land Preparation

The contract plowing was started by the attendance of the Study Team. The forms of application and agreement on contract plowing were prepared previously. All the records were handed over to the representatives of farmers' group before the leave of the Study Team.

Machinery cultivation contribution by group farmers under the Pilot Project was calculated on the cost-sharing basis effective only during the period of January 1 to June 30, 2003, which was translated into Indonesian language and approved officially by farmers' group. There were the following three categorized rates:

Category	Operation System "A" Full Provision with Operator and Fuel	Operation System "B" Partial Provision with Fuel & without Operator	Operation System "C" No provision of Fuel & Operator
Contribution by Farmer	US$ 30.00	US$ 23.00	US$ 8.00

Remarks:

a) Machinery used: Siam Kubota Model SK131 with moldboard plow, rotor harrow, leveler and puddling wheels
b) No. of machinery used and operators available: 2 units and 2 operators
c) Contract shall be exchanged before carrying out services
d) Area to be cultivated shall be measured correctly before entering into plowing services
e) The above tariffs are based on the principle of "cost-sharing" instead of "cost-recovery" tentatively

At the same time, however, recommended tariff under normal operation was also estimated for managing only Kubota hand tractors on the basis of independent market-economy entrepreneur:

I. Prerequisite Conditions (effective as January 2003)

a) Machinery used: Siam Kubota Model SK131 attached with plow, rotor harrow, leveler and paddy wheels
b) Total available units used: 14 units
c) Hand tractor purchase price: Rp18,500,000 = 2,056 US$/unit with accessories
d) Total investment cost: US$ 28,784.00
e) Machinery life: 5 years
f) Depreciation cost: US$ 5,756.80/year
g) Total no. of units operable: 13 units (average one unit being out of operation)
h) Fuel price: 0.47 US$/lit
i) Fuel cost per hectare: 30 lit/ha x 0.47 US$/lit = 14.10 US$/ha
j) Operator cost/month: 7.00 US$/day x 30 days = US$210/month
k) M.O.R./month (Machine Operable Ration per Month: 60 % (18 days/month)
l) Plowing efficiency: 0.4 ha/day (7 hours/day)
m) Plowing period: 90 days (single crop)

II. Monthly Operation Cost

a) Area cultivated/month: 0.4 ha/day-unit x 18 days/unit = 7.2 ha/month
b) Fuel cost/month: 14.10 US$/ha x 7.2 ha = US$ 101.52 /month
c) Machinery depreciation cost/month: US$ 411.2/3 months = US$ 137.07/month
d) Maintenance cost/month: US$ 137.07 x 10 % = US$ 13.71/month
e) Operators cost/month: US$ 210/month-person x 1/3[1/] = US$ 70/month
1/: The remained 2/3 shall be covered by threshing and milling services
f) Administration cost/month:
b) + c) + d) +e) x 10 %= US$ 32.33/month

Total = US$ 354.63/month, or US$ 49.25/ha

Starting from March 4, 21 farmers including six non-members signed the "Agreement on Contract Plowing" for plowing and puddling their fields and operated. Most farmers chose Category "C" contract. The total amounts of contract were US$ 202 for 15.8 ha. The money collected is kept by the manager of farmers' group, Haburas Manatuto.

The procedure of contract plowing and puddling was decided as follows:

a) The farmers who want to make a contract inform to Haburas Manatuto,
b) The related area is measured by the attendance of Haburas Manatuto,
c) The agreement is signed between Haburas Manatuto and farmer,
d) The plowing and puddling schedule is made previously by Haburas Manatuto,
e) The condition of tractor is checked by Haburas Manatuto in cooperation with the former MB mechanic.
f) Plowing and puddling are conducted,
g) The payment is made in due time by farmers.

2) Contract Threshing

The AGRINDO rice thresher is an axial-flow, feeding, peg-tooth type mechanical paddy thresher. It is powered by Honda 5.5 Hp gasoline engine that drives directly both the threshing drum and the blower through a single grooved B-section pulley and V-belts. The machine consists of the following main components: feeding table, threshing drum, cleaning assembly and discharge outlet. Even though attached as standard accessory, hopper is not utilized since the straw harvested in Manatuto is longer than ani-ani in Indonesia and easy to cause clogging. The feeding table, which is attached to the main frame through a pin holds materials for threshing.

The rate of feeding is controlled by the operator. The threshing drum consists of a single open-type cylinder with eight longitudinal flat bars. Seven equally spaced peg teeth are mounted on each bar. A chassis is incorporated where the transport wheels and its assembly are connected. The machine is also provided with two detachable towing bars. As from June 16, 2003, contract threshing has been done for four farmers, of whom one was non-member. As detailed in Table H.21 in Annex H, it was evaluated for its capacity and performance as follows and there were wide differences among farmers:

A. Conditions of Paddy	Four Farmers
1. Variety	IR64 or Dinas
2. Straw-Kernel Ratio	1:0.617 ~ 1:0.806
3. Moisture Content (% in wet)	10.9~20.6
4. Straw Length (mm)	220 ~ 640
5. Drying Method before threshing	on-the-field and levee
B. Field Performance	
6. Threshing Drum Speed (rpm)	580 ~ 600
7. Threshing Capacity – Intake (kg/hr)	269.64 ~ 365.22
8. Threshing Capacity – Output (kg/hr)	184.58 ~ 225.34

Analyzing the above results, recommended contribution by contract farmers is calculated as follows:

I. Prerequisite Conditions

a. Simple machine and so operation shall be done by farmer himself,
b. Fuel and oil shall be provided by Haburas Manatuto to eliminate flammable accident,
c. On the basis of three months threshing service period per year (June ~August), serviceable sixty days/year (20 days/month x 3 months), eight hours/day (morning 8:00 ~ 12:00 and afternoon 13:00 ~ 17:00),
d. Machine capacity : Intake 300 kg/hr and Output 195 kg/hr

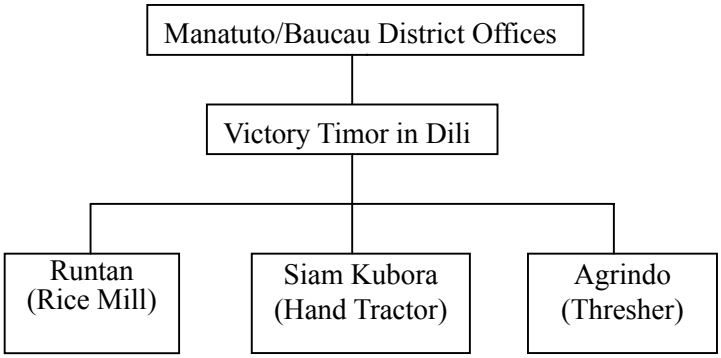
II. Contribution (per unit)

a. Depreciation: machine life five years and initial investment cost US$ 920.00
b. Fuel plus oil cost: gasoline US$ 0.50/lit and oil US$ 4.00/lit
c. Spare parts and repair cost: initial investment cost x 10 %
d. Administration cost: total expenditures x 20 %

	III. Annual Expenditures per Unit a. Depreciation expenditure : US$ 184.00 b. Fuel plus oil expenditure : US$ 237.60 = US$ 216.00 (8 hrs/day x 60 days x 0.9 lit/hr x US$ 0.50/lit) + US$ 21.60 c. Spare parts plus repair expenditure : US$ 18.40 d. Administration expenditure : US$ 88.00 (US$ 440.00 x 20 %) IV. Total Expenditures US$ 528.00/year or US$ 8.80/day or US$ 1.10/hr or US$ 0.37/100kg – intake paddy or US$ 0.56/100kg – output paddy or US$ 4.40/half day or US$ 8.80/day
Issues	1) Hand Tractor The procedure for making the contract is yet to be understood by the group managing staffs and farmers. The instruction was given to them, but it still takes time to have them comply fully with the rules. The continuous support is needed particularly for the following: a) To make sure to keep tractors in good condition, b) To make a schedule of tractor operation to maximize its use, c) To keep the collected contribution in a safe place, preferably at bank, d) To make a budget plan. Parts of tractors were broken so frequently. The reasons are: a) tractors are used without daily check, b) without permission by managing staffs, and c) operated by unskilled farmers. Therefore, it was decided to use only operation system "A" contract. Tractor should be operated by one of four operators. This rule will be applied to new farmers after plowing and pudding are completed. The rate of contract plowing with tractor is estimated at US$ 49/ha if all costs including depreciation are to be recovered. The Study Team considers this rate is not accepted by farmers at this stage. The suitable rate and contract system should be further more considered. 2) Thresher Viewing from the results of threshing works, these are the remarkable facts which may obstruct the smooth hiring system. The following shall be understood and improved for the system sustainability: a) Indispensable necessity of contract threshing schedule including date, starting time, estimated volume and hours required for threshing, b) Workers necessitated, on-the-field threshing shed, vinyl sheets to be laid on the field and shift of paddy bundles to be threshed to near the machine, all such preparation shall be completed before hiring, c) To dry paddy below 20 % in wet basis, otherwise it causes easily clogging inside threshing drum or waste outlets, which occurs surely longer time loss. d) Return the machine immediately after completion of threshing.

