CHAPTER IV.

CONCLUSION AND RECOMMENDATIONS

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

4.1 Implementation of the Pilot Project

4.1.1 Problems/Causes and Countermeasures Identified through the Implementation of the Pilot Project

1) Project Implementation Capability of Government Administration

a) Low Participation of MAFF and District Agricultural Coordination Office to the Pilot Project

Problems/Causes

Major administrative coordination bodies of the East Timor government side for the Pilot Project implementation were the Ministry of Agriculture, Forestry and Fisheries (MAFF) and Manatuto District Agricultural Coordination Office (DACO). However, for the entire implementation period of the Pilot Project from November 2002 to July 2003, these government bodies at the central and district level played relatively low responses in the activities related to the Pilot Project.

According to the Government Budget Document (2003-2004) prepared by the Ministry of Planning and Finance, the allocated budgets to an agricultural sector in 2003 fiscal year (July 2003-June 2004) is 1.72 million US$ with low amounts, which is equivalent to 2.2 percent[1] of the national budgets (CEFT) out of 79.11 million US$. This small budget causes absolute shortage of government staff in the agriculture sector not only at central level, but also at district level. Current number of permanent government staff at both central and district levels is 146. As a result, it is obvious that the government officers cannot afford to support other works aside from their own routine works. Such supporting works consists of agricultural extension and supporting services to farmers and capacity building for government staff and farmer's representatives, which was proposed in the Mid-Term Integrated Agricultural Development Plan.

Countermeasures

In order to solve the shortage of government staff, MAFF should make more efforts to allocate more budgets to the agricultural sector. According to the recent information,

[1] For the references, the ratio of agricultural budgets against for the total national budgets in the typical rice production countries in South-East Asia are as follows: Indonesia 3.1%, Malaysia 2.8%, Cambodia 2.5%, Thailand 8.3%, Laos 13.8%, and Philippines 6.5%, respectively.

MAFF plans to employ 117 new permanent staff from the beginning of 2003 fiscal year, resulting in 263 staff in total. With the increased budgets and qualified staff mentioned above, it could be expected in future that the government can afford to put more supports for the implementation of projects than before.

b) Unmatured District Government Organizations

Problems/Causes

Counterpart bodies for the implementation of the Pilot Project were Manatuto DACO and ex-Mobile Brigade agency, which had been established by the assistance of UNDP. The latter organization is no more functional because of disbandment of its organization in 2001, although a mechanical engineer of the ex-Mobile Brigade was essential for the Pilot Project, especially in the areas of mechanical farming. Under these situations, the mechanical engineer joined the Pilot Project without official position and salary, in compliance with direct requests from farmers to repair and maintain farm machines such as tractor.

The cause of this condition is disbandment of Mobile Brigade project and organization as mentioned above, as well as no coordination among related agencies in Manatuto District. Therefore, restructuring of these agencies concerned should be done by the MAFF and Manatuto DACO.

Countermeasures

Appropriate organizational arrangement and countermeasure should be urgently taken under the jurisdiction of the MAFF and Manatuto District Office.

c) Government Activities Relying on Donor's Supports

Problems/Causes

After independence in May 2002, all the government activities have been managed and operated under the policy of East Timorlization, and their achievements are rapidly realized in the agricultural sector. Actually, rehabilitation works of the Laclo Irrigation System in Manatuto District, in which the Pilot Project was undertaken by the JICA Study Team is located, have been preceded under the management of UNOPS so far, and will be completed by the end of December 2003. By the rehabilitation works, paddy cultivation areas in the whole system reaches 420 ha in this cropping season in 2003, which is about double of the last year figure, 187 ha.

However, the total budgets and capacity of human resource of MAFF are not enough to cope with expected activities, and this hinders the government to implement its own activities such as agricultural technical assistances, related supporting and extension services to farmer, etc., which were proposed in the Mid-Term Integrated Agricultural Development Plan, without necessary supports from foreign donors.

As already mentioned above, it is obvious that these problems are mainly caused by severe and absolute shortage of total budgets and human resources. In addition, both organizational and individual capacities of both central/local government staff and supporting organizations are relatively weak.

Countermeasures

In order to solve these problems, capacity strengthening of the government and local staff should be started as soon as possible.

2) Project Implementation Capability of NGOs

a) Low Motivation as an Expert and Low Diligence

Problems/Causes

The Study Team collaborated with one of the international NGOs throughout the Pilot Project. There is a common development strategy among the government and major donors that NGOs take an important role in the implementation of the development projects in East Timor because the capacity of the current government is quite limited. The Pilot Project was planned in line with this strategy and worked together with a NGO that is familiar with the situations of the project area. In particular, the Study Team expected the NGO to assist the Study Team's field level activities. The team assumed that the NGO was capable to do it effectively.

At the completion of the Pilot Project, the following issues can be raised. As for the management of the NGO and its local staff directly worked with the Study Team, their capacities were yet to be far more developed if they assist the government and consultants as expected. In particular, motivation and diligence to the work as well as the knowledge on their own fields are still considered at a primitive level. In East Timor, a number of existing NGOs is in fact still quite small, and most of them have recently started their activities in delivering emergency aid goods to the people. More experiences in other various fields are necessary to improve their performance.

Countermeasures

Although the experience of the Study Team is limited, it can be noted that the NGOs in the country should be seriously trained through on-the-job manner. At present, over-expectation to NGOs is not desirable. The NGOs themselves should also make efforts to train the staff for the long-term, but not attempt to make an immediate profit by employing temporary staff. It should be reminded that the NGOs are yet expected to play key roles in many kinds of development projects in East Timor.

3) Project Implementation Capability of Farmer's Organization

a) Limited Leaders with Adequate Capability for Organizing the Farmers

Problems/Causes

One of the most essential matters in organizing the farmers is that a leader exits among the farmers. A leader is the person respected by the farmers, mainly those devoting oneself to the farmers. A person, pretending to be a leader but actually schemes to make a profit for oneself, can never be regarded as a leader.

At the commencement of the Pilot Project, planning workshops were held for five days. Thanks to the effort and influence of one farmer, a lot of farmers attended the workshops for the whole period. The farmers were eventually organized into a group called Haburas Manatuto as the participants to the activities of the Pilot Project. This farmer also provided his lands for the setting up of the demonstration farm and the meeting house for the Pilot

Project. Those events made the Study Team think that he was a reliable leader.

However, it was unfortunate that he gradually turned out to be seeking as much personal benefits as possible. His various behaviors in the Pilot Project could by no means have him respected by the members. He as a leader failed to mobilize the farmer members into the training that the Study Team provided. Haburas Manatuto was almost dead for a while, and therefore the Study Team had to reorganize it for activation.

With a new leader, Haburas Manatuto started functioning. He started understanding his roles and did a lot of works voluntarily. This experience gave a good lesson for the Study Team that finding out a leader is not easy. Moreover, it should not be neglected that being a real leader is a difficult task also for oneself since money or something similar may easily alter one's mentality.

Countermeasures

When organizing the farmers, the following items should therefore be part of the principles:

(i) A person motivated strongly for the promotion of the collective works be sought as a leader.

(ii) That person continuously be assessed his/her characters and aptitude as a real leader by letting him/her handle small money.

b) Hard Implementation of the Pilot Project under Participatory Approaches

Problems/Causes

The Pilot Project has faced various difficulties in organizing the farmers for its implementation. The participation of the farmer members to the training of rice cultivation was particularly low, even though the programs of the projects were prepared based on the results of the planning workshops conducted with the farmers. At the beginning, it was therefore not quite clear for the Study Team why the farmers did not want to participate. To be worse, the farmers easily neglected the issues agreed in the workshops and meetings. It was thought that keeping words is not important in their society.

The Study Team found various possible causes of those problems:

(i) The farmers were accustomed to be paid some money to attend training in the Indonesian Time. The farmers expected the same in the Pilot Project whatever the contents were. The Pilot Project however did not intend to pay any money, as the objective of the Project was to develop their capacities for themselves.

(ii) The members once decided among themselves all the harvests from the demonstration farm belong to the land owner. However, they were actually not happy with this decision and lost their interests to participate.

(iii) Many of the farmers have been traditionally organized by three to ten people within the same clan. Groups beyond that relationship can hardly be seen except those created by political reasons. Collective works with other farmers are not their custom.

As the project proceeded, it was getting clear to the Study Team that the farmers are interested merely in the short and immediate benefits, but not the long term. The farmers are said to be of dependency syndrome, which is to make themselves overly depend on others when attempting to obtain something. It should not be easy for those people to get motivated for making own efforts for self-reliance. The capacity building of themselves, which may take long time, cannot really be interesting to them, while more immediate benefits such as money, tractors or other farm machineries are much more attracting (it however should be emphasized that the farmers are honest in work when paid).

Countermeasures

To overcome those difficulties in organizing the farmers, the following should be considered:

(i) It should not be expected from the very beginning of the Project that the farmers have much enthusiasm for building their own capacities or think by themselves their future for long term. It needs strong supports from outside and may still take long time to make this happen. A bottom up approach is not very much effective for this case.

(ii) Therefore, at first, some incentives should be incorporated in project activities to get the farmers motivated for collective actions. The incentives should be the things attracting them strongly, and are usually the immediate benefits for them. For the Pilot Project, they were hand tractors, threshers and rice mill machines.

(iii) It should clearly be explained to the farmers that any member in an organization has some responsibilities as well as the right to get some benefits. For the Pilot Project, the farmers had to pay some fees and participate in group activities to become the members. Otherwise, they could not enjoy the benefits. This is one of the ways for effectively organizing the farmers.

(iv) In addition, an organization should start with simple and clear rules. Do not try to decide many things at once. Unfortunately, an agreement does not seem to be important traditionally, and the change of this mentality may be happened only gradually through teaching them that they should follow simple rules.

(v) Some consideration is needed for the relations among the farmers when the immediate benefits are used as an incentive in the project. It may easily create antagonism among the members since people tend to feel negatively against those enjoying the benefits. Any benefits should be given only to those fulfilling the obligations, and this process should be clearly shown to other members.

c) Cooperative Utilization and Management of Farm Machinery

Problems/Causes

- High cost required for land preparation and post-harvest works

  It is recognized that most farmers traditionally give a half of harvest in case of land owners and 1/3 in case of contract farmers to a Rencah dealer as Rencah cultivation charge. In case of threshing, one sack (average 35 kg paddy) is given to a threshing agent per 13-sack threshing, equivalent to 7.7 percent of a full harvest as threshing fee. Farm services such as land preparation, threshing and milling are relatively high because

it represents 61 percent (in case of land owner) to 76 percent (contract farmer) of total rice yield.

In a proposal to establish "Mariana Agriculture Service Center (ASC) in Bobonaro District under the World Bank "Agricultural Rehabilitation Project I (ARP I)" for targeting to market white rice, cost for land preparation and threshing/transportation represent 20.2 and 21.6 percent, respectively, of the total labor production cost as summarized in the following table. Furthermore, most farmers do not know real size of their paddy field and accept the size told by Rencah or threshing agents for their own convenience to business.

Land Preparation, Threshing and Milling Cost among Total Yield of Rice Farming

Paddy Yield 2,000 kg/ha and Respective Service Cost converted to Paddy	(A) Land Owner	(B) Contract Farmer
(1) Land preparation cost	1,000 kg (a half of yield)	1,334 kg (1/3 of yield)
(2) Threshing (a sack per 13 sacks)	105 kg	105 kg
(3) Sub-total {(1) + (2)}	1,105 kg	1,439 kg
(4) Net gain {2,000kg – (3)}	895 kg	561 kg
(5) Milled rice volume (recovery rate 65 %)	581.8 kg	364.7 kg
(6) Milling cost (0.02 US$/kg-milled rice)	US$ 11.636	US$ 7.294
(7) Volume converted to paddy (paddy farm gate price 0.10 US$/kg)	116.36 kg	72.94 kg
(8) Net gain {(4) – (7)}	778.64 kg	488.06 kg
(9) % against total yield {(8) ÷ 2,000kg}	38.9 %	24.4 %
(10) % of total cost of land preparation, threshing & milling	61.1 %	75.6 %

Source: JICA Study Team

Labor Production Cost per Hectare (2001)

Farming Work	Labor Production Cost (US$/ha)	Weight (%)
Land Preparation	60.28	20.2
Seedling Preparation	6.70	2.2
Transplanting	33.48	11.2
Weeding	33.48	11.2
Chemical Application	13.39	4.5
Fertilizer Application	6.70	2.2
Irrigation	13.39	4.5
Canal Maintenance	13.39	4.5
Harvest	53.57	17.9
Threshing	25.00	8.4
Transport	39.29	13.2
Total	298.67	100.0

Source: Proposal for Establishment of Agricultural Service Center (ASC) in Bobonaro District under the World Bank "Agricultural Rehabilitation Project"

- Low skill for farm machinery operation and maintenance technology of farmers

  i) Hand tractor: Zigzag run, particularly turning at dead lands, causes not only more time loss, but also useless fuel consumption. This may cause breakdown by sinking the tractor into plowed mud field, and may reduce the area of planned daily operable land, which in turn hinders efficient machinery hiring system.

  ii) Thresher: Whenever moisture contents of rice bundles to be threshed exceed 20 percent, clogging at straw exhaust outlet or stoppage of rotating drum are easily occurred. Moisture contents of rice bundles directly affect threshing capacity and the excessive feeding volume of rice causes the stoppage of threshing drum. Lots of such stoppages affect the reduction of threshing capacity (300 kg per hour standard intake capacity of rice bundle) and also disturb the efficient management of hiring system.

  iii) Rice milling unit: Improper adjustment of paddy feeding volume, clearance between rubber rolls and load on polishing roll affects deeply milling recovery and capacity. The rate of moisture content of intake paddy also causes the broken rice at high or low rate and so 15-16 percent moisture content is always expected to arrange.

- Absence of farm machinery dealing market including supply of spare parts
  One of the serious matters encountered during the Pilot Project was difficulty of getting spare parts. Usually when the suppliers or manufacturers start to introduce machinery, they arrange before-and-after sales service network. However, the tractors with implements operated in this time were donated by emergency and humanitarian aid and farm mechanization has just started. Consequently service network is not yet established in East Timor.

<u>Countermeasures</u>

- Cost-down of production services
  Farm mechanization for land preparation, threshing and milling works under the Pilot Project could surely improve labor productivity as well as decrease the service costs remarkably. Cost-down can be realized by good operation, preliminary proper preparation for the reduction of time and fuel losses and better work plan, and more promotion of group purchase of farm input in bulky discount deal including seed, fertilizer, agro-chemical and fuel.

- Operation and maintenance
  Operation and maintenance technology can be improved through getting more experiences by farmers themselves with continuous training programs including repair technology at the established mechanical workshops.

- Supply of spare parts
  Information of procurement channels for spare parts (Siam Kubota hand tractors donated by JICA and Agrindo threshers and Satake rice milling unit provided by the Pilot Project) was transferred to the farmers' group and Districts Officers,. However, spare parts for machinery made in Korea, China and the USA under MB are difficult to obtain at present, and arrangement of after-care network in private sector is rather difficult for the time

being. Therefore it is required to arrange procurement channels and get those spare parts smoothly by the MAFF initiatives because the ministry is an official beneficiary of the machinery.

4) Paddy Rice Cultivation and Experimental Results

a) Mix-up of Different Paddy Varieties Seeds

Problems/Causes

Around the Pilot Project site, almost every seed of paddy rice is self-kept and farmers normally do not purchase seeds because there are neither nursery shops nor experimental stations that provide certified seeds. Under these circumstances, it may result in the mixing of different varieties seeds.

During the project implementation period, the Study Team observed that different height of paddy plants were grown in the same plot. If paddy rice is produced only for home consumption, the variety mix-up may not be a serious problem. However, if paddy rice becomes a sales commodity, the mix-up of several varieties means low quality rice because of following reasons.

- If several varieties of different growth periods are harvested at the same time, it is quite possible to mix with unripe and broken grains due to early or late harvesting.
- It is usual that the characteristics of grain (long or short, color and so forth) differ by each variety and distinct mix-up of different varieties makes the paddy sales price lower.

Thus the farm income decreases by the variety mix-up.

