IV. PILOT STUDY ON MARICULTURE

IV. PILOT STUDY ON MARICULTURE IN LEMBATA

1. Planning of the Pilot Project

1.1 Selection of Target Species

The technology for brackish water pond culture of prawns and milk fish is well established in Indonesia and the private sector is anticipated to continue the lead in technical developments in this area. In addition, seaweed culture technology is also well established and operators are in the process of developing high quality products based on market supply and demand

In contrast, although the groupers, sea cucumbers, and mud crabs are highly potential culture products, the culture industry in these fisheries products remain undeveloped. Of these species, the seedling production technology for sea cucumbers and mud crabs has hampered the development of culture activities and the industry must wait until this technology is fully developed. Seedling production of groupers has been successful and nursery culture has also been successfully implemented in some regions. As mentioned earlier, the culture of groupers is high profitable. Groupers are shipped as live fish and the propagation culture of natural fry has also been implemented in the study area of the M/P. Therefore, if nursery culture technology is introduced, grouper culture is anticipated to develop rapidly in the study area.

The pilot project conducted a trial culture of groupers during the first four months of the nursery stage, which is a very difficult and problematic stage. Two species will be cultured - the humpback grouper and the tiger grouper. The humback grouper is one of the highest priced fish on the market, but it is prone to diseases and its growth is slow. In contrast, the tiger grouper is cheaper than the humback grouper, but it is highly disease resistant and its growth period is short.

1.2 Selection of the Project Site

1.2.1 Selection of the Project Fishing Community

As mentioned earlier, it is difficult to accurately assess the development potential of water areas suited for aquaculture under the existing conditions. However, based on a map of the current state of aquaculture, it is possible to ascertain potential development areas to some extent.

Generally, strong winds prevail during east-west monsoon season in Indonesia. In regions where cage culture is conducted, the cages are set up in bays or in channels between islands and other areas which are not greatly affected by the monsoon. Saleh Bay in Sumbawa Island, Waworada Bay, Sape Bay, and Labuan Bajo in the Flores Island, Konga

Bay, and the island channel to the east of Larantuka are some of these areas that are not affected by monsoon. However, some water bodies, like Saleh Bay which is an enclosed bay, are affected by the inflow of water from the land during the rainy season which lowers the saline concentration of the marine water.

Grouper culture is not conducted in the study area and regions with a suitable aquaculture environment are not clearly known. But the Gondol Research Institute for Mariculture has reported that when salinity concentration levels are lowered, the VNN disease ratio among groupers rises. In addition, a large volume of fish tends to perish during the rainy season at the culture farms in Lampung.

Data on the transitions in saline concentrations and water quality of these two bodies of water according to consecutive years could not be obtained during the field study. Therefore, although the inner areas of the harbour or sites near the river mouth are potentially feasible for culture activities, they were excluded from the list of possible pilot project sites.

Water bodies where cage culture is presently conducted and cage culture development sites of the district Fisheries Office were studied and the following four potential sites were selected based on the duration period required for survey team members to stay or commute to the site.

Province	District	Village
NTB	Sumbawa	Pulau Bungin
NTB	Bima	Bajo Pulang
NTT	Ngada	Ruing
NTT	Lembata	Tapolangu

1.2.2 Selection of the Pilot Project Site

Based on a review of the three criteria of stable feed supply (trash fish), marketing network for fishery products, and assistance organization for fishermen, Tapolangu was selected as the pilot project site. The following are the conditions for each site.

	Pulau Bungin	Bajo Pulang	Ruing	Tapolangu
Stable fish feed supply (trash fish)	o	o	×	o
Marketing network	o	o	o	o
Fisher assistance organization	×	×	×	o

Live fish shippers had installed cages at the four sites of Pulau Bungin, Bajo Pulang, and Ruing. There are plans to install cages at Tapolangu as well, but they have not been implemented yet. The fish feed supply or trash feed is abundant in Pulau Bungin and Bajo Pulang and the live fish shippers are engaged in a year-around harvest of trash fish. Tapolangu is a fishing village that is engaged in year-around fishing activities. It is also possible to purchase trash fish from neighbouring villages. In Ruing, fishing activities come to a standstill during the monsoon season and there is the risk that cage culture fish may perish due to starvation.

Although live fish shippers were found at both sites, due to the small production volume of live groupers, the buying price was extremely low. The pilot project is expected to produce more than 200kg and direct sales to the middlemen in Denpasar are anticipated. Based on the findings of an interview survey of the middlemen in Denpasar, it was found that sea bass is purchased at around Rp.283,500/kg at either site.

Regarding the supporting organisation, there was no NGOs assisted fishermen's activities except TNC (The Nature Conservancy) in Lab. Bajo. However, there was a NGO, which had relationship with fish farmer's group conducting grouper culture in Lampung. The working condition of aquaculturalists from Lampung would be made easier if there is assistance from local NGOs is available when aquaculture technology is transferred. In addition, it is expected that the NGO will support the fishermen in Lewolein after terminating the pilot project.

1.2.3 Workshop

The survey did not include the selection of fishermen participating in the pilot project. However, a summary explanation of the project was given to the village chief, the village steering committee, the youth group and fishing related representatives; and the opinions of the village were solicited. The major questions asked by the village side and the response of the survey team is shown in the table below.

Questions	Answers
• Will the rearing cages interfere with current fishing operations?	• The cages will be installed based on thorough consultations with the village chief and fishing related persons.
• Will members of the existing Kelompok participate in the culture activities?	• The culture activities will be conducted for 24 hours on a rotational basis. Therefore, it will not be possible for participants to be engaged in other activities. If possible, persons who are not employed in a specific job are desirable.
• Fishermen sell their fish to middlemen in the village who also have to earn a living. Will JICA purchase trash fish from these middlemen?	• This is not a JICA project; it is a project that will be implemented by the village community. The required volume of trash fish is 30kg/day. The budget is limited and the project would like to purchase fish directly from fishermen. We have also sought the opinion of the women buyers about this issue. The buyers have said 30kg a day will not affect their livelihood.
• Bagan harvesting is not possible during the full moon. Will other large fish be bought as feed during this time?	• Trash fish will be used as much as possible. If the fishing village is unable to harvest trash fish, it will be purchased from neighbouring villages and markets. However, villagers will be consulted as much as possible on the countermeasures that will be taken. At this time, the district Fisheries Office gave the specific name of the feed fish and provided explanations. The same question expressing concern about the impact on the middlemen's livelihood was asked, but the villagers appeared to be satisfied with the explanation provided by the district Fisheries Office.
• Whenever activities are begun, licenses are required and the activities are stopped. Will this project be able to obtain a license?	• The district Fisheries Office explained that this project was being implemented for the fishermen and licenses were not needed. But, it is also possible to obtain licenses. The district Fisheries Office is preparing to issue licenses.
• Although we would like this project to be implemented, we are worried about thievery. What about security issues?	• If possible, the cages will be installed in areas where they can be seen from village homes. In addition, 24-hour watches will be carried out on a rotational basis. Sufficient security measures will be taken.

The villagers were positive about the pilot project. However, due to their limited knowledge of aquaculture, specific concepts were difficult to grasp. Activities to inform and solicit the villagers' understanding will be needed when the project is implemented.

In addition, project related personnel other than the villagers pointed out the following.

- The ownership of the equipment and materials, the methods that will be used, the content of the tasks that will be implemented should be clearly defined and the understanding of the villagers should be adequately cultivated.
- Fishermen may raise the fish price when they realize that trash fish will be purchased regularly for the project. Therefore, a buying contract for trash fish should be signed with the fishermen.

A draft document stipulating the ownership of the equipment and materials, conditions of use, the roles and tasks of each participant was prepared by the JICA Study Team, and was finalized through discussions between the JICA Study Team and Kelompok at the beginning of implementation stage (See Attachment 1). The purchase system for trash fish was formulated during the implementation stage according to the prevailing situation.

2. Outline of the Project

There were no participants at the workshop with knowledge about aquaculture. Subsequently, the project was formulated based on the interview findings of aquaculture operators in Lampung and the Kelompok in Situbondo. In particular, information on organizing fishermen and the issues that exist in culture activities that were obtained from the Kelompok in Lampung were invaluable.

A Project Design Matrix (PDM) was compiled based on these survey findings, in conjunction with the interview findings of the aquaculture centres and each district Fisheries Office (see Table 2.1). A summary of the project is given below.

(1) Objective of the project: The grouper culture technology conducted in Lampung will be transferred to the pilot project site.

Presently, the average survival rate of groupers raised in Lampung from fingerling to market size is about 60 percent. This is during the initial four-month culture period when the death ratio is the highest. Groupers who survive this period grow to more than 100g to 200g and the death rate is minimal.

This pilot project is the first to be conducted in NTT where the natural and social conditions differ from Lampung. Subsequently, the survival ratio for this initial four-month period was set at 40 percent. The survival ratio will be raised with each succeeding culture

cycle. The goal will be to achieve a survival ratio of higher than 60 percent by the third cycle.

(2) Outputs

1) Six villagers will be selected to participate in the project

As mentioned above, a workshop was held in the village and a summarized explanation of the project was provided for the villagers. The village chief and other major leaders of the village were asked to select the project participants. Based on the example set at Lampung, six participants were selected based on the number of cages that will be installed. The following selection criteria were submitted by the survey team.

- Fishermen who are trained in Lampung will be required to teach the feeding technique to other fishermen at the initial start of the project. Therefore, participants must have at minimum a junior high school education.
- Cage culture involves heavy labour. Therefore, young people should be selected as much as possible.

2) Floating cages are installed (the set up technology will be transferred)

The floating cages will be made by the participants under the supervision of the contractor. The participants will learn the construction and maintenance methods of necessary equipment and materials through this activity.

3) Culture technology from Lampung will be modified to suit the conditions at the site

The culture methods that are developed in different natural and social conditions can not be introduced in its original form to other regions. Therefore, the culture methods introduced from Lampung must be adjusted to the environment in NTT. The purchase and feed method will be adjusted to the local fishing conditions and the customs and practices in NTT.

4) Inputs

The following input will be required for the pilot project.

JICA: Cages, one set of culture instruments, fingerlings, feed, operating costs, etc.

Indonesian side: One officer from the Lembata district Fisheries Office (evaluator), six fishermen

As explained above, cultured fish will be sold to the live fish exporters in Denpasar. In this case, a minimum shipment volume of 200kg/cycle will be required. Therefore, to ensure the sustainability of the culture project, the scope of the project will be set to enable a minimum shipment volume of 200kg/cycle.

Implementation Schedule

The pilot project will be implemented according to the following schedule.

Activities	2001				2002				
	Sept.	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Workshop	▲								
Selection of Participants	▲								
Training at Lampung									
Purchase Seedlings		▲							
Installation of Cages									
Rearing Trials									

Presently, the supply volume of grouper seedlings is limited. To purchase 4,000 seedlings at one time, it is necessary to order the seedlings three months prior to the start of the project (seedling production takes 3 months). If the preparation period for seedling producers is included, the seedlings must be ordered in mid-October.

3. Implementation Stage

3.1 Modification of the Project Design

(1) Modification of the project period

As mentioned above, the Pilot Project was planned to start from the beginning of February. Training for participants was carried out in Lampung as scheduled. However, transportation of a part of materials for cage and seeds was postponed, due to the rough sea conditions influenced by the typhoon between Bali and Flores Island. Participants constructed cage frames from mid-February and finished on March 4. Participants made rearing nets after building up the frames. However, the transport of seedlings was delayed until mid-March, and the rearing experiment started from March 15. As a result, the rearing period of the experiment was shortened to two months. The evaluation survey was carried out after analysing the results of the rearing experiment.

In addition, the expected sized seedlings could not be obtained, since project implementation was delayed. Therefore, the size of the seedlings was also changed as explained below.

(2) Additional participants

Originally, only six villagers in Tapolangu were selected to participate in the Pilot Project. However, the Indonesian side requested the addition of one technical staff member from Lombok Aquaculture Station to participate in the Pilot Project.

In addition, the NGO mentioned above (Masyarakat Budidaya Pesisir), which is connected to the fishermen group in Lampung, also dispatched one volunteer as a facilitator.

(3) Condition of the rearing experiment

The condition of the rearing experiment was as follows.

Tested fish:	Humback grouper	Average body weight 34g	2,488 fingerlings
	Tiger grouper	Average body weight 55g	803 fingerlings
Rearing period :	2 months (from 15 March to 15 May 2002)		
Rearing method :	Floating cage		
Feeding :	Feeding trash fish 4 times / day (5~10% of total body weight)		
Water temperature	30 to 32 °C		
Salinity	34 to 37 ppt.		

Basically, trash fish landed in the Tapolangu was fed to the groupers, and artificial feed donated by the Gondol Research Institute for Mariculture was used when the needed volume of trash fish could not be purchased.

(4) Modification of Project Purpose

The survival rates of the Humback and Tiger groupers during the project period were set at 40 percent and 80 percent, respectively, as an indicator of the project purpose in the initial project design. Since the size of the humback grouper changed to 34g, the targeted survival rate was also adjusted to 80 percent.

3.2 Mid-term Monitoring

Basically, the daily work such as feeding and net replacement was carried out by the members of the Kelompok under the guidance of the Kelompok leader. The JICA study team provided the Kelompok leader with some basic ideas and moderated them when problems arose. The members of Kelompok through the group discussion drew out necessary measures.

The problems and measures that were implemented during the first month of the trial operation are shown in the table below.

Problems	Measures
• Leader couldn't grasp the progress of the work because each member worked individually and did not report to the leader. (Only the working hours was set up in this period.)	• All of the members agreed to follow the daily working schedule. All members came to work on the floating cages during working time after preparing the daily working schedule.
• All of the members attended church on Sunday morning.	• The JICA study team allowed members to attend church services after feeding the fish in the early morning. The members were required to return to work after worship (11 a.m.).
• The data on the purchase volume of trash fish and feeding volume were not accurate.	• The JICA study team trained all members on how to use the balance sheet. The work record was taken by a member, and the leader kept the books after checking the record.

Problems related to confirmation of work schedules, recording data, and other tasks arose at all stages of the activities because the participants have had no experience working in groups other than in village or church related activities. Therefore, it was their first

experience to work in a group according to a time schedule. In view of these circumstances, basic training in implementing project activities is necessary for participants when group projects utilizing the village residents are implemented.

A workshop to confirm the problems and the work content was held with the members of Kelompok during the middle of rearing experiment and the following issues were discussed.

(1) Ice purchasing method

Fish is landed during the early morning hours in Lembata. The project purchased trash fish for feed from local fishermen at the project site. This trash fish was kept in insulated box with ice, and the feed was given 4 times a day (7:00, 10:00, 14:00, 17:00) during the project period.

The project site, Tapolangu, does not have electricity and ice is not available at the project site. The JICA study team purchased and transported ice from Lewoleba about one hour away by car during the initial stages of the project. However, it is economically unviable for the Kelompok in Tapolangu to purchase ice from Lewoleba due to the high transport cost. Therefore, the need set up an ice purchasing system by the Kelompok was discussed.

Some alternatives for purchasing ice were discussed in the workshop. The alternatives that were discussed for review are shown below.

Alternatives	Items to be examined
• To purchase ice from Lewoleba continuously. An acquaintance in Lewoleba will be asked to transport the ice to the village.	• It is estimated that the transport cost will be more than Rp. 10,000/day.
• There is a public bus run that from Balauring to the east side of Tapolangu to Lewoleba. It would be able possible to order ice in Balauring, and bring it to the site by bus.	• The Kelompok doesn't have any contacts in Balauring.
• There is a ice shop in the next village, Hadakewa. They would deliver the ice, if the transport cost is paid.	• It is doubtful whether the shop will be able to provide a constant supply ice, due to the frequent power cuts.

As a result of the discussions, the alternative to purchase ice from the shop in Hadakewa was chosen, and the Kelompok took action, but the shop did not have transport means. In addition to discussions about the ice purchasing system, feeding methods that did not require the use of ice were also discussed.

Alternatives	Items to be examined
• Sign a contract with certain fishermen for landing fish in the afternoon.	• Fishermen are unable to land fish before 6 p.m.
• To set up a small cage on the Bagan where the Kelompok purchases trash fish, and keeps the live fish for the afternoon feeding until noon.	• Agreement of the owner of the Bagan is required. It is also not known how long the trash fish can live in a small cage.

The Kelompok was unable to reach concrete conclusions during the workshop. The

JICA study team decided to purchase ice from Lewoleba for a while, and would study the alternatives mentioned above. It was also pointed out to look into another feed supply source, because of the decreasing catch volume of the Bagan during the full moon period.

(2) Registration of the Kelompok

The villagers chose all of the members of the Kelompok, and the Kelompok was registered at the District Fisheries Office before the Pilot Project started.

The District Fisheries Office also pointed out that license for utilizing the water area was also necessary. There are two types of licenses that are available for water area usage--one is permanent license that is granted to profit-making organizations, and the other is a short-term one-year license. The short-term license can be extended every year.

Although the Kelompok wanted to apply for a permanent license at the beginning of the project, the applicant must pay the taxes when the organization receives investment from third parties. This is disadvantageous for the Kelompok because their operation costs are supported by the other organizations.

As the result, the JICA study team and the Kelompok decided to acquire the one-year license for the Pilot Project. The Kelompok will request extend the license after the Pilot Project is completed, as required.

(3) Future activities after completion of the Pilot Project

The major issue that the Kelompok discussed was the possibility of continuing the project activities after the Pilot Project was completed. Tiger grouper will be sold during the project period, and its sales revenue will be used to cover future operation costs in the initial project design. However, sales of the tiger grouper during the project period were difficult, because the project period was reduced from 4 months to 2 months and initial size of the seedlings was smaller than originally planned.

The Kelompok was unable to invest in the operation costs for the project activities, although they wanted to continue the activities. The Kelompok needs support from other organizations, but they also want to retain their independence.

The JICA study team explained that it could not provide an answer at that time, although it also would examine the possibility of setting up a future support system to continue the project activities. The JICA study team also pointed out that the support from other organizations would last only several years. The Kelompok should become self-sufficient in the future.

3.3 Result of Rearing Experiment

The rearing experiment produced good results--the survival rate of the humback and tiger grouper during the first two months was 99 percent and 89 percent, respectively. In addition, the fish showed good monthly body weight gain—more than 60 percent for the humback grouper and 40 to 50 percent for the tiger grouper.

The low survival rate of the tiger grouper is caused by rough handling of the fish during the first monthly measuring activity. As a result, the Kelompok improved its handling method. Mass mortality of tiger grouper did not occur except mortality at the first monthly measuring. It is expected that the survival rate of tiger grouper will also increase to the same levels as the humback grouper.

	Rearing period (months)		
	Initial	1	2
Humback grouper			
Total number of fish	2,488	2,474	2,465
Survival rate	100.0%	99.4%	99.1%
Average body weight (g)	34	56	91
Body weight gain (%)	-	64.6%	62.7%
Feeding volume			
- Trash fish (kg)		180.6	312.1
- Artificial diet (kg)		13.0	14.4
FCR			
- Trash fish		3.4	3.6
- Artificial diet		1.5	1.5
Tiger grouper			
Total number of fish	803	800	713
Survival rate	100.0%	99.6%	88.8%
Average body weight (g)	55	78	117
Body weight gain (%)	-	41.8%	50.9%
Feeding volume			
- Trash fish (kg)		93.8	122.3
- Artificial diet		2.8	0.2
FCR (Feed Conversion Ratio)			
- Trash fish		5.2	5.7
- Artificial diet		1.5	1.5

As mentioned above, although trash fish landed at the project site was basically used as feed for the groupers, artificial diet also was fed when a sufficient volume of trash fish could not be purchased. This artificial diet was used in the rearing experiment implemented by the Gondol Research Institute of Mariculture. The Gondol Research Institute of Mariculture reported that the feed conversion rate (FCR) of this artificial diet was 1.5. It is estimated that the FCR of trash fish is 3.4 to 3.6 for the humback grouper, and 5.2 to 5.7 for the tiger grouper, on the supposition that the same FCR of the artificial diet was used in the pilot project. The results obtained from the pilot project lacks accuracy since c conditions such as insufficient and intermittent feeding volume occurred. Optimum feeding volume and nutritional requirement are the next issues that must be addressed in the development of grouper culture.

3.4 Profitability of the Grouper Cage Culture

Profitability of the grouper cage culture is estimated based on the result of the pilot project. But due to the introduction of large-sized seedlings of more than 30g, the rearing period of the pilot project was reduced. However, the income and expenditure that are incurred for normal sized seedlings has been estimated.

Trash fish is not a suitable feed source due to large fluctuations in the supply volume and price. Therefore, the income and expenditures were estimated on the use of artificial diet. FCR of artificial diet is estimated at 1.5 (Reported by the Gondol Research Institute of Mariculture), and unit price is estimated at Rp. 20,000/kg (including transport costs). Expenditure also includes the training cost which consists of a three-month OJT by a staff member from the Lombok Aquaculture Station, and monitoring activities once every two weeks by an officer from the district Fisheries Office for three years.

As shown on the following table, grouper cage culture would generate profits from the third year and profits of Rp. 1,322 million in the seventh year.

Income and Expenditures of the Grouper Cage Culture

Expenditure — Unit: Rp million

	1	2	3	4	5	6	7
Facilities	66	-					
Seeds	82	29	29	57	29	29	57
Feed	1	1	1	2	1	1	2
Wage	22	22	22	22	22	22	22
Miscellaneous	2	2	2	2	2	2	2
Sub-total	173	54	54	83	54	54	83
Training	10.4	1	1	-	-	-	-
Total	183	55	55	83	54	54	83

Income

	1	2	3	4	5	6	7
Selling products	0	236	472	236	236	472	236
Balance	-183	-3 414	568		750	1,168	1,322

Note: Input; 4 units of cages, 2,000 of humback grouper seedlings per 9 months, other equipment
Transportation cost of seed decreases 50% from 18th month

As mentioned earlier, grouper cage culture will generate large profits on a long-term basis. But the problem is that a loan system is unavailable for small-scale fishermen to borrow a large amount of money.

3.5 Development Issues for Mariculture in Tapolangu

Some of the issues for developing mariculture in Tapolangu were pinpointed thorough the Pilot Project. These are issues that will reoccur when the mariculture projects are implemented in the project area. Therefore, mariculture projects in this area must review the following issues.

(1) Insufficient feed supply during the full moon period and the high price of feed

The Kelompok purchased anchovies caught with Bagan as a feed for the pilot project. However, the production volume of Bagan falls during the full moon period, and the Kelompok could not purchase an adequate volume of trash fish from Bagan fishermen. The main fishing method in Tapolangu is Bagan and purse seine conducted around the FAD. The Kelompok purchased fusiliers of about 50 to 100g/fish from purse seine fishermen. However, the head, bone and fins of fish of this size are unusable as feed, and the yield of feed is about 50 percent of the total volume of the fish. In addition, wholesale prices increase during the full moon period due to the shortage of fish in the market, and Rp. 4,400/kg of fusiliers was purchased during the peak project period. This means that the unit price of feed using local fish cost Rp. 8,800/kg at the peak period, because the feed yield is only 50 percent. Moreover, the landing volume of fusiliers is also quite small during the full moon period.

Therefore, artificial diet was also used in the pilot project when the Kelompok was unable to purchase an adequate volume of trash fish, although trash fish was the main feed source. The artificial diet was used by the Gondol Research Institute of Mariculture. According to the Gondol Research Institute of Mariculture, the feed conversion rate (FCR) of this artificial diet is 1.2, and the unit price of the diet is Rp. 10,000/kg.

The production volume of Bagan decreases, and wholesale fish prices increase in the study area of the Master Plan, although the Bagan is anticipated to be the feed supply source for mariculture. Therefore, the productivity level of trash fish during the full moon period in the village is also considered an indicator of mariculture potential.

(2) Lack of a supply system for aquaculture materials

There is no shop selling aquaculture materials in the study area, due to minimal development of aquaculture in the area. Therefore, some materials such as net, float and medicines were purchased from a shop in Surabaya but time is required to deliver the materials to the study area, especially Flores Island where the marketing network is undeveloped. However, a stable supply of necessary materials is indispensable for aquaculture development.

Therefore, a supply system for aquaculture materials should be established when an aquaculture project is implemented in the area. District Fishery Office will be able to cope with emergencies only in the case of small projects.

(3) Project and social activities of the participants

As devout Catholics, all of the members attend church on Sunday morning. In addition, they are often involved in other church related social activities. These social

activities often clashed with the working schedule of the pilot project. Based on the discussion between the Kelompok and the JICA study team, the members of the Kelompok agreed to attend the social activities on a rotational basis. Regarding the worship on Sunday morning, the JICA Study Team permitted members to attend church after the early morning feeding. The members were required to return to work after church services (11 a.m.).

As mentioned above, all of the members have been influenced by religious activities, if all the members belong to the same church, it is better to consider setting up a member selection criteria based on religion

4. Final Evaluation

The final evaluation of the Pilot Project was conducted using the Project Cycle Management Method and the five evaluation criteria. Survey items and results of each criterion are shown on a evaluation grid (see Table 4.1).

An interview survey of participants and related organizations was carried out in the workshop which was held on after the rearing experiment was terminated. In addition to the five evaluation criteria, evaluation from the participant's perspective was also carried out, since the pilot project was implemented with the community's participation. An outline of the PCM and the five evaluation criteria are shown in the Attachment 2.

A summary of the evaluation is given below.

4.1 Efficiency

In assessing efficiency, the achievement level of the outputs in comparison to the efficient use of financial, human and material resources were examined.

As of May15 2002, the planned outputs were nearly achieved. All of the input was also utilized efficiently. Serious problems were not recognized, except the reduced project period, due to delays in the seed supply. It seems that there was no negative point from the standpoint of efficiency.

Four outputs mentioned in the PDM, i.e., "establishment of Kelompok", "training of participants in Lampung", "installation of floating cage", and "modification of aquaculture techniques", were nearly achieved. However, aquaculture techniques were not acquired during this short term, and members of the Kelompok acquired only a segment of the basic techniques. They will need continuous training in aquaculture.

All of the equipment was installed on time except the seedlings. As mentioned in "3. Implementation Stage", the project period was shortened due to delays in the seedling supply.

All of the inputted equipment were procured in Indonesia. Some materials such as

wooden boards, which were procured in Lembata, were basically purchased at the project site. Members of the Kelompok have already learned the construction methods for the floating cage and net.

All inputs utilized were efficiently, and problems regarding the quality and quantity of the input did not occur during the project period. It seems that the scale of the project, which was designed based on minimum production volume, is also appropriate.

4.2 Effectiveness

Effectiveness concerns the extent to which the project purpose was achieved, or is expected to be achieved, in relation to the outputs produced by the project.

As mentioned above, the rearing experiment produced good results, and the survival rate of the humback and tiger groupers during the first two months were 99 percent and 89 percent, respectively. In addition, a good monthly body weight gain for the humback grouper was more than 60 percent, and 40 to 50 percent for the tiger grouper. In addition, no technical problems were confirmed during the rearing experiment. It is concluded that the Kelompok acquired the adequate technical skills for grouper culture. Thus, it was concluded that the project purpose was achieved.

4.3 Impact

The impact of a project is intended and unintended, direct and indirect, positive and negative changes as a result of the project.

Any negative impacts on the environmental and social aspects in Tapolangu haven't been reported during the project period.

Many villagers visited n the floating cages during the project period. Due to the lack of other employment opportunities, many youth in Tapolangu emigrate to Malaysia and other countries. Therefore, the leaders are interested in the pilot project as a source of employment for the village.

As mentioned earlier, a staff member from the NGO also participated in the pilot project. This NGO intends to assist the project activities continuously that include environmental and social development issues as well.

Some traders weren't able to purchase fish from fishermen when the landing volume was low at Tapolangu, because the Kelompok purchased a certain amount of fish every day. Therefore, the Kelompok and NGOs are studying measures to transport the fresh fish from the landing sites in the district where an abundant volume of fish is collected.

4.4 Relevance

Relevance is to question whether the outputs, project purpose and overall goals are still in keeping with the priority needs and concerned at the time of evaluation.

It was concluded that the Pilot Project was relevant in terms of the Indonesian government's policy on aquaculture development and the formulation of job opportunities in Lembata.

The Indonesian government has placed high priority on developing humback grouper and tiger grouper culture. Although seedling production technology of these species was established by the "Multispecies Hatchery Project" in cooperation with JICA, the rearing culture of groupers using floating cages has not disseminated in Indonesia. The Gondol Research Institute of Mariculture also started a rearing experiment of humback grouper using floating cages. In addition, some District Fishery Offices and private companies also started a rearing experiment in each area.

In contrast, Tapolangu, where the project site is located, has limited job opportunities, and many youth immigrate to areas outside of the island. When grouper culture becomes established as an industry, it will provide job opportunities in Tapolangu and Lembata.

In view of the above, it has been concluded that the pilot project, which studied the possibility of grouper culture by the village community, meet the development policy of the government and the needs of the communities, and its relevance is very high.

4.5 Sustainability

Sustainability of the development project is to question whether the project benefits are likely to continue after the JICA project has come to an end.

The Kelompok strongly desires to continue the project activities, and has acquired adequate rearing techniques. However, they lack the financial ability to manage the operation costs, and also do not have sufficient experience in organized management. Therefore, their management capabilities in financial and organizational areas should be enhanced.

The NGO that participated in the pilot project, namely Yayasan Masyarakat Budidaya Pesisir, intends to assist the kelompok to continue the project activities in the area of finances, operations, and management. The NGO has already signed an agreement with the Kelompok. Future activities of the Kelompok will be reported by the NGO to the JICA expert in the Gondol Research Institute of Mariculture and the JICA study team.

Therefore, it has been concluded that the necessary conditions for continuing the project activities have been satisfied.

4.6 Participation of Villagers

The JICA study team did not discuss the project contents with village community from a technical viewpoint, because of the lack of personnel with sufficient aquaculture knowledge and experience in Tapolangu. Therefore, the JICA study team explained the contents of project activities, and confirmed the occurrence of problems related to the project activities.

However, the Kelompok conducted most of the project activities independently during the implementation stage. In addition, the Kelompok has the strong desire to continue the project activities; and the participation level of the village in the pilot project community was high.

4.7 Conclusion

The aim of the pilot project was to confirm the technical feasibility of cage culture for groupers by local fishermen. Although the two-month experiment was too short for a rearing experiment, capability to implement the project by the fishermen was confirmed through the experiment. Therefore, it was concluded that local fishermen are sufficiently capable to manage grouper culture activities, if the required training and materials are supplied. However, most of local fishermen do not have the knowledge and experience of organization management. This capability can not be acquired through short term training. Therefore, long-term OJT in organization management is necessary to develop self-sufficient grouper culture operations by local fishermen.

5. Recommendation and Lessons Learned

5.1 Recommendation

Based on the experience gained during the two-month rearing experiment, following measures are recommended to continue the project activities in Tapolangu.

(1) Introducing artificial diet

As mentioned above, the unstable supply of trash fish is one of the major problems that confront the aquaculture business in Tapolangu. In addition, the price of trash fish also increases during the peak period. Thus, it is very difficult to use trash fish landed at the project site as feed.

The Gondol Research Institute of Mariculture conducted rearing experiments using artificial diet in cooperation with private companies, and the results were published on 23 May 2002. The companies that cooperated with the experiments plan to sell the artificial diet for grouper culture. It is recommended that the Kelompok in Tapolangu shift from trash fish

to the artificial diet for feed, if the artificial diet can be purchased in Indonesia. The artificial diet will provide a stable source of feed, and eliminates the need to use ice to store feed. In addition, considering the FCR, the artificial diet is more economical.

(2) Reducing the seed transportation cost

The project site, namely Tapolangu, is located in the eastern region of Flores Island, and is distantly located from Bali where grouper seedlings are produced. In addition, the transportation network is also undeveloped. Therefore, the transport cost for seedlings is expensive, in addition to a long transport time.

It is necessary to reduce the transport cost of seedlings by effectively operating the fish farm. Therefore, it is recommended that seedlings are purchased when farm products are shipped to Bali. The transport cost should be reduced if the seedlings and farm products are transported by together.

(3) Disease prevention

Parasites are one of the major problems in grouper cage culture in Indonesia. The groupers kept in the pilot project were bathed in fresh water every month to prevent the infestation of parasites. Disease treatment is time-consuming and costly for fish farms. In addition, the survival and growth rates of fish also decrease.

Some members of the Kelompok commented that they didn't have the technical skills to provide treatment. However, it is very dangerous to use medicine without appropriate knowledge.

In consideration of the present knowledge and skills of the Kelompok, the most important issues are not the treatment, but the prevention of diseases.

One prevention measure against parasites is to keep the rearing conditions clean. The Kelompok was taught to change the rearing net at least once a week. It is recommended to maintain clean conditions and continuous disease prevention measures.

5.2 Lessons Learned

It is suggested that following points should be investigated when the grouper culture projects are established in NTB and NTT.

(1) Developing the supply system for artificial feed and other materials /equipment

Coastal fisheries such as Bagan are a main feed supply source for feeding culture in NTB and NTT. However, as mentioned earlier, the supply volume fluctuates. Therefore, the introduction of artificial diet should be examined in future projects.

Aquaculture materials and equipment are also brought in from outside NTB and NTT provinces. Therefore, the supply system for aquaculture materials/equipment should also be considered when an aquaculture project is designed.

(2) Clarifying the nutritional requirement

There are many subjects to be studied, although artificial diet for grouper is developing. It is indispensable to clarify the nutritional requirement of groupers in order to ascertain the composition of the artificial diet. In addition, the amount of other ingredients such as vitamins and fatty acids should also be clarified for mariculture using trash fish.

Lombok Aquaculture Station alone has the capability to implement a rearing experiment for grouper culture in the survey area. It is necessary to clarify the nutritional requirement of groupers to establish appropriate techniques of grouper culture.

(3) Developing new target species for aquaculture/developing live fish market in Indonesia

The grouper culture has been started in many areas in Indonesia. Although there are not many successful cases, it is estimated that the production volume of live groupers will increase sharply when grouper culture techniques become established. Most of the production of grouper culture is exported to foreign countries at this stage, and quite few volume of live grouper is consumed in Indonesia. Therefore, it is supposed that the increasing of production volume leads decreasing of market price of grouper. It is recommended that the new target species for aquaculture and live fish market in Indonesia should be developed for sustainable development of mariculture.

(4) Future Subjects for Developing Grouper Cage Culture

It is confirmed that there is no technical constraints for implementing grouper cage culture by small-scale fishermen. It seems that the projects implemented by the government fail due to an insufficient supply of feed and operation costs. Because the salary for participants was not included in the assistance provide by the government, the participants had to work not only for the project, but also in other activities to earn their living. As the result, the willingness to work for the project decreased, since the participants would not receive any income from the project more than 1.5 years. It seems that the poor rearing conditions due to inappropriate management of cages led to a high mortality rate of the fish.

The grouper cage culture requires large initial investments. Facilities and seedlings of grouper cage culture cost more than Rp. 150 million, and it will cost more than Rp. 180 million in the first year, including the operation costs. Unfortunately, a financial system for small-scale fishermen for large loans does not exist.

Therefore, following system should be established for developing grouper cage

culture.

- The Government should support not only the initial investment, but also management costs until the first harvest.
- New loan system should be established that would enable small-scale fishermen to borrow more than Rp. 180 million.

Local government units have enhanced grouper cage culture, and implemented projects that supply cages and seedlings to small-scale fishermen. Therefore, it is urgently necessary for grouper culture development to establish a loan system that will secure enough revenue to cover operation costs.

The grouper cage culture by local government units would fetch a large profit from the third year. It will be able to develop grouper culture continuously, if a part of the profit is returned as capital for the next project.