2-7	Technical and economical data is collected.
Progress	1) Demonstration Farm a) Demonstration farm (field "A" and "B", total 1.97 ha) was utilized for practical training and plowed/puddle by trainees approximately 1.5 ha effectively. The remained 0.47 ha was cultivated by "Rencah". b) Major principle data on labor productivity were collected in demonstration farm together with small sampling in outside demonstration farm, and those results on labor productivity indicate the following: - Topography of paddy field affects deeply on required times and fuel consumption per unit area, saying irregular and small size plots and higher levees in the area obstruct efficient operation of tractor to realize shorter time and less fuel consumption. - Also skillfulness and experience of tractor operator affect the required times and fuel consumption per unit area and times of breakdowns.
Issues	Above results can be found in Table H-2 and Table H-3 informing wide ranges of time required and fuel consumption converted to per hectare as: Plowing: 13 hours and 52 minutes ~ 76 hours and 56 minutes/ha and fuel consumption 9.4 lit ~ 43.9 lit Puddling: 6 hours and 51 minutes ~ 13 hours and 52 minutes/ha and fuel consumption 3.6 lit ~ 9.4 lit "Rencah": At demonstration farm (0.4 ha) Date / Time / No. of Keepers / No. of Buffalo Heads used March 17, 03 / 09:15-13:45 / 4 / 48 March 24, 03 / 09:00-13:20 / 4 / 35 March 29, 03 / 10:17-14:12 / 5 / 37 Total / 12 hrs 45 min (3 days) / 13 man-day / 120 heads Note; At neighboring field (0.062 ha) : 45 minutes, 16 heads buffaloes and 4 keepers, or 12 hours and 7 minutes/ time x normal 3 times with every one week interval = 36 hours and 21 minutes/ha

2-8	Additional spare parts for hand tractor under the Pilot Project
Progress	On June 17, 2003, additional spare parts for Siam Kubota SK Walk-Behind Tractor mounted with Kubota Diesel Engine ET80 as detailed in Table H.7 in Annex H were inspected, accepted and transported to Manatuto MB workshop. Those spare parts were divided into two groups, one of which was for Manatuto and the other for Baucau, and handed over to the respected persons in charge as shown in Table H.8 and Table H.9 in Annex H of Delivery Note.
Issues	Most spare parts numbers were changed without any previous notice by the manufacturer and moreover all labels of parts names were entitled in Thai language, which were translated into English. A ny way, the channel to order spare parts and to receive them within one month for hand tractor, thresher and

	rice milling unit including prime movers has been established as shown below. And procedures indicating the flow of systems for usage of spare parts were agreed among the related agencies such as MAFF, district offices, ex-Mobile Brigade staff, Haburas Manatuto members, etc, as shown in Table H.23.  a) MB tractors procured and donated by JICA through PPI United Tractors Jl. Raya Bekasi Km.22, Jakarta 13910 – Indonesia, Direct : (62-21) 4605952, 46823539, Phone : (62-21)4605959, 4605979, Fax : (62-21)4600903, e-mail : bp170845@centrin.net.id b) Original manufacturer of hand tractor The Siam Kubota Industry Co., Ltd, 101/19-24 Navanakorn Industrial Estate, Klong Luang, Pathumtani, Thailand, Tel : 909-0300, Fax : 529-0081, Mr. Ekasith/Export Business, e-mail : ekasiths@cementhai.co.th c) Manufacturer of thresher : Agrindo, Surabaya, Indonesia d) Manufacturer of mobile rice milling unit Rutan, Mr. Sutjipto, Tel : 62-31-3550191, Fax : 62-31-3536977, e-mail : rutanxm@indosat.net.id e) Handling agent in Dili Victory Timor, Rua De Colmera No.11, Dili, Mr. Wiliam Belo, Sing/ Manager, Mobile : 670-723-4868

2-9	Assembling, adjustment and trial running of mobile rice milling unit
Progress	On June 20, 2003, mobile rice milling unit consisting of such major components of Satake milling unit, diesel engine and base stand was duly inspected and accepted at the supplier Victory Timor warehouse in Dili, transported to Manatuto MB workshop on June 21, 2003 and assembled on June 26, 2003. The Satake mobile rice milling unit is a one-pass, rubber roll (4 inch) type rice mill. It is powered by a 15 kw or 20 Hp Ratna diesel engine which drives directly the polisher main shaft through a multiple-grooved B-section pulley and four V-belts. The step-down pulley at the main shaft drives the husker main shaft and the bran blower shaft through a single-grooved B-section pulley and V-belt. The husk aspirator and vibration sieve provided at the hopper are driven by the husker main shaft also through a V-belt and a cam. During June 26 - 27, 2003, it was adjusted under trial operation by milling of three sacks of paddy for ready services. Training and contract milling will be

started to carry out whenever group farmers are ready to mill their paddy. It is expected to get an average input capacity of 700 kg/hr using local variety with an average moisture content of 14.5 percent in wet basis and an average milling recovery of 68percent.

I. Prerequisite Conditions

a)	Milling Capacity	Milled rice 250 kg/hr or 5 sacks-50kg/hr
b)	Daily operation hours	7 hours
c)	No. of Keepers	2 persons
d)	Machine Life	8 years
e)	Initial Investment Cost	US$ 6,307.20
f)	Annual Operation Days	219 days
g)	Fuel & Oil Price	0.50 US$/lit

II. Daily Cost required

a)	Depreciation Cost	3.60 US$/day (US$ 6,307.20÷8 years ÷219 days)
b)	Fuel & Oil Cost	9.35 US$/day(2.6 lit/hr x 7 hrs/day x 0.50 US$/lit + 0.25 US$/day-engine oil)
c)	Keepers' Cost	US$ 5.00/2 persons – day
d)	Maintenance Cost	3.00 US$/day
e)	Administration Cost	3.15 US$/day
	Total	24.10 US$/day-milled rice or 0.69 US$/sack-50 kg or 0.014 US$/kg-milled rice

3.3.4 Irrigation Canal

3-1	The longitudinal and cross section surveys were done on the selected secondary canal.
Progress	As one of component in the Pilot Project, JICA Study Team improved the irrigation canal (selected Inkero Secondary Canal) that aligns from the main canal to the Pilot Project area. The principle and processes are shown below; ♦ Study Team did survey and design. ♦ Rehabilitation works such removals of sedimentation in canal were done by farmers themselves. ♦ Study Team procured materials/tools for rehabilitation works such as excavation, digging of sediment with the cost-sharing concept. ♦ A local staff (CARE) worked with farmers and the Study Team Survey work for formulating the improvement plan of Inkero 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 the Study Team

Issues	The works that needs skills such as surveying was indispensable. Therefore it was difficult to participate in the survey works for farmers.

3-2	The canal design was done.
Progress	Study Team did the design work for canal improvement. The design mainly indicates the necessary digging depth of the existing Inkero canal bed in order to get the irrigation water properly from main canal. The dimensions for design are referred to the number applied by UIRP. - Irrigated area: 45 ha - Unit water demand: 5.05 lit/sec/ha - Design discharge: 0.23 cu.m/sec
Issues	The designing work also needed technical skills. Therefore it was difficult to participate for farmers, too.

3-3	The schedule for on-farm maintenance was discussed and prepared.
Progress	(1) Farmers normally maintain their secondary canals before the starting time of cropping season. They spent one week for grass cutting and two weeks for the de-silting work in the canal. However, these maintenance works are done only once a year. (2) It is very difficult to prevent sedimentation in the secondary canal perfectly. Therefore routine/periodic maintenance work such as de-silting was required for the maintenance of secondary canals and on-farm facilities like pipe culverts that cross the road. (3) The Study Team explained the present situations and proposed the maintenance method as indicated below. a) Routine maintenance works The routine maintenance works should be done frequently. They include cutting of grasses at canals, particularly their inner sections. The works also include de-silting and removal of debris in the secondary canals. b) Periodic maintenance and repair works The periodic maintenance and repair works should be done before or just after cropping season. The works related to the secondary canal and ancillaries shall include: i) re-shaping of the canal slope, ii) removal of silt or sediments inside the secondary canals, and iii) removal of debris and other obstructions.
Issues	The discussion of the detail of maintenance works schedule was done in January, 2003.

3-4	Maintenance works (including canal cleaning) was done.
Progress	(1) According to the design, the maintenance work such as removing the sediment in the canals was done by farmers, as shown bellow. - Duration : From December 8 to 20, 2002 - Item of work : Digging/de-silting work, volume of de-silting 250 cu.m - Participants : Labors were shouldered by farmers (15 – 20 farmers) - Materials/Tools : The Study Team procured following materials/tools based on the discussion during workshops with farmers. · Shovel 30 nos. · Hoe 17 nos. · Aiswak (local cal) 35 nos. · Katana 35 nos. (2) They have discussed how to share the irrigation water before starting land preparation. They settled the order to get the irrigation water to respective paddy field. This is called "Traditional Way". However, there were no division boxes along the Inkero canal at present. Farmers have made weir using soil, grass, twigs, etc. to share the irrigation water. Considering the present situation, it was difficult to distribute exactly the irrigation water based on their agreement decided by farmers themselves. The water distribution/management has been so far done roughly. Therefore, with the Pilot Project, Study Team tried to set up the division boxes to distribute the irrigation water properly.
Issues	(1) The Study Team procured the materials/tools needed. As an important concept of the Pilot Project, Study Team considered the 'Cost-Sharing' system. The Pilot Project introduced a cost-sharing system which requires the users pay for what they are benefited. Farmers and the Study Team have already discussed this matter on the workshop. The discussion regarding to the sharing ratio of the cost was done February 2003. (2) For maintenance works, some materials/tools such as cement, shovel, hoe, etc. were prepared. A warehouse was needed for storing these materials/ tools. In consequence of discussion with farmers, Study Team decided to use the storage owned by one farmer near the pilot farm. In this connection, the Study Team trained the farmers how to manage the materials/tools properly in terms of following matters. - Nomination of responsible person - Key management - Management by book keeping

3.3.5 Water Management

4-1	The current water management practices and WUA's functions are discussed with the farmers and WUA's leaders.
Progress	To discuss the current water management practices and the WUA's functions, two meetings were held in December 2002. One was with the DAO, all chiefs of villages and the WUA President. Another meeting was with the chief of Sau village, the WUA President and the farmers participating in canal cleaning of Inkero Secondary Canal. An interview was also made to a Marino (traditional water tender) on the traditional practices of water management in the area. Through the workshop and the meetings, the following problems were raised: (1) WUA establishment and selection of officers The farmers were not satisfied with the WUA's officers and their operations. One of the reasons was that the farmers were not well aware of how the WUA officers were selected. It was observed by the Study Team that the chiefs of the villages had not explained well to the farmers on the WUA establishment and the selection of the officers. The WUA officers had not communicated well with the farmers as well. The farmers were then proposing the new WUA officers be elected by vote of the farmers. (2) Use of an excavator Farmers also complained that the construction machineries of bulldozer and backhoe shovel provided by the UNOPS to the district had been rented out by the WUA in and outside of the project area without any information to the farmers. The distrust of the farmers towards the WUA, regarding money transactions, was high. It was considered necessary to improve communication and relationships between the WUA and farmers, and review in what way the WUA structure and management should be if it is to be supported by the farmers. It was also considered the system to assure financial transparency be introduced at the earliest time into the WUA. In January and February 2003, three meetings were conducted to discuss water management issues and the above problems. It was however difficult to continue the intended discussion since the problems of the WUA were continuously raised and concentrated. The Study Team finally had to decide that the problems of the WUA be solved first and asked the participants to discuss it among themselves, together with the responsible parties such as the UNOPS, MAFF and the district office. Then, the participants of the meetings, i.e., the chiefs of the villages, the president of the WUA, and the farmers agreed that, on April 3, 2003, the president explains what responsibilities he had and what he had fulfilled, and on the same day, the election of the new WUA officers be held. The DIO mentioned he would be responsible for the arrangement of those events (see Annex G, Aid Memoir, Meeting for Effective Water Management No.1 and No.2) . After all, the election was held on April 25. The Study Team could not be present there as it was out of the service period. According to the report given by JICA Dili Office, it was duly conducted with the presence of the officers/staff of MAFF, the sub-district, UNOPS, UNDP, JICA Dili Office and CARE as well as the chiefs of four

	villages. The new WUA officers were elected by vote of the farmers. Among 292 farmers registered, 79 farmers voted.

4-2	The training plan for water management is discussed and prepared.
Progress	In the workshop of November 2002, the needs of the farmers for water management training were discussed. The current water management practices had also been confirmed with the chief Marino by walking through the main canal. In the preparation of the training plan, the Study Team considered water management in future is also based on the traditional system; that is continuously to have the Marinos (traditional water tenders) at the core of the operations. The improvement of the traditional system is needed through the training. It was originally planned that water management training in the Pilot Project would be provided only at the secondary canal level since the UNOPS would do it at the main canal level. Later, it was however considered necessary even for the Pilot Project to include the main canal level into the training. The reasons are: a) There are four Marinos responsible for the whole irrigation system including the main and secondary canals. All of them should be included in the training as they traditionally cooperate each other for water management. b) The water management at the secondary canal does not require much higher skills beyond the current system since water flows plot to plot. The attention should therefore be paid more on the main canal. Accordingly, the list of the farmers participating into the water management training was prepared (see Table G.3-1 in Annex G). Due to the problems mentioned in 4-1, the training plan was finally prepared in January 2003 with the following activities (see Annex G): - To form a water management group consisted of Marinos and leaders of all secondary canals - To instruct them on effective water management - To campaign for building the farmers' awareness on the importance of water fee payment

4-3	The schedule for water management is discussed and prepared.
Progress	The schedule for water management was explained and discussed with the text prepared by the Study Team when the instruction on effective water management was given to the participants in January and February 2003.

4-4	The water fee collection and use are discussed, and the rule is made.
Progress	In the planning workshop and the following meetings in December 2002, the plan of water fee collection was explained to the farmers. The farmers traditionally paid water fee to the Marinos every season in the form of paddy. In principle, the rate was usually one bag of paddy per hectare although it varied depending on the yield. It was observed that the farmers were not aware of the new plan of water fee

	collection. The WUA officers should have explained and discussed this issue with the farmers clearly and thoroughly. In the meeting of February 2003, the issue of water fee collection was again discussed. The Study Team observed that some participants had clearly understood the importance of water fee collection. The participants mentioned that the traditional leaders (Ketua Adat) and the Marinos are the ones that traditionally decide and collect the water fee. Picture materials were prepared and used for raising the farmers' awareness on the importance of water fee payment (see Annex G).
Issues	According to the discussion with the new president of the WUA in June 2003, an advisory team will be soon organized to discuss the issues of water management and collection of water fee. The team members will be the chiefs of four villages, four Ketua Adat, and representatives of all secondary canals. If any decisions are made by the team, the WUA will start its activities. A system of water fee collection should be established at the earliest time. It should take the traditions and local dynamics of the area into consideration. It is expected that the authorities concerned make sure that the advisory team be organized and make a suitable system soon.

4-5	The training of water management is conducted through rice production period.
Progress	In the meetings of January and February 2003, the instructions on effective water management were given to the water management group (see Annex G).
Issues	To make it more effective, this sort of training should continuously be given even after the WUA starts functioning.

4-6	If possible, the water fee is collected after harvest.
Issues	Although most of the farmers have not completed harvesting by end June, the collection of the water fee will be difficult until the new WUA starts functioning and secures its transparency. The farmers should also become aware of the importance of the payment, and therefore the strong efforts of the agencies concerned should be made mainly through awareness building campaigns and continuous discussions. For securing the transparency in the WUA, it is important to reflect various lessons leant from the experiences in organizing Haburas Manatuto on the WUA's management in future.

4-7	The O&M Manual prepared by the UNOPS is reviewed with the farmers and commented for its improvement.
Progress	The experiences of the Pilot Project have been recorded and are shown in the final report. There are many suggestions included for the O&M Manual.

Table 3.3-1 Experimental Cultivation in the Demonstration Farm

1 Fertilizer Experiment

Abbr.	Treatment	Application Amount (kg/ha)			
		N (Nitrogen)		P_2O_5	K_2O
		Basal dressing	Top dressing	(Phosphorus)	(Potassium)
F1	None fertilizer (Control)	0	0	0	0
F2	None nitrogen	0	0	30	30
F3	Only top dressing	0	30	0	0
F4	Only basal dressing	30	0	0	0
F5	Split dressing 1	20	10	0	0
F6	Split dressing 2	30	15	0	0
F7	Split dressing 3	40	20	0	0
F8	Only organic fertilizer	0	0	0	0

N was applied with Urea.
P_2O_5 was applied with SP36.
K_2O was applied with KCl.
All seedlings were transplanted in a row.
Weeding was done.

2 Planting methods

Abbr.	Treatment
P1	Random transplanting
P2	Row transplanting
P3	Direct seeding

No fertilizer was applied.
Weeding was not done.

3 Weeding

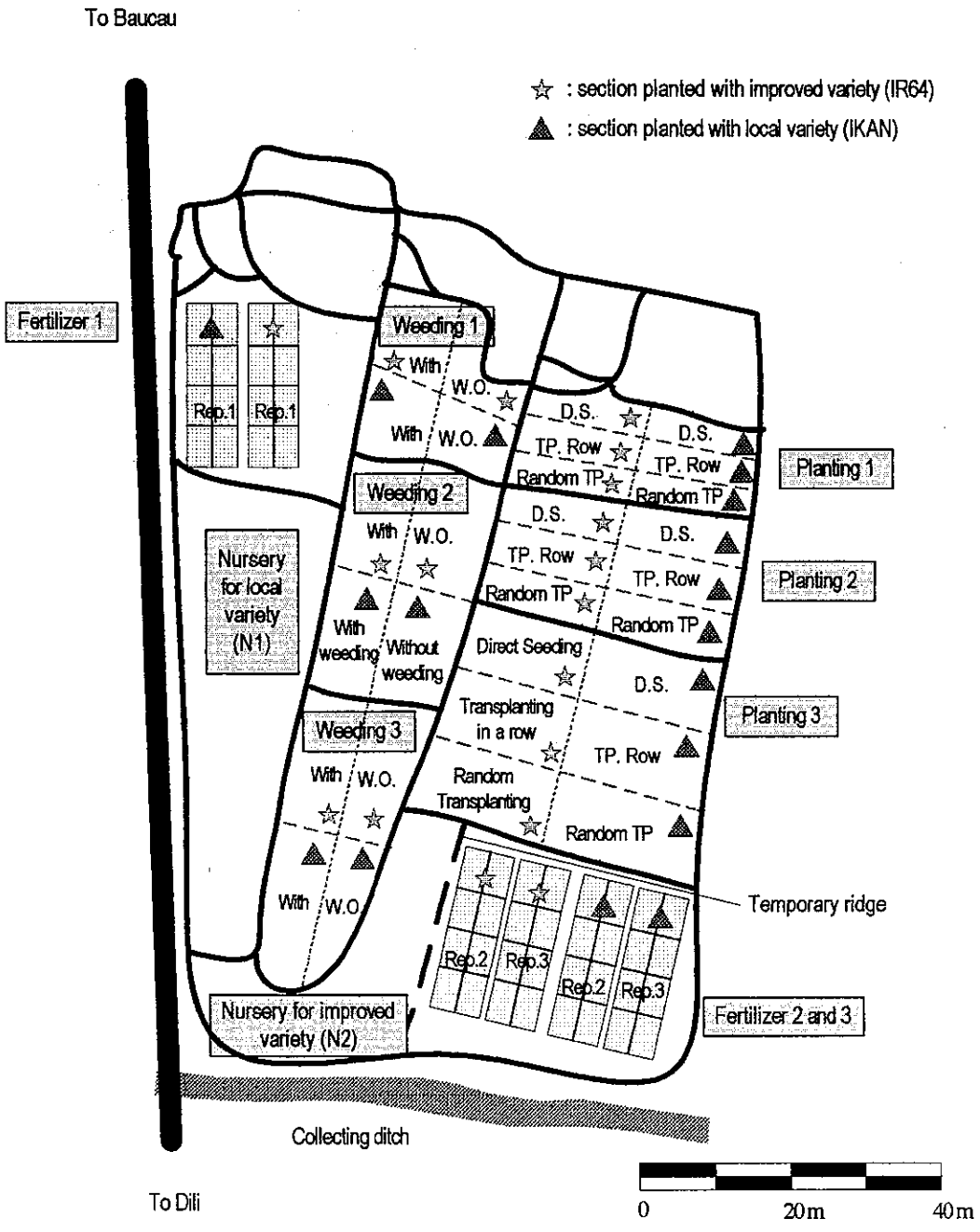
Abbr.	Treatment
W1	Do weeding
W2	Do not weeding

All seedlings were transplanted in a row.
No fertilizer was applied.

NOTES:

Two varieties (IR64 and one local variety, IKAN) were used in all the treatments.
All the treatments had three replications.
Yield component survey and yield survey by unit area sampling were done.

Figure 3.3-1 Map of Demonstration Farm - Site A



Layout of Fertilizer Experiment Sections

Rep.1		Rep.2		Rep.3	
5	2	8	4	3	4
6	8	7	3	8	2
1	7	6	1	1	7
4	3	5	2	6	5

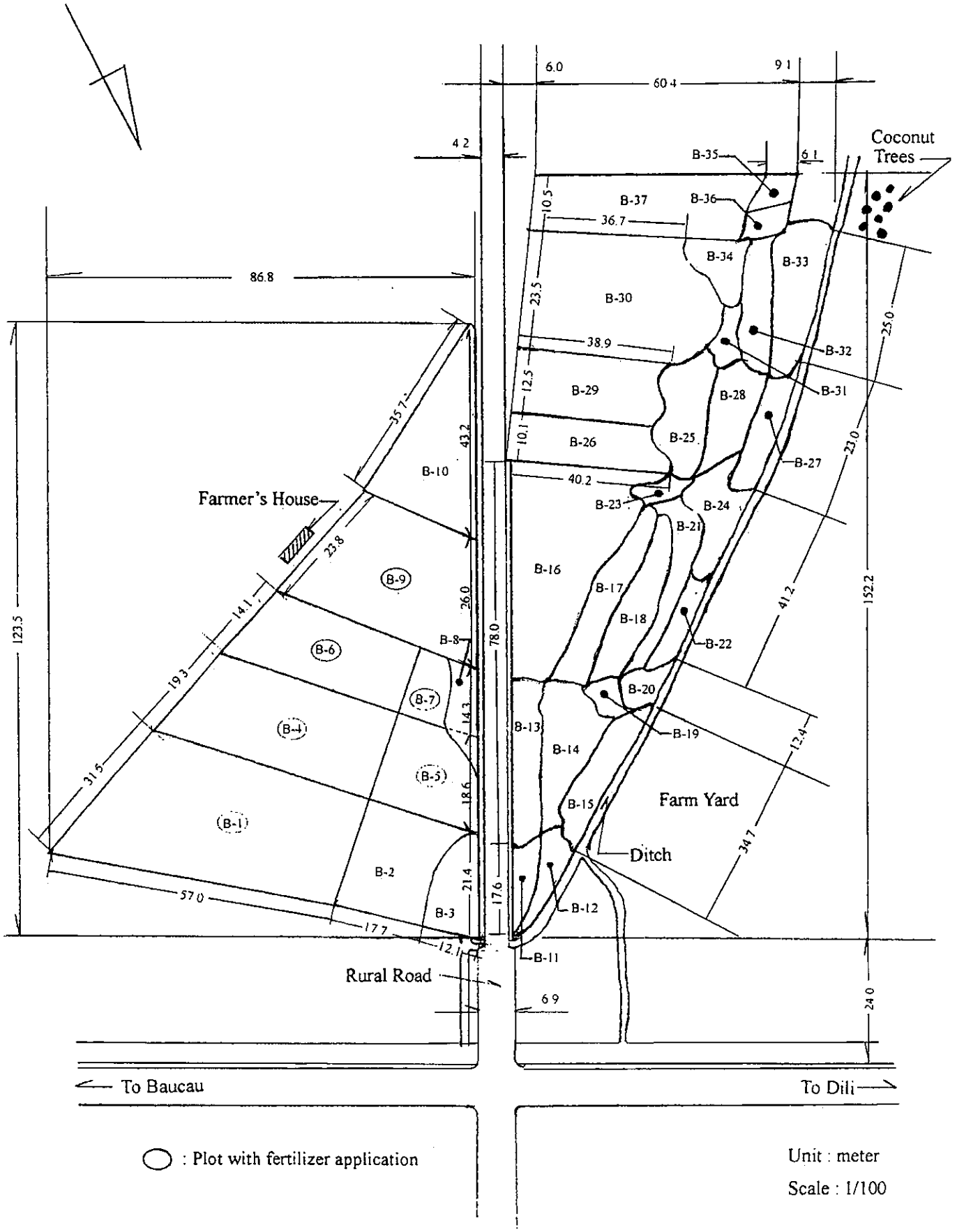
Local Variety

Rep.1		Rep.2		Rep.3	
1	7	7	5	8	7
8	4	6	2	6	4
3	2	3	1	3	2
6	5	4	8	5	1

Improved Variety

Abbr.	Application Amount (kg/ha)			
	N (Nitrogen)		P_2O_5	K_2O
	Basal	Top	(Phosphorus)	(Potassium)
1	0	0	0	0
2	0	0	30	30
3	0	30	0	0
4	30	0	0	0
5	20	10	0	0
6	30	15	0	0
7	40	20	0	0
8	Only organic fertilizer			

Figure 3.3-2 Map of Demonstration Farm – Site B



3.4 Monitoring and Evaluation of the Pilot Project

3.4.1 Monitoring of the Pilot Project

The Study Team monitored each activity at the site during the fieldwork stages through observation and interview on relevant people, which is called "external monitoring". On the other hand, farmers monitored their own activities, which are called "internal monitoring". The results of the monitoring are shown below in order of the activities of the Plan of Operations as shown in Table 1.3-2.

1) Common Activities

(1)	The planning workshop
External Monitoring	The first workshop was conducted with about 50 local people consists of concerned farmers for five days. The problems tree and objectives tree were analyzed, and the PDM and the PO was orderly prepared. The Pilot Project was considered as started well though it was said generally that working cooperatively was difficult for farmers. A MAFF's officer with much experience as a facilitator facilitated the workshop. He rendered great service to the success of the workshop.
Internal Monitoring	According to the new members of Haburas Manatuto, not all result of the workshop was same as the opinion of the attendance, since not all participants made speech at the meeting.

(2)	The list of the participants
External Monitoring	Among attendant of the planning workshop, 36 members were listed as the participants of the activities of the Pilot Project. Those members were organized into three working groups, and the leaders of each group were selected at the same time.
Internal Monitoring	According to the new members of Haburas Manatuto, many attendance of the workshop were senior farmers who were in a position of leadership, and young farmers, who practically attended the activities, were limited.

(3)	The roles and responsibilities among the persons concerned
External Monitoring	The roles and responsibilities of the persons concerned were discussed in the planning workshop and summarized clearly in the Plan of Operations.
Internal Monitoring	According to the new members of Haburas Manatuto, they were not able to understand "participatory approach" until they actually attended the activities.

(4)	The socio-economic survey
External Monitoring	The Study Team conducted a hearing survey on 41 households, using a questionnaire for two weeks. The Study Team selected three households from each secondary canal as samples. The Study Team found out that these samples were high-income households because selection was made mainly in consideration on easy access to visit during the survey.
Internal Monitoring	According to the enumerators, hearing data might not reliable since almost all farmers did not have experience in measurement and their memories on quantities were not clear.

(5)	The meetinghouse
External Monitoring	The Study Team designed a meetinghouse for the Pilot Project, and carpenters constructed the house with farmers organized by them. The house was used for meetings and farm work. An attached small warehouse was used to keep farming equipments and materials for the Pilot Project. Though it was an earthen floor at first, farmers floored it with cement two months later in the beginning of March 2003. Before the building of the meetinghouse, farmers used to have a meeting on an open space at a farmer's garden.
Internal Monitoring	New members of Haburas Manatuto evaluated that the meetinghouse looks good, suitable for their needs and constructed with adequate costs. On the other hand, farmers insisted that the Study Team should have asked the members to construct the house but not carpenters. They wanted to participate in the construction works not only because of earning money but because they wanted build their meetinghouse by themselves, they said.

2) Production Technologies of Rice

(1)	The plan for the demonstration farm
External Monitoring	The Study Team had a meeting with 12 farmers to explain the idea of the demonstration farm, followed by the discussion on the details. Though using of IKAN as a local variety was recommended by the farmers and accepted in the meeting, presently the farmers seldom plant the variety.
Internal Monitoring	The content of the experiment was explained again upon the request from new members of Haburas Manatuto after the reorganization, since almost all new members had not attended the meeting on the experimental plan.

(2)	Preparation of the demonstration farm
External Monitoring	In the planning workshop, a representative of the secondary canal suggested that he offered his farmland as demonstration farm field. The participating farmers agreed to use the field, thus, the location of demonstration farm was decided.

	The representative was an influential man in the area, and had played a role of leader since the selection stage of the Pilot Project site. In terms of the location of demonstration farm, if he did not offer his land, the selection could be difficult to decide if he did not offer his land, since ordinary farmers could not afford to lend their land.
Internal Monitoring	New members of Haburas Manatuto pointed out that, one of the reasons the original members did not participate in the activities was that the demonstration field was located within land of the representative. They said that the general farmers tended to avoid entering the field due to their dislike of the representative.

(3)	Preparation of the rice seeds
External Monitoring	The Study Team imported the seeds of improved variety (IR64) from Indonesia through a dealer in Dili. As for the seeds of native variety (IKAN), the local seeds were given by the landowner of the demonstration farm fields.
Internal Monitoring	According to the new members of Haburas Manatuto, IKAN is bigger grain size than other varieties, and easily fall. The farmers are presently planting varieties of Barito, Java, IR, Sisidade and so on. They think all varieties are almost the same in terms of taste, yield and price.