It seems that the two main causes of varieties mix-up are: i) inappropriate post-harvest procedures and ii) mixed transplanting in nursery beds. The former one means the mixing of rice grains by inappropriate threshing work and storage. As for the latter one, many farmers generally transplant seedlings in nursery beds where some seedlings still remain there. If the variety of transplanted seedlings is the same as the one in the nursery bed, there is no mix-up but if it is not, different varieties consequently grow in the same field.

Countermeasures

To avoid mixing up of different varieties seeds, it is suggested to take following measures immediately.

- To improve post-harvest procedures, it needs to extend appropriate post-harvest handling procedures of paddy rice to farmers. Taking into the considerations that there are presently no agricultural extension services in Manatuto, extension of post-harvest procedure information should be done by an ad hoc meeting/project/program.

- To avoid inappropriate transplanting in nursery beds, it is necessary to let farmers know that all seedlings should be taken out from the nursery before transplanting seedlings. This could be done simultaneously with the same ad hoc meeting/project/program for post-harvest handling. If possible, other knowledge related to various farming technologies should be also extended together since the farming technologies are still at

low level.

b) Low Availability of Agricultural Inputs

Problems/Causes

For the increase of paddy rice production, management of soil nutrition and pest is very important. However, there are no shops for agricultural inputs such as fertilizers and pesticides except in Dili. For farmers in Manatuto, it is not feasible to purchase agricultural inputs like fertilizers and pesticides in Dili and to transport them to their own farmland far from the capital.

Also the prices of these inputs are relatively expensive and not purchasable to ordinary farmers because all of the inputs are not domestically produced but imported from abroad. Accordingly the less usage of agricultural inputs partly causes low yield level of paddy rice, particularly in case farmers cultivate improved varieties that are normally more fertilizer effective than local varieties.

Countermeasures

Because the agricultural inputs such as fertilizers and pesticides are not manufactured in East Timor, it is impossible to arrange them within the Manatuto area. Hence it is very difficult to expand utilization of these agricultural inputs with effective measures.

One option for farmers to obtain agricultural inputs more cheaply is collective purchase of the inputs in Dili that makes the unit price cheaper than individual purchase. Government could assist the farmers to transport the inputs from Dili to Manatuto if public vehicles are properly arranged.

If chemical fertilizers are not available, another alternative is to cultivate local varieties. In general, local varieties are more adaptive to the present extensive farming system and local environment and are less fertilizer effective so the differences of yield level with/without fertilizer application is small. Under the extensive farming conditions (e.g. without fertilizer and pesticide application), local varieties are often more productive than improved varieties. Consequently the variety selection according to the farmland conditions and chemical fertilizer availability becomes very important.

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

c) Understanding Local Culture and Customs

Findings

In rural areas, there are specific culture and customs that are related to farming practices. A variety of ceremonies, which were observed before doing Rencah, harvesting and threshing during the Pilot Project period, is one example in Manatuto. Normally farmers do not carry on the next farming practice without these ceremonies. Some of them may be clearly understandable for the East Timorese, but some of them are not for foreign donors/NGOs because they are not logical for them and sometimes are beyond their comprehension.

As for farming practices, women mainly work for picking seedlings, transplanting and harvesting while men do for land preparation and water management. In addition, many farmers take it for granted that the government provide various services for farming probably due to the past Indonesian rule (e.g. irrigation and drainage facilities and their maintenance, paddy rice marketing, daily allowance for attendance of seminars). Therefore, particularly for foreign donors/NGOs, it is crucial to understand and accept farmers' customs, culture, time scale and nature to achieve fruitful project/program results.

4.1.2 Outcomes of the Pilot Project and Future Projection

1) Results of Experimental Cultivation

The experimental cultivation of the Pilot Project put more emphasis on the effects of treatments within the same variety (fertilizer application, weeding and planting methods) rather than variety differences as described in Chapter 3. Furthermore the experiment was done in one field with small size within the Laclo Irrigation System so it needs to pay attention to extend the results to other areas. (See Table 4.1-1, 4.1-2, 4.1-3, 4.1-4 and Annex E for the results of statistical analysis.)

Fertilizer Experiment

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

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

Planting Method

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

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

Weeding

According to the unit area sampling data, the yield level of IR64 significantly decreased without weeding. The data of IR64 for yield component survey did not show significant differences except for plant height. As for the long culm variety, IKAN, weeding did not

show any important differences in the yield level of unit area sampling and the various data of yield component survey, which in turn suggests that IKAN is relatively competitive to weeds.

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

Fertilizer Application

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

Planting Method

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

Weeding

As for the short culm variety, IR64, the degree of yield decrease seems to be more serious if weeding is not practiced, and weeding on proper time is desirable. (Some experiments in Japan indicate that the paddy yield decreases 8-57 % without herbicide application and does to 18-55 %[2] without intertillage)

2) Farm Machinery

A lot of farm machines were donated by foreign donors to East Timor under emergency and humanitarian assistances to increase agricultural production and to improve the shortage of agricultural labor. It is necessary to accelerate the farm mechanization to increase agricultural productivity for food security and self-reliance in East Timor with its limited human resources.

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

[2] Refer to the following Internet Web Site:
http://www.alps.pref.nagano.jp/hukyu/98-1/981h02.pdf、http://www.alps.pref.nagano.jp/hukyu/98-2/982h05.pdf and http://www.pref.saga.jp/nourin/nougyougijutsu/jizoku/pdf/B8.pdf (All data are written in Japanese.)

establish a farm machinery training and hiring center and introduce adequate machinery for increasing agricultural production by cultivation of fallow land and double cropping. The center should be business-oriented which serves contract plowing, spraying, threshing and milling by hiring machinery system and secures sustainable management.

Number of Farm Machinery (refer to Table H.2 and H.4)

Up to September 2001, farm machinery shown in the table below were donated by foreign countries under emergency and humanitarian aids and distributed to each district. For rainy season cropping, more than 12 thousand hectare can be cultivated by these machines. These machines should not be used by only some privileged farmers, but be publicly utilized under proper system and management.

Farm Machinery Donated and Distributed by Foreign Donors

Farm Machinery	Quantity
a) 4-wheel Tractor (attached with implements)	55 sets
b) Hand Tractor (attached with implements)	468 sets
c) Thresher	100 units
d) Separate Rice Mill	100 units
e) Grain Blower	100 units
f) Mist Duster	100 units
g) Hand Sprayer	400 units
h) Tip Cart	50 units
i) Excavator	3 units
j) Hand Tools	24,940 units

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

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

- Kubota Power Tillers
  Two units of Kubota power tillers (tractor) were rent out to the Haburas Manatuto Farmers Group from District Agricultural Coordination Office (DACO) when land preparation started. According to the agreement exchanged between the DACO and the farmers group, the power tillers would be returned to the DACO after completion of land preparation works. Therefore, the Study Team could not commit on the ownership and the right to use these power tillers at this stage. However, the Study Team requested to DACO to give high priority for using the power tillers to the Haburas Manatuto Farmers Group for the next season, considering the fact that the Study Team provided necessary spare parts for these hand tillers during the study period.

- Farming Tools and Meeting House
  Farming tools such as shovels, katana, toes, aiswak, and chairs were purchased by the Study Team during the study period. These farming tools were transferred to the Haburas Manatuto Farmers Group at the beginning of July 2003 by the Study Team.

  Furthermore, a meeting house, which was used for group meeting, storage for production materials and equipments, etc. was built by the Study Team. This meeting house was also transferred to the Haburas Manatuto Farmers Group.

- Spare Parts for Kubota Power Tiller
  The study Team procured some sets of spare parts for the Kubota power tillers, and stored them in the ex-Mobile Brigade storage. The Study Team transferred these spare parts to DACO of Manatuto and Baucau at the termination of the Pilot Project.

  Regarding the management of these spare parts, the Study Team proposed a spare part utilization system after discussions with relevant government agencies at central and district levels, JICA East Timor Office, representatives of farmer's group, and ex-Mobile Brigade staff, etc.

- Farm Machinery such as Threshing and Milling Machines
  The Study Team procured two units of threshing machines and one unit of milling machine before harvesting of the paddy, and actual operations of the machine were done in the beginning of July 2003 under the proposed rental system. Before the termination of the Study, transfer policy of the machines was also discussed with the relevant government agencies mentioned above. The Study Team also examined options on optimal organization for maintaining the machines properly, as shown in Table4.2-1. As a result, the Study Team proposed a management plan which includes that DACO has ownership of the machines while Haburas Manatuto Farmers Group operates them and is responsible for daily maintenance.

  Considering the current situation in and around the Pilot Project area in Laclo Irrigation System, more detailed investigation on this issue would be necessary. Therefore the Study Team tentatively transferred the machines to the JICA East Timor Office, and the Office would finally make a decision after discussions with the MAFF.

  At the explanation meeting on Draft Completion Report held on July 8, 2003 at the MAFF, these farm machineries were handed over to the MAFF.

4) Case Studies of Annual Household Income

a) Impact of Paddy Yield Increase

If unit yield of paddy increases 0.5 ton/ha compared with the present yield of 2.0 ton/ha, rice produce will increase by 0.65 ton/house (1.3 ha/house x (2.5 ton/ha – 2.0 ton/ha)). If the whole increase amount is sold, annual income per household will increase by US$ 65, which is equivalent to 17 percent of the total income of a model farmer (refer to 2.7.2). The annual household income by rice sales amounts to US$187 (43 % of total annual income).

If unit yield increases 1.5-fold (3.0 ton/ha), rice produce will increase by 1.3 ton/house (1.3 ha x (3.0 ton/ha – 2.0 ton/ha)). If the whole increased amount of rice is sold, annual income per household will increase by US$ 130, which is equivalent to 35 percent of total income of a model farmer. The annual household income of rice sales amounts to US$ 252 (50 % of total annual income).

b) Effects of Double Cropping of Paddy Rice

If a half area of the field is cultivated twice a year with the present yield level, rice produce will increase by 1.3 ton/house (1.3 ha x 50 % x 2.0 ton/ha). If the whole increased amount of rice is sold, annual income per household will increase by US$ 130, which is equivalent to 35 percent of total income of a model farmer. The annual household income of rice sales amounts to US$ 252 (50 % of total annual income).

If the entire field is cultivated twice a year with the present yield level, rice produce will increase by 2.6 ton/house (1.3 ha x 100 % x 2.0 ton/ha). If the whole increased amount of paddy is sold, annual income per household will increase by US$ 260, which is equivalent to 70 percent of total income of a model farmer. The annul household income of rice sales amounts to US$ 382 (60 % of total annual income).

c) Results of Case Studies

Results of case studies using a model household are summarized as shown in the table below. For the time being, farmers should aim to earn over US$ 100 of rice sales per year. If rice marketing succeeds, unit yield reaches 2.5 ton/ha, and a half of own field is double cropped, a farmer will be able to earn more than US$ 300 by rice sales.

Estimation of Annual Income of the Model Household

Unit Yield (ton/ha)	Item	Single Cropping	Double Cropping	
			50 %	100 %
2.0	a) Total Income (US$)	372	502	632
	b) Rice Income (US$)	122	252	382
	c) b/a (%)	33	50	30
2.5	a) Total Income (US$)	437	600	762
	b) Rice Income (US$)	187	350	512
	c) b/a (%)	43	58	67
3.0	a) Total Income (US$)	502	697	892
	b) Rice Income (US$)	252	447	642
	c) b/a (%)	50	64	72

5) Prospect of Double Cropping of Rice

When the Study Team asked the members of Haburas Manatuto whether they do double cropping in the next season, all of them answered that they plan to do. However,

double cropping does not seam so easy for them because it needs double labor and material inputs per year. Moreover their words and actions often do not accord. Therefore the Study Team considered that increase of double cropping would be limited.

On the other hand, farmers who cultivates a small field (e.g. less than 0.5 ha) can do double cropping if they have enough water and willingness. Because small fields need less labor and inputs than big fields, it is expected that small-scale farmers have more motivation to do double cropping to produce more.

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

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

4.1.3 Necessary Activities to Follow-up the Pilot Project

1) Haburas Manatuto Farmers Group

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

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

i) The current officers should stay in the same position for one year and fulfill their responsibilities as stated in paper.

ii) Haburas Manatuto is open to any farmers in Laclo Irrigation System, but the farmers should understand there are obligations as well as benefits, and agree to follow the regulations to become the members.

iii) The financial transparency should be assured for the collected money and its expenditures. The money should be deposited in a safe place.

iv) The properties such as the threshers, rice mill machines, meeting house, etc. should be used equitably by the members, and maintained in a good condition at any time.

v) The payment for renting the machines should be made in cash by all farmers as soon as possible. This will be possible since irrigation is resumed from this year.

vi) The business plan should be made for using the machines as well as the collected money efficiently and making profits for Haburas Manatuto.

vii) Relations among the members should carefully be watched. The farmers tend to criticize and antagonize each other, particularly when they see possible immediate benefits. Unnecessary conflicts should be avoided.

2) Water Users Association (WUA)

In the Laclo Irrigation System, a water users' group had existed since 1969 and was functional until 1996 when floods destroyed the System. The UNOPS reactivated the group as the WUA in 2001 when it started the rehabilitation works of the System. The new organizational structure of the WUA was recommended by the UNOPS, and the president and other officers were selected. The Pilot Project was planned to work with the then-WUA for strengthening its capacities on water management.

The Study Team had several meetings with the district officers, chiefs of the villages, then-WUA officers and the farmers to understand water management conditions and prepare a training plan. It was however found, through the discussions, there were some problems in the then-WUA, and this eventually had the former officers replaced with the new officers elected by the farmers.

According to the new WUA president, an advisory team, composed of the chiefs of the villages, the traditional leaders and the representatives of all secondary canals, was to be organized soon for discussing the issues of water management and collection of water fee. The new WUA would start functioning after the advisory team made any decision. The WUA, as the new organization, would of course need supports from outside. The authorities concerned should therefore guide the WUA properly for strengthening its capacity. The experiences in strengthening Haburas Manatuto would be of much help.

Regarding water management for the Laclo Irrigation System, at least three issues should be considered: a) water distribution in wet and dry seasons; b) maintenance of canals and structures (cleaning and repair); and c) collection of water fee necessary for O&M. Current conditions and actions to be taken by the authorities concerned for each issue are shown below (see Annex G for more details):

Water Distribution

Current Conditions	Actions to be taken
1. Four Marinos are traditionally responsible for water distribution at the main canal. 2. Water volume is quite sufficient in wet season. 3. Few farmers traditionally cultivated rice in dry season.	1. There is already a traditional way to distribute water in dry season – no urgent action is needed except training Marinos for gate control to avoid over-flow of water. 2. There should be a market or other incentives for the farmers to cultivate rice in dry season. It is not yet known to what extent the farmers are motivated for making a profit – no urgent action is needed.

Maintenance of Canals and Structures (cleaning and repair)

Current Conditions	Actions to be taken
1. Huge volume of sands and silts are flowing into canals. 2. The farmers are traditionally organized for cleaning main and secondary canals by the Marinos.	1. Regular cleaning of the canals is important. If by manual, the farmers are traditionally mobilized to clean it. - No urgent action is needed. 2. However, if cleaning by machine, training for machine operation and maintenance is needed as they are not accustomed to.

Collection of Water Fee for the O&M

Current Conditions	Actions to be taken
1. There is no budget source for the O&M of the System, because of no collection of water fee from farmers. 2. Farmers traditionally pay water fee to the Marinos in form of paddy.	1. Water fee should be collected from the farmers for making sure O&M is done. All the farmers using the System should understand and agree to pay water fee. Awareness building is necessary. 2. The suitable system to collect water fee should be established. Collection should be started as early as possible. 3. Training on financial and other management should be provided to the WUA officers.

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

the traditions in the area should be incorporated into the new system to be established. For example, the farmers traditionally pay water fee in form of paddy not cash. Collecting paddy could start the new system.

4.2 Reflections to the Agricultural Development Plan in East Timor

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

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

4.2.1 Production Technology of Rice

1) Agronomic Research

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

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

2) Multiplication and Dissemination of Certified Seeds

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

- To make certified seeds available domestically, it is necessary to launch a rice seeds multiplication center which produces certified seeds to farmers.
- To deliver certified seeds all over the country, it is necessary to establish seeds dissemination system either commercially or publicly.