FIGURES AND TABLES

Table 2.1 PDM of the Pilot Project

Duration : From Feb. 2002 to May 2002

Project area: Tapolangu, Lembata | Target Group: Kelompok in Tapolangu | Prepared by JICA Study Team on Sept. 2001

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal Groupers culture is industrialized in Lembata District.			• Market price of groupers doesn't decrease.
Project Purpose Kelompok in Tapolangu acquire groupers nursery techniques.	• More than 80% of humback grouper and tiger grouper remain at the end of the Pilot Project.	• Working record	• Villagers invest cage culture. • Kelompok transfers the established techniques to others.
Output 1 Participants of the project are selected by village people. 2 Representatives of the Kelompok learn the nursery techniques at Lampung. 3 Floating cage is set up at Tapolangu. 4 Lampung method is revised in line with the farming condition in Tapolangu.	1 Kelompok consisted of 6 members are established. 2 Representatives are trained at fish farm in Lampung. 3-1 3 unit (4nets/unit) of floating cages are installed in Tapolangung. 3-2 2,000 of humback grouper and 1,500 of tiger grouper are kept in cages. 4 Kelompok keep the seeds using Lampung nursery techniques.	1 Registration record of the Kelompok 2 Certification from the Lampung fish farm 3-1 Delivery record 3-2 Delivery record 4 Working record	•
Activities 1-1 Member of the Kelompok was selected by Village people. 1-2 The Kelompok is registered with District Fisheries Office 2-1 Representatives are selected from members. 2-2 Representatives are trained at fish farm in Lampung. 3-1 Floating cages are build up. 3-2 Grouper seeds are released in the cage. 4-1 The Kelompok feed trash fish to groupers. 4-2 The Kelompok maintain and watch the cages.	Input Japanese side Dispatch of consultant 1 consultant 4 MM Training of the Kelompok Provision of equipment - 3 units of floating cages - 2,000 of humback - 1,500 of tiger grouper - Trash fish for feeding - Wage of workers	Indonesian side 6 participants as members of Kelompok	• Trash fish is supplied everyday. • Seed isn't infected virus. **Preconditions** • People in Tapolangu agree to set up the grouper culture.

Table 4.1 Evaluation Grid of the Pilot Project (8 pages)

Evaluation Point	Points To Be Checked	Information/ Indicators	Data Source	Check Results
1 Efficiency 1-1 To what degree is the output achieved?	1) Did the 6 villagers participate the project?	•Working record •Registration data of Kelompok	JICA Study Team Kelompok	Yes 6 members were selected village people, and they participated the Pilot Project.
	2) Were the 3 participates trained and mastered culture techniques in Lampung?		Fish farm in Lampung JICA Study Team	Yes The fish farm in Lampung, where the members of Kelompok were trained, certified that these members acquired necessary techniques. Besides, JICA Study Team evaluated that the trainees acquired only basic skills. Their skill will be brushed up through the OJT.
	3) Was the Lampung's culture techniques revised in line with the farming condition in Tapolangu?		JICA Study Team Kelompok	Yes Based on the culture methods in Lampung and Lombok Station, Kelompok improved procedure of daily works such as procurement and preservation of feed, net replacement and fish handling.
1-2 Was the project size appropriate compared with the project purpose?	1) Was the size of the fish farm (cages) appropriate?	•Project design report (Interim report)	JICA Study Team Kelompok	Yes The products of the rearing experiment are planed to sell to exporter in Bali. The farm is designed in consideration with the exporter's minimum purchase volume of live fish.
	2) Was the size of Kelompok (number of member) appropriate?		JICA Study Team Kelompok	Yes Number of members was designed based on the number of cages. Members of the Kelompok also mentioned that the number of member is fit the volume of daily works.
	3) Was the project period appropriate?		Kelompok	No The project was designed to harvest a part of groupers at the end of project period. However, project period was shortened, because of delay of inputs. As the result, indicator of the project purpose was revised. However, the Kelompok evaluated that the 2 months was enough for the training period.

Table 4.1 Evaluation Grid of the Pilot Project (8 pages)

1-3 Was the timing of the cooperation relevant?	1) Was the grouper seed supplied constantly in Indonesia?		JICA Expert in Gondol Research Institute for Mariculture	Yes JICA has been implemented "Multi-species Hatchery Project" in Gondol Research Institute for Mariculture since 1994. As the result, 2 million fingerlings of groupers were produced in Gondol area including private sector in 2001.
	2) Did the grouper nursery techniques establish in Indonesia?		JICA Expert in Gondol DGA	Yes Only some fishermen groups in Lampung and Situbondo succeeded the grouper nursery and rearing. However, any project implemented by the government never succeeded.
	3) Did the project satisfy the needs of local government?		Fisheries Office	Yes Grouper is one of important target fish for mariculture in Lembata. Lembata Fishery Office intends to introduce grouper culture in rural areas.
1-4 Were the all inputs installed in time?	1) Were cages, seeds and other materials installed in time?	• Records of installation	JICA Study Team Contractor	No All of the equipment was planed to install by the end of January 2002. However, because of rough condition of sea, seed transportation was delay to middle of March. As the result, project period was shortened from 4 months to 2.5 months.
	2) Was a member of JICA Study Team dispatched in time?	• Assignment schedule	Kelompok	Yes A member of JICA Study Team arrived at 9 February, and prepared for the pilot project.
	3) Did the Kelompok establish in time?	• Record of Fishery Office	Fisheries Office Kelompok	Yes Kelompok was established in January 2002.

Table 4.1 Evaluation Grid of the Pilot Project (8 pages)

1-5 Were the quality and quantity of inputs appropriate?	1) Did the members of Kelompok have enough capability to work in fish farm?	•Rearing record	JICA Study Team Staff of the Lombok Station	Yes All members acquired basic techniques of grouper culture. However, 2 months is too short to acquire the all of necessary techniques. More training is required for continuing the activities. The staff of the Lombok Aquaculture Station also pointed out that the members have enough capability for daily works, but lack of knowledge about fish diseases.
	2) Did the member of JICA Study Team have appropriate knowledge and experience to teach the Kelompok?		Kelompok Staff of the Lombok Station	Yes Both the member of Kelompok and staff of the Lombok Station agreed that the member of JICA Study Team has enough techniques and knowledge.
	3) Were the seeds of groupers installed in good condition?	•Rearing record	Kelompok Staff of the Lombok Station	Yes Although some seeds died due to oxygen deficient during transportation, any other seeds didn't die after the installation..
	4) Was the number of seeds appropriate?	•Rearing record	Kelompok Staff of the Lombok Station	Yes The number of seeds was deiced based on the size of cage and rearing density of fish in Lampung. Almost all of the cages are used for rearing fish. It seems that the number of seeds was appropriate. However, the staff of Lombok Station pointed out that the Lombok Station keeps fish with higher density.
	5) Were the quality of cages and other equipment/materials appropriate?		Kelompok Staff from Loka Lombok	Yes. There was no problem about the quality of equipment. The staff of Lombok Station also evaluated that the quality of cages was as good as the one in the Lombok Station.
	6) Were the quantity of cages and other equipment/materials appropriate?		Kelomopk Staff from Loka Lombok	Yes. The quantity of the equipment/materials was met the number of participants.

Table 4.1 Evaluation Grid of the Pilot Project (8 pages)

Evaluation Point	Points To Be Checked	Information/ Indicators	Data Source	Check Results
2 Effectiveness 2-1 Was the groupers nursery techniques established in Tapolangu?	1) Was the survival rate of Humback grouper in the project period more than 80%?	• Rearing record	Kelompok Staff from Loka Lombok	Yes There was no serious mortality of humback grouper during 2 month experiment, and it's survival rate is 99%. In addition, monthly weight gain is also more than 60%. There is no serious matter confirmed during the rearing experiment.
	2) Was the survival rate of Tiger grouper in the project period more than 80%?	• Rearing record	Kelompok Staff from Loka Lombok	Yes Although the survival rate of the tiger grouper was lower than humback grouper, it marked 89%. The low survival rate was caused by rough handling at the first monthly measuring, Based on this fault, the Kelompok improved the handling method, and no serious mortality occurred again.
2-2 Was the grouper culture in Tapolangu feasible?	1) Would the project be able to get profit?	• Cost estimation of the Project	JICA Study Team	Yes Grouper cage culture makes a large profit, although it is required a large amount of initial investment. The problem is that there is no loan system available for artisanal fishers for borrowing such amount of money.

Table 4.1 Evaluation Grid of the Pilot Project (8 pages)

Evaluation Point	Points To Be Checked	Information/ Indicators	Data Source	Check Results
3 Impact 3-1 Was the project contributed to the improvement of aquaculture sector?	1) Was the project contributed to the technical upgrading of grouper culture?		JICA Expert in Gondol DGA	Yes Results of the Pilot Project were submitted to the Gondol Research Institute of Mariculture and DGA. Due to quite limited rearing data published in Indonesia, this data would be utilized for grouper culture in Indonesia.
	2) What are the factors contributing to / inhibiting the aquaculture development?		JICA Expert in Gondol	A seminar of grouper culture targeted on private investor was held on 23 May 2002 at Gondol Research Institute of Mariculture. Contents of the Pilot Project also reported in the seminar. One of main grouper farm in Indonesia has problems of quality and quantity of trash fish supplied as feed. Due to introducing artificial diet, effectiveness of artificial diet also confirmed through the Pilot Project
3-2 Was the project contributed to regional development?	1) What extent has the project contributed to the socio-economic improvement in Lembata district?		Village leader NGOs	The Pilot Project hasn't influenced economic improvement in Tapulangu because the products of the Pilot Project haven't been purchased yet during the project period. However, the NGOs participated in the Pilot Project intend to assist Tapolangu continuously including environmental aspect. It is expected that the implementation of the Pilot Project and activities of the NGOs based on the Pilot Project improve the socio-economic situation in the district.
	2) What are the factors contributing to/inhibiting the development of Tapolangu?		Village leader Fishery Office	Some middlemen couldn't purchase fish from fishers because the Kelompok purchases certain amount of fish everyday. The JICA Study Team discussed productivity of the trash fish with village people during the workshop in September 2001. Although the village peoples answered that there was no problem for trash fish supply, this information wasn't correct.
3-3 How was other contribution of the project?	1) Was there any other positive or negative impact in technical, institutional, environmental or other aspects?		Village leader Fisheries Office Kelompok	No the other negative impact on the environmental and social aspect was reported during the Pilot Project.

Table 4.1 Evaluation Grid of the Pilot Project (8 pages)

Evaluation Point	Points To Be Checked	Information/ Indicators	Data Source	Check Results
4 Relevance 4-1 Was the Project planning relevant?	1) Did the grouper culture development meet the needs of village people in Tapolangu?		Village leader Kelompok	Yes. There are quite limited job opportunities in Tapolangu, and many youth emigrate to outside of the island. When the grouper culture is industrialized, it formulates job opportunity in Tapolangu and Lembata
4-2 Were the needs in Indonesia well identified?	1) Is the grouper culture still consistent with the fisheries development policy in Indonesia?		District Fisheries Office	Yes. The Government of Indonesia put high priority for developing humback grouper and tiger grouper culture. Gondol Research Institute of Mariculture also started a rearing experiment of humback grouper using floating cage. In addition, some District Fishery Offices and private companies also started a rearing experiment in each area.
	2) Is the grouper culture an appropriate method for realizing the rural fisheries development in Indonesia?		District Fisheries Office	Yes Grouper culture is focused as a new investment target in Indonesia. The NGOs also plans to develop Tapolangu based on the grouper culture.
	3) Is grouper culture an appropriate method to improve the income situation of people in Tapolangu?		District Fisheries Office Kelompok	Yes. As mentioned on "•", it is expected that the grouper culture expects very high profitability.
4-3 Was the cooperation planning process relevant?	1) Was the target level of the output relevant?	•PDM	JICA Expert in Gondol DGA	Yes The target level of the output was relevant, and no problem is occurred due to the target level of the output.
	2) Was the target level of the project purpose appropriate?	•PDM	JICA Expert in Gondol DGA	Yes The target level of survival rate, 80% is very high to compare the other fish farms in Indonesia, although its rearing period is only 2 months. It is said that the actual survival rate (99% and 89%) is quite good result.
	3) Did the outputs contain all of necessary items for realizing the project purpose?	•PDM	JICA Expert in Gondol DGA	Yes All of necessary items for developing aquaculture in rural area are contained in output. However, the Kelompok pointed out that dosage for fish diseases wasn't included in the activities.

Table 4.1 Evaluation Grid of the Pilot Project (8 pages)

Evaluation Point	Points To Be Checked	Information/ Indicators	Data Source	Check Results
5 Sustainability 5-1 Does the Kelompok have organizational sustainability?	1) Are there any political supports to the Kelompok for grouper culture development?		District Fisheries Office	Yes. Lembata District Fisheries Office has no specific plan to support the Kelompok in this stage. However, the District Fisheries Office plans to monitor the Kelompok activity, and assist them, if necessary
	2) Does the Kelompok have enough supports from the other concerned organizations?		NGOs Kelompok	Yes. The NGOs (Masyarakat Budidaya Pesisir) dispatched a moderator to the Pilot Project intends to assist the project activities in Tapolangu continuously. The moderator continues his job in the site project site until the Kelompok has enough managing ability.
	3) Does the Kelompok intend to continue the project activities?		Kelompok	Yes. All of the 6 members intend to continue the project activities.
5-2 Does the Kelompok have financial sustainability?	1) Is operating expenses for the project activities securely acquired?		NGOs Kelompok	Yes. The Kelompok made a agreement with the Masyarakat Budidaya Pesisir to get a loan for operation costs of the project. The amount of loan is repaid when the Kelompok harvests the fishes.
	2) Is the official financial support guaranteed?		District Fisheries Office	No Kelompok will be supported by the NGOs mentioned above (5-1-2). There is no financial assistant from government side.
5-3 Does the Kelompok have material and technical sustainability?	1) Does the Kelompok utilize transferred technology properly?		JICA Study Team Kelompok	Yes The Kelompok acquired basic techniques and utilize it for daily work. There is no problem to continue project activities. Due to matter of quality control of medicines, disease prevention was enhanced in spite of training for medical treatment.
	3) How does the Kelompok member transfer aquaculture techniques to other members?		JICA Study Team Kelompok	They work together on the floating cages every day, and teach each others. So far, this OJT is worked effectively.

Attachment-1

Management Condition of the Pilot Project

The Japan International Cooperation Agency (hereinafter refereed as "JICA") is implementing "The Study on Fisheries Infrastructures Support and Coastal Communities Development Plan in East Indonesia" in cooperation with the Ministry of Marine Affairs and Fisheries, Republic of Indonesia since June 2001. In conjunction with this study, JICA and the Ministry of Marine Affairs and Fisheries agreed to implement a pilot project in Tapo Langun, Leba Tukan district, Lembata province in NTT that will serve as the basis of a mariculture development plan for the eastern region of Indonesia. The pilot project will be managed by JICA, the Ministry of Marine Affairs and Fisheries and an aquaculture group in Tapo Langun. Their respective roles in the pilot project are delineated below.

1 Purpose and Content of the Pilot Project

The pilot project will introduce nursery technology for groupers, that was developed by the fish farmer group in Lampung province, to Tapo Langun, Leba Tukan district, and Lembata district.. The Pilot Project will be implemented according to the following procedure.

1. An aquaculture group will be established in Tapo Langun.
2. Representatives of the aquaculture group will be trained at a fish farm in Lampung.
3. Floating cages will be set up at Tapo Langun.
4. The culture techniques will be revised to suit the aquaculture environment in Tapo Langun.

2 Pilot Project Participants

The participants of the pilot project will consist of the aquaculture group, DOF Lembata and the JICA study team. In addition, an aquaculturalist from the fish farmer group in Lampung who will participate in technical transfer activities will also be included in the participants.

The fish farmer group in Tapo Langun will be comprised of a group leader, an accountant and four members. The leader and accountant will be selected by the members. However, the leader will be restricted to those persons who received training in Lampung.

3 Role of the Each Participant

The role of the each participant is as follows.

(1) Fish Farmer Group

- Will be responsible for the management of the floating cages such as the replacement of nets, fish transfer. etc.

- Will be responsible for purchasing fish food, preparing and feeding fish.
- Will be responsible for measuring the fish that is cultured.
- Will conduct fish disease prevention measures.
- Will be responsible for recording culture data (survival rate, body length and weight, feeding volume, etc.).
- Will be responsible for the financial management of the pilot project. This role will be transferred from the JICA Study Team by the end of project period to the fish farmer group.

(2) JICA Study Team

- Will be responsible for procuring and installing floating cages and necessary equipment.
- Will be responsible for procuring grouper seeds.
- Will be responsible for training of fish farmers.
- Will be responsible for project management (including financial management.
- Will be responsible for monitoring and evaluating the pilot project.

(3) DOF Lembata

- Will be responsible for the overseeing the registration of the pilot project and other necessary administrative requirements.
- Will be responsible for auditing the pilot project.
- Will be responsible for monitoring and evaluating the pilot project.

(4) Fishermen Group in Lampung

- Will provide instruction on floating cage construction.
- Will provide supervision on feeding and rearing groupers.

4 Ownership of the Equipment

The following equipment will be prepared for the project by the JICA Study Team.

Floating cage (including nets)
Aerator
Portable light
Waterproof light
Stainless cutting knives
Mincer
Feed basket
Bowl
Stainless scissors
Hunting knife
Boat including outboard engine

The fish farmer group will utilize the equipment in project activities under the guidance of

the JICA Study Team. Since the equipment will be owned by JICA, the fish farmer group does not have the right to sell or rent the equipment.

5 Project Implementation Rules

(1) Budget

1) Operation cost (food, fuel, etc.)

The operation cost for all project activities that will be conducted during the project period (from January to May 2002) will be prepared by the JICA Study Team.

The JICA Study Team will pay the accountant the required budget every week. The accountant will record all payments and expenditures in an account book and will keep all receipts.

The JICA Study Team and DOF Lembata will periodically audit the account book. The leader and the accountant of the fish farmer group will be responsible for implementing the project activities accurately under the guidance of the JICA Study Team and the DOF Lembata.

2) Assisting the Living Expenses of the Fish Farmer Group

The JICA Study Team will pay each member of the fish farmer group Rp. 70,000/ person every week to assist their living expenses. This financial assistance will be paid through the accountant. This assistance will be paid while the members participate in the pilot project and it will be discontinued when the member leaves the pilot project.

3) Bank Account

The fish farmer group must open a bank account in Lewoleba, and it will be used only for budget management by the JICA Study Team during the project period.

(2) Sales Revenue

Revenue generated from the sales of the cultured fish will be paid into the bank account of the fish farmer group. The revenue will be divided and allocated for budget operations, equipment replacement, project extension activities, and remuneration for group members under the guidance of the JICA Study Team and the DOF Lembata. This remuneration will be paid only to the participating members of the pilot project when the fish are sold. Members who leave the pilot project before the fish are sold forfeit all rights to receive remuneration from the project.

(3) Equipment

1) Equipment Manager

The members of fish farmer group will rent all the equipment from JICA Study Team. The

leader of the group will take full responsibility for the management of the equipment.

2) Users

The right to use the equipment will be restricted to the members of fish farmer group. All equipment may not be rented or used by other persons or groups.

3) Reparation for Lost or Damaged Equipment

The fish farmer group shall be responsible for the immediate reparation of all lost equipment. If the fish farmer group is unable to pay the reparation costs, the purchase cost of the new equipment will be deducted from the assistance funds paid by the JICA Study Team to the group members for living expenses. In the case of damaged equipment, the repair and/or replacement costs will be paid by the JICA Study Team during the project period.

Attachment-2

Outline of the PCM

(1) What is a PCM?

The Project Cycle Management (PCM) Method is a tool for managing the entire cycle of a development project - from formulation and implementation to evaluation - by means of a project format termed the Project Design Matrix (PDM).

(2) Elements Constituting PDM

PDM is a table summarizing a project that shows the narrative summary of the project (inputs, outputs, project purpose, and overall goal), important assumptions and objectively verifiable indicators needed for a project as well as the logical relationships among them. The definition of each element was as follows;

Overall Goal:	The effect of a development project expected to be attained as a result of the Project Purpose being achieved.
Project Purpose:	An objective that is expected to be achieved as a result of project implementation and which is revealed in the form of specific benefits or impacts for the target group.
Outputs:	Several objectives that must be achieved for the Project Purpose to be attained. Outputs are expected to be achieved by implementing Project Activities.
Activities:	Specific actions taken by the project to produce Outputs through the effective use of personnel, funds and equipment (Input).
Input:	Personnel, funds, equipment, land, and facilities necessary for the implementation of the project, offered both by the donor and recipient countries.
Preconditions:	Necessary conditions that must be fulfilled before a project is initiated. If these conditions are not met, the project should not be initiated.
Important Assumptions:	Conditions important to the success of a project, but which are beyond the control of the project and whose probably of being l satisfied cannot be assured.
Objectively Verifiable Indicators:	Standards that show the achievement of the Outputs, Project Purpose, and Overall Goal in specific terms.
Means of Verification:	Data sources for Objectively Verifiable indicators.

(3) Project Evaluation and PCM

The project should be evaluated in the following terms:

Efficiency:	Measure the efficiency with which the Outputs have been achieved through Inputs, in terms of both quantity and quality, considering the appropriateness, timing cost, and benefit of the Inputs (the relationship between Inputs and Outputs).

Effectiveness:	Identify the achievement of the Project Purpose, focusing on the extent to which the Project Outputs contributed to its achievement.
Impact:	Assess the project's effects, both positive and negative, inside and outside of the project, including those effects not anticipated at the project planning stage.
Relevance:	During the evaluation stage, examine the compliance of the project objectives with the development policy and needs of the expected beneficiaries, and the relevance of the project components.
Sustainability:	Assess whether the benefits of the project will be sustained after the donor's assistance is terminated.

The five evaluation criteria (efficiency, effectiveness, impact, relevance and sustainability) help in focusing the evaluation questions to conduct a comprehensive evaluation. These evaluation criteria directly linked to the design elements of the narrative summary for evaluation.

The results of the above evaluation are incorporated into the next project planning as suggestions and lessons learned from experience. It is therefore important to keep a record of the project planning process, establish indicators for monitoring and evaluation, and specify the means of verification.

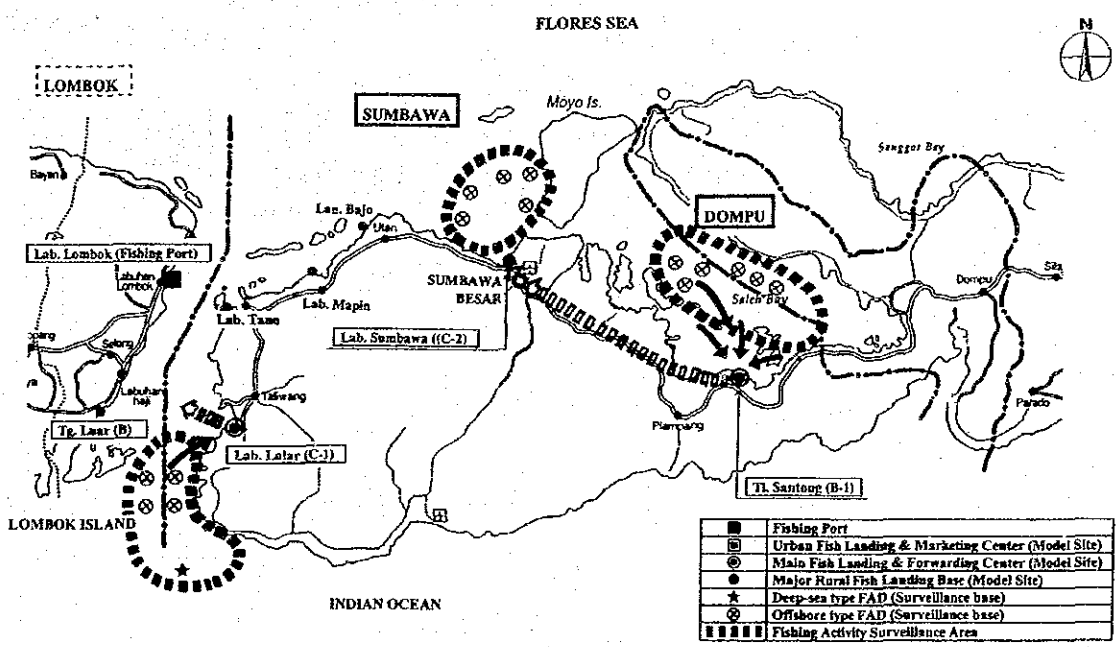
APPENDIX-1

Outline of Project Design of Each Model Site

The outline of project design was prepared as indicated in the following pages based on the objectives, scope, and level of improvement discussed in Part III Master Plan 4.1-4.7" which includes the basic concepts. The basis for estimation of the scale/capacity by districts in attached Table 1 (Equipment for Fishing Area Expansion and Surveillance) and in attached Table 2 (Equipment for Fish Marketing and Processing), and the respective cost breakdowns are shown in attached Table 3. The basis for estimation for the number of fishing boats by model project sites is shown in Table 4(1) ~ (10), and the scale of facilities is shown in attached Table 5(1)~(13), and the construction cost by model areas is shown in attached Table 6(1)~(13). The overall summary of the construction cost by model sites is shown in attached Table 7.

1. Sumbawa District

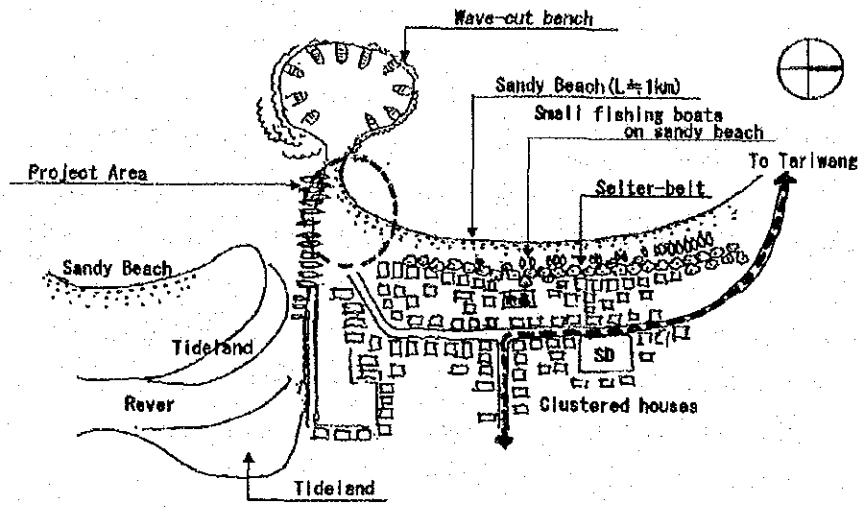
(1) Overall Network Plan



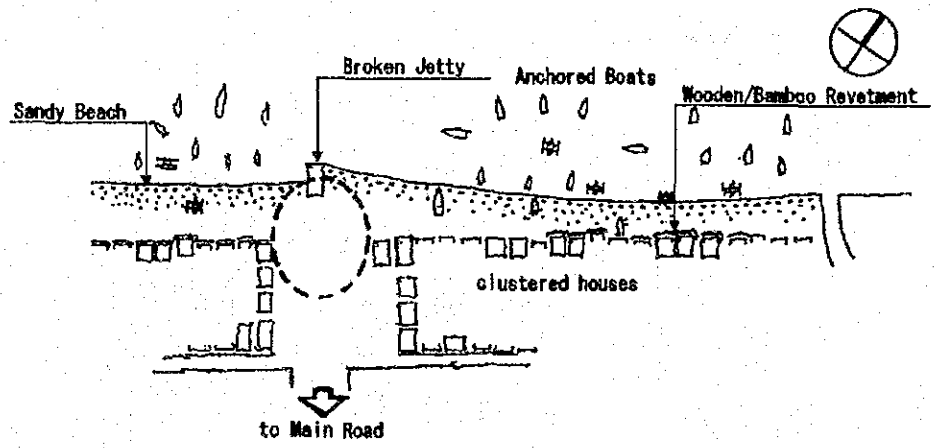
(2) Existing Conditions of Model Sites

The existing conditions of the model sites, namely Lab. Lalar Lab. Sumbawa and Santong are shown in the following page.

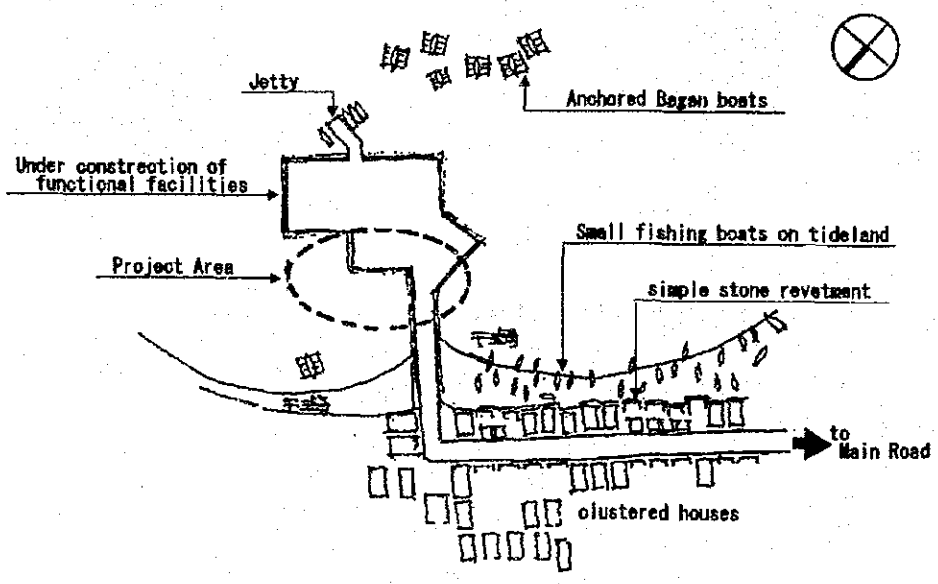
1) Lab. Lalar (Taliwang)



2) Lab. Sumbawa (Sumbawa)



3) Santong (Plampang)



(3) Target Scale

Model Site		Lab. Lalar (Taliwang)	Lab. Sumbawa (Sumbawa)	Santong (Plampang)
Effected Area		Kec.Taliwang coast	Kec.Sumbawa coast	Kec.Plampang coast
No. of fishing households		653	635	854
Estimated Fish Catch 1999-2012		587 - 777 ton/year	975 - 1,290 ton/year	8,048 - 10,648 ton/year
Average daily fish landing		1.6 - 2.1 ton/day	2.7 - 3.5 ton/day	22.0 - 29.2 ton/day
Ditto (at peak season)		2.4 - 3.2 ton/day	4.0 - 5.3 ton/day	33.1 - 43.8 ton/day
No. of fishing boats	Non-powered	180	94	123
	Outboard	118	126	184
	Inboard	1	24 (8 purse-seine)	59 (Bagan)
Daily fresh fish dealing		1.6 - 2.1 ton/day	2.6 - 3.5 ton/day	21.5 - 28.5 ton/day
Daily processed fish		0.8 - 1.1 ton/day	1.4 - 1.9 ton/day	11.6 - 15.3 ton/day
Major markets		Taliwang (30 min. by car) Tg. Luar (3 hrs by boat)	S.Besar (15 min. by car) Mataram (6 hrs. by car) Denpasar (15 hrs. by car)	Plampang (15 min. by car) S.Besar (1 hr. by car) Mataram (7 hrs. by car)
No. of fish buyers per day (fish landing site)		20-30 village women 1 demersal fish collector (fresh)	20-30 village women 12 demersal fish collectors (3 alive, 8 fresh, 1 sea cucumber)	50-60 village women 10-20 beach traders (men) 2 demersal fish collectors (fresh)
Sumbawa Besar Fish Market		No. of retailers: fresh fish 50-100 persons/day, dried fish 10 persons/day Estimated sales volume: fresh fish 2.5-5.0 ton/day (average 3.1 ton/day) Opening time: 06:00-18:00 Others: Selling fish by kg (use of balance)		

(4) Site Plan

Model Site	Area (m2)
Lab. Lalar (Taliwang)	1,380
Lab. Sumbawa (Sumbawa)	2,620
Santong (Plampang)	3,610

(5) Facilities & Equipment Plan

1) Facilities

Function	Facilities	Brief Specification	Scale / Area		
			Lab.Lalar	Lab.Sumbawa	Santong
Fishing port basic facilities	Landing jetty	For motorised boats	24m	60m	Existing
	Mooring facility	For small boats, simple structure	20m	12m	12m
	Slipway	For repair & maintenance of motorised boats	4m	7m	7m
	Boat ramp		40m2	90m2	90m2
	Boat repair lot		30m2	80m2	80m2
	In-site roads		500m	50m	Existing
	Revetment	For securing sea-side access	-	100m	300m
Fish handling, marketing, processing and sales	Handling/auction hall		70m2	120m2	Existing
	Fresh fish storage	Space for keeping cool boxes	9m2	134m2	-
	Fish agent office	For fish collectors	25m2 (1 booth)	200m2 (8 booths)	50m2 (2 booths)
	Fish retail market		-	Existing	-
	Model fish processing facility	For boiled/dried fish (Improved type)	185m2	295m2	2,200m2
	Fishery products diversification centre	Processing room, cooking room, mess for extension, etc.	-	200m2	-
	Ice plant & storage	Space only	25m2	25m2	184m2
Fishing activity support	Office	Fisheries & coop. office, kiosk, training/meeting room (community meeting room)	160m2	160m2	Existing
	Mini-workshop	For maintenance of engine, manufacturing of cool box, etc.	40m2	40m2	40m2
	Net yard	Net drying yard, repair yard, work space, storage	240m2	330m2	370m2
	Fuel depot	Gasoline and diesel oil	60m2	60m2	60m2 (5kl)
	Public toilet		30m2	30m2	30m2
	Garbage depot		1 lot	-	1 lot
	Parking lot		125m2	175m2	250m2
Fishing village environment	Village road/drainage		500m	-	-
	Water supply	Piping from water source, reservoir tank	1 lot	-	-

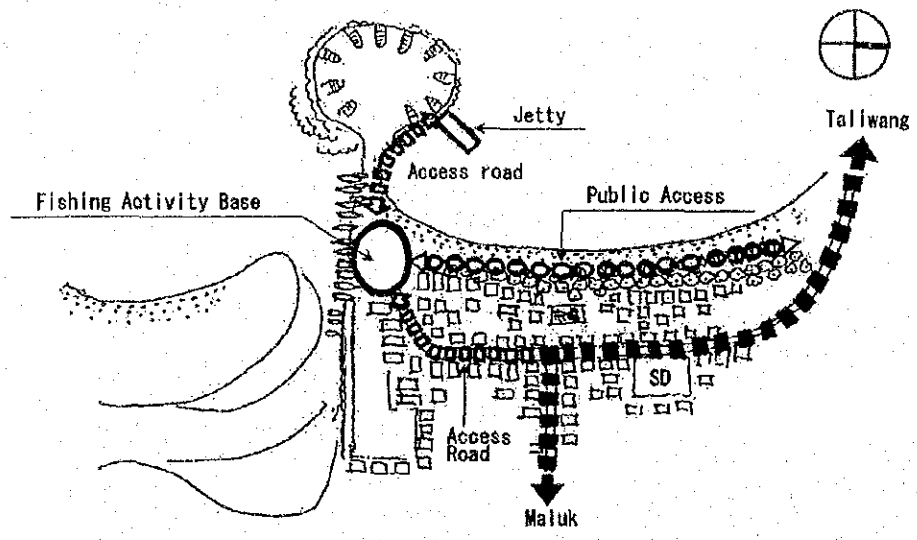
Notes:
1. Lab. Lalar: Due to the effects of swell from Indian Ocean and waves during north-west monsoon, a breakwater would be made to create the calm water zone behind the small island. For implementation of the project, however, it is necessary to analyse the effects to transformation of sand beach by breakwater, in addition to the detailed survey and analysis on geographic and soil conditions, sea conditions (wave, tide, current, etc.), land ownership, water sources, and environmental effects.
2. Lab. Sumbawa: Due to the risks of transformation of the existing beach by the effects of drift sand, landing facilities are of jetty type without breakwater so that it is difficult to create the calm water zone. Mooring of fishing boats would be as it is. For implementation of the project, it is necessary to do detailed survey and analysis on geographic and soil conditions, sea conditions (wave, tide, current, etc.), land ownership, and environmental effects.
3. Santong: The existing PPI will be utilised. The land reclamation will be made to create the required land area. It is necessary to obtain the community's consensus on construction of revetments for mooring of small boats and keeping public access at sea-side of the existing village.

2) Equipment

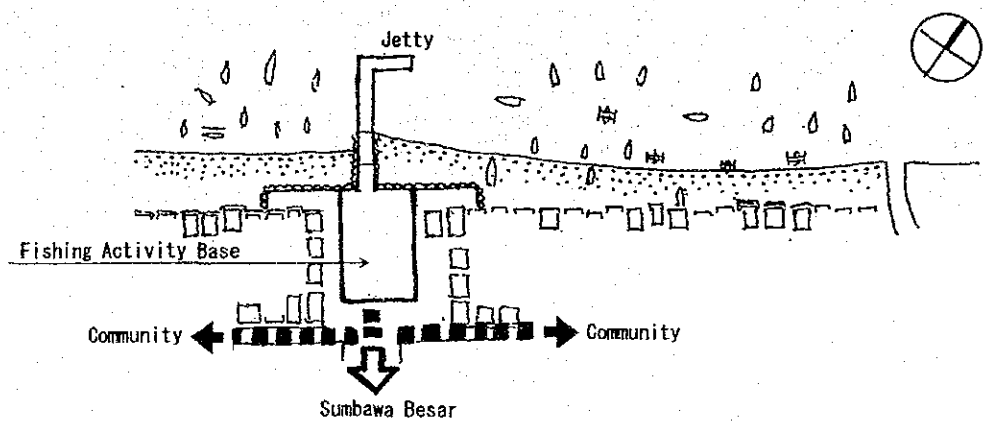
Function	Equipment	Brief Specification	Capacity / Quantity		
			Lab.Lalar	Lab.Sumbawa	Santong
Fresh fish marketing	Ice making plant	Block ice (25kg)	2 ton/day	2 ton/day	15 ton/day
	Ice storage		5 m3	9 m3	54 m3
	Cool box	25L/45L/80L/200L	72 pcs.	118 pcs.	957 pcs.
Fish processing	Materials for dried fish processing	Drying rack (1m wide, w/cover)	50 m	80 m	580 m
		Drying pallet (50x80cm)	180 pcs.	290 pcs.	2,320 pcs.
		Boiling kiln (for 5 pallets boiling)	2 units	3 units	24 units
		Storage shelves (for 15 pallets)	6 units	10 units	78 units
	Packing equipment	Work table, vacuum packer	1 set	1 set	4 set
	Experimental equipment	Equipment for fish ball, cracker, smoked fish, cooking equipment, etc.	-	1 lot	-
Fih shipment & information	Multi-purpose transport boat	12m long, 40hp, fish hold approx. 3m3, GPS/VHF radio	1 unit	-	-
	Multi-purpose vehicle	For shipping of fish, procurement of fuels, etc., 3 ton payload	1 unit	1 unit	-
	Fax	For market Information network	1 unit	1 unit	1 unit
Fishing grounds diversification	Small engine	For motorization, 5.5-22hp	11 units	6 units	7 units
	Fishing materials	For gill nets and hand-lines	For 11 boats	For 6 boats	For 7 boats
	Model fishing boat	Approx. 15GT, purse-seine	1 unit	1 unit	1 unit
Fishing grounds management	Deep-sea FAD	For creation of fishing grounds and surveillance bases of coastal waters	1 unit	1 unit	-
	Offshore FAD		4 units	2 units	6 units
	Shallow FAD		-	6 units	7 units
	VHF radio	For land station and field use	6 units	4 units	7 units
	GPS	Portable, for search of boat position	5 units	3 units	6 units
	Speed boat	7-8m long, 75hp x 2 units, fish finder/GPS/VHF radio	1 unit	1 unit	1 unit
	Data analysis set	For database of registered boats and fishery statistics	1 unit	1 unit	1 unit
Fishing activity support	Hand tools	For carpentry and mechanical repair works	1 lot	1 lot	1 lot

3) Facilities Zoning Plan

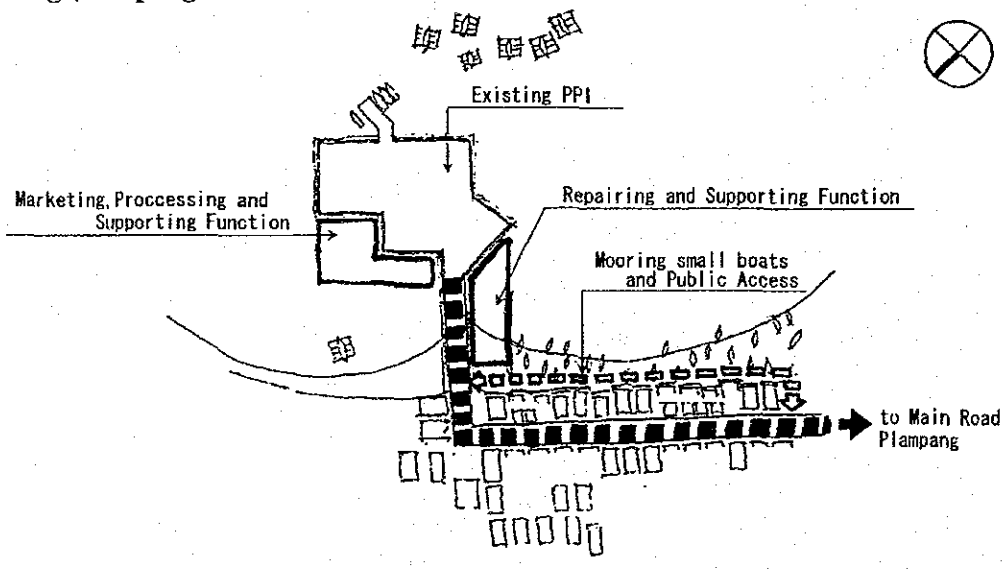
a) Lab. Lalar (Taliwang)



b) Lab. Sumbawa (Sumbawa)



c) Santong (Plampang)



(6) Implementation Plan

1) Implementation schedule

Year	2002	2007	2012
Strengthening of fish coops.			
Training of fishermen and staff			
F/S & detailed designing			
Construction & procurement			
Operation & management			
Extension to neighbour areas			

Note: Extension to neighbour areas includes the following.

1) Expansion of fishing grounds to south coasts of Sumbawa from Lab.Lalar (camp fishing having a base at Sejorong, Tetar, and Bebar villages, collaboration networking with local villages, etc.)
2) Extension to other north coast areas (Lab.Bajo, Lab.Alas, Lab.Mapin) using the Lab.Sumbawa model.
3) Extension to other areas of Tl. Saleh (Lab.Terata, Lab.Sangoro using the Santong model.

2) Project cost

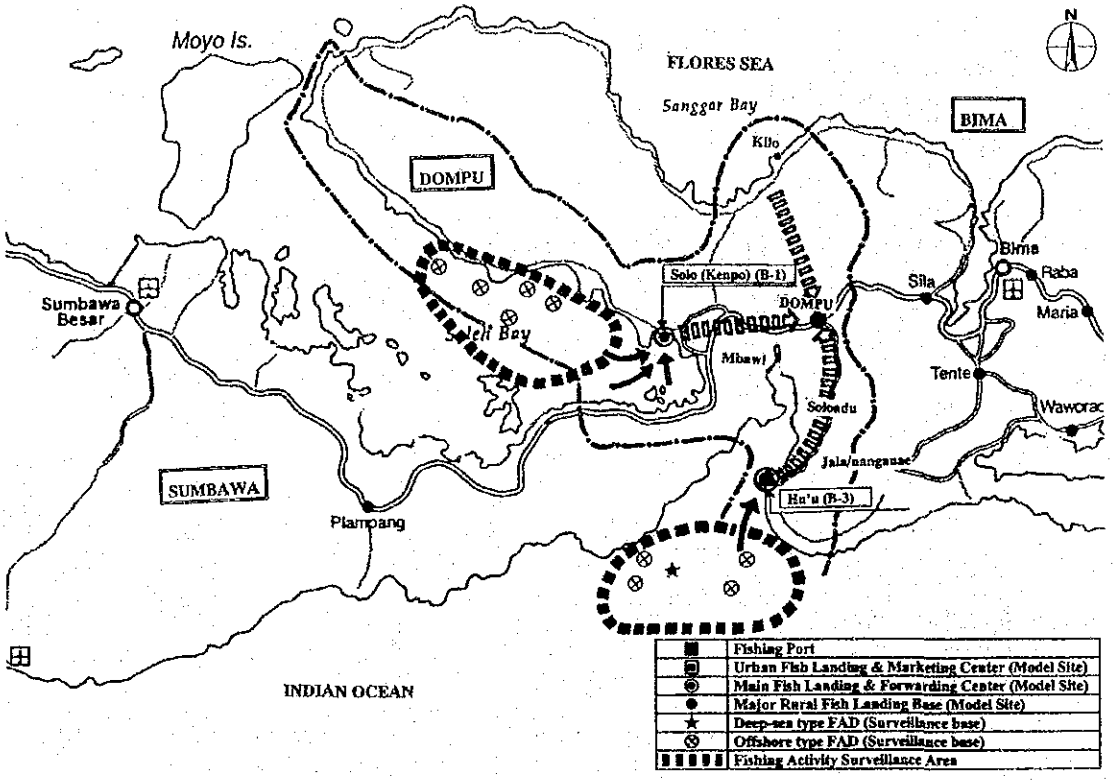
Unit: billion Rp

Model Site	Construction	Equipment	Activity	Total
Lab. Lalar (Taliwang)	4.3	2.1	1.6	8.0
Lab. Sumbawa (Sumbawa)	5.4	2.3	1.9	9.6
Santong (Plampang)	4.6	5.1	2.4	12.1
Sub-Total	14.3	9.4	5.9	29.7
Contingency (sub-total 30%)	4.3	2.8	1.7	8.9
Total	28.6	12.2	7.6	38.6

Note: Cost of activity covers necessary costs before the completion of construction such as for study, designing & supervision, and education & training, assuming 25% of construction and equipment costs.

2. Dompu District

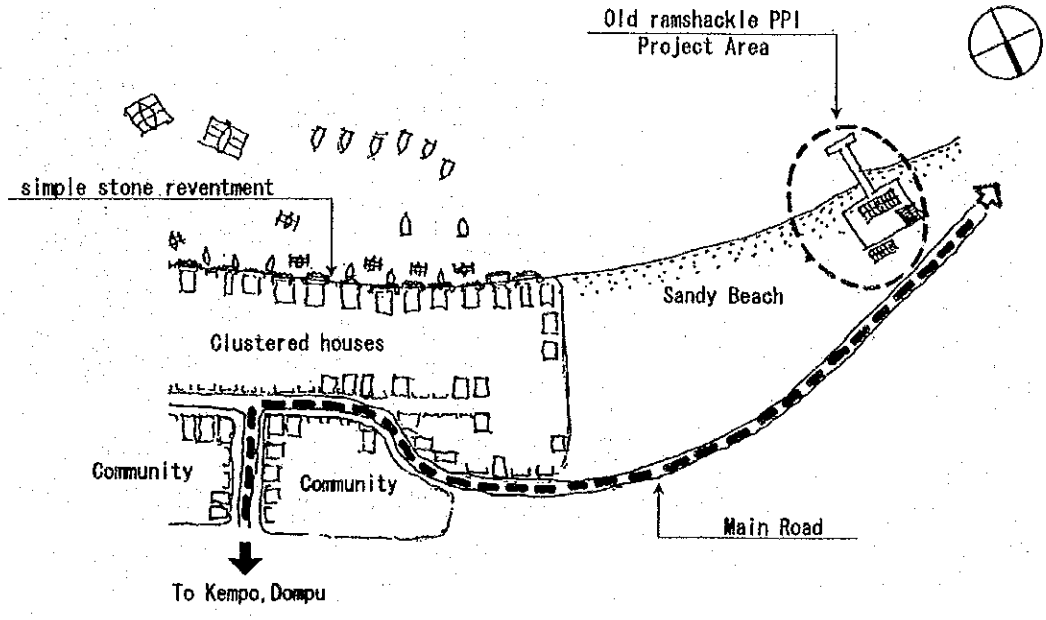
(1) Overall Network Plan



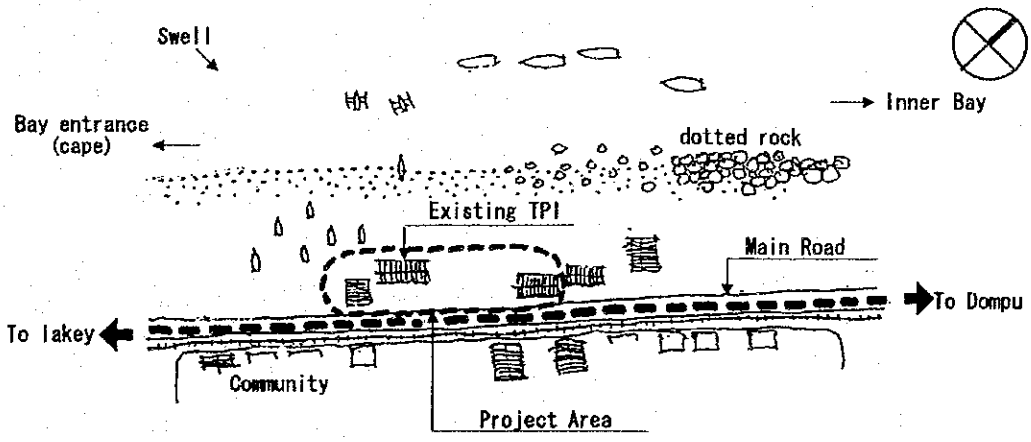
(2) Existing Conditions of Model Sites

The existing conditions of the model sites, namely Soro and Hu'u are shown in the following page.

1) Soro (Kempo)



2) Hu'u (Hu'u)



(3) Target Scale

Model Site		Soro (Kempo)	Hu'u (Hu'u)
Effected Area		Kec.Kempo coast	Kec.Hu'u coast
No. of fishing households		440 (hearing)	130 (hearing)
Estimated Fish Catch 1999-2012		2,599 - 3,436 ton/year	1,829 - 2,418 ton/year
Average daily fish landing		7.1 - 9.4 ton/day	5.0 - 6.6 ton/day
Ditto (at peak season)		10.7 - 14.1 ton/day	7.5 - 9.9 ton/day
No. of fishing boats	Non-powered	247	210
	Outboard	118	121
	Inboard	41 (31 Bagan, 10 purse-seine	10 (purse-seine)
Daily fresh fish dealing		6.9 - 9.2 ton/day	4.9 - 6.5 ton/day
Daily processed fish		3.7 - 4.9 ton/day	2.6 - 3.5 ton/day
Major markets		Dompu (0.5 hr. by car)	Dompu (1.5 hrs. by car)
No. of fish buyers per day (fish landing site)		20-30 village women 50-60 beach traders (women) 80 fish collecting boats 4 demersal fish collectors (fresh)	20-30 village women
Dompu Fish Market		No. of fish retailers: fresh fish 100-200 persons/day, dried fish 10 persons/day Estimated sales volume: fresh fish 3.0-6.0 ton/day (average 3.8 ton/day)	

(4) Site Plan

Model Site	Area (m2)
Soro (Kempo)	2,625
Hu'u (Hu'u)	2,025
Dompu market	1,290

(5) Facilities & Equipment Plan

1) Facilities

Function	Facilities	Brief specification	Scale / Area		
			Kempo	Hu'u	Dompu
Fishing port basic facilities	Landing jetty	For motorised boats	72m	-	-
	Mooring facility	For small boats, simple structure	20m	-	-
	Slipway	For repair & maintenance of motorised boats	7m	7m	-
	Boat ramp		90m2	90m2	-
	Boat repair lot		80m2	80m2	-
	In-site roads		-	-	-
	Revetment	For securing sea-side access	700m	200m	-
Fish handling, marketing, processing and sales	Handling/auction hall		220m2	160m2	-
	Fresh fish storage	Space for keeping cool boxes	-	28m2	39m2
	Fish agent office	For fish collectors	100m2 (4 booths)	-	-
	Fish retail market	Expansion of existing fish market	-	-	400m2 (100 units)
	Model fish processing facility	For boiled/dried fish (Improved type)	720m2	530m2	-
	Fishery products diversification centre	Processing room, cooking room, mess for extension, etc.	-	-	-
	Ice plant & storage	Space only	62m2	49m2	-
Fishing activity support	Office	Fisheries & coop. office, kiosk, training/meeting room (community meeting room)	160m2	160m2	75m2
	Mini-workshop	For maintenance of engine, manufacturing of cool box, etc.	40m2	40m2	-
	Net yard	Net drying yard, repair yard, work space, storage	330m2	330m2	-
	Fuel depot	Gasoline and diesel oil	70m2 (5kl)	60m2 (3kl)	-
	Public toilet		30m2	30m2	30m2
	Garbage depot		1 lot	1 lot	1 lot
	Parking lot		225m2	75m2	350m2
Fishing village environment	Village road/drainage		-	-	-
	Water supply	Piping from water source, reservoir tank	1 lot	-	-

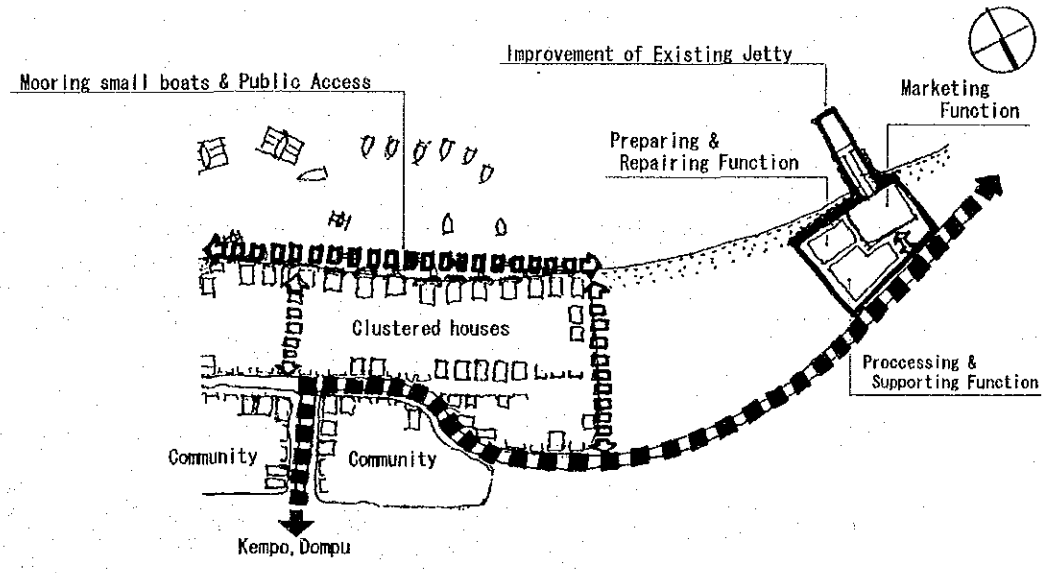
Notes:
1. Soro Kempo: The existing facilities would be rehabilitated and expanded having a centre for fishery related activities on the existing PPI. Due to the slightly far from fishing village, however, It is necessary to get consensus from community on utilisation of project facilities. It is also necessary to obtain the community's consensus on construction of revetments for mooring of small boats and keeping public access at sea-side of the existing village. For implementation of the project, it is necessary to do the detailed survey and analysis on geographic and soil conditions, sea conditions (wave, tide, current, etc.), land ownership, water resources, and environmental effects.
2. Hu'u: Due to the effects of swell from Indian Ocean, no marine civil structure (fish landing facility) would be planned. For implementation of the project, it is necessary to do the detailed survey and analysis on geographic and soil conditions, sea conditions (wave, tide, current, etc.), land ownership, and environmental effects.
3. Dompu (market): It is necessary to make a utilisation plan (zoning and flow) of overall market not only for fish.

2) Equipment

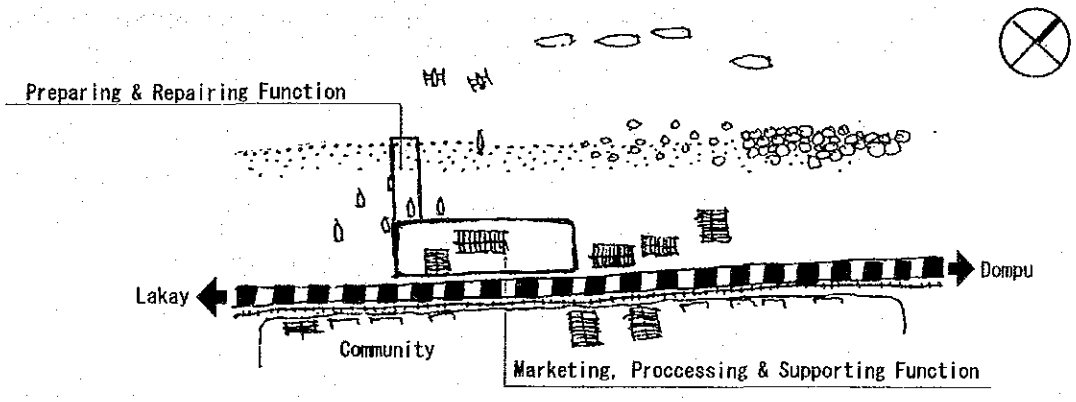
Function	Equipment	Brief Specification	Capacity / Quantity		
			Kempo	Hu'u	Dompu
Fresh fish marketing	Ice making plant	Block ice (25kg)	5 ton/day	4 ton/day	-
	Ice storage		18m3	14m3	-
	Cool box	25L/45L/80L/200L	312 pcs.	219 pcs.	-
Fish processing	Materials for dried fish processing	Drying rack (1m wide, w/cover)	190 m	140m	-
		Drying pallet (50x80cm)	750 pcs.	530 pcs.	-
		Boiling kiln (for 5 pallets boiling)	8 units	6 units	-
		Storage shelves (for 15 pallets)	25 units	18 units	-
	Packing equipment	Work table, vacuum packer	2 sets	1 set	-
	Experimental equipment	Equipment for fish ball, cracker, smoked fish, cooking equipment, etc.	-	-	-
Fih shipment & information	Multi-purpose transport boat	12m long, 40hp, fish hold approx. 3m3, GPS/VHF radio	-	-	-
	Multi-purpose vehicle	For shipping of fish, procurement of fuels, etc., 3 ton payload	-	1 unit	-
	Fax	For market Information network	1 unit	1 unit	1 unit
Fishing grounds diversification	Small engine	For motorization, 5.5-22hp	15 units	13 units	-
	Fishing materials	For gill nets and hand-lines	For 15 boats	For 13 boats	-
	Model fishing boat	Approx. 15GT, purse-seine	1 unit	1 unit	-
Fishing grounds management	Deep-sea FAD	For creation of fishing grounds and surveillance bases of coastal waters	-	1 unit	-
	Offshore FAD		5 units	4 units	-
	Shallow FAD		6 units	-	-
	VHF radio	For land station and field use	6 units	6 units	-
	GPS	Portable, for search of boat position	5 units	5 units	-
	Speed boat	7-8m long, 75hp x 2 units, fish finder/GPS/VHF radio	1 unit	1 unit	-
	Data analysis set	For database of registered boats and fishery statistics	1 unit	1 unit	-
Fishing activity support	Hand tools	For carpentry and mechanical repair works	1 lot	1 lot	-

3) Facilities Zoning Plan

a) Soro (Kempo)



b) Hu'u (Hu'u)



(6) Implementation Plan

1) Implementation Schedule

Year	2002	2007	2012
Strengthening of fish coops.			
Training of fishermen and staff			
F/S & detailed designing			
Construction & procurement			
Operation & management			
Extension to neighbour areas			

Note: Extension to neighbouring areas includes the following.

1. Extension to Kilo area (as well as to Sanggar area of Bima district) using the Bima model.
2. Extension to Pekat area using the Kempo model (Expansion of fishing grounds for Kempo area)
3. Expansion of fishing grounds to south coasts of Sumbawa from Hu'u (camp fishing having a base at Sekokat fishing village)

2) Project Cost

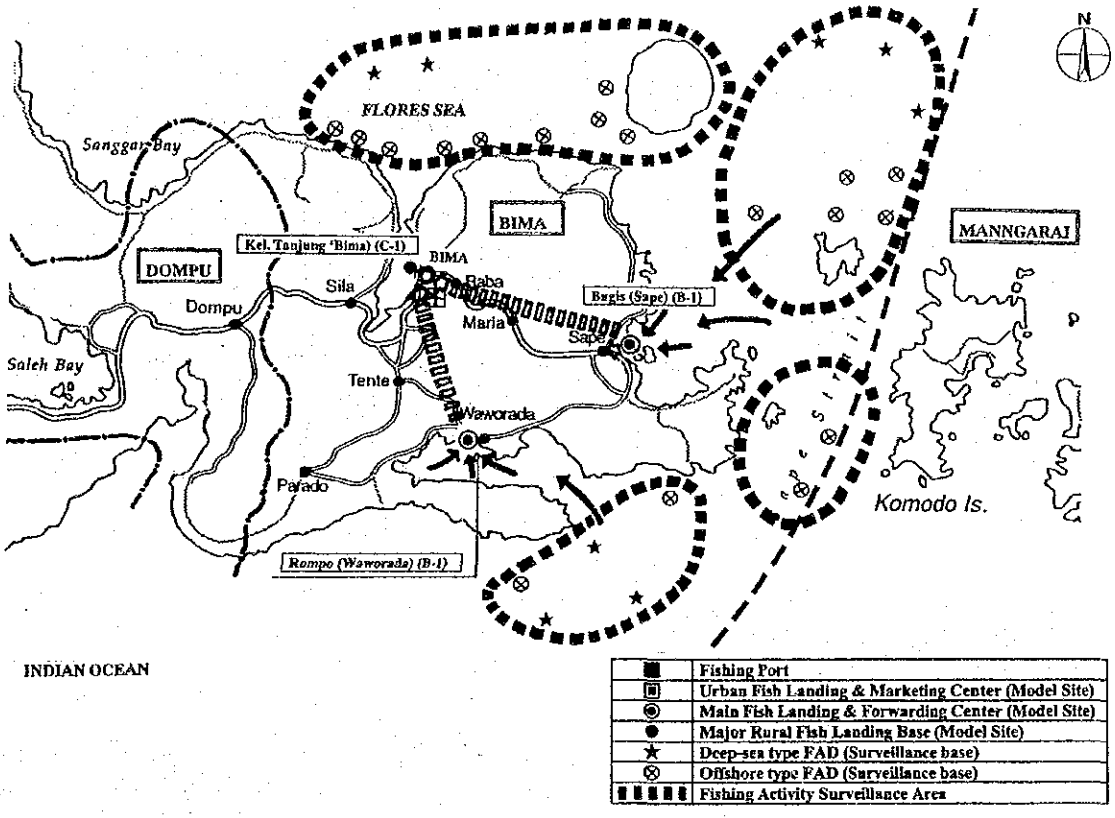
Unit: billion Rp

Model Site	Construction	Equipment	Activity	Total
Soro (Kempo)	7.2	2.6	2.5	12.3
Hu'u (Hu'u)	2.7	2.4	1.3	6.4
Dompu market	*1.6*	-	*0.4*	*2.0*
Sub-Total	11.5	5.0	4.2	20.7
Contingency (sub-total x 30%)	3.5	1.5	1.3	6.2
Total	15.0	6.5	5.5	26.9

Note: Cost of activity covers necessary costs before the completion of construction such as for study, designing & supervision, and education & training, assuming 25% of construction and equipment costs.

3. Bima District

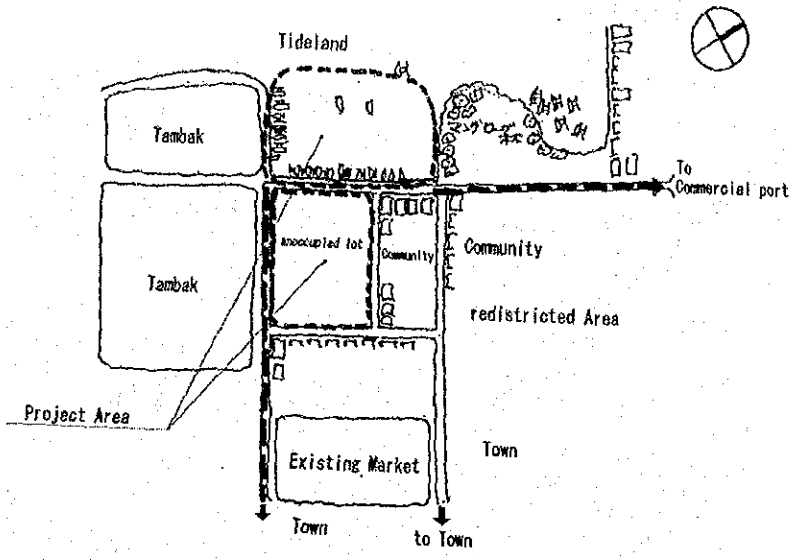
(1) Overall Network Plan



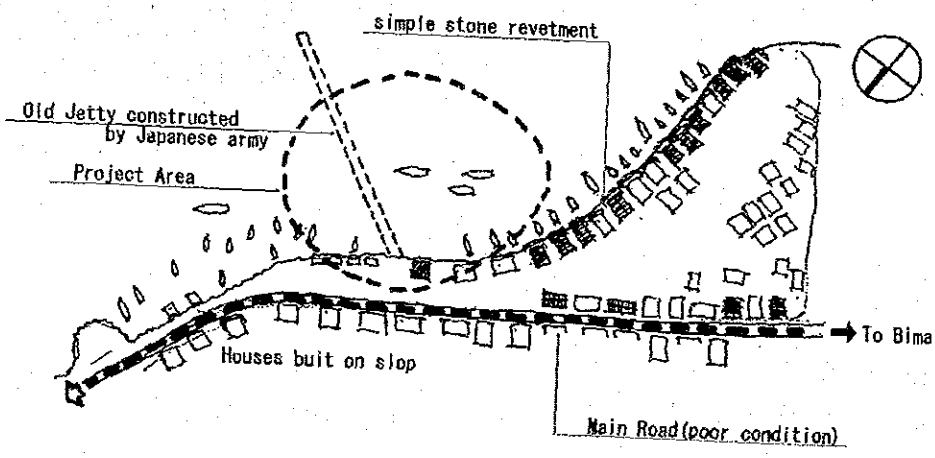
(2) Existing Conditions of Model Sites

The existing conditions of the model sites, namely Tanjung, Rompo and Bugis are shown in the following page.

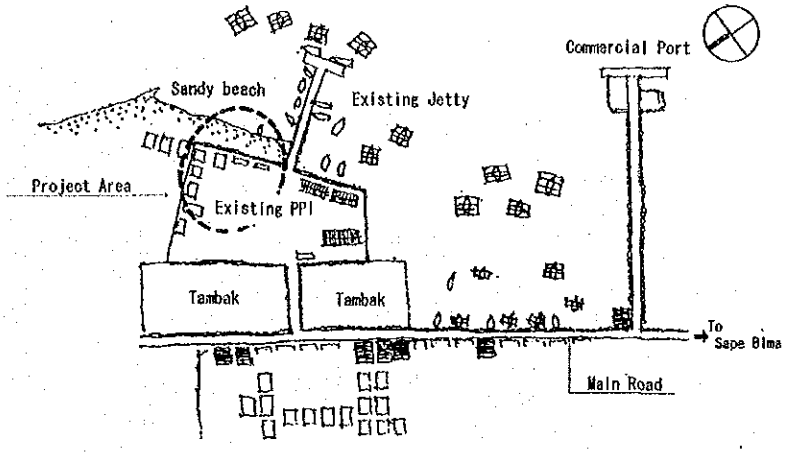
1) Tanjung (Bima)



2) Rompo (Waworada)



3) Bugis (Sape)



(3) Target Scale

Model Site		Tanjung (Bima)	Rompo (Waworada)	Bugis (Sape)
Effected Area		Tl.Bima & north coast	Tl.Waworada & its vicinity	Tl.Sape & its vicinity
No. of fishing households		Approx. 1,000 (estimate)	Approx. 1,000 (estimate)	1,162 (only Bugis village)
Estimated Fish Catch 1999-2012		509 - 629 ton/year	7,074 - 8,736 ton/year	11,709 - 14,571 ton/year
Average daily fish landing		1.4 - 1.7 ton/day	19.4 - 23.9 ton/day	32.3 - 39.9 ton/day
Ditto (at peak season)		2.1 - 2.6 ton/day	29.1 - 35.9 ton/day	48.5 - 59.9 ton/day
No. of fishing boats	Non-powered	57	82	40
	Outboard	90	84	45
	Inboard	352 (35 Bagan)	308 (139 Bagan, 25 purse-seine)	836 (204 Bagan)
Daily fresh fish dealing		1.3 - 1.7 ton/day	18.9 - 23.4 ton/day	31.5 - 38.9 ton/day
Daily processed fish		0.7 - 0.9 ton/day	10.2 -- 12.6 ton/day	17.0 - 21.0 ton/day
Major markets		Bima (5 min. by Dokar)	Bima (2 hrs. by car) Renda, Ngali, Tente (0.5-1.5 hrs. by car)	Bima (2 hrs. by car) Sape (15 min. by Dokar) Wawu (1hr. by car) Denpasar (22 hrs. by car)
No. of fish buyers per day (fish landing site)		20-30 village women	20-30 village women 20-30 beach traders (women) 3 demersal fish collectors (fresh) 25 fish collecting boats	50-60 village women 18 demersal fish collectors (fresh) 4 pelagic fish collectors (fresh)
Bima Fish Market (Pasar Baru)		No. of fish retailers: fresh fish 100-150 persons/day, dried fish 10 persons/day Estimated sales volume: fresh fish 5.0-7.5 ton/day (average 5.6 ton/day) Opening time: 06:00-12:00		

(4) Site Plan

Model Site	Area (m2)
Tanjung (Bima)	4,065
Rompo (Waworada)	5,060
Bugis (Sape)	7,445

(5) Facilities & Equipment Plan

1) Facilities

Function	Facilities	Brief Specification	Scale / Area		
			Bima	Waworada	Sape
Fishing port basic facilities	Landing jetty	For motorised boats	80m	72m	Existing
	Mooring facility	For small boats, simple structure	8m	8m	4m
	Slipway	For repair & maintenance of motorised boats	13m	13m	25m
	Boat ramp		110m2	160m2	300m2
	Boat repair lot		120m2	120m2	320m2
	In-site roads		-	500m	-
	Revetment	For securing sea-side access	200m	700m	200m
Fish handling, marketing, processing and sales	Handling/auction hall		60m2	600m2	Existing
	Fresh fish storage	Space for keeping cool boxes	287m2	-	-
	Fish agent office	For fish collectors	75m2 (3 booths)	75m2 (3 booths)	550m2 (22 booths)
	Fish retail market	Expansion of existing fish market	400m2	-	-
	Model fish processing facility	For boiled/dried fish (Improved type)	155m2	1,930m2	3,205m2
	Fishery products diversification centre	Processing room, cooking room, mess for extension, etc.	200m2	-	-
	Ice plant & storage	Space only	13m2	147m2	245m2
Fishing activity support	Office	Fisheries & coop. office, kiosk, training/meeting room (community meeting room)	160m2	160m2	220m2
	Mini-workshop	For maintenance of engine, manufacturing of cool box, etc.	40m2	40m2	60m2
	Net yard	Net drying yard, repair yard, work space, storage	820m2	660m2	990m2
	Fuel depot	Gasoline and diesel oil	120m2 (8kl)	100m2 (7kl)	160m2(16kl)
	Public toilet		30m2	30m2	40m2
	Garbage depot		-	1 lot	1 lot
	Parking lot		600m2	250m2	500m2
Fishing village environment	Village road/drainage		-	500m	-
	Water supply	Piping from water source, reservoir tank	-	1 lot	-

Note 1. Tanjung (Bima): It is necessary to make an utilisation plan (zoning and flow) of overall market not only for fish as a second market. It is also necessary to take appropriate countermeasures against urban pollution such as drainage system, garbage treatment, etc., as sea bottom become shallow with abundant sludge due to the discharge of sewage to the sea. For implementation of the project, it is necessary to do the detailed survey and analysis on geographic and soil conditions, sea conditions (wave, tide, current, etc.), land ownership, and environmental effects.

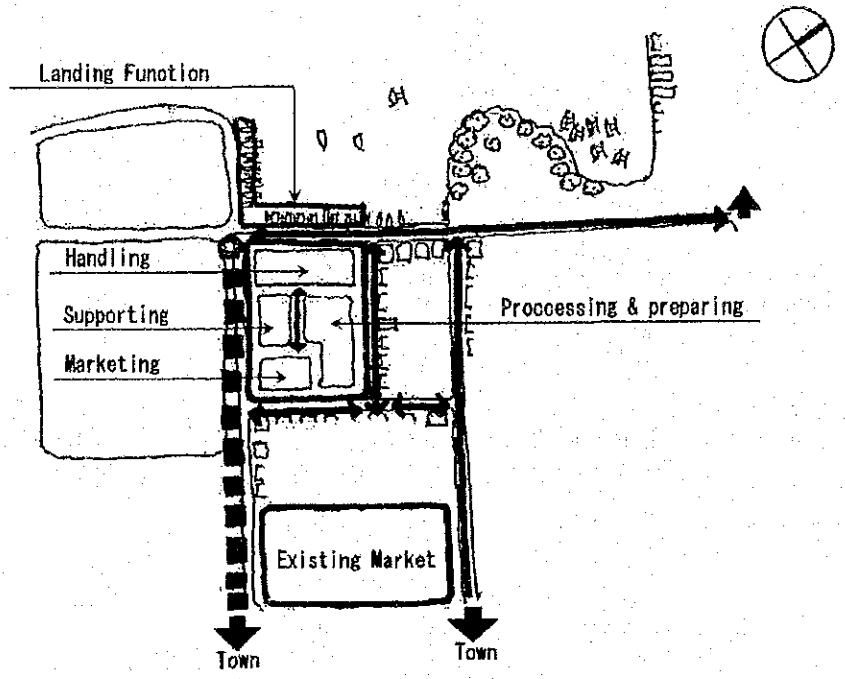
1. Rompo (Waworada): Land reclamation would be needed because of the limited area of village. It is necessary to obtain the community's consensus on construction of revetments for mooring of small boats and keeping public access at sea-side of the existing village. Improvement of road between Waworada and Bima would be required to ensure the easier transportation of fish. For implementation of the project, it is necessary to do the detailed survey and analysis on geographic and soil conditions, sea conditions (wave, tide, current, etc.), land ownership, water resources, and environmental effects.
2. Bugis (Sape): The existing PPI will be utilised. The shortage of land will be covered by reclamation of north side of the existing jetty. It is necessary to clearly regulate the roles between the existing jetty and projected area, as well as between fish landing centre and the existing ferry terminal / commercial port zones. For implementation of the project, it is necessary to do the detailed survey and analysis on geographic and soil conditions, sea conditions (wave, tide, current, etc.), land ownership, and environmental effects.

2) Equipment

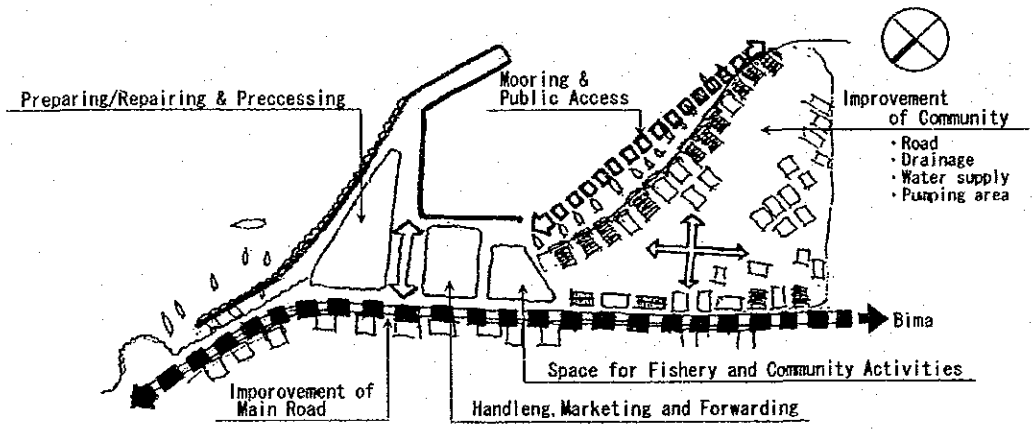
Function	Equipment	Brief Specification	Capacity / Quantity		
			Bima	Waworada	Sape
Fresh fish marketing	Ice making plant	Block ice (25kg)	1 ton/day	13 ton/day	22 ton/day
	Ice storage		5 m3	50m3	81m3
	Cool box	25L/45L/80L/200L	62 pcs.	843 pcs.	1,405 pcs.
Fish processing	Materials for dried fish processing	Drying rack (1m wide, w/cover)	40 m	510m	850m
		Drying pallet (50x80cm)	150 pcs.	2,040 pcs.	3,400 pcs.
		Boiling kiln (for 5 pallets boiling)	2 units	21 units	34 units
		Storage shelves (for 15 pallets)	5 units	68 units	114 units
	Packing equipment	Work table, vacuum packer	1 set	4 sets	6 sets
	Experimental equipment	Equipment for fish ball, cracker, smoked fish, cooking equipment, etc.	1 lot	-	-
Fish shipment & information	Multi-purpose transport boat	12m long, 40hp, fish hold approx. 3m3, GPS/VHF radio	-	-	-
	Multi-purpose vehicle	For shipping of fish, procurement of fuels, etc., 3 ton payload	-	-	-
	Fax	For market Information network	1 unit	1 unit	1 unit
Fishing grounds diversification	Small engine	For motorization, 5.5-22hp	3 units	5 units	2 units
	Fishing materials	For gill nets and hand-lines	For 3 boats	For 5 boats	For 2 boats
	Model fishing boat	Approx. 15GT, purse-seine	1 unit	1 unit	1 unit
Fishing grounds management	Deep-sea FAD	For creation of fishing grounds and surveillance bases of coastal waters	2 units	2 units	3 units
	Offshore FAD		9 units	3 units	7 units
	Shallow FAD		-	8 units	21 units
	VHF radio	For land station and field use	12 units	6 units	11 units
	GPS	Portable, for search of boat position	11 units	5 units	10 units
	Speed boat	7-8m long, 75hp x 2 units, fish finder/GPS/VHF radio	1 unit	1 unit	1 unit
	Data analysis set	For database of registered boats and fishery statistics	1 unit	1 unit	1 unit
Fishing activity support	Hand tools	For carpentry and mechanical repair works	1 lot	1 lot	1 lot

3) Facilities Zoning Plan

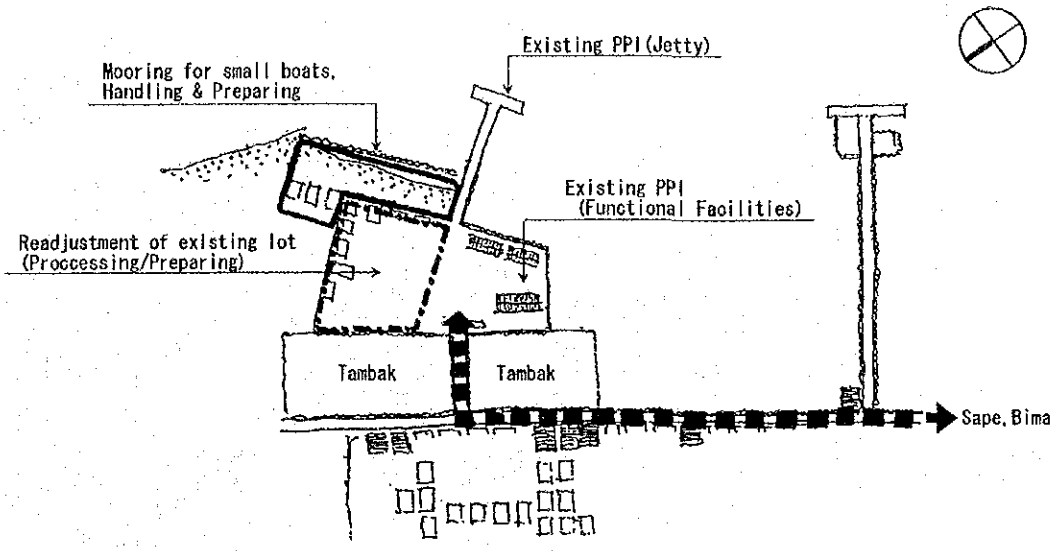
a) Tanjung (Bima)



b) Rompo (Waworada)



c) Bugis (Sape)



(6) Implementation Plan

1) Implementation Schedule

Year	2002	2007	2012
Strengthening of fish coops.			
Training of fishermen and staff			
F/S & detailed designing			
Construction & procurement			
Operation & management			
Extension to neighbour areas			

Note: Extension to neighbour areas includes the following.
Extension to Sanggar area (as well as to Kilo area of Dompu district) using the Bima model.

2) Project Cost

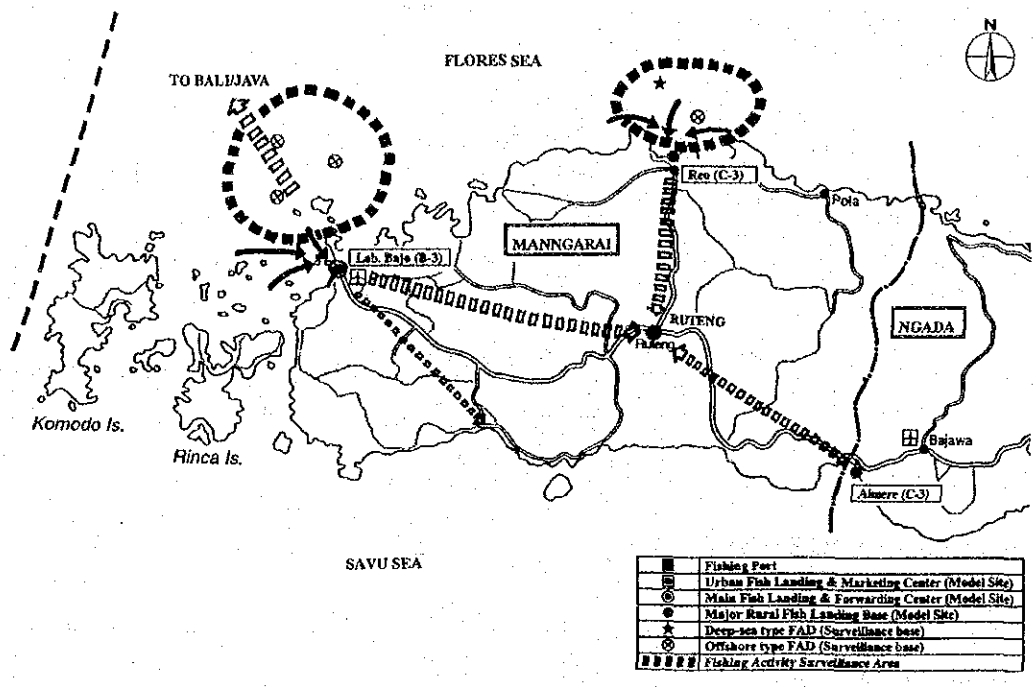
Unit: billion Rp

Model Site	Construction	Equipment	Activity	Total
Tanjung (Bima)	7.9	2.3	2.6	12.8
Rompo (Waworada)	11.8	4.6	4.1	20.5
Bugis (Sape)	8.1	7.0	3.8	18.9
Sub-Total	27.8	13.9	10.5	52.2
Contingency (sub-total x 30%)	8.3	4.2	3.2	15.7
Total	36.1	18.1	13.7	67.9

Note: Cost of activity covers necessary costs before the completion of construction such as for study, designing & supervision, and education & training, assuming 25% of construction and equipment costs.

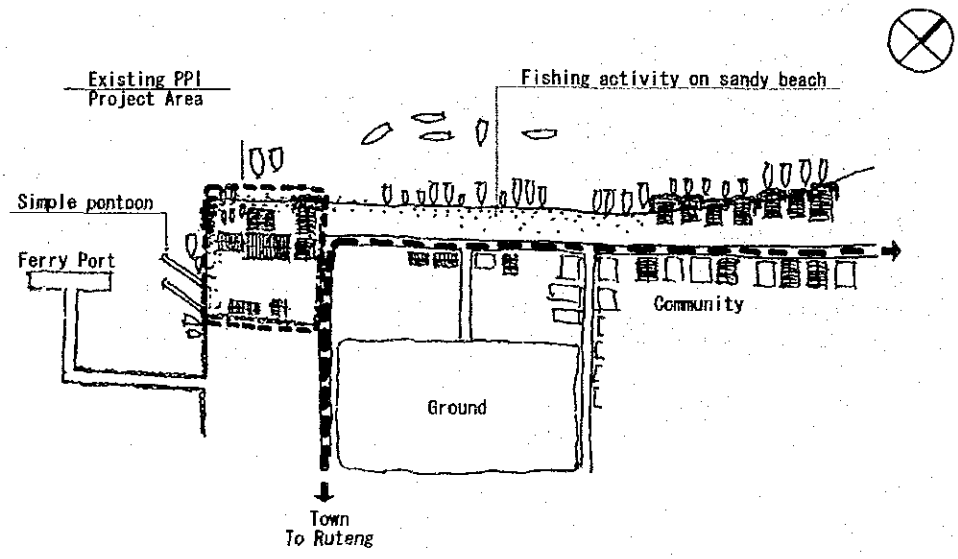
4 Manggarai District

(1) Overall Network Plan



(2) Project Site (Model Site)

1) Lab. Bajo (Komodo)



2) Reo (Reo)

Currently the bank of a river is used as landing site, which is small and narrow; it is necessary to examine for other site.

(2) Target Scale

Model Site		Lab. Bajo (Komodo)	Reo (Reo)
Effected Area		Kec.Komodo coast	Kec.Reo coast
No. of fishing households		Full-time 1,781, Part-time 809	Full-time 115, Part-time 983
Estimated Fish Catch 1999-2012		3,002 - 3,806 ton/year	819 - 1,038 ton/year
Average daily fish landing		8.2 - 10.4 ton/day	2.2 - 2.8 ton/day
Ditto (at peak season)		12.3 - 15.6 ton/day	3.4 - 4.3 ton/day
No. of fishing boats	Non-powered	299	130
	Outboard	0	0
	Inboard	226 (204 Bagan)	22 (6 Bagan, 1 purse-seine)
Daily fresh fish dealing		8.1 - 10.1 ton/day	2.2 - 2.7 ton/day
Daily processed fish		4.3 - 5.5 ton/day	1.2 - 1.5 ton/day
Major markets		Ruteng (4 hrs. by car) Denpasar (30 hrs. by car)	Ruteng (3 hrs. by car)
No. of fish buyers per day (fish landing site)		20-30 village women 10-20 beach traders (men) 5 demersal fish collectors (fresh)	10-20 village women 5-10 beach traders (men)
Ruteng Fish Market		No. of fish retailers: fresh fish 10-20 men & 10-20 women, dried fish 70 men/day Estimated sales volume: fresh fish 1.2-2.5 ton/day (average 1.6 ton/day) Opening hours: 16:00-20:00	

(4) Site Plan

Model Site	Area (m2)
Lab. Bajo (Komodo)	3,355
Reo (Reo)	1,720
Ruteng	355

(5) Facilities & Equipment Plan

1) Facilities

Function	Facilities	Brief Specification	Scale / Area		
			Lab.Bajo	Reo	Ruteng
Fishing port basic facilities	Landing jetty	For motorised boats	14m	-	-
	Mooring facility	For small boats, simple structure	28m	-	-
	Slipway	For repair & maintenance of motorised boats	7m	-	-
	Boat ramp		90m2	-	-
	Boat repair lot		80m2	-	-
	In-site roads		-	200m	-
	Revetment	For securing sea-side access	320m	100m	-
Fish handling, marketing, processing and sales	Handling/auction hall		320m2	130m2	-
	Fresh fish storage	Space for keeping cool boxes	-	-	84m2
	Fish agent office	For fish collectors	125m2 (5 booths)	-	-
	Fish retail market		-	160m2 (20 units)	-
	Model fish processing facility	For boiled/dried fish (Improved type)	1,050m2	295m2	-
	Fishery products diversification centre	Processing room, cooking room, mess for extension, etc.	200m2	-	-
	Ice plant & storage	Space only	62m2	25m2	-
Fishing activity support	Office	Fisheries & coop. office, kiosk, training/meeting room (community meeting room)	220m2	160m2	50m2
	Mini-workshop	For maintenance of engine, manufacturing of cool box, etc.	60m2	40m2	-
	Net yard	Net drying yard, repair yard, work space, storage	50m2	330m2	-
	Fuel depot	*Gasoline and diesel oil*	*80m2 (4kl)*	*20m2*	-
	Public toilet		40m2	30m2	30m2
	Garbage depot		1 lot	-	1 lot
	Parking lot		175m2	75m2	75m2
Fishing village environment	Village road/drainage		-	-	-
	Water supply	Piping from water source, reservoir tank	-	-	-

Notes: 1. Lab. Bajo: D ue to the limited land area, the function would be focused on fish collecting & forwarding. In case that the north-east beach of the existing site can be utilised, the project could be realised on full-scale by doing reclamation and revetment. It is necessary to secure the navigation channel of ferry at the stage of detail planning. For implementation of the project, it is also necessary to do detailed survey and analysis on geographic and soil conditions, sea conditions (wave, tide, current, etc.), land ownership and environmental effects.

2. Reo: The existing river-side landing place would be improved and expanded. It is necessary to discuss with river management body on utilisation of river-mouth basin. It is impossible to install civil structure except revetment due to the anticipated strong water flow during rainy season. The improvement of main road to Ruteng would be indispensable to ensure the appropriate fish marketing. For implementation of the project, it is also necessary to do detailed survey and analysis on geographic and soil conditions, river water flows, and environmental effects.

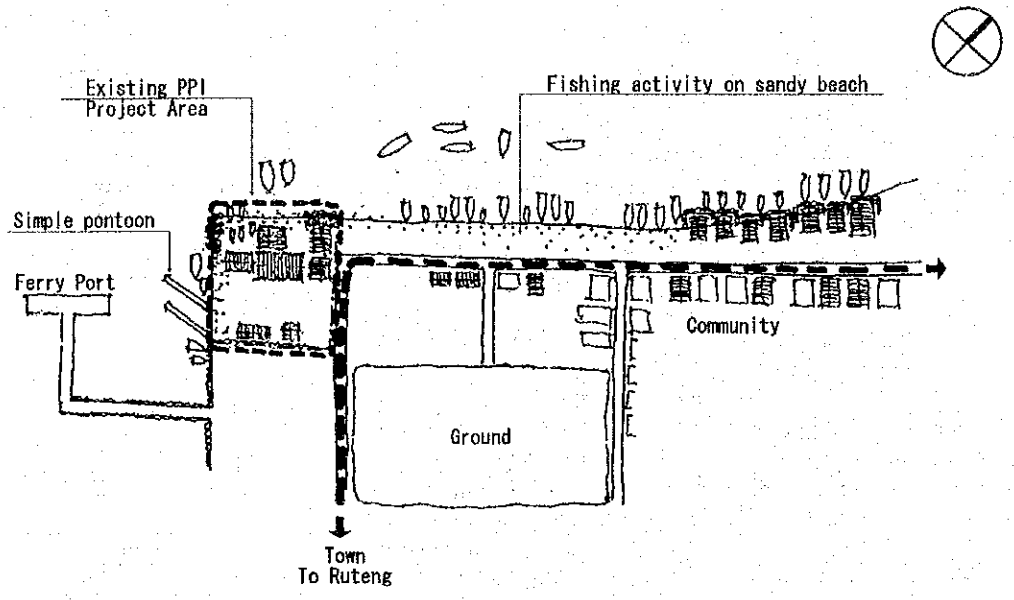
3. Ruteng (market): It is necessary to make an overall utilisation plan (zoning) of market not only for fish but also for other products.

2) Equipment

Function	Equipment	Brief Specification	Capacity / Quantity		
			Lab.Bajo	Reo	Ruteng
Fresh fish marketing	Ice making plant	Block ice (25kg)	7 ton/day	2 ton/day	-
	Ice storage		27m3	9m3	-
	Cool box	25L/45L/80L/200L	454 pcs.	125 pcs.	-
Fish processing	Materials for dried fish processing	Drying rack (1m wide, w/cover)	220 m	60m	-
		Drying pallet (50x80cm)	870 pcs.	240 pcs.	-
		Boiling kiln (for 5 pallets boiling)	9 units	3 units	-
		Storage shelves (for 15 pallets)	29 units	8 units	-
	Packing equipment	Work table, vacuum packer	2 sets	1 set	-
	Experimental equipment	Equipment for fish ball, cracker, smoked fish, cooking equipment, etc.	1 lot	-	-
Fih shipment & information	Multi-purpose transport boat	12m long, 40hp, fish hold approx. 3m3, GPS/VHF radio	-	-	-
	Multi-purpose vehicle	For shipping of fish, procurement of fuels, etc., 3 ton payload	-	1 unit	-
	Fax	For market Information network	1 unit	1 unit	1 unit
Fishing grounds diversificatio n	Small engine	For motorization, 5.5-22hp	18 units	8 units	-
	Fishing materials	For gill nets and hand-lines	For 18 boats	For 8 boats	-
	Model fishing boat	Approx. 15GT, purse-seine	1 unit	1 unit	-
Fishing grounds management	Deep-sea FAD	For creation of fishing grounds and surveillance bases of coastal waters	1 unit	1 unit	-
	Offshore FAD		2 units	1 unit	-
	Shallow FAD		4 units	2 units	-
	VHF radio	For land station and field use	4 units	3 units	-
	GPS	Portable, for search of boat position	3 units	2 units	-
	Speed boat	7-8m long, 75hp x 2 units, fish finder/GPS/VHF radio	1 unit	1 unit	-
	Data analysis set	For database of registered boats and fishery statistics	1 unit	1 unit	-
Fishing activity support	Hand tools	For carpentry and mechanical repair works	1 lot	1 lot	-

3) Facilities Zoning Plan

a) Lab. Bajo (Komodo)



(6) Implementation Plan

1) Implementation Schedule

Year	2002	2007	2012
Strengthening of fish coops.	----------		
Training of fishermen and staff		----------	
F/S & detailed designing		----------	
Construction & procurement		----------	
Operation & management		----------	
Extension to neighbour areas		----------	

Note: 1) Extension to neighbour areas includes the following.
2) Expansion of fishing grounds to north and south coasts from Labuan Bajo (camp fishing having a base at Golomori, etc.)
3) Extension to Terang area using the Labuan bajo model.
4) Extension to Pota area using the Reo model.

2) Project Cost

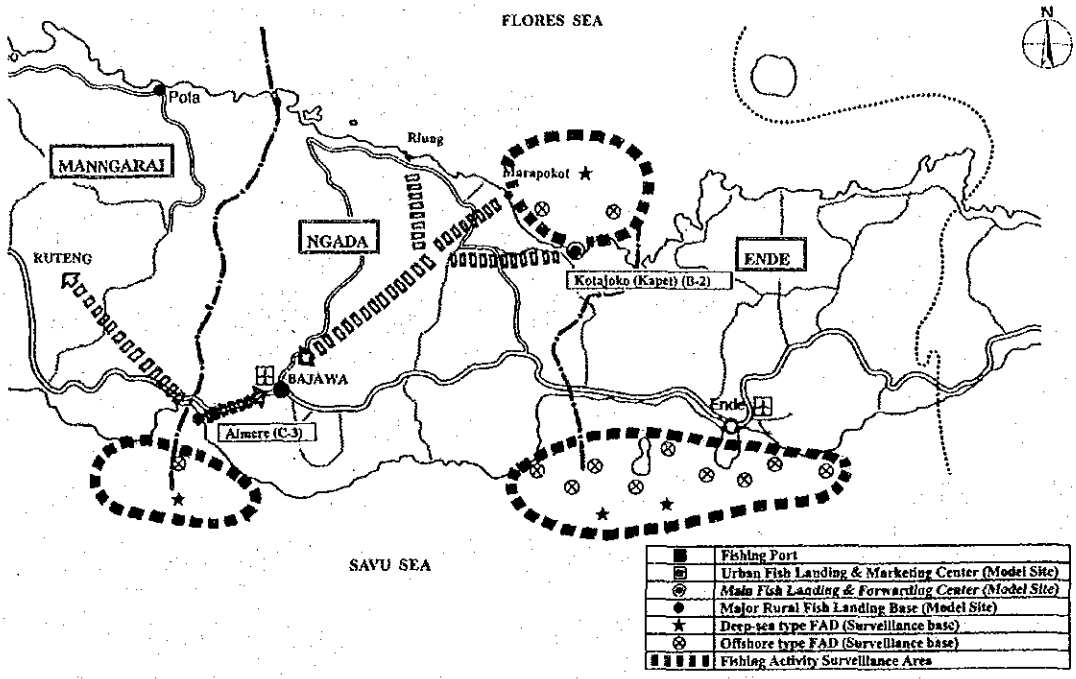
Unit: Rp billion

Model Site	Construction	Equipment	Activity	Total
Lab. Bajo (Komodo)	6.2	3.8	2.5	12.5
Reo (Reo)	2.8	1.8	1.2	5.8
Ruteng market	0.6	-	0.2	0.8
Sub-Total	9.6	5.6	3.9	19.1
Contingency (sub-total x 30%)	2.9	1.7	1.2	5.7
Total	12.5	7.3	5.1	24.8

Note: Cost of activity covers necessary costs before the completion of construction such as for study, designing and supervision, and education & training, assuming 25% of construction and equipment costs.

5 Ngada District

(1) Overall Network Plan

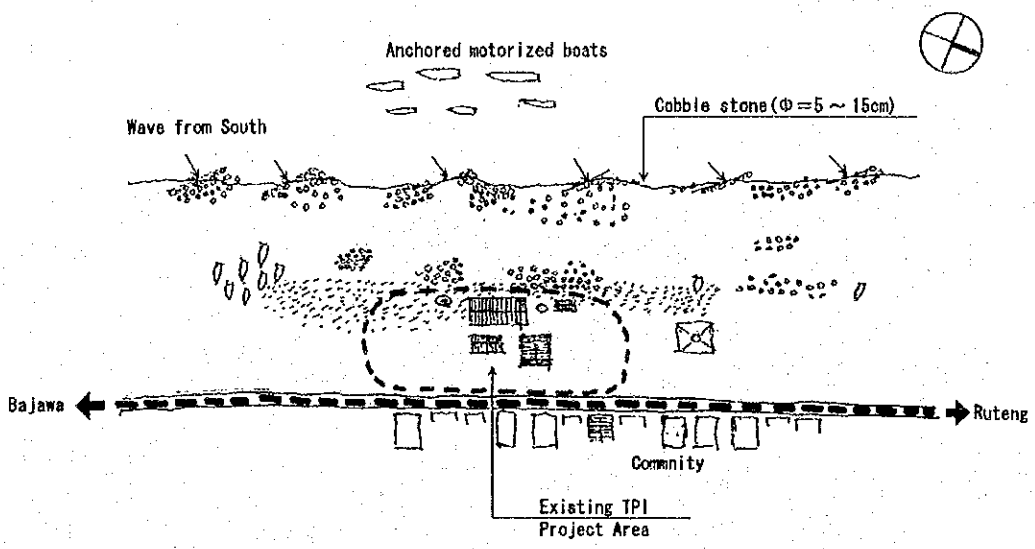


(2) Project Site (Model Site)

1) Kotajoko (Aisesa)

No figure on present conditions

2) Aimere (Aimere)



(3) Target Scale

Model Site		Kotajoko (Aisesa)	Aimere (Aimere)
Effected Area		Overall north coast (transfer of all fishing villages)	Kec.Aimere coast
No. of fishing households		Full-time 165, Part-time 132 (north coast total)	Full-time 33, Part-time 104
Estimated Fish Catch 1999-2012		1,553 - 1,828 ton/year	464 - 546 ton/year
Average daily fish landing		4.3 - 5.0 ton/day	1.3 - 1.5 ton/day
Ditto (at peak season)		6.4 - 7.5 ton/day	1.9 - 2.2 ton/day
No. of fishing boats	Non-powered	131	73 boats
	Outboard	67	3 boats
	Inboard	23 (19 purse-seine)	7 (purse-seine)
Daily fresh fish dealing		4.2 - 4.9 ton/day	1.3 - 1.4 ton/day
Daily processed fish		2.2 - 2.6 ton/day	0.7 - 0.8 ton/day
Major markets		Bajawa (3 hrs. by car)	Bajawa (1 hr. by car) Ruteng (2 hrs. by car)
No. of fish buyers per day (fish landing site)		50-60 village women 10-20 beach traders (men) 1 demersal fish collector (fresh)	20-30 village women
Bajawa Fish Market		No. of fish retailers: fresh fish 50-100 persons/day, dried fish 20 persons/day Estimated sales volume: fresh fish 1.2-2.5 ton/day (average 1.6 ton/day) Opening hours: 16:00-20:00	

(4) Site Plan

Model Site	Area (m2)
Kotajoko (Aisesa)	2,355
Aimere (Aimere)	1,280
Bajawa market	475

(5) Facilities & Equipment Plan

1) Facilities

Function	Facilities	Brief Specification	Scale / Area		
			Kotajoko	Aimere	Bajawa
Fishing port basic facilities	Landing jetty	For motorised boats	60m	14m	-
	Mooring facility	For small boats, simple structure	16m	8m	-
	Slipway	For repair & maintenance of motorised boats	4m	4m	-
	Boat ramp		50m2	60m2	-
	Boat repair lot		40m2	50m2	-
	In-site roads		-	-	-
	Revetment	For securing sea-side access	-		-
Fish handling, marketing, processing and sales	Handling/auction hall		200m2	60m2	-
	Fresh fish storage	Space for keeping cool boxes	-	-	200m2
	Fish agent office	For fish collectors	-	-	-
	Fish retail market		-	-	200m2 (50 units)
	Model fish processing facility	For boiled/dried fish (Improved type)	450m2	155m2	-
	Fishery products diversification centre	Processing room, cooking room, mess for extension, etc.	-	-	-
	Ice plant & storage	Space only	37m2	13m2	-
Fishing activity support	Office	Fisheries & coop. office, kiosk, training/meeting room (community meeting room)	160m2	160m2	50m2
	Mini-workshop	For maintenance of engine, manufacturing of cool box, etc.	40m2	40m2	-
	Net yard	Net drying yard, repair yard, work space, storage	840m2	330m2	-
	Fuel depot	Gasoline and diesel oil	40m2	20m2	-
	Public toilet		30m2	30m2	-
	Garbage depot		1 lot	-	1 lot
	Parking lot		75m2	75m2	75m2
Fishing village environment	Village road/drainage		-	-	-
	Water supply	Piping from water source, reservoir tank	-	-	-

Note 1. 1. Kotajoko (Aisesa): The project would have to be linked and well coordinated with the district capital transfer plan. It is necessary to examine the possibility of transformation of beach (countermeasure against drift sand) in case of sandy beach. In case that the transfer of district capital would delay, It is indispensable to improve the road connecting to Bajawa. For implementation of the project, it is also necessary to do detailed survey and analysis on geographic and soil conditions, sea conditions (wave, tide, current, etc.), land ownership and environmental effects.

2. Aimere: The improvement would be made effectively utilising the existing TPI. Land procurement necessary for on-land facilities would be essential condition. For implementation of the project, it is also necessary to do detailed survey and analysis on geographic and soil conditions, sea conditions (wave, tide, current, etc.), water resources, land ownership and environmental effects.

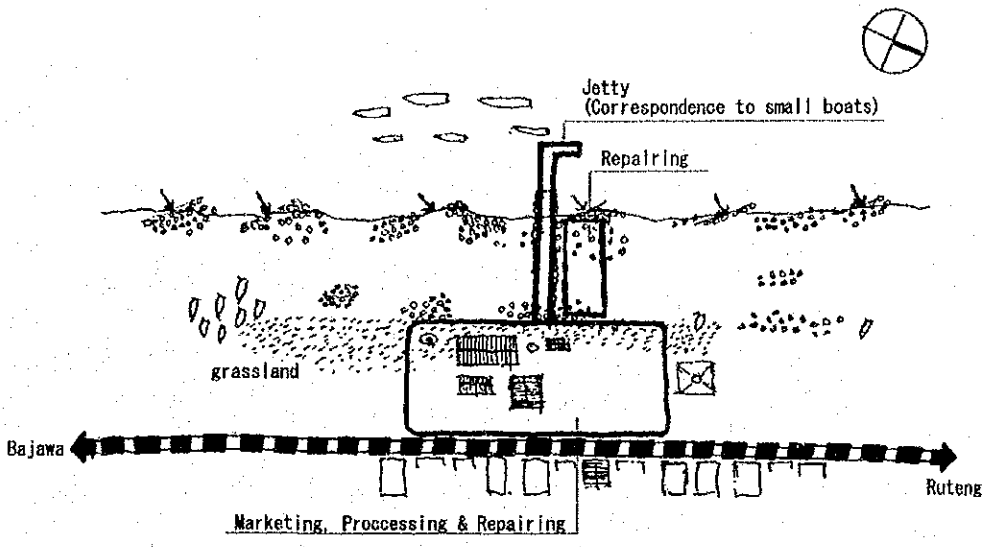
3. Bajawa (market): It is necessary to make an overall utilisation plan (zoning) of market not only for fish but also for other products.

2) Equipment

Function	Equipment	Brief Specification	Capacity / Quantity		
			Kotajoko	Aimere	Bajawa
Fresh fish marketing	Ice making plant	Block ice (25kg)	3 ton/day	1 ton/day	-
	Ice storage		14 m3	5 m3	-
	Cool box	25L/45L/80L/200L	187 pcs.	58 pcs.	-
Fish processing	Materials for dried fish processing	Drying rack (1m wide, w/cover)	140 m	40m	-
		Drying pallet (50x80cm)	530 pcs.	160 pcs.	-
		Boiling kiln (for 5 pallets boiling)	6 units	2 units	-
		Storage shelves (for 15 pallets)	18 units	6 units	-
	Packing equipment	Work table, vacuum packer	1 set	1 set	-
	Experimental equipment	Equipment for fish ball, cracker, smoked fish, cooking equipment, etc.	-	-	-
Fih shipment & information	Multi-purpose transport boat	12m long, 40hp, fish hold approx. 3m3, GPS/VHF radio	-	-	-
	Multi-purpose vehicle	For shipping of fish, procurement of fuels, etc., 3 ton payload	1 unit	1 unit	-
	Fax	For market Information network	1 unit	1 unit	1 unit
Fishing grounds diversification	Small engine	For motorization, 5.5-22hp	8 units	4 units	-
	Fishing materials	For gill nets and hand-lines	For 8 boats	For 4 boats	-
	Model fishing boat	Approx. 15GT, purse-seine	1 unit	1 unit	-
Fishing grounds management	Deep-sea FAD	For creation of fishing grounds and surveillance bases of coastal waters	1 unit	1 unit	-
	Offshore FAD		2 units	1 unit	-
	Shallow FAD		4 units	1 unit	-
	VHF radio	For land station and field use	4 units	3 units	-
	GPS	Portable, for search of boat position	3 units	2 units	-
	Speed boat	*7-8m long, 75hp x 2 units, fish finder/GPS/VHF radio*	*1 unit*	*1 unit*	-
	Data analysis set	For database of registered boats and fishery statistics	1 unit	1 unit	-
Fishing activity support	Hand tools	For carpentry and mechanical repair works	1 lot	1 lot	-

3) Facilities Zoning Plan

a) Aimere (Aimere)



(6) Implementation Plan

1) Implementation Schedule

Year	2002	2007	2012
Strengthening of fish coops.	----------		
Training of fishermen and staff		----------	
F/S & detailed designing		--------	
Construction & procurement		--------	
Operation & management			----------
Extension to neighbour areas			----------

Note 1. Extension to neighbour areas: Extension to each areas of south coast of both Ngada and Manggarai districts (Maumbawa, Nangaroro, Mborong, Iteng, and Nangalili

2. The project of Kotajoko area (KAPET site) would be executed after the transfer of fishermen from Riung and Marapokot areas is confirmed.

2) Project Cost

Unit: billion Rp

Model Site	Construction	Equipment	Activity	Total
Kotajoko (Aisesa)	4.0	2.1	1.5	7.6
Aimere (Aimere)	2.2	1.5	0.9	4.6
Bajawa market	0.8	-	0.2	1.0
Sub-Total	7.0	3.6	2.6	13.2
Contingency (sub-total x 30%)	2.1	1.1	0.8	4.0
Total	9.1	4.7	3.4	17.2

Note: Cost of activity covers necessary costs before the completion of construction such as for study, designing & supervision, and education & training, assuming 25% of construction and equipment costs.