(4) Growing of seedlings／(5) Land preparation	
External Monitoring	In the nursery bed, there were some damages of the leaves by cattle and worms. In order to exterminate the harmful worms, the seedlings were kept under water overnight. Plowing and paddling of the field were implemented from January 27, 2003 to March 5, 2003. The attendance of the original members of Haburas Manatuto was low. The land preparation was very hard because the surface of the field was not flat, and a lot of grass was grown in the field.
Internal Monitoring	New members of Haburas Manatuto estimated that the reason of low attendance of original members was, the landowner who was not trusted by the farmers has managed the works, and also they were too busy with works in their own field. According to a local assistant, the grass having hard roots grows throughout the area, and the roots sometimes hurt farmer's feet since they work in fields with bare foot. Rubber-soled footgear brought from Japan by the Study Team worked well to protect farmer's feet from the roots.

(6)	Transplanting and direct seeding
External Monitoring	Three methods were experimented; transplanting in a row, random transplanting and direct seeding. The transplanting needed five or six seedlings per hill because the conditions of the seedlings and the surface of the field were not so good that the rooting ratio was low. Reorganization of Haburas Manatuto was done during the transplanting stage.

Internal Monitoring	The new members of Haburas Manatuto were glad to learn the new method, transplanting in a row. They prefer to try the new transplanting method and weeding by a weeder. According to senior farmers, almost all farmers adopted direct seeding in Indonesian time.

(7)	Application of fertilizer
External Monitoring	Basal dressing and top dressing were implemented in accordance with the plan of fertilizer experiments. The top dressing was done by a local assistant. The farmers do not have proper knowledge of fertilizer though they have high interest of using it.
Internal Monitoring	They expected a lot on the fertilizer experiments because they had no idea what kind of fertilizer suited the land, and how much they should apply it.

(8)	Weeding
External Monitoring	The Study Team prepared hand-push type weeders at the site, and introduced them into the field. The effect of the weeder was confirmed after transplanting in a row, however, the timing of weeding and the adjustment of depth of water were difficult for the farmers as compared with current farming precision.
Internal Monitoring	The farmers were reluctant to try transplanting in a row + weeder because they have no experience of early weeding by using weeder, though they understood that transplanting in a row made possible to use a weeder.

(9)	Harvesting
External Monitoring	Harvesting work was done from 4 June for IR64, and from 16 June for IKAN. In the traditional way, they put knife beside a part of a bundle of straw, 20 cm up from surface of land, and tear off the bundle diagonal upward. It is work of women, traditionally, and many harvesting women were observed around the site.
Internal Monitoring	The Study Team tested Japanese sickles for harvesting, and the farmers favorably received them since the edges were very sharp. Local sickles from Indonesian time which were same as Japanese type were inferior in the sharpness, they explained.

(10)	Yield surveys
External Monitoring	Yield measurements for yield component survey as well as yield survey by unit area sampling were conducted from June 19 to June 28 after the harvesting. The Study Team employed some labors from farmers around the Pilot Project site since the measurement work of the number of panicles and grains required

	much manpower. The measurements by the farmers partially seemed rough but they worked hard comparatively.
Internal Monitoring	The farmers showed much interest on the result of the experiments, especially on the comparative experiments. The way of comparison of the results itself was new to the farmers and stimulated their interests, which might be caused by their lack of opportunities of thinking by themselves.

(11)	Study tour
External Monitoring	The study tour to Baucau was conducted on March 6in order to observe a system of contract plowing with a tractor. In Baucau, the current conditions and problems were explained by Baucau side, and the both sides exchanged the views. This occasion seemed not to serve well as a reference of studying the system since the main topic was the problem of the system in Baucau alone. On the other hand, it was useful to give 15 attended members of Haburas Manatuto awareness as a group and talked with members of other farmers' group. Also, the Study Team was able to learn lessons, which could be applied to an implementation of a same type of study.
Internal Monitoring	Lack of the spare parts was a common problem, and the members of Haburas Manatuto recognized the importance of the measurement. Use of tractor in Baucau needs more attention since the soil in Baucau is harder. Haburas Manatuto seemed to be better organized than the group in Baucau, members of which were observed complaining inconsistently.

3) Farm Mechanization

(1)	Training plan for farm mechanization
External Monitoring	Training plan for farm mechanization was formulated, aiming to made training on power tiller operation for 9 farmers, contract land preparation for 10 farmers (15 ha), contract threshing for15 farmers (22 ha) and contract milling for 20 farmers (4 ton of paddy). Cultivation area of paddy was increased over double in this season due to the improvement of Laclo irrigation facilities and use of farm machines, which has contributed to reduce the labor in accordance with the farmers' need.
Internal Monitoring	The farmers were eager for using farm machines, therefore practical training in the contract land preparation and their expectation that the machines might be transferred to Haburas Manatuto, strongly motivated them to participate the Pilot Project. Number of farm machines in the Manatuto area were too small for more than a hundred farmers who wanted to use, with the condition that the rental fee remain low.

(2) Operation training of tractor/ (3) Operation training of thresher/ (4) Operation training of rice mill	
External Monitoring	Operation trainings were conducted for the following items; hand tractor for nine farmers, thresher for 11 farmers and rice mill for 5 farmers, which included non-members of Haburas Manatuto. Reorganization of Haburas Manatuto was executed after the operation training of hand tractor. The Manatuto District has started implementing a project by renting hand tractor to each secondary canal, however, the operation method was not explained. As the result, many troubles were occurred and caused breakdown of one of the machines. Therefore, the staffs in the District realized keenly the importance of a guidance of operation, and evaluated highly the struggle of the Pilot Project. However, they have not yet planned the introduction of the operation guidance to their project after this season.
Internal Monitoring	It was great for some farmers that the training made them possible to operate the machine alone though they need more technical trainings, as many farmers had no experience of the operation. In the operation of the hand tractors, machine troubles occurred so many times that they requested training for the repair.

(5)	Hiring of farm machines
External Monitoring	Hiring of farm machines were implemented as follows; contract land preparation for 22 farmers (16 ha), contract threshing for four farmers (approximately 2 ha), and contract milling for four farmers (approximately 0.1 ton of paddy). Renting of threshers and rice mill were limited because the hiring was offered before the main working season, and it was limited time to hire since the preparation took longer time. If a new milling place will be opened, they will enjoy the reduction of transportation workload because each household is presently bringing necessary paddy to an existing milling place little by little.
Internal Monitoring	Many farmers wanted to use the hand tractors and threshers since the machines were not enough for the demands. Some farmers rented the machine by deferred payment because they cold not pay the money before harvesting.

(6) The plan of the hiring system of farm machines/ (7) Collection of technical and economic data	
External Monitoring	The Study Team collected data on the performance and cost through the hiring system and the test run, and formulated plan of the hiring system of contract land preparation, threshing and milling based on the conclusion of the analysis. They can continue the use of machines if the management will be done according to the plan since the rental fee includes the depreciation expenses. Charging system based on the rented hours is necessary for rental fee to be reduced by improving working efficiency, though the current charge system is based on the quantity by area or processed volume.

Internal Monitoring	Farmers are not used to figure or calculation in daily life so it is difficult to be understood. As compared with ordinary farmers, some of their leaders showed strong interests in calculating money.

(7) Collection of technical and economic data/ (8) Comparison of traditional and mechanized farming	
External Monitoring	The Study Team collected data on traditional faring method such as rencah and foot threshing, and analyzed the labor productivity and cost compared with the method using machines. The conclusion of the analysis showed that the remarkable time and cost could be reduced though labor cost was very low. The farmers will be able to do double cropping after this year since the improvement and construction of the irrigation facilities will be completed at the end of this year. Therefore, at least the productivity will drastically improved though the volume of selling rice would not increase rapidly because rice for self consumption is not enough and there are also some problems in marketing. It is expected that land preparation by using hand tractor become major method since there are not enough buffalo for rencah, and a lot of grasses are withered in dry season.
Internal Monitoring	Though the improvement of labor productivity by using machines was remarkable as compared to Rencah and foot threshing without equipment, the farmers could understand more concretely the improvement through the results of calculations.

4) Improvement of Irrigation Canal

(1) The longitudinal and cross section surveys/ (2) The canal design	
External Monitoring	The longitudinal and cross section surveys of selected Inkero Secondary Canal were conducted, and the Study Team designed the canal in order to obtain irrigation water properly from the improved main canal and to supply the water to each field smoothly.
Internal Monitoring	The local stuff surveyed on secondary canal under the direction of the Study Team. Excavation and cleaning of the secondary canal were implemented using the designed drawings.

(3) The plan for maintenance works of the secondary canal/ (4) Maintenance works of the secondary canal	
External Monitoring	The farmers who own land around the secondary canal excavated and cleaned the canal in December 2002. Therefore, they could obtain water from the improved main canal. The Study Team proposed the periodic maintenance works twice a year considering the condition on the sedimentation of silt from the main canal as well as growing of weeds. Also, the Study Team designed a simple division box, and farmers made one on the upper part of the secondary canal. The structure is effective to divert

	irrigation water, and the operation and maintenance works are easier than traditional ones.
Internal Monitoring	Five among 15 members of Haburas Manatuto who attended a review meeting had knowledge on the division box. According to the members, easy operation and maintenance was advantage, however they also pointed out that farmers who attended the construction were limited.

5) Water Management

(1)	Grasp of activities of the current water management
External Monitoring	Meetings were held two times in December 2002, and water management practices as well as the functions of WUA were discussed by the DAO, all chiefs of villages, the WUA president and members of the WUA.
Internal Monitoring	At these meetings, the members proposed a) the new WUA officers should be elected by voting of the members, b) The existing WUA officers should explain to the members about the rental of an excavator and also how the rental fee is managed.

(2) The training plan for water management/ (3) The schedule for water management/ (4) The plan for the water fee collection/ (5) The training of water management/ (6) The water fee collection after harvest/ (7) Comments to the O&M manual	
External Monitoring	The plans for the instructions to the organized water management group on effective water management was formulated by the Study Team, and the training program of building awareness on the payment of water fee were finalized. The instruction on water management including its schedule was made to the group in January and February 2003. As for the water fee collection, the Study Team built awareness among the water management group and members emphasizing importance of payment, using training materials. Record of the activities on water management in the Completion Report included a lot of suggestion to the O&M manual prepared by the UNOPS.
Internal Monitoring	The new WUA president informed the Study Team that they were planning to organize an advisory team, which consists of the chiefs of villages, the traditional leaders and the representatives of all secondary canals, to study the issues on water management and collection of water fee.

3.4.2 Outcomes and Evaluation for the Pilot Project

Evaluation of the Pilot Project was made under the following Evaluation Grid.

Evaluation Grid

Evaluation Item	Survey Contents	Index	Data Source	Survey Method
1) Relevance	1- 1) Has the project purpose accorded with needs of the farmers?	1- 1- 1) Did the farmers agree with the project purpose and the method?	Field Report	Referring
		1- 1- 2) Did the farmers participate in the activities, appropriately?	ditto	ditto
2) Effectiveness	2- 1) Has the project purpose been achieved?	2- 1- 1) Are the capacities of more than half of the farmers improved?	Participants of workshop	Hearing
3) Efficiency	3- 1) Have the activities of Production Technologies of Rice implemented, efficiently?	3- 1- 1) Did more than half of the participating farmers understand both the merits and demerits of local/improved rice varieties?	Participants of workshop	Hearing
		3- 1- 2) Were the appropriate fertilizer application levels for the varieties used identified?	ditto	ditto
		3- 1- 3) Did more than half of the participating farmers adequately understand the positive effects of weeding and row transplanting?	ditto	ditto
	3- 2) Have the activities of Farm Mechanization implemented, efficiently?	3- 2- 1) Were the increasing of labor productivities through partial farm mechanization of rice cultivation confirmed?	Farm machinery expert	Interview
		3- 2- 2) Were the trainings on farm mechanization conducted, adequately?	Participants of workshop	Hearing
		3- 2- 3) Did at least 9 farmers come to be able to operate the machines for plowing and threshing?	Farm machinery expert	Interview
		3- 2- 4) Was the plan of the hiring system of farm machinery prepared through the analysis of its possibilities?	ditto	ditto
		3- 2- 5) Was the rate of broken rice reduced by 60% of the present rate in order to promote local marketing of rice in Manatuto?	ditto	ditto
	3- 3) Have the activities of Irrigation Canal implemented, efficiently?	3- 3- 1) Was the schedule for maintenance of the branch canal prepared?	Facility expert	Interview
		3- 3- 2) Did the farmers provide labor free of charge to renovate and clean the branch canal, adequately?	Canal condition	Monitoring
		3- 3- 3) Were the trainings on the branch canal design conducted, adequately?	Facility expert	Interview
		3- 3- 4) Were the irrigated areas adequately expanded by improving the canals?	Household Survey	Referring
	3- 4) Have the activities of Water Management implemented, efficiently?	3- 4- 1) Was the water management schedule prepared?	Organization expert	Interview
		3- 4- 2) Was the training program for effective water management prepared?	ditto	ditto
		3- 4- 3) Were the trainings on water management conducted, adequately?	Participants	Hearing
		3- 4- 4) Were the water fees collected from the farmers after the harvest?	Organization expert	Interview
		3- 4- 5) Was the list of suggestions to the UNOPS prepared for the improvement of the O&M Manual prepared by the UNOPS?	ditto	ditto
		3- 4- 6) Did many farmers positively assess that available irrigation water increase through the cooperation among the neighboring farmers, compared with period in and before 1996?	ditto	ditto
4) Impact	4- 1) Will the farmers apply the new skills to rice cultivation in the next	4- 1- 1) Will more than half of the farmers apply new skills to rice cultivation in the next season?	Participants of workshop	Hearing
5) Sustainability	5- 1) Will Haburas Manatuto continue their activities?	5- 1- 1) Does the organization have a proper rule?	Field Report	Referring
		5- 1- 2) Does the organization have a good leader?	Members of Haburas Manatuto	Hearing
		5- 1- 3) Does Haburas Manatuto have the right to use farm machines?	Judgement by JICA East Timor Office	Hearing
		5- 1- 4) Does the organization manage their finance, appropriately?	Organization expert	Interview

1) Relevance

1-1) Has the project purpose accorded with needs of the farmers?

1-1-1) Did the farmers agree with the project purpose and the method?

Before the beginning of earnest implementation of the Pilot Project, the preparation workshop was held in November 2002. In the meeting, the project purpose, which was "The capacities of the farmers in the area for rice production and management of farmers' groups are enhanced." and the method, which consisted of four components (Production Technologies of Rice, Farm Mechanization, Irrigation Canal and Water Management), were duly discussed among the persons concerned including the farmers, and they reached the agreement. Therefore, the project purpose has accorded with needs of the farmers.

1-1-2) Did the farmers participate in the activities, appropriately?

But 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.

If we should define "needs" as realizable desire in the project, we have to say the participatory approach that they had understood in the preparation workshop was not their "needs" but their "hopes".

2) Effectiveness

2-1) Has the project purpose been achieved?

2-1-1) Are the capacities of more than half of the farmers improved?

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 farmer's group.

3) Efficiency

3-1) Have the activities of Production Technologies of Rice implemented, efficiently?

a) Initially, 35 farmers attended the activity. They were divided into three groups, and began each activity. But the participants had been reduced day-by-day, and 16 farmers established the new group at the beginning of March 2003.
b) The Study Team prepared the training materials, rice seeds, which included one of local variety, as they did not have the seed, and fertilizers.
c) The paddy fields were rented on a condition of the whole produce would be handed over to the land-owner.
d) Cost-sharing of seeds and fertilizers between the Team and farmers was not

conducted since they were fully occupied with only labor sharing.

3-1-1) Did more than half of the participating farmers understand both the merits and demerits of local/improved rice varieties?

All participants of this activity learned the merits and demerits of local/improved variety through the activities. Produced quantity of the local variety is not greatly influenced by the condition of the cultivation. Though yield of the improved variety can be increased under good condition of the cultivation, it is lower than the local variety under poor condition. They had a wish for cultivation of the improved variety at first.

3-1-2) Were the appropriate fertilizer application levels for the varieties used identified?

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.

3-1-3) Did more than half of the participating farmers adequately understand the positive effects of weeding and row transplanting?

All participants of this activity adequately understood the positive effect of row transplanting and the effect of weeding, especially for improved variety. The farmers had evaluated that the effect of transplanting by row is low since a weeder cannot weed out their roots, according to their experience in the pilot project site. So, the expert of the Team explained again that they could weed completely by a weeder before grass grow big.

3-2) Have the activities of Farm Mechanization implemented, efficiently?

a) The Study Team prepared the training materials, two hand-tractors and the spare parts, two thresher, a rice mill, instructors of operations, and fuel for the testing.
b) Farmers covered fuel for the renting of hand tractors.

3-2-1) Were the increasing of labor productivities through partial farm mechanization of rice cultivation confirmed?

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 performance of the introduced rice mill was almost same as existing machines in Manatuto town

3-2-2) Were the trainings on farm mechanization conducted, adequately?

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 three farmers, which were adequate days for the participants to learn the operation of each machine, but they were not enough for the maintenances as lack of time.

3-2-3) Did at least nine farmers come to be able to operate the machines for plowing and threshing?

All participants of the machine trainings (cf. 3-2-2) came to be able to do basic operation of the machines. They still need a lot of experiences to become skilled operators, but they can do normal operation by themselves, now. It can be said the training made their capacity rapidly improved, considering their action at the beginning of the trainings. Farmers broke some parts of the hand tractors as they tried to move the machines in their own way, and almost put their hand into moving drum of the thresher in order to try to remove jammed straws.

3-2-4) Was the plan of the hiring system of farm machinery prepared through the analysis of its possibilities?

The plan of the hiring system of a hand tractor, thresher and rice mill was prepared. It is estimated that the introduced machines will be used more than the existing systems since the proposed rental fees are less than the existing ones. Though more reasonable method, which rent out by hours is studied on paper, getting out of the traditional ways, which rent out by area or output of threshing seems to take a lot of times.

3-2-5) Was the rate of broken rice reduced by 60 percent of the present rate in order to promote local marketing of rice in Manatuto?

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. The measure reasons were considered that the moisture of rice was too low, and the nature of the variety was easy to be broken. Over 14 percent of the moisture is required for reducing of broken rice ratio on the one hand and less than 18 percent is required for threshing due to avoid the stop up of a thresher on the other. It is difficult for them to put moisture of paddy among the four percent through the existing way, which uses the sun in days as a unit.

3-3) Have the activities of Irrigation Canal implemented, efficiently?

a) The Study Team prepared the materials and equipments for the making of the division box.
b) About 15 farmers participated the making of the division box.
c) Cost-sharing of the equipments between the Study Team and farmers was not conducted since they were fully occupied with only labor sharing.

3-3-1) Was the on-farm maintenance of the canal schedule prepared?

The schedule for the maintenance of the branch canals was prepared in December 2002, and the dredging and cleaning were implemented in January 2003. They have implemented the dredging and cleaning once a year before the beginning of the irrigation in the past. They will need to do the work, partially before the beginning of the second season if farmers who cultivate paddy in twice will increase in the near future.

3-3-2) Did the farmers provide labor free of charge to renovate and clean the branch canal, adequately?

The renovation and cleaning was implemented in January 2002 by free labor of the farmers. The use of the canal for irrigation without question proved that their work was adequate. Conventionally, dredging and cleaning for each branch canal were implemented by farmers, cooperatively before the beginning of the irrigation. The way of the maintenance work of each community seemed fairly different at every secondary canal.

3-3-3) Were the trainings on the branch canal design conducted, adequately?

The measurement of around the diversion at the secondary canal was conducted by a central officer and some his staff under supervision by the expert of construction supervision. The facility design expert designed the canal with the officer and his staff, and the drawings were showed to the farmers, who renovated them using the drawings.

3-3-4) Were the irrigated areas adequately expanded by improving the canals?

Regarding Household Survey, cultivated land of this season became 2.2-fold of the last season. Therefore, cultivated land in Inkero is estimated about two-fold increase of cultivated land in 2002, which is caused by the whole improving of Laclo Irrigation System, and the repair of the secondary canal is one part of them.

3-4) Have the activities of Water Management implemented, efficiently?

a) The Study Team prepared the training materials.
b) Members of water management group participated the training program for effective water management.

3-4-1) Was the water management schedule prepared?

Water management schedule was prepared in January 2003, which was written in the Field Report (3) (cf. Annex G). The schedule was made under divided five stages in a season of the irrigation, which were i) Planning before season, ii) Cleaning and repair before season, iii) Water distribution, iv) Cleaning during operation, and v) Cleaning and repair after season.

3-4-2) Was the training program for effective water management prepared?

The training program for effective water management was prepared in January 2003, which was shown in the Field Report (3) (cf. Annex G) with the water management schedule. The component of the program consists of Water distribution, Maintenance works (cleaning and repair) of the facilities and Collection of water fee necessary for the O&M.

3-4-3) Were the trainings on water management conducted, adequately?

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 four three times

during in January and February. The trainings fitted the existing situation of the WUA, and they ought to conduct a similar training again since the union officials have changed.

3-4-4) Were the water fees collected from the farmers after the harvest?

They are planning to begin the collection of the water fees after this harvest season. Collecting money as the water fee from farmers is so difficult that they are considering collecting in kind for a time, like a traditional way, and WUA sells the paddy to get cash, for the time being. Regarding the collection of water fee, they are planning to set a section in the WUA in order to examine the details.

3-4-5) Was the list of suggestions to the UNOPS prepared for the improvement of the O&M Manual prepared by the UNOPS?

The recommendation of important points for the improvement has finalized in this report. One of the points is that they can get enough water in the rainy season, but if many farmers cultivate rice in the dry season in the future, which means double cropping, they will have to manage water much more strictly.

3-4-6) Did many farmers positively assess that available irrigation water increase through the cooperation among the neighboring farmers, compared with period in and before 1996?

It will be clear at the end of irrigation in the next year since whole improvement construction of the canal will continue to the end of this year. As to the irrigation in this season, necessary quantity of irrigation water for planted area of paddy seemed to be completely covered though there were some arguments about the timing for stopping of the water distribution.

4) Impact

4-1) Will the farmers apply the new skills to rice cultivation in the next season?
4-1-1) Will more than half of the farmers apply 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.

a) Land preparation by a hand tractor (20 farmers)
b) Transplanting using a rope (5 farmers)
c) Weeding by a weeder (5 farmers)
d) Threshing by a thresher (20 farmers)
e) Milling by a rice mill (20 farmers)

5) Sustainability

5-1) Will Haburas Manatuto continue their activities?
5-1-1) Does the organization have a proper rule?

The group has a proper written regulation. Maters of the members and the renting of the machines were provided by the regulation. Regarding members, qualification, officers, selection of the officers, registration/ membership fee/monthly fee, management of accountant and obligation to participate in the group activities are specified in it.

5-1-2) Does the organization have a good leader?

The current leader has high leadership compared with other members. According to the other members, his leads to participate in the activities were highly regarded on the one hand and it was a problem that he had not transferred the accounts to the treasurer on the other, regarding his activity during the Pilot Project.

5-1-3) Does Haburas Manatuto has the right to use farm machines?

The two hand tractors will return to Manatuto district, and same tractors would rent to the group in the next season. The two threshers and one rice mill were proposed to be used by Haburas Manatuto, however these machines will be tentatively handed over by the Study Team to the JICA East Timor Office. At the final workshop meeting held on July 3, 2003, the Study Team informed to the group members to use these machines in this cropping season. After that, at the explanation meeting of the Draft Completion Report by the Study Team held on July 8 at a meeting hall in MAFF, these farm machines were handed over to MAFF.

5-1-4) Does the organization manage their finance, appropriately?

They have a treasurer, who can keep the books, but there was a misappropriation of five US dollar, and they have not collected about 30 US dollar yet, since some farmers have no cash to pay. After this, it will become the key to keep the confidence of the members that the treasurer will continue to manage the account, and no one will misappropriate it for personal use.