3) Agricultural Inputs

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

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

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

4.2.2 Farm Machinery

Studying successful systems for farm mechanization and training with minimum cost in other countries, institutions are managed by a) government, b) cooperatives, c) private sector, d) large-scale growers or e) small- and medium-scale farmers' joint enterprises. In East Timor government support is still needed to boost the center at an initial stage under the following objectives and framework. Even though it is guaranteed to sustain as a business-oriented private firm, a farmer earns more or less US$ 200 (yield 2,000 kg/ha x US$ 0.10/kg-paddy farm gate price) which is very small for accumulating investment capital.

Even now, farmers who own lands more than 1.5 ha produce rather big surplus of rice (harvest 2,000 kg/ha x milling recovery 65% = white rice 1,300 kg, meanwhile annual rice consumption per household: 55.5 kg/capita/year x 6.7 persons/household = 371.85 kg/household /year, difference = 928.15 kg) and supply through informal marketing channel to relatives and neighbors since formal marketing channel has not yet established. Demands are strong and surrounding environment is favorable to establish the center. Remarkable reduction of working cost by mechanization was confirmed, and farmers' attitudes towards farm

mechanization are very positive by the implementation of the Pilot Project.

The center should be started as an authority belongs to the MAFF at its initial stage since the Government support is indispensable for establishing the system, especially for initial fund and conducting good management due to lack of accumulated investment capital and management know-how by farmers. During the first stage, it should be operated as a commercial enterprise by hiring those machinery and equipment donated effectively, and then it should be managed as a business-oriented firm for securing sustainability of the center after the completion of repaying the initial fund.

a) Objective

- To increase production by moderating labor shortage and peak, and by cultivating fallow land
- To reduce post-harvest losses
- To increase employment by establishing nationwide farm machinery service network and by developing appropriate farm machinery and industry in private sector

b) Recommended Locations: Dili and three local sites, total four sites

c) Beneficiaries: Farmers, NGO staff, employees working in farm machinery industry and the Government of East Timor

d) Major Activities

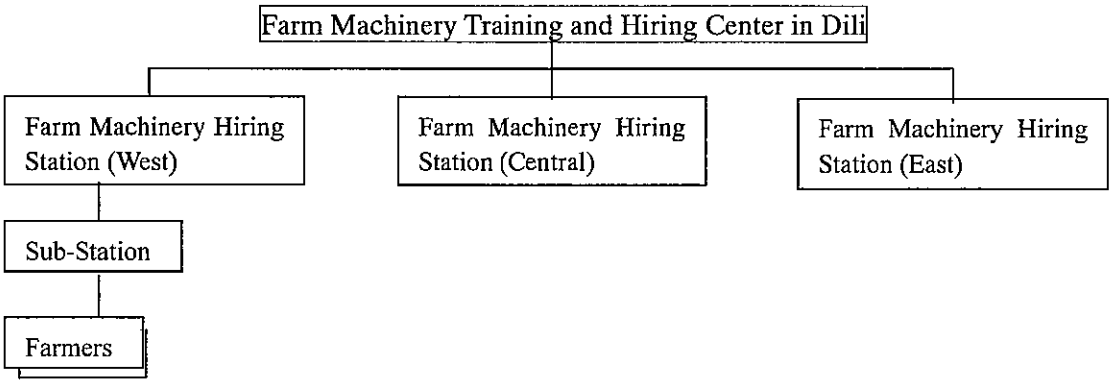
- To hold workshops with front line extension offers and leading farmers
- To promote capacity building
- To consolidate training, hiring machinery and support facilities (post-harvest equipment and facilities such as rice mill, dryer, warehouse) to support reconstruction of farm produce marketing channel
- To train repair technology
- To inspect and improve the quality and performance of the machinery introduced, for example, to reduce the additional cost and labor required for cleaning paddy after threshing

e) Target of Mechanical Works

- Preparation of nursery bed
- Plowing/puddling
- Disease and pest control
- Threshing by machine with higher separation/cleaning capacity
- Milling for marketable and competitive quality rice against imported rice
- Transport and marketing

f) Organizational Plan

It is recommended to establish the Agricultural Machinery Training and Hiring Center with local Stations and Sub-Stations to promote the farm mechanization including upland farming services widely in East Timor.



g) Training for Farm Mechanization

Systematic training in accordance with training curriculum (25 percent indoor lecture and 75 percent field practice) is a very important activity for farm mechanization in East Timor. It is desirable to train extension officers, leading farmers and mechanics by means of domestic and foreign courses on the basis of medium term plan.

4.2.3 Necessary Steps for Capacity Building and Organizing Farmers

In the Development Plan Report[3], the following five steps were recommended for capacity building and organizing farmers (see the Development Plan for details):

Flow of Recommended Capacity Building and Organizing Farmers

Step 1 (social preparation): Building awareness in the farmers towards self-reliance

⇩

Step 2 (leader): Making sure the community has the leader(s) respected by the people

⇩

Step 3 (organizational establishment): Building the community's self-supportive capacity – establishing suitable organizational structures and raising its management capacity shall be necessary.

⇩

Step 4 (organizational development): Making clear the roles and responsibilities of the leaders and members – an incentive to the leaders and supervision of their performances shall be necessary for making sure the responsibilities are fulfilled.

⇩

[3] The Study on Integrated Agricultural Development of East Timor, prepared by Study Team in July 2002

Step 5 (sustainability of the activities): Raising the commitments and sense of ownership of the community towards the project activities – a process in which the community people participate in the project planning shall be necessary. A benefit of participation shall be understood by the people.

Regarding the above steps, following notes can be made based on the experiences in the Pilot Project:

The Development Plan

Step 1: Awareness Building- Farmers should make efforts to become self-reliant since they cannot expect the same supports as they had in the Indonesian time. Only they can raise or at least maintain their living standards. Therefore, social preparation was recommended in the Development Plan as the first step for changing their mentality of dependency and building their awareness for self-reliance. However, from the experience of the pilot project, this step should be considered in the following way.

Note ⇩

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

Social preparation is still considered important and should be implemented at the early stage of development. However, only this will have only limited impacts on the development. Farmers look at very immediate benefits, and this is what they can be motivated to work for. It should not be expected that the farmers may have long-term thinking and start actions soon, merely by providing awareness building or other social preparation programs. It may take long time or may not happen.

Therefore, it is recommended that the farmers at first be motivated to move forwards with immediate benefits such as money or other tangibles. For example, any kinds of training will pay some money to the farmers if they attend. They at the same time are given obligations to achieve certain level of comprehension or technical levels at the end, or otherwise less money will be paid. Through this way, they start participating training, and making efforts to build their capacities intentionally or unintentionally. To motivate the farmers, it can be said that the modality of supports should be changed from bottom up to top down, at first with using incentives.

The Development Plan

Step 2: In the Development Plan, as the second step to organize the farmers, it was recommended a leader be found in the community, or else a person be trained to be a leader. This is still important, but the following should be noted:

Note ⇩

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

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

As mentioned in the Development Plan, a leader, who is the most influential to the people, is not identical among the areas of the country. For identifying the leaders in each community, it is necessary to understand the historical backgrounds how a community was established. The Chapter 2 describes the so-called traditional leaders, but not the village chiefs elected by the vote of the people, were the leaders in the communities of the Pilot Project. For organizing farmers, a farmer leader, who is respected by other farmers, should emerge from the farmers themselves. It is important those farmer leaders be assisted by the community leaders in their functions.

The Development Plan

Step 5: To make sure that the project activities will be continued by the farmers even after the support from outside are ended, the farmers should be equipped with the sense of ownership, with which the feel they own the project. In the Development Plan, therefore, recommended that a process, in which the farmers participate in the project from the planning stage, or they donate labor or materials to the project, be included.
From the experience of the Pilot Project, however, the following can be noted.

Note

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

To have the beneficiaries continue the project activities, it is important to build up in their mind the sense of ownership towards the project. However, the farmers are of the extreme mentality of dependency, and it is not easy to improve it even if participatory approach is adopted. This is different from what is commonly believed. The major reasons why participatory approach has recently been used are: a) a project can incorporate the needs of the beneficiaries in it, b) The commitment of the beneficiaries towards a project can be raised, by making them aware that they are directly related to the project through participating in the planning and implementation of the project, and c) their capacity on operation and maintenance of the project can be raised, etc.

Regarding the farmers in the project area, however, a) the needs of the farmers are mostly the immediate benefits, b) their commitment should be sought by top down approach, and c) the farmers may not really want to participate in the project for building their capacities. Thus, there may be no particular reason that participatory approach should be adopted in projects.

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

- Do not give indications to the farmers that a project is given to them, but explain the farmers that there are responsibilities and rights (benefits), and only those fulfill the responsibilities can enjoy the benefits of project.

- For keeping the interests of the farmers on project, incorporate in the project the activities which can show within the short time the immediate benefits for the farmers. Do not expect the farmers' enthusiasm, but pull out their willingness with the incentives (immediate benefits).

- The supports of the government as well as NGOs to the farmers cannot be much expected since their resources and capacities are quite poor. Therefore, while their capacities should be more strengthened, donors should assist projects for long term. Or else, it should be considered projects can continuously show whatever incentives to the farmers.

4.2.4 Donor's Supports to the MAFF Activities for Agricultural Extension Services

In the Minimum-Scale Development, which has been described in the Development Plan Report, agricultural extension and supporting services to farmers were stated as a one of the urgent and prerequisite activities of the MAFF. However, under the current severe situations of the MAFF (limited budgets allocated to agricultural sector and absolute shortage of staff (refer to the paragraph of 4.1.1, "1) Project Implementation Capability of Government Administration")), it is considered to be difficult for the MAFF to implement these activities effectively and timely. Therefore, the MAFF should request to the related donors to make support these agricultural extension and supporting services for farmers. Furthermore, from the view point of long-term development in case of the Full-Scale Development, program for capacity building-up for the targets of government staff, NGOs, farmer's representatives should be formulated by the MAFF.

4.2.5 Implementation of Agricultural and Rural Development Projects

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

drastically increasing[4].

In case of the Minimum-Scale Development described in the Development Plan Report, supply and demand analyses for the development scenario during target period of 2007 were made. For an increase in rice production, 22 irrigation schemes (2,450 ha in total), which are categorized into the non-functional irrigation scheme with lightly to medium-damaged of irrigation facilities, were recommended to be rehabilitated with an assistances of related foreign donors. Out of these irrigation schemes, the World Bank is currently rehabilitating four schemes[5]. Other seven schemes[6] would be rehabilitated until the end of the year 2002 under TFET budget. On the other hand, for an increase in maize production, which is main staple food in East Timor, production increase was recommended to be realized by an increase in unit yield and the improvement of post-harvest losses.

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

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

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

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[4] Trend of Rice Import of East Timor (20.2 thousand ton in 2000, 27.1 thousand ton in 2001, and 31.8 thousand ton during six months in 2003)

[5] (Baedubu and Uaibati in Viqueque district, Bilimau and Halicao in Bobonaro district, respectively with 805 ha in total area.

[6] Seisal-down in Baucau district, Marco, Cailaco/Meligo, Batugade in Bobonaro district and Tono, Oemathitu, Naktuka in Oecussi distrct, with 658 ha in total area.

Table 4.1- 1 Summary of Statistical Analysis of Experimental Cultivation

I Unit Area Sampling (unit yield)

Treatment	IR64	IKAN
1 Type of Fertilizer		
1- 1 Fertilizer Experiment - Type of Fertilizer (F1,F2,F7,F8)	N.S. (not significant)	N.S. (not significant)
1- 2 Fertilizer Experiment - Nitrogen Level (F1,F5,F6,F7)	Unit yield significantly increases in F5, F6 and F7.	N.S.
1- 3 Fertilizer Experiment - Nitrogen Application Method (F3,F4,F5)	N.S.	N.S.
2 Planting Method	Unit yield significantly decreases in P3.	Unit yield significantly decreases in P2 and P3.
3 Weeding	Unit yield significantly decreases in W2.	N.S.

II Yield Component Survey

(unit yield, number of grains per panicle, number of panicles per hill, 1000- grain weight, ripened grain ratio, plant height)

Treatment	IR64	IKAN
1 Type of Fertilizer		
1- 1 Fertilizer Experiment - Type of Fertilizer (F1,F2,F7,F8)	Plant height significantly increases in F2 and F7. No other data are	Plant height significantly increases in F7. No other data are
1- 2 Fertilizer Experiment - Nitrogen Level (F1,F5,F6,F7)	Plant height significantly increases in F5, F6 and F7. No other data are	Plant height significantly increases in F7. No other data are
1- 3 Fertilizer Experiment - Nitrogen Application Method (F3,F4,F5)	N.S.	Plant height significantly increases in F3 and F4. No other data are
2 Planting Method	Plant height significantly decreases in P3. No other data are	Plant height significantly decreases in P3. No other data are
3 Weeding	Plant height significantly decreases in W2. No other data are	N.S.

Table 4.1- 2 Results of Statistical Analysis for Unit Area Sampling

1 Fertilizer Experiment

(1) Type of Fertilizer

1) IR64

Treatment	Yield (ton/ha)
F1 Control	1.78
F2 P_2O_5- 30, K_2O- 30 (kg/ha)	3.04
F7 N- 60 (kg/ha)	3.02
F8 Organic Manure	2.40
Coefficient of variation (%)	19.2
F test	N.S.
LSD (5%)	-
LSD (1%)	-

2) IKAN

Treatment	Yield (ton/ha)
F1 Control	2.58
F2 P_2O_5- 30, K_2O- 30 (kg/ha)	2.80
F7 N- 60 (kg/ha)	3.22
F8 Organic Manure	2.53
Coefficient of variation (%)	9.1
F test	N.S.
LSD (5%)	-
LSD (1%)	-

(2) Nitrogen Level

1) IR64

Treatment	Yield (ton/ha)
F1 Control	1.78
F5 Basal- 20, Top - 10 (kg/ha)	2.68
F6 Basal- 30, Top - 15 (kg/ha)	3.10
F7 Basal- 40, Top - 20 (kg/ha)	3.02
Coefficient of variation (%)	12.5
F test	**
LSD (5%)	0.66
LSD (1%)	1.00

2) IKAN

Treatment	Yield (ton/ha)
F1 Control	2.58
F5 Basal- 20, Top - 10 (kg/ha)	3.15
F6 Basal- 30, Top - 15 (kg/ha)	3.06
F7 Basal- 40, Top - 20 (kg/ha)	3.22
Coefficient of variation (%)	25.3
F test	N.S.
LSD (5%)	-
LSD (1%)	-

(3) Nitrogen Application Method

1) IR64

Treatment	Yield (ton/ha)
F3 Basal- 0, Top - 30 (kg/ha)	3.05
F4 Basal- 30, Top - 0 (kg/ha)	2.82
F5 Basal- 20, Top - 10 (kg/ha)	2.68
Coefficient of variation (%)	22.3
F test	N.S.
LSD (5%)	-
LSD (1%)	-

2) IKAN

Treatment	Yield (ton/ha)
F3 Basal- 0, Top - 30 (kg/ha)	2.63
F4 Basal- 30, Top - 0 (kg/ha)	2.94
F5 Basal- 20, Top - 10 (kg/ha)	3.15
Coefficient of variation (%)	23.8
F test	N.S.
LSD (5%)	-
LSD (1%)	-

2 Planting Method

1) IR64

Treatment	Yield (ton/ha)
P1 Random T.P.	3.07
P2 T.P. in a row	3.02
P3 Direct Seeding	1.65
Coefficient of variation (%)	11.1
F test	**
LSD (5%)	0.37
LSD (1%)	0.54

2) IKAN

Treatment	Yield (ton/ha)
P1 Random T.P.	3.34
P2 T.P. in a row	2.56
P3 Direct Seeding	1.94
Coefficient of variation (%)	12.7
F test	**
LSD (5%)	0.43
LSD (1%)	0.62

3 Weeding

1) IR64

Treatment	Yield (ton/ha)
W1 With weeding	3.14
W2 Without weeding	2.29
Coefficient of variation (%)	16.4
F test	*
LSD (5%)	0.63
LSD (1%)	0.95

2) IKAN

Treatment	Yield (ton/ha)
W1 With weeding	3.02
W2 Without weeding	2.50
Coefficient of variation (%)	20.3
F test	N.S.
LSD (5%)	-
LSD (1%)	-

Table 4.1- 3 Results of Statistical Analysis for Yield Component Survey

1 Fertilizer Experiment

(1) Type of Fertilizer

1) IR64

Treatment	Yield (ton/ha)	Number of grains per panicle	Number of panicles per hill	1000- grain weight (g)	Ripened grain ratio (%)	Plant height (cm)
F1 Control	1.74	42.3	10.3	25.2	90.0	78.1
F2 P_2O_5- 30, K_2O- 30 (kg/ha)	2.82	55.6	12.2	25.2	90.6	86.1
F7 N- 60 (kg/ha)	2.63	54.9	11.6	25.8	89.5	82.8
F8 Organic Manure	1.85	44.4	10.1	25.0	88.7	77.8
Coefficient of variation (%)	29.6	21.7	14.7	3.0	3.3	5.1
F test	N.S.	N.S.	N.S.	N.S.	N.S.	**
LSD (5%)	-	-	-	-	-	3.07
LSD (1%)	-	-	-	-	-	4.10

2) IKAN

Treatment	Yield (ton/ha)	Number of grains per panicle	Number of panicles per hill	1000- grain weight (g)	Ripened grain ratio (%)	Plant height (cm)
F1 Control	2.49	73.9	8.0	25.4	75.7	149.5
F2 P_2O_5- 30, K_2O- 30 (kg/ha)	2.81	71.6	9.7	25.1	75.4	146.7
F7 N- 60 (kg/ha)	3.09	73.9	10.2	25.4	72.2	161.7
F8 Organic Manure	2.24	64.1	8.7	25.5	75.6	147.1
Coefficient of variation (%)	26.4	20.1	13.7	2.1	6.9	4.6
F test	N.S.	N.S.	N.S.	N.S.	N.S.	**
LSD (5%)	-	-	-	-	-	5.08
LSD (1%)	-	-	-	-	-	6.80

(2) Nitrogen Level

1) IR64

Treatment	Yield (ton/ha)	Number of grains per panicle	Number of panicles per hill	1000- grain weight (g)	Ripened grain ratio (%)	Plant height (cm)
F1 Control	1.74	42.3	10.3	25.2	90.0	78.1
F5 Basal- 20, Top - 10 (kg/ha)	2.89	55.3	12.3	25.8	92.2	84.8
F6 Basal- 30, Top - 15 (kg/ha)	2.66	55.1	11.7	25.6	91.9	83.6
F7 Basal- 40, Top - 20 (kg/ha)	2.63	54.9	11.6	25.8	89.5	82.8
Coefficient of variation (%)	19.8	10.7	19.1	3.2	1.9	5.3
F test	N.S.	N.S.	N.S.	N.S.	N.S.	**
LSD (5%)	-	-	-	-	-	3.22
LSD (1%)	-	-	-	-	-	4.31

2) IKAN

Treatment	Yield (ton/ha)	Number of grains per panicle	Number of panicles per hill	1000- grain weight (g)	Ripened grain ratio (%)	Plant height (cm)
F1 Control	2.49	73.9	8.0	25.4	75.7	149.5
F5 Basal- 20, Top - 10 (kg/ha)	2.71	73.1	8.9	25.1	67.5	146.9
F6 Basal- 30, Top - 15 (kg/ha)	2.78	81.0	8.3	25.3	75.3	144.4
F7 Basal- 40, Top - 20 (kg/ha)	3.09	73.9	10.2	25.4	72.2	161.7
Coefficient of variation (%)	24.4	16.8	15.8	2.0	6.7	5.5
F test	N.S.	N.S.	N.S.	N.S.	N.S.	**
LSD (5%)	-	-	-	-	-	6.12
LSD (1%)	-	-	-	-	-	8.19

Table 4.1- 3 Results of Statistical Analysis for Yield Component Survey (continued)

(3) Nitrogen Application Method

1) IR64

Treatment	Yield (ton/ha)	Number of grains per panicle	Number of panicles per hill	1000- grain weight (g)	Ripened grain ratio (%)	Plant height (cm)
F3 Basal- 0, Top - 30 (kg/ha)	3.10	54.9	14.1	24.9	90.0	83.7
F4 Basal- 30, Top - 0 (kg/ha)	2.22	48.0	10.8	26.0	89.5	81.9
F5 Basal- 20, Top - 10 (kg/ha)	2.89	55.3	12.3	25.8	92.2	84.8
Coefficient of variation (%)	29.2	15.0	15.6	2.6	2.6	4.7
F test	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
LSD (5%)	-	-	-	-	-	-
LSD (1%)	-	-	-	-	-	-

2) IKAN

Treatment	Yield (ton/ha)	Number of grains per panicle	Number of panicles per hill	1000- grain weight (g)	Ripened grain ratio (%)	Plant height (cm)
F3 Basal- 0, Top - 30 (kg/ha)	2.67	74.1	8.8	25.6	71.6	164.0
F4 Basal- 30, Top - 0 (kg/ha)	2.99	77.8	9.6	25.3	78.1	164.1
F5 Basal- 20, Top - 10 (kg/ha)	2.71	73.1	8.9	25.1	67.5	146.9
Coefficient of variation (%)	17.7	10.9	15.3	3.7	15.0	7.0
F test	N.S.	N.S.	N.S.	N.S.	N.S.	**
LSD (5%)	-	-	-	-	-	8.26
LSD (1%)	-	-	-	-	-	11.12

Table 4.1- 3 Results of Statistical Analysis for Yield Component Survey (continued)

2 Planting Method

1) IR64

Treatment	Yield (ton/ha)	Number of grains per panicle	Number of panicles per hill	1000- grain weight (g)	Ripened grain ratio (%)	Plant height (cm)
P1 Random T.P.	3.13	49.4	9.8	25.0	88.5	81.7
P2 T.P. in a row	2.53	55.0	11.3	25.5	87.0	85.4
P3 Direct Seeding	-	-	-	-	-	69.6
Coefficient of variation (%)	-	-	-	-	-	7.5
t test (F test)	N.S.	N.S.	N.S.	N.S.	N.S.	**
LSD (5%)	-	-	-	-	-	4.42
LSD (1%)	-	-	-	-	-	5.96

2) IKAN

Treatment	Yield (ton/ha)	Number of grains per panicle	Number of panicles per hill	1000- grain weight (g)	Ripened grain ratio (%)	Plant height (cm)
P1 Random T.P.	2.52	67.3	7.0	24.4	74.5	158.7
P2 T.P. in a row	2.13	64.1	8.2	24.7	76.5	160.7
P3 Direct Seeding	-	-	-	-	-	139.7
Coefficient of variation (%)	-	-	-	-	-	5.2
t test (F test)	N.S.	N.S.	N.S.	N.S.	N.S.	**
LSD (5%)	-	-	-	-	-	5.96
LSD (1%)	-	-	-	-	-	8.02

3 Weeding

1) IR64

Treatment	Yield (ton/ha)	Number of grains per panicle	Number of panicles per hill	1000- grain weight (g)	Ripened grain ratio (%)	Plant height (cm)
W1 With weeding	3.31	60.4	13.0	25.9	92.5	79.5
W2 Without weeding	1.80	45.2	9.5	25.7	90.2	71.7
Coefficient of variation (%)	-	-	-	-	-	6.4
t test (F test)	N.S.	N.S.	N.S.	N.S.	N.S.	**
LSD (5%)	-	-	-	-	-	3.62
LSD (1%)	-	-	-	-	-	4.91

2) IKAN

Treatment	Yield (ton/ha)	Number of grains per panicle	Number of panicles per hill	1000- grain weight (g)	Ripened grain ratio (%)	Plant height (cm)
W1 With weeding	2.89	71.7	9.9	24.3	75.5	156.8
W2 Without weeding	2.86	72.1	9.8	24.2	70.9	151.9
Coefficient of variation (%)	-	-	-	-	-	-
t test (F test)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
LSD (5%)	-	-	-	-	-	-
LSD (1%)	-	-	-	-	-	-

Table 4.1- 4 Calculated Cost and Benefit of Significant Treatments

1 Fertilizer Experiment

1) IR64

Symbol	Cost				Unit Yield (ton/ha)	Income (US$/ha) Gross	Net	Balance (US$/ha)
F1	(Control)	N	P_2O_5	K_2O		Unit price of paddy:		
	kg/ha	0.00	0.00	0.00		US$5/50kg		
	US$/ha	0.00	0.00	0.00				
				0.00	1.78	178.00	178.00	0.00
F5		N	P_2O_5	K_2O				
	kg/ha	30.00	0.00	0.00				
	US$/ha	22.83	0.00	0.00				
				- 22.83	2.68	268.00	245.17	67.17
F6		N	P_2O_5	K_2O				
	kg/ha	45.00	0.00	0.00				
	US$/ha	34.24	0.00	0.00				
				- 34.24	3.10	310.00	275.76	97.76
F7		N	P_2O_5	K_2O				
	kg/ha	60.00	0.00	0.00				
	US$/ha	45.65	0.00	0.00				
				- 45.65	3.02	302.00	256.35	78.35

Note: Transplanted in a row and with weeding.

2 Planting Method

1) IR64

Symbol	Cost		Yield (ton/ha)	Income (US$/ha) Gross	Net	Balance (US$/ha)
P1	Random Transplanting (Control)			Unit price of paddy:		
	Required labor forces (man- day):	21.80		US$5/50kg		
	Unit labor cost (US$/day):	2.50				
		- 54.50	3.07	307.00	252.50	0.00
P2	Transplanting in a row					
	Required labor forces (man- day):	42.10				
	Unit labor cost (US$/day):	2.50				
		- 105.25	3.02	302.00	196.75	- 55.75
P3	Direct seeding					
	Required labor forces (man- day):	1.30				
	Unit labor cost (US$/day):	2.50				
		- 3.25	1.65	165.00	161.75	- 90.75

Note: No fertilizer application and without weeding.

2) IKAN

Symbol	Cost		Yield (ton/ha)	Income (US$/ha) Gross	Net	Balance (US$/ha)
P1	Random Transplanting (Control)			Unit price of paddy:		
	Required labor forces (man- day):	21.80		US$5/50kg		
	Unit labor cost (US$/day):	2.50				
		- 54.50	3.34	334.00	279.50	0.00
P2	Transplanting in a row					
	Required labor forces (man- day):	42.10				
	Unit labor cost (US$/day):	2.50				
		- 105.25	2.56	256.00	150.75	- 128.75
P3	Direct seeding					
	Required labor forces (man- day):	1.30				
	Unit labor cost (US$/day):	2.50				
		- 3.25	1.94	194.00	190.75	- 88.75

Note: No fertilizer application and without weeding.

Table 4.1- 4 Calculated Cost and Benefit of Significant Treatments (continued)

3 Weeding

1) IR64

Symbol	Cost		Yield (ton/ha)	Income (US$/ha) Gross	Net	Balance (US$/ha)
W1- 1	With manual weeding (Control)			Unit price of paddy:		
	Required labor forces (man- day):	5.00		US$5/50kg		
	Unit labor cost (US$/day):	2.50				
		- 12.50	3.14	314.00	301.50	0.00
W1- 2	With weeder weeding					
	Required labor forces (man- day):	2.50				
	Unit labor cost (US$/day):	2.50				
		- 6.25	3.14	314.00	307.75	6.25
W2	Without weeding					
	Required labor forces (man- day):	0.00				
	Unit labor cost (US$/day):	2.50				
		0.00	2.29	229.00	229.00	- 78.75

Note: No fertilizer application and transplanted in a row.

Table 4.2-1 **Organizational Options for Maintaining Agricultural Machinery (Threshing and Milling Units)**

Items	Case-1 (Under Haburas Manatuto)	Case-2 (Under WUA)	Case-3 (Under District Agricultural Office)
1. Agricultural Machinery and Their Ownership/Right of Use Threshing machine: 2 units Rice mill : 1 unit	Ownership of the machinery will belong to District Agricultural Office, and Haburas Manatuto will operate and maintain these machineries.	Ownership of the machinery will belong to District Agricultural Office, and WUA, which has been organized under the UNOPS project in December 2000, will operate and maintain these machineries. However, Haburas Manatuto has a prioritized right to use these machineries.	Ownership and management right of the farm machineries will be given to the District Agricultural Office.
2. Outline of Current Activities of the Organization and Responsible Capacity	Haburas Manatuto was organized at the start of The Pilot Project in November 2003 to implement the Project under participatory approaches. Present number of members is 22 farmers under the secondary canals of -------out of 13 secondary canals in Laclo Irrigation System, which has total irrigation area of 660 ha. Haburas Manatuto is presently managed under the direction of manager, assistant manager, accountant and auditor, and considered to be capable to manage the machinery under the adequate support of MAFF and District Agricultural Officers.	Major functions of the WUA are water distribution in Laclo Irrigation System and maintenance works (clearing and repair) of irrigation facilities. In April 2003, election of board members was made, since previous president of the WUA was not supported by farmers, and the PWC had a difficulty in conveying their management information and message. As a result, new board members of president, vice-president, secretary and treasurer were elected.	District Agricultural Office has routine administrative works in the agricultural field in Manatuto district under the MAFF. However, only one agricultural officer is presently appointed, although an increasing plan of MAFF staff is proposed at central level. Rental management of tractors granted under the ex-Mobile Brigade plan is done under the responsibility of the District Agricultural Officer.
3. Expected Outcomes and Problems when handled	Member's motivation for participation to the Pilot Project will be raised, and self-reliance of the organization will be realized by introduction of rental systems of the machinery to the surrounding farmers. Succeeded management of the organization including such rental systems will become one of the cores in the Laclo Irrigation System, and is expected to be spread to the other farmer's groups. However, technical and management supported by the District Agricultural Officer, MAFF, JICA Dili Office, NGOs, ex-Mobile Brigade mechanical expert, etc. will be essential, because Haburas Manatuto is still young organization due to newly established as mentioned above.	As mentioned above, WUA does not have a function to operate and maintain effectively the farm machineries, because of water user association, so that difficulty to handle the farm machinery is prospective for current WUS. Haburas Manatuto, on the other hand, will face to serious problems with no possibility of self-reliance of their activities without opportunity for introducing rental systems of farm machinery.	Under the absolute shortage of the distinct agricultural officers mentioned above, no capacity for effective management of additional farm machineries could not be expected. Haburas Manatuto, on the other hand, will also face to serious problems with no possibility of self-reliance of their activities without opportunity for introducing rental systems of farm machinery.
4. Sustainability of the Machinery	Rental charges for the JICA Team procured machinery will be collected and deposited by Haburas Manatuto, and utilized for management of group, procurement of necessary parts and input materials, and also utilized for replacement costs of the machineries in future.	It will be difficult for the current WUA to expect effective utilization and maintenance of the JICA Team's procured farm machineries.	It could be considered that JICA Team's procured farm machineries will be maintained and managed for rental to the beneficial farmers equally on the Laclo Irrigation System under the proper jurisdiction of District Agricultural Officer, as same to the farm machineries granted under the ex-Mobile Brigade plan.
5. Merits and Demerits	Merits - Increase in member's motivation to participate farmer's group of Haburas Manatuto and strengthening of capacity building the farmer's group - Realization of self-reliance of farmer's group - Impact on spreading similar establishment of farmer's group to the other areas in Laclo Irrigation System Demerits - Relative young organization needed by technical and management support by District Agricultural Office, NGOs, etc.	Merits - Non Demerits - No concretization of two organizational activities by Haburas Manatuto and WUA - No possibility to expect the self-reliance for Haburas Manatuto without opportunity for introducing rental systems of farm machineries - No expectation of effective utilization of farm machineries by WUA	Merits - Centralization of utilization management and maintenance of farm machineries together with those machineries granted under the ex-Mobile Brigade with technical support of ex-Mobile Brigade mechanical expert Demerits - No expectation of effective utilization of farm machineries due to absolute shortages of District Agricultural Officers - No possibility to expect the self-reliance for Haburas Manatuto without
6. Overall Evaluation	+++	+	++