CHAPTER 3 PILOT ACTIVITIES

3.1 Introduction

3.1.1 Objectives

(1) Objectives

During the initial phase of the Study, the JICA Study Team reviewed the current environmental management activities in Guilan, and identified a number of promising environmental measures that could be implemented within the current capacities of the Iranian organizations. Some of such promising environmental measures were implemented as pilot activities in order to:

- evaluate the effectiveness of promising environmental measures through trial implementations,
- gain real-life experiences required to upscale such activities in the future,
- promote environmental education and public awareness of the Anzali Wetland conservation
- promote public participation in the conservation of the Anzali Wetland,
- promote coordination among various stakeholders, and
- incorporate the experiences of the pilot activities into the environmental master plan, and improve the effectiveness of the master plan.

(2) Pilot Activities as Environmental Initiatives

The pilot activities in this study were implemented before the development of the master plan, and this had confused some Iranian experts who see logical steps of a major project as: Study → Plan Formulation → Pilot Project (Activity) → Full Implementation. However, the growing evidence in many counties shows that good environmental management practices are often spurred by small-scale initiatives. The pilot activities in this Study were designed to become such environmental initiatives.

3.1.2 Design Principles

(1) Design Principles

The following design principles were considered in designing the pilot activities.

Table 3.1.1 Design Principles of Pilot Activities

Principles	Remarks
Focal Areas	The focal areas of the pilot activities, in accordance with the principal planning areas of the master plan: Wetland management, Watershed management, Water quality control, Solid waste management, and Environmental education.
Commitment	The implementing organizations should be committed to the implementation of the pilot activities.
Technical Effectiveness	The pilot activities should be technically effective to solve problems that cause the deterioration of the environmental conditions of the Anzali Wetland.
Educational Benefit	The pilot activities should have marked educational benefit to the people in the area.
Wide Applicability	The pilot activities should have a high potential to be applied in other parts of the study area and throughout Iran.
Sustainability	The pilot activities should be based on low-cost, appropriate technologies to ensure their sustainability.

3.1.3 Implementation Schedule

The implementation schedule is schematically shown in Figure 3.1.1.

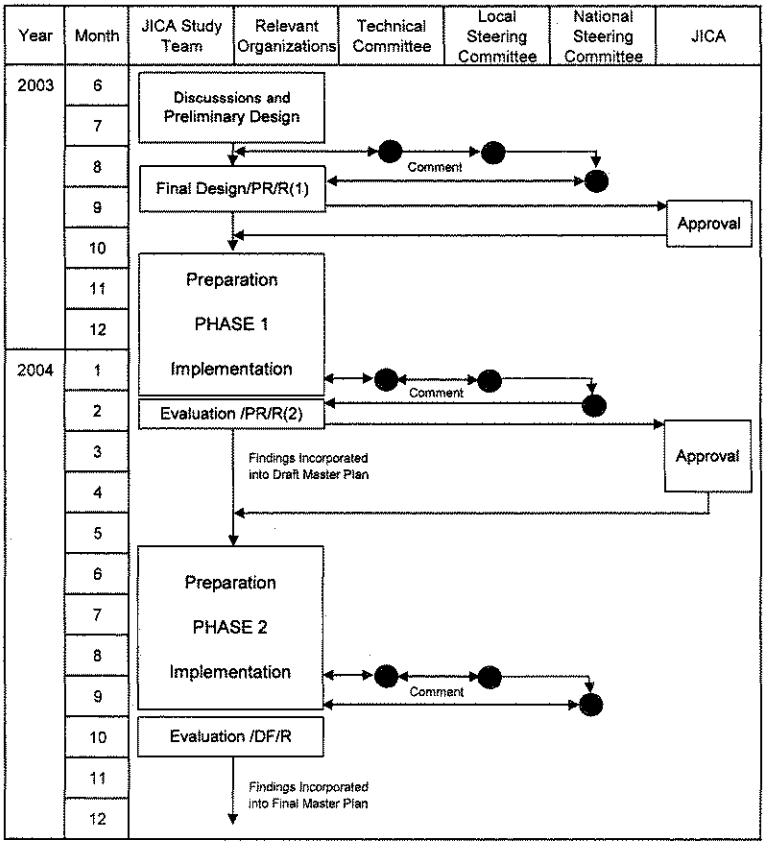


Figure 3.1.1 Implementation Schedule of the Pilot Activities

The pilot activities were implemented in two phases. The first phase was started in fall of 2003. Some of the activities were initiated right from the beginning, while other activities

needed preparation, and for such activities Phase 1 was used for detailed designing and preparations. Throughout the activities, the progress was closely monitored, and at the end of Phase 1, all activities were evaluated (Interim Evaluation) and the plans for Phase 2 activities were proposed. The Phase 2 activities were started in late spring of 2004. After Phase 2, the final evaluations were carried out with respect to: (i) participation and commitment, (ii) technical effectiveness, (iii) educational benefit, and (iv) sustainability.

3.2 Selection Processes

3.2.1 Discussions with Local Experts

In order to come up with effective pilot activities, numerous discussions with local experts were carried out in June-August 2003. Based on these discussions, the JICA Study Team developed preliminary designs in July-August 2003, and counter proposals were submitted by stakeholders. Based on these ideas, further discussions with the stakeholders were held. Among the organizations participating in the preliminary designs of the pilot activities are: DOE-Guilan (Natural Environment Department, Human Environment Department), MOJA-Guilan (Watershed Management), Bony Fish Research Center, Natural Resource Research Center, Rice Research Center, Mining and Industry Organizations, Urban Water and Wastewater Company, Rural Water and Wastewater Company, environmental NGOs (Women's Association against Pollution, Fuman Sabz Aiin, Masal NGO, South Caspian Institution for Environmental Science), municipalities (Masal, Fuman, Somehsara, Anzali, Lashtensha, Rasht, and Kochesfehan), Institute for Environmental Research, local contractors, internet and publishing companies, and many others.

3.2.2 Discussions at Steering Committee Meetings

The proposed activities were discussed at the Local Steering Committee Meeting No. 3 held on August 10, 2003 and the first technical committee meeting held on August 19, 2003. All committee members were requested to fill out questionnaires, and valuable comments were collected and reflected into the design of the activities.

3.3 Pilot Activities

3.3.1 Ecotourism

(1) Objectives

Ecotourism contributes to wise use of the wetland and to enhance the awareness of people about wetland conservation. The main objectives of this activity were to

- develop a trial program for ecotours,
- confirm the feasibility of ecotourism, and
- establish a trial ecotourism network.

(2) Activities

Table 3.3.1 shows the overall schedule of the activities.

Table 3.3.1 Progress of Ecotourism Activities

Work Item	2003				2004									
	9	10	11	12	1	2	3	4	5	6	7	8	9	10
1. Selection of Ecotourism Area														
2. Planning of Eco-tour Program														
3. Establishment of Trial Network														
4. Nature Interpreter Training														
5. Preparing of Signboard (20 pieces, steel)														
6. Instillation of Signboard														
7. Implementation of Eco-tour														
8. Evaluation														

1) Selection of Ecotourism Area

Environmental zoning was taken into account for the selection of the ecotourism area. The ecotourism area was mainly set up in the wise use zone. The ecotourism area is also affected by the accessibility and a central part was selected.

2) Planning of the Ecotour Program

In the beginning of the planning, ecotourism resources were arranged on the map of the wetland (Figure 3.3.1). As facilities had not been prepared for the ecotour which was held in the pilot activity, ecotourism resources were guard stations and natural resources such as birds, plants and fish.

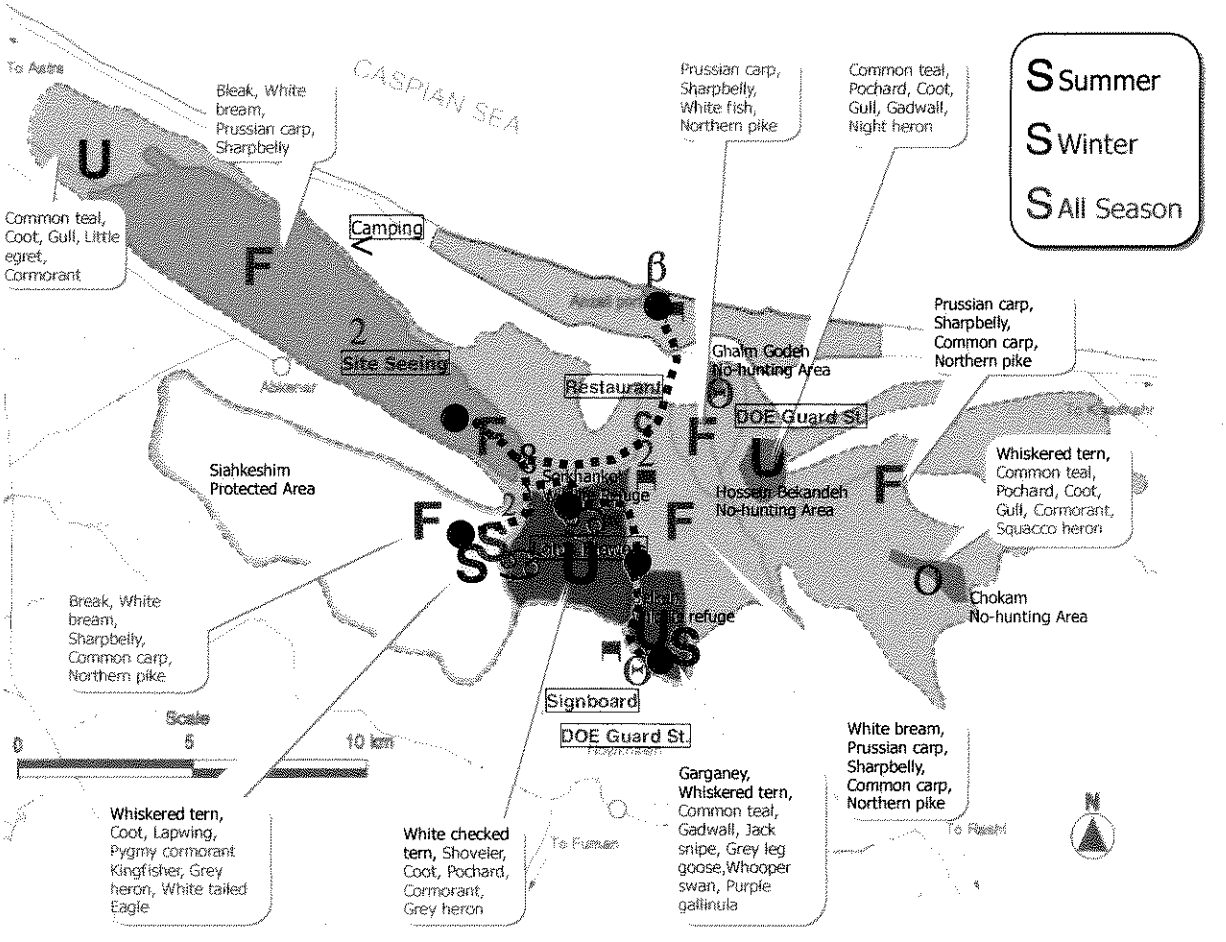


Figure 3.3.1. Ecotourism Resources Map

The following ecotour program was planned with the ecotourism resources map by a nature interpreter in association with the JICA Study Team. The route is shown in Figure 3.3.1.

Ecotour program

1. 8:00 Meeting in Rasht
2. 8:15 – 9:00 Moving to Selkeh (Guard station)
3. 9:00 – 10:00 Educational activities
   (1) Explanation of program
   (2) Explanation of wetland
   (3) Explanation of wildlife (birds, fish and plants)
   (4) Bird watching
   (5) Quiz competition and Tea break
4. 10:00 – 12:00 Site Seeing and Fishing
   Selkeh – Fishing point – Lotus community in Sorkhankol – Siahkesim – Lagoon – Anzali port
5. 12:00 – 13:00 Lunch (Restaurant in Anzali)

6. 13:30 – 14:00 Ending activities
   (1) Questionnaire and discussion
   (2) Prize to quiz competition
7. 14:00 – 14:45 Moving to Rasht

One thousand copies of leaflets which introduced the ecotourism and its resources with the resource map were prepared.

3) Establishment of a Trial Ecotourism Network

A meeting on the development of ecotourism was held as shown in Table 3.3.2. The JICA Study Team presented the importance of the establishment of ecotourism network. Participants especially CHTO are interested in the development of ecotourism. They agreed to make a trial ecotourism network for this pilot activity and implement it jointly.

Table 3.3.2 Meeting on the Development of Ecotourism

Meeting on the Development of Ecotourism	
Date	16 September 2004
Participants	CHTO (2), DOE (1), Travel Agencies (5), Local Nature Interpreter (1), JICA Study Team (1)
Topics	1. Presentation (Presented by JICA Study Team) 1) What is Eco-tourism? 2) Why Eco-tourism? 3) Image of Eco-tourism 4) Operation of Eco-tourism 5) Pilot Activity "Eco-tour" 2. Discussion (Moderated by Dr. Sharif, CHTO) 1) Establishment of a Trial Eco-tourism Network 2) Implementation of Pilot Activity "Eco-tour"

4) Nature Interpreter Training

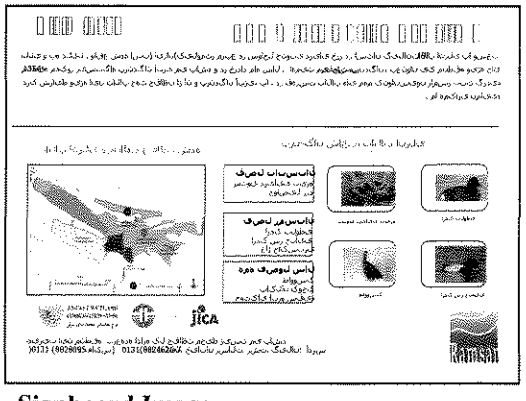
Two nature interpreters were trained as shown in Table 3.3.3. Training was implemented through the ecotourism activities such as preparation of the ecotourism handbook for the guide and the textbook for participants, planning of the ecotour, management of the ecotour, and practice of interpretation in the field.

Table 3.3.3 Nature Interpreter Training

Trainee	Period	Contents of Training
Ms. Shabnam Ronaghi	Jan. - Feb. 2004	• Preparation of Ecotourism Handbook • Preparation of Textbook • Preparation of Ecotour • Practice in the Field • Implementation of Ecotour
Mr. Shahram Farhangi	Sep. - Oct. 2004	• Revision of Ecotourism Handbook • Preparation of Textbook • Coordination of Ecotourism Network • Preparation of Ecotour • Practice in the Field • Implementation of Ecotour

5) Installation of Signboards

Twenty signboards were installed in the wetland. Eight signboards were prepared to give basic information for the tourists. Twelve signboards were prepared for environmental education.



Signboard Image
(General Information of the Anzali Wetland)

List of installed signboards

- General Information of the Anzali Wetland (Sorkhankol and Anzali port)
- Information regarding Ramsar Convention (Selkeh)
- Food-Chain in the Anzali Wetland (Sorkhankol)
- Breeding Birds (Selkeh)
- Wintering Waterfowl (Selkeh)
- Lotus Flowers (Sorkhankol)
- Rules for the Bird Watching Tower (Selkeh)
- Environmental Education (Selkeh, 12 boards)

6) Implementation of the Ecotour

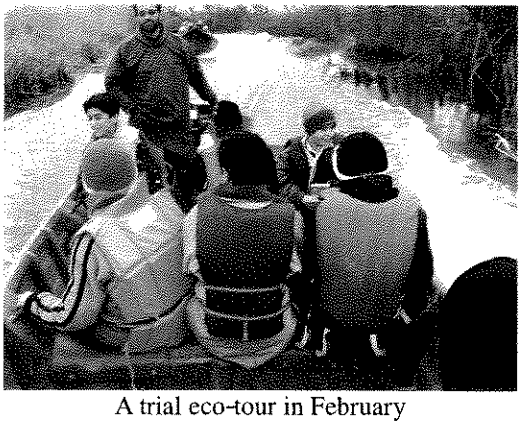
The first set of trial ecotours was carried out from February 6, 2004, and the second set were carried out from September 27, 2004 as shown in Table 3.3.4. Stakeholders joined especially for the second ecotours as follows.

- Organizer: CHTO and tour agencies
- Guide: Local nature interpreter and DOE officials
- Boat driver: Local fishermen

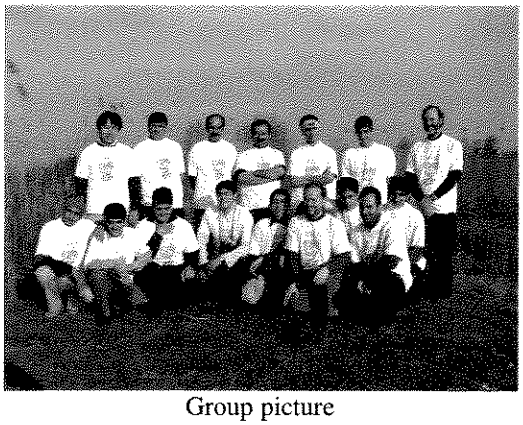
- Lunch: Local restaurant

Table 3.3.4 Implementation of Ecotour

	Date	Participants
First ecotours	February 6, 2004	Guidance school and high school students
	February 7, 2004	People in Rasht
	February 8, 2004	People in Rasht
	February 9, 2004	DOE staff
	February 13, 2004	Teachers
Second ecotours	September 27, 2004	Travel agencies owners
	September 28, 2004	Teachers
	September 29, 2004	University students
	September 30, 2004	NGOs
	October 1, 2004	Guidance school students



A trial eco-tour in February



Group picture

Figure 3.3.2 Photographs of Eco-tourism Activities

A textbook and leaflet were distributed to each participant, and the questionnaire was collected at the end of the ecotour.

(3) Final Evaluation

1) Participation and Commitment

DOE, CHTO and travel agencies are active in efforts to develop the ecotourism. The ecotourism has been promoted at the mountain area of Guilan province by UNESCO. They are relatively familiar with the ecotourism concept, and they are eager to extend the activity to the Anzali Wetland. Especially CHTO attended all days during the second ecotours, and put up a part of budget for this activity.

2) Result of the Questionnaire

A questionnaire was written and collected at the end of the ecotour everyday. Results of the questionnaire for the second ecotour were evaluated in this section. (There is no result from the NGOs because the nature interpreter did not collect the questionnaires from the NGOs.)

Overall, the activity went well, and most participants in the trial ecotours had a positive impression. Figure 3.3.4 shows participants were satisfied. No. 1 is not at all satisfied and 5 is completely satisfied. Most of the teachers were completely satisfied, while guidance school students were not as well satisfied. Three teachers also answered that the explanations regarding the wetland were interesting and should be included in the environmental education. It is thought that the program is suitable to enhance understanding of the wetland, but not as attractive as the recreational tour.

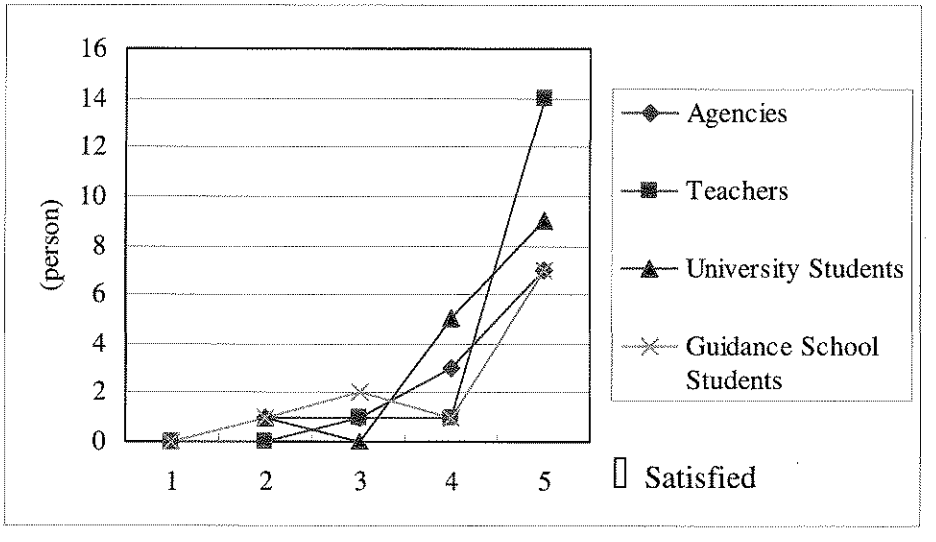


Figure 3.3.3 Satisfaction of the Participants

Most impressive destination is shown in Figure 3.3.5. Sorkhankol was the most popular destination because the lotus community could be observed. Even though the flowering season had finished, people like lotuses. In the mean time, Siakeshim was the most popular for university students. Guidance school students prefer fishing to observation and explanations.

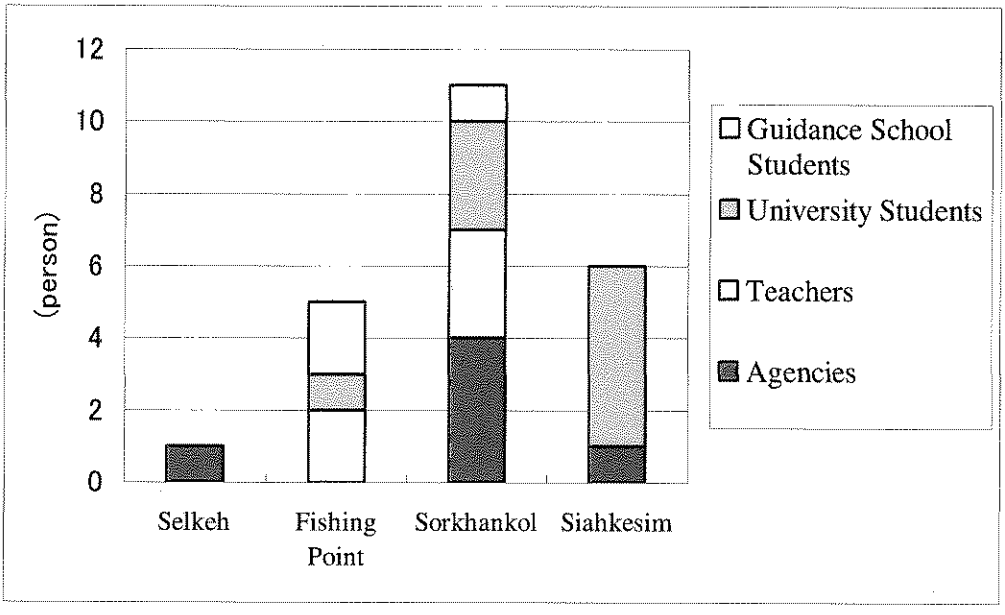


Figure 3.3.4 Most Impressive Destination

Desirable activities for the ecotour were chosen from fishing, kayaking, hunting and water skiing (multiple answers were possible.). Fishing is most popular, while agencies are interested in all activities. Hunting is relatively popular, though it is prohibited without a license.

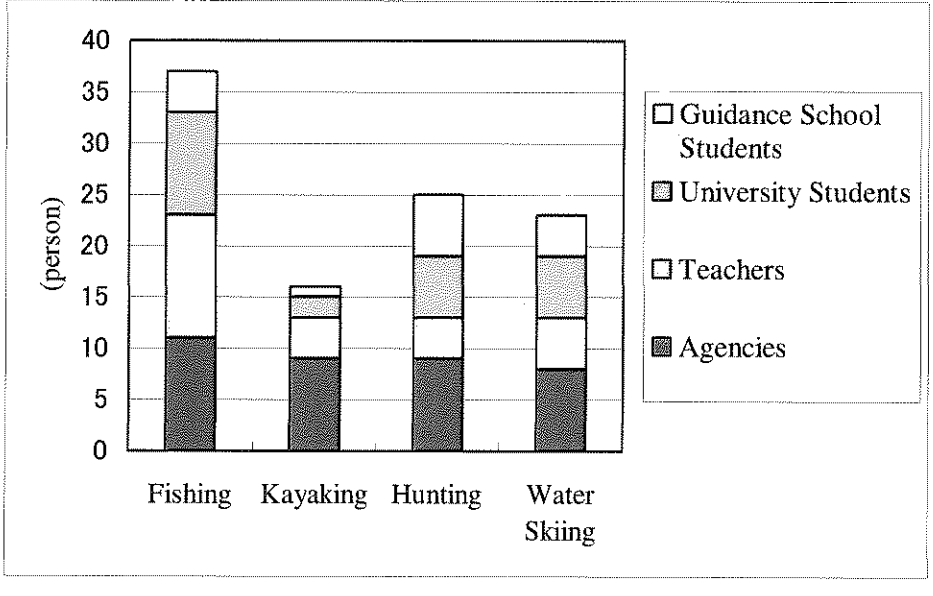


Figure 3.3.5 Desirable Activity

As for the feasibility of ecotourism in Anzali Wetland, willingness to pay was asked. The average willingness to pay of each group is shown in Figure 3.3.6. Agencies answered that they were willing to pay about 70,000 Rials, but other groups answered less than 50,000 Rials. The tour fee is approximately estimated by the

implementation cost of the ecotours as follows.

Expense for 15 tourists

Boat	1,200,000 Rials
Nature interpreter	348,000 Rials
Lunch	675,000 Rials
Miscellaneous	300,000 Rials
Total	2,523,000 Rials

Tour fee for a tourist

(2,523,000 + 504,600 (20% of expense)) / 15 = 201,840 Rials

Willingness to pay is considerably smaller than the prospected tour cost. In order to make the ecotourism feasible, the tour fee has to be reduced.

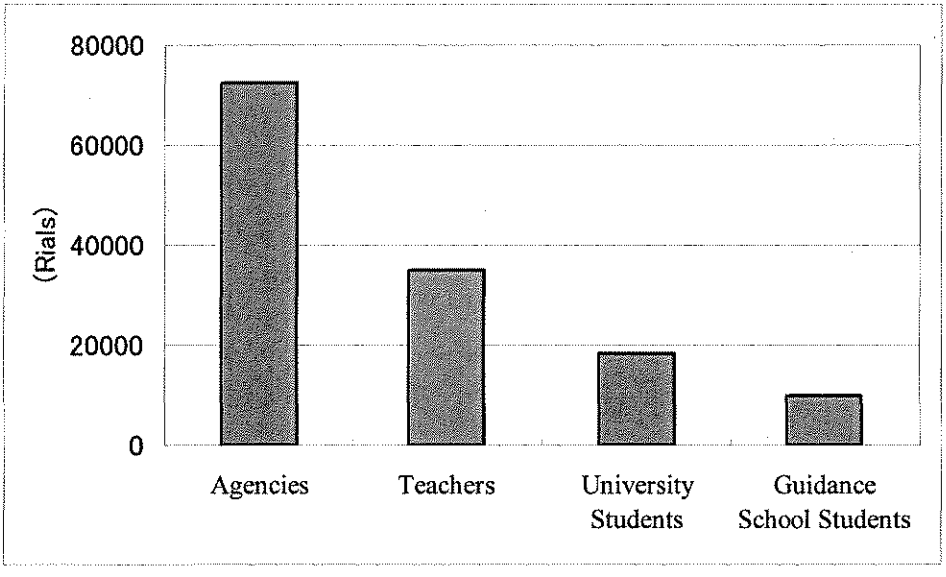


Figure 3.3.6 Willingness to Pay for the Ecotour

(3) Sustainability

Stakeholders are interested in the development of ecotourism, and most participants of ecotours answered that they would like to participate in the ecotour again. This means that ecotourism has potential in the Anzali Wetland. However, a serious issue is the deference between willingness to pay and actual cost. In order to solve the problem, the following action should be taken.

- Preparation of attractive facilities
- Preparation of attractive programs
- Dissemination of the value of ecotourism

- Cost reduction

Attractive facilities and programs make people willing to pay a higher fee. It takes time so that people understand the value of those attractive facilities and programs. Cost reduction is important to let the people participate and find the value especially at the first stage. Furthermore there are the people who visit Anzali seaside from Tehran. Many of them can afford to pay the appropriate ecotourism fee. The people should be invited to the ecotours to secure the sustainability of ecotourism.

3.3.2 Wetland Education Program

(1) Introduction

Environmental Education is integrated into each component of the Master Plan for the Conservation of the Anzali Wetland. One specific section of the Plan covers environmental education and raising awareness for the formal and non-formal education system. One of the methods proposed to support the development of environmental education and raise awareness is through the establishment of a coherent and systematic approach to wetland education. This section describes the Wetland Education Program that has been developed as a pilot activity as part of the study.

In summary, the pilot activity involved a number of components, including the construction of a simple Wetland Education Center consisting of a classroom and supported by other education facilities including a trail, boardwalk and bird watching hide. Education programs and resources have been developed for school students and teachers, and a team of teachers trained as wetland experts.

(2) Objectives

The overall goals of the Wetland Education Program are that human impacts on the Anzali wetland will be reduced and the wetland will have a more secure and sustainable future. The objectives of the Wetland Education Program are to:

- Create an excitement and enthusiasm amongst children and young people for the natural environment
- Develop awareness, knowledge and understanding of wetland ecology in Anzali in children and young people
- Build the capacity of children and young people to apply this understanding through practical conservation activities and behavior changes
- Provide a facility for raising public awareness of the wetland,

The goal and objectives of the WEP have been achieved through a variety of activities.

(3) Progress of the Activities

Table 3.3.5 summarizes the progress of the activities.

Table 3.3.5 Progress of the Wetland Education Program

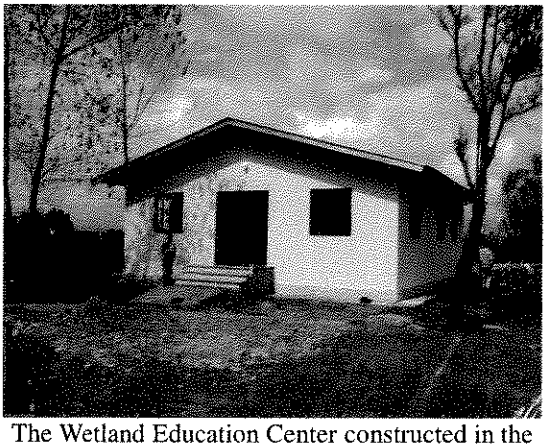
Work Item	2003				2004									
	9	10	11	12	1	2	3	4	5	6	7	8	9	10
1. Needs Analysis														
2. Construction of Education Center														
3. Construction of Related Facilities														
4. Teacher Training Programme														
5. Studentes Training Programme														
6. Development of Education Materials														
6. Wetland Expert Team														
7. Education Center Advisory Group														
8. Business Plan														

1) Needs Analysis

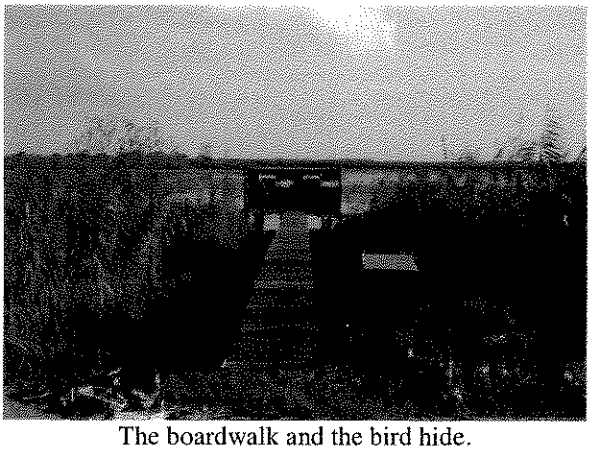
A questionnaire survey was undertaken in 50 schools to establish the baseline situation for environmental education and the needs for the future. The survey, together with the workshop evaluations, established the fact that teachers would welcome the opportunity to teach more environmental education and supported the development of the Wetland Education Program. When asked about the establishment of the Wetland Education Center most teachers said that they would be able to take their children to the Center.

2) Construction of the Wetland Education Center

At the heart of the Wetland Education Program is the construction of Iran's first Wetland Education Center. The Center is located adjacent to the Department of Environment Guard Station at Selkeh on the southern edge of the wetland and on the edge of the Selkeh Wildlife Refuge. The Center consists of a small classroom which can hold a class of 35, an office and kitchen area. There is a separate toilet block, and the main building is surrounded by a small open area. The Center is separated from the Guard Station and has a separate entrance. The Center will be used as a base for education programs for teachers and school students. It will also be used as a base for eco-tourist activities for the general public. The DOE will also run other education related activities from the Center and will offer the Center to other organisations such as NGOs who might wish to use it.



The Wetland Education Center constructed in the Selkeh Wildlife Refuge.



The boardwalk and the bird hide.

Figure 3.3.7 Wetland Education Center

The selection of the location for the Wetland Education Center took longer than planned and was a complex process involving lengthy discussions and evaluations of different locations. The design of the Center was also a challenge. It would have been good to have been able to design and construct a more imaginative building that reflected wetland building traditions and incorporated environmental characteristics such as solar panels and the like. However, on the positive side, the process from the start of the selection process to the actual construction of the building was less than nine months and since the final budget approval was only given at the start of Phase II, the pace of development has been swift. It must be remembered that this is the first Wetland Education Center in Iran and any new development is bound to take time!

3) Construction of Other Facilities

In addition to the Wetland Education Center, the following facilities have been constructed near the Center.

1) A one kilometer education trail with twelve A3 sized education signs.
2) A 6.4 meter high observation tower
3) A short boardwalk into the wetland
4) A bird watching hide

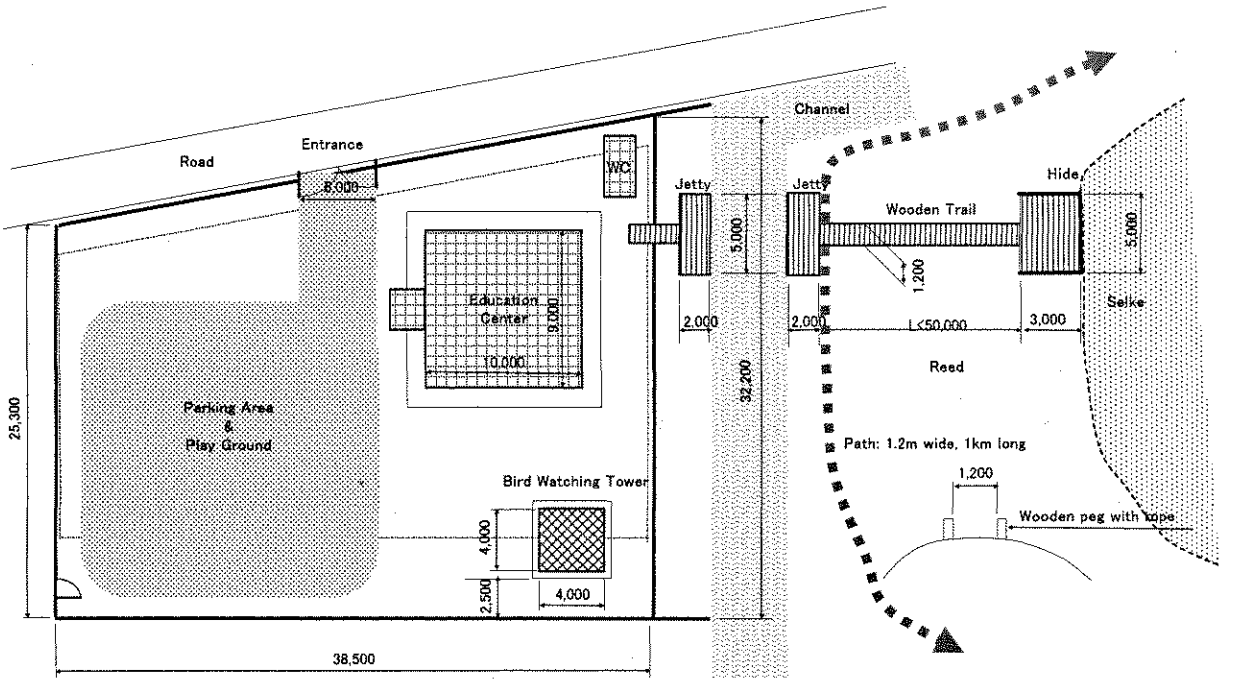


Figure 3.3.8 Layout of the Environmental Education Facilities

Some of these facilities were constructed as part of the Ecotourism pilot activity but will obviously be used by school groups visiting the Center. The observation tower is in the grounds of the Center. Leading from the Center is the boardwalk, bird hide and wetland trail. A pilot activity to demonstrate the use of reed beds in water purification is located on the trail. The signs along the trail have been specifically designed for use by children and young people. Opposite from the Center a Tehran based NGO has developed a breeding area for Swans. This NGO will also use the Center and people visiting the Center can also see the Swan sanctuary.

4) Development of Educational Materials

Five hundred copies of an identification key for wetland birds have been produced. The key was based on the model identification key for young people used in environmental education in the United Kingdom. The key will be used on courses at the Wetland Education Center and will also be distributed to selected schools around the wetland. The key is A3 size and contains color illustrations of the different birds that can be found in the Anzali wetland.

Seven hundred and fifty copies of an A1 sized poster about entitled "Anzali Wetland" have been produced and distributed to schools around the Anzali wetland by the Ministry of Education. The poster describes how the wetland works, outlines some of the problems of the wetland, and describes how these are being overcome.

Teachers will be trained on how to use the posters as part of training courses at the Wetland Education Center.

5) Teacher Training Program

A one day training course for teachers about the wetlands has been developed. This course was piloted by 15 teachers who attended the workshop, which was based at the Guard Station at Selkeh. In the future, the Center will be used as a base for teacher training courses run by the DOE, Ministry of Education, the Wetland Expert Team, and others. In addition, two one day workshops were held at the DOE in Rasht to introduce teachers to environmental education and student centered learning. Although not directly related to the Wetland Education Program the workshop gave valuable insights into teachers views about environmental education and the challenges they faced when implementing student centerd approaches in the classroom. Visits were also made to three schools - an Elementary School or Girls, a Boys' Guidance School and a High School for girls which also provided further information on whether the proposals in the Wetland Education program would work. All the feedback was positive.

6) School Students Program

A one day course about the wetland for students has been developed. This course was piloted with two groups of students – one from a Guidance School and one from a High School with both groups visiting Selkeh and being taught from the Guard station and outside in the Wetland. In the future, the Wetland Expert team will develop other programs that will be offered to schools, which it is expected will bring groups of students to the Center for courses lasting from half a day to a day.

Identifying bird species in the field

Learning the importance of the ecosystem

Figure 3.3.9 Photographs of Environmental Education Activities

7) Wetland Expert Team

The effectiveness and sustainability of the Center will depend on being able to run courses from the Center. During the Study, a start was made on creating and training a Wetland Exert Team selected by the DOE and the Guilan Ministry of Education. The purpose of the team will be to develop and run courses from the Wetland Education Center. When a school contacts the DOE and requests a course for a group of students, the Center Manager will contact one or more of the teachers on the Wetland expert team to teach the course. The team has been provided with an initial briefing about the work and role of the Center, and will be provided with further training by both national and international organizations. The leader of the Wetland Expert Team has been appointed by the DOE. The Terms of reference for the Team are included as Appendix IV.

8) Wetland Education Center Advisory Group

A Wetland Education Center Advisory Group has been established and has met twice. The Group consists of representatives of the different stakeholder groups related to environmental education including the DOE, Ministry of Education, NGOs, teachers groups, and representatives of the local administration and Governors office in Anzali. The purpose of the group is to support and encourage the development of programs, and in particular, to explore the mechanisms for local financial support.

9) Business Plan

A Business Plan has been developed for the Wetland Education Center. This has been discussed with key members of DOE staff and with the Advisory Group. In addition, seven hundred and fifty copies of a promotional leaflet have been produced and distributed to all schools around the wetland. This A4 colour leaflet promotes the Wetland Education Program and the Center together with other education activities for schools undertaken by the Department of Environment. These include the Natural History Museum that is under construction in the DOE building in Rasht, and the services offered by the Public Relations Department to schools.

(4) Final Evaluation

1) Participation and Commitment

DOE actively participated in the development of the program. For example, DOE provided the site for the wetland education center and other related facilities in the Selke Wildlife Refuge. Two staff members were assigned to the program, and the

manager of the Selke Guard Station actively assisted in the construction of these facilities. Other staff assisted the purchase of the equipment for the center.

Support for the development of programs amongst teachers and students was especially strong and participation enthusiastic. Nearly 50 local schools cooperated in the questionnaire survey, and about 15 teachers actively involved in the development of the program.

2) Technical Effectiveness and Educational Benefit[1]

In many ways it is difficult to fully evaluate the success of the Wetland Education Program. As the Center was constructed, educational materials developed and trails created in Phase II of the project, it has not been possible to run activities based at the actual center and test out all the components of the Program. Had it been possible to construct the Center and other educational facilities in the Phase I, then testing the Wetland Education program at the Center would have been possible. At any rate, efforts were made to evaluate the program by asking the participants about their opinions:

The teacher participants gave very positive feedback to the Wetland Education program and their evaluation of the workshop was very high. The evaluation questionnaire asked: if they had learnt new information about the wetlands; what they thought about each activity; what they thought about the student centered approach and whether they would bring their classes to the Center. The average evaluation score being four out of five with teachers scoring the student centered approach especially high. All the teachers said that they would be able to use the methods in their classroom teaching and that they could bring students to the Center. The plan for the future is that this course can be run by the Wetland Education team from the DOE. The Wetland Teaching Experts and the Center Manager will be able to deliver this program to teachers.

For students, the response was also very positive with the only negative comments being about the distance walked! All the students said that they had enjoyed learning about the wetlands using student centered methods, and especially liked the web of life and camouflage games. All wanted to visit the wetland again and to bring their families with them. The Wetland Teaching Experts and the Center Manager will be able to deliver this program to students.

[1] Because the technical effectiveness and educational benefit of these activities overlap, they are evaluated together.

It has not been possible yet to evaluate the poster, the leaflet, the trail and the watching tower because these elements of the program were completed towards the end of Phase II. These components of the wetland education program were available just after the start of the new school year, and schools were too busy to pilot the components before the Study Team departed from Rasht. However the Wetland Expert Team and the Center manager will be able to test these elements of the Program.

3) Sustainability

Overall, the wetland education program has high sustainability as long as the following two critical issues for the future are looked after:

- The management of the Wetland Education Program
- Ensuring the use of the Center.

The management of the Center for at least the first year will be the responsibility of the Department of the Environment. The DOE is to appoint persons responsible for management. In the future the DOE will review alternative approaches to management that will allow greater flexibility in terms of the development of programs and the potential to generate income through the provision of services for schools and other target groups such as tourists. The DOE are considering contracting an NGO to manage the Center. An NGO would also be able to access national and international grants to develop the work of the Center and would also be able to charge for services more easily. Such a strategy is not new. The DOE in Tehran has contracted with an NGO to establish the new Ramsar Education and Training Center in Ramsar, and so examples exist of this kind of relationship between the DOE and an NGO.

The success of the Center will depend on the use of the Center. This will depend on the on the promotion of the program of opportunities to schools and other groups, and the response by schools to the programs. In the first year, the target is to have a minimum of one school group a week during the school year. From the feedback form teachers and from the support of the Ministry of Education, it appears that teachers will be able to bring groups to the Wetland Education Center and will be enthusiastic to do so. There are no real barriers to using the Center. Discussions with DOE also suggest that the Center will be used by other non formal education groups as well, and the nearby Swans NGO will use the building for activities.

For the Wetland Education Program and the use of the Wetland Education Center to reach their full potential, further support will be required from the DOE. The members of the Wetland Teaching Expert Team need further training in working with groups outside and teaching in a student centered way. They also need more content training on the issues affecting wetland and about wetland ecology. The Center manager, although enthusiastic, also needs training on management issues. The Environmental Education Expert on the JICA Team has arranged for a volunteer from the UK to spend time with at the Center during November and January. He will be able to train the team and also undertake further development work related to the use of the Wetland Trail and other facilities.

However, further training will be needed to enable the Center manager and his team to be independent and work towards the sustainability of the Center. Hence it is proposed that JICA considers further support for the development of the programs at the Center through the placement of a long term expert at the Center and provide an opportunity for the Center Manager and key staff to visit Japan to see wetland teaching in action.

3.3.3 Beneficial Use of *Azolla* as Fertilizer

(1) Objective

Azolla is an invasive alien plant species that has spread all over the wetland. It is a major ecological problem in the wetland. On the other hand, *Azolla* associates with N-fixing blue-green algae and contains rich nutrients. In this activity, the potential of *Azolla* compost as fertilizer in rice cultivation was tested. If *Azolla* compost is proved to be a good fertilizer, a large-scale program to use *Azolla* from the wetland in agriculture can be developed.

(2) Activity

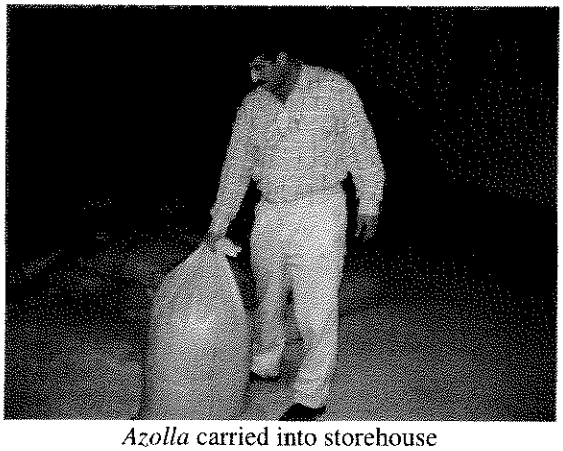
Table 3.3.6 shows the overall schedule of the activity.

Table 3.3.6 Progress of Pilot Activity on Beneficial Use of Azolla as Fertilizer

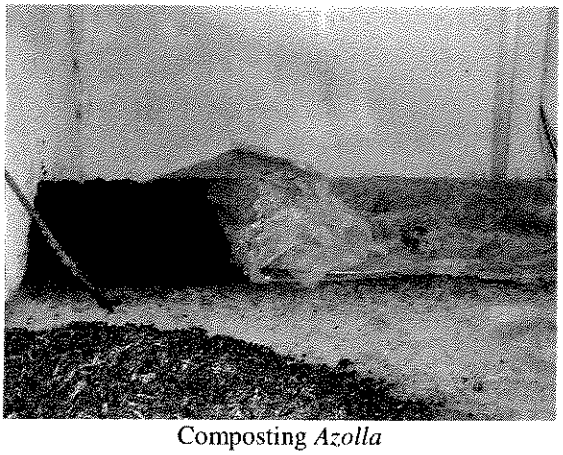
Work Item	2003				2004									
	9	10	11	12	1	2	3	4	5	6	7	8	9	10
1. Gathering Azolla			■											
2. Composting				■	■	■	■	■	■					
3. Spreading									■					
4. Cultivation										■	■	■		
5. Harvesting													■	
6. Analysis						■				■			■	
7. Reporting													■	■

1) Gathering and Composting

The *Azolla* was gathered from the wetland and carried into the Rice Research Institute of Iran (RRII) in December. A total of 2903.5 kg of *Azolla* was mixed with 349.3 kg of rice straw*. Water content percentages of *Azolla* and rice straw are 83 % and 12%, respectively. The mixture of *Azolla* and rice straw were 50:50 by volume. The mixture was spread to make *Azolla* compost in the storehouse of RRII. The mixture was scattered for aeration. Watering and stirring were conducted twice per week.



Azolla carried into storehouse



Composting *Azolla*

Figure 3.3.10 Photographs of Compost of *Azolla*

2) Spreading

75 kg of paddy (Hasemi: local rice variety) was put in the nursery land in April. Then plowing of the experimental land and setting off boundaries among the plots were implemented. The total plots were 27 (3 plots for each of the 9 different experimental treatments) and each plot area was 8m x 19m in the experimental land.

Weighted compost was spread in each plot, and a certain amount of chemical fertilizer was also applied as shown in Table 3.3.7. Three bottles (0.5 liters each) of herbicide (Saturn or Bentiocarb) were also applied on every plot.

Table 3.3.7 Treatment Area and Amounts of Chemical Fertilizer and Compost or Wet *Azolla*

Treatment	Plot area (m^2)	Compost (kg)	Fresh *Azolla* (kg)	Nitrogen (kg)	Phosphorus (kg)	Potassium (kg)
T1= Control= no fertilizer, no compost, no *Azolla*	152	0	0	0	0	0
T2= Chemical fertilizer (N. P. K.)	152	0	0	2	1	1
T3= Compost	152	47	0	0	0	0
T4= Compost	152	76	0	0	0	0
T5= Compost + Chemical fertilizer (N.)	152	76	0	2	0	0
T6= Compost + Chemical fertilizer (N. P. K.)	152	76	0	2	1	1
T7= Compost	152	107	0	0	0	0
T8= Compost	152	183	0	0	0	0
T9= Wet *Azolla*	152	0	92	0	0	0

Source: JICA Study Team (2004)

3) Cultivation

Five days after the application of herbicide in May, the young rice plants were transplanted into the experimental land. Then, irrigation, pest control, weeding and observing conditions were implemented for the cultivation of rice.

4) Harvesting

The rice of each plot was harvested separately and weighted in September.

5) Analysis

Analysis was implemented as follows.

- Compost samples in the beginning and ending of the process for determining contents of N.P.K- %O.C- EC- pH.
- Soil samples for determining contents of N.P.K.- %O.C- EC- pH- CEC- texture- pb- pp and calculating some properties.

(3) Final Evaluation

1) Participation and Commitment

The RRII was established in 1993, and it has 190 staff and 62 experts. They have studied the application of organic and green manure to supply nutrient the requirements of rice plants. Utilization of fresh *Azolla* was also studied, however,

composting of *Azolla* had not been investigated. RRII was interested in this activity for this reason. At the beginning of the activity, the general manager assembled many experts and discussed this activity. Then, project members were selected and this activity started with the overall assistance of RRII.

2) Technical Evaluation

The composting of the mixture of *Azolla* and rice straw went well. Ingredients of the compost were analyzed as shown in Table 3.3.8.

Table 3.3.8 Analysis of Compost

Item	Sample	pH of Paste	% O.C	$10^3 \times$ EC	Total.N %	Total.P %	Total.K %
Compost (Initial)	1	-	44.8	-	2.370	0.22	2.19
	2	-	43.3	-	2.370	0.27	2.19
	3	-	45.6	-	2.370	0.22	2.02
Compost (Final)	1	6.4	37.83	21.58	2.662	0.18	2.47
	2	6.8	30.53	18.26	3.127	0.21	2.35
	3	6.6	29.96	18.26	2.734	0.20	2.45

Source: JICA Study Team (2004)

Soil samples were also analyzed as shown in Table 3.3.9.

Table 3.3.9 Analysis of Soil

Soil sample	Depth (cm)	EC $\times 10^3$	PH of Paste	CEC (meq/ 100gr)	O.C (%)	Total N (ppm)	P (avg.) (ppm)	K (avg.) ppm	Sand (%)	Silt (%)	Clay (%)	Texture
1	0-30	1.83	7.5	31	2.46	2280	20.0	234	8	44	48	Si.C
2	0-30	1.81	7.4	33	2.52	2320	21.9	244	10	42	48	Si.C
3	0-30	1.89	7.4	29	2.43	2270	19.1	214	8	46	46	Si.C

Source: JICA Study Team (2004)

Potential of *Azolla* as the fertilizer is described in terms of the grain yield. The result of grain yield is shown in Table 3.3.4. Mean grain yield is shown in Figure 3.3.2. There are differences among lines, but the ratios among treatments are almost same in each line. Grain yield of T1 (control) was about 3,000 kg/ha. T3 (3 ton/ha of compost) and T9 (6 ton/ha of fresh *Azolla*) were lower than T1, and the other treatments were higher than T1. The highest grain yield was T5 (compost and nitrogen) at about 4,000 kg/ha. Normal treatment with chemical fertilizer (T3) produced about 3,500 kg/ha. Since the treatment with compost produced about 3,350 kg/ha, differences of grain yields between chemical fertilizer and compost were small. As for the compost application, the different application rates, T3 (3 ton/ha of compost) showed low yield, while T4 (5 ton/ha), T7 (7 ton/ha), T8 (12 ton/ha), gave almost the same grain yields. The result shows that 5 ton/ha of

compost is enough. Treatment with compost and chemical fertilizer produced a high yield (T5) and a low yield (T6). The reason is not identified, and the combination of compost and chemical fertilizer needs to be investigated in detail. However, it was confirmed that the application of more than 5 ton/ha of compost is as effective as the application of chemical fertilizer.

Table 3.3.10 Grain Yield

(Unit: kg/ha)

Treatment	Line 1	Line 2	Line 3
T1= Control= no fertilizer, no compost, no *Azolla*	2947.37	3118.42	2934.21
T2= Chemical fertilizer (N. P. K.)	3493.42	3500.00	3460.53
T3= Compost	2309.21	3011.84	2631.58
T4= Compost	3223.68	3526.32	3319.35
T5= Compost + Chemical fertilizer (N.)	3585.53	4276.32	3856.58
T6= Compost + Chemical fertilizer (N. P. K.)	2855.26	3157.24	3032.90
T7= Compost	3184.21	3486.84	3250.00
T8= Compost	3203.95	3579.00	3342.11
T9= Wet *Azolla*	2440.79	2763.16	2661.84

Source: JICA Study Team (2004)

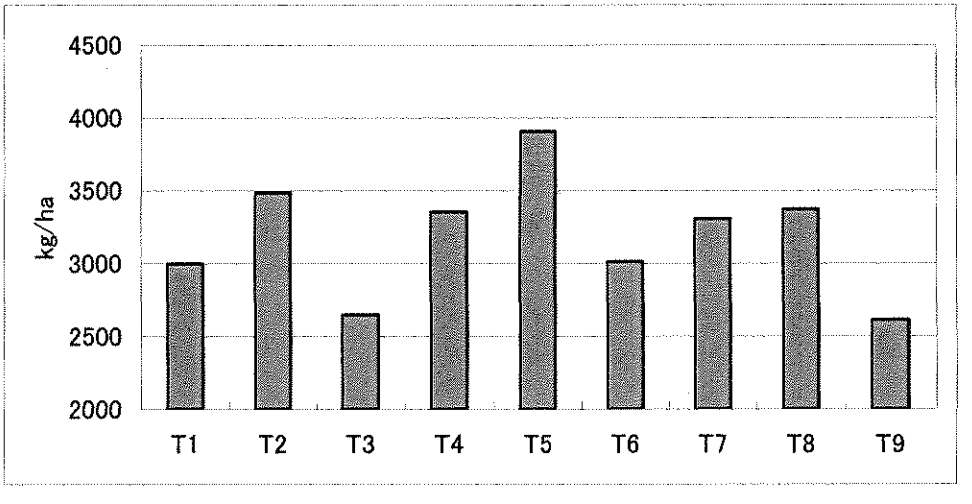


Figure 3.3.11 Mean Grain Yield of Each Treatment

(4) Sustainability

Potential of *Azolla* as a fertilizer was confirmed as it is effective. Farmers from Somehsara visited the experimental field in RRII, and their reaction was very positive. *Azolla* fertilizer can be promoted among local farmers through the extension services of MOJA. The difficulty of the promotion is the composting activity. It takes a long time and costs a lot. Gathering of *Azolla* is heavy labor and not practical for farmers. One of the solutions is to use the *Azolla* as planed for removal in the master plan (see part 3). Removed *Azolla* should be distributed to the farmers in the vicinity of the wetland (buffer zone) to make the compost. Application of compost in the buffer zone corresponds to the wetland ecological management plan. MOJA and DOE should discuss and collaborate to promote this activity and to make it sustainable.

Figure 3.3.12 Observation by Farmers

3.3.4 Erosion Control

(1) Objective

The objective of this activity was to demonstrate the effectiveness of fencing, seeding, straw matting, check dams, and reforestation to reduce erosion from the mountain areas, and thus reduce sediment load to the Anzali Wetland.

(2) Progress of the Activity

Table 3.3.4 shows the overall progress of the activity.

Table 3.3.11 Progress of the Erosion Control Activities

Work Item	2003				2004									
	9	10	11	12	1	2	3	4	5	6	7	8	9	10
1. Design						▬								
2. Contract											▬			
3. Gabion Construction												▬		
4. Fencing (Rangeland)				■ ■	■ ■				▬					
5. Straw Matting				■ ■	■ ■				▬					
6. Fencing (Tree Planting)					▬									
7. Tree Planting					▬									
8. Tree Planting Day												● ●		
9. Pamphlet											▬			
10. Sign Board Design					▬									
11. Sign Board Installation						▬								
10. Evaluation													▬	

Note: ▬ : Implementation, ■ ■ ■ : Preparation

1) Selection of the Activity Sites

There are two types of erosion-related problems in the mountain areas of the watershed. The first type is erosion in the rangelands, which is triggered by overgrazing followed by sheet erosion, rill erosion and gully erosion. The other is erosion caused by the illegal felling of trees. Considering these problems, two pilot activity sites were selected in the Masulehroudkhan basin after a series of discussions with MOJA, NRGO and other stakeholders.

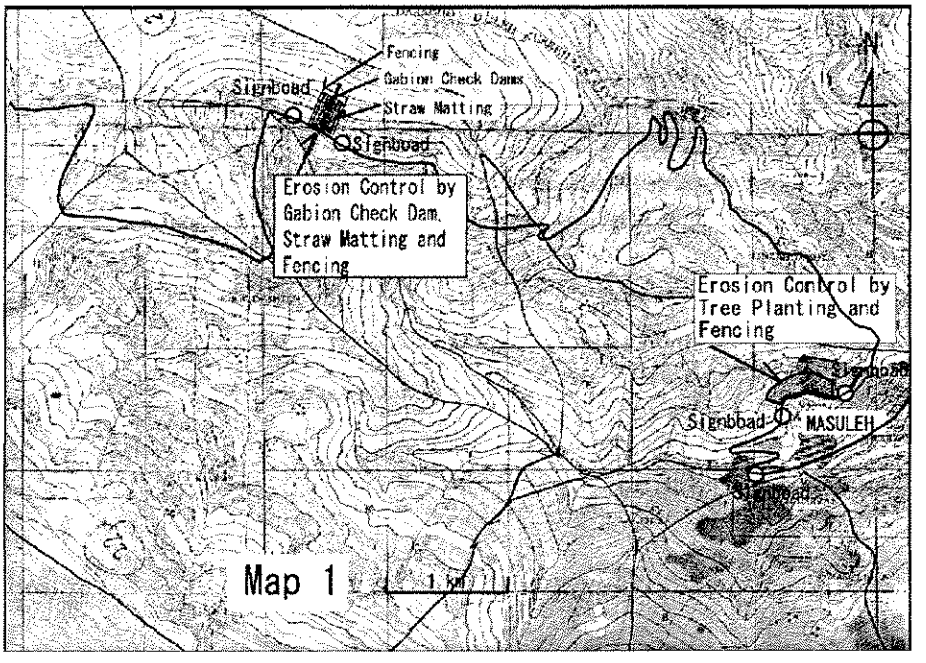


Figure 3.3.13 Sites of Erosion Control Pilot Activities

2) Erosion Control by Gabion Check Dams, Straw Mats and Fencing

In this activity, the effectiveness of a combination of erosion control technologies was tested in an area (300 m x 200 m) severely damaged by a gully. The selected technologies are (i) fencing to keep off livestock, (ii) seeding with grass seed to speed up vegetation recovery, (iii) straw matting to protect the area from sheet erosion, and (iv) gabion check dams to prevent progression of the gully erosion. Figure 3.3.14 schematically shows the measures tested.

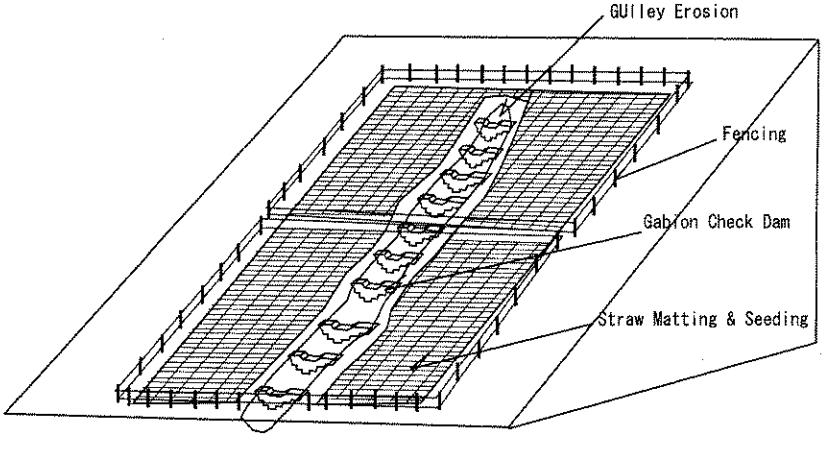
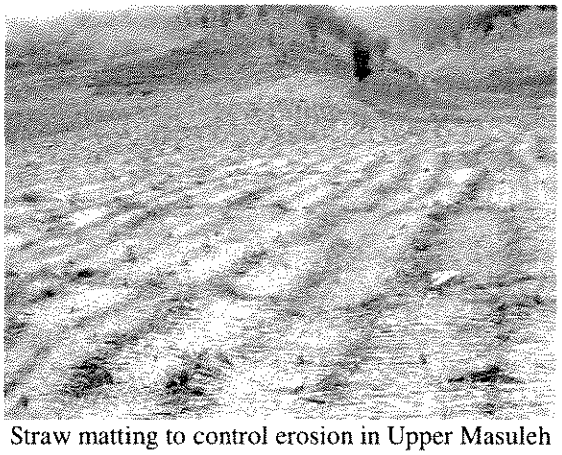
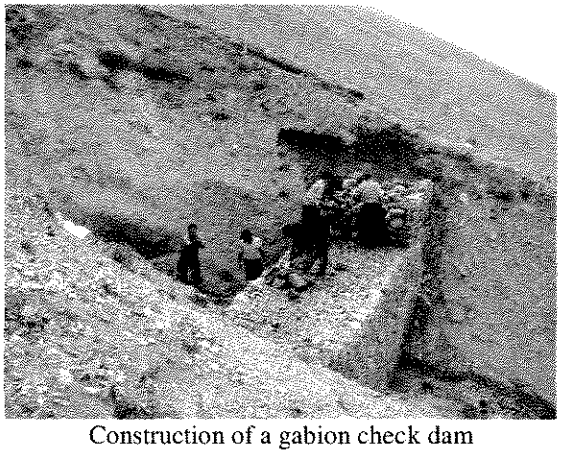


Figure 3.3.14 Schematic Diagram of Erosion Control Work in Upper Masuleh Site

The preparation of the straw mat (20,000 m^2) and fence started in December 2003, and all materials were prepared. Due to snow in the upper Masuleh basin, it took until late spring to complete the installation of the straw mat and fence. Then, 7 gabion check dams were constructed in August-September, 2004. Two signboards explaining the activity were erected at the site. The work was entrusted to a local contractor with technical assistance from MOJA and the team.



Straw matting to control erosion in Upper Masuleh

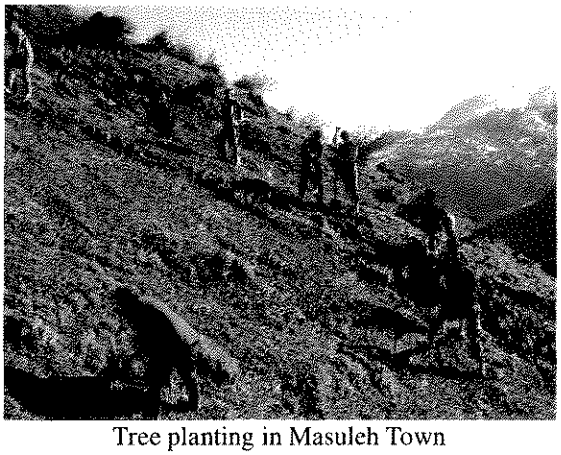


Construction of a gabion check dam

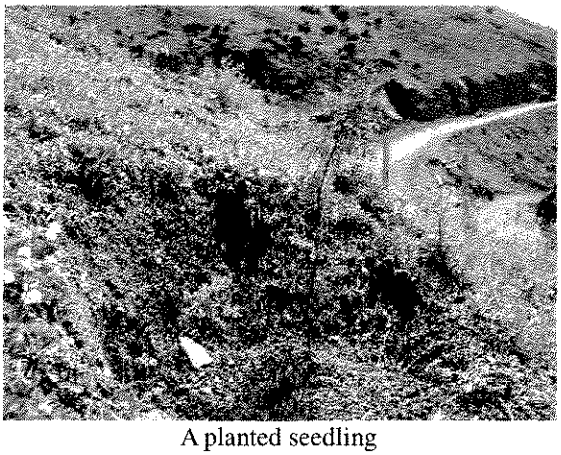
Figure 3.3.15 Erosion Control Activities in Upper Masuleh Watershed

3) Tree Planting

In total, 110 ha in Masuleh town was planted by the joint efforts of this study (10 ha) and NRGO Guilan (100 ha), and signboards explaining the activity were erected in the area. All seedlings were provided by NRGO. The tree planting itself was entrusted to a local contractor.



Tree planting in Masuleh Town



A planted seedling

Figure 3.3.16 Tree Planting Activities in Masuleh Town

4) Tree-Planting Ceremonies

In order to promote the activities, tree planting ceremonies were organized on September 6 and 7, 2004. Despite rainy weather, about 110 graziers, local residents and other stakeholders participated in the ceremonies. A pamphlet explaining problems of erosion was distributed, and the importance of watershed protection was discussed.

Tree planning ceremony

Figure 3.3.17 Photographs of the Erosion Control Activity

(3) Final Evaluation

1) Participation and Commitment

The main stakeholders involved in this activity were NRGO, MOJA, graziers and the town of Masuleh. The participation of these stakeholders was commendable.

NRGO participated in the tree planting activity and provided seedlings free of charge. With the participation of NRGO, it was possible to reforest 110 ha, rather than the 10 ha originally designed. NRGO coordinated the tree planting ceremonies, explained to the local residents/graziers about the activities, and requested that people keep livestock off the activity sites.

MOJA actively took part in the erosion control activities in the upper Masuleh basin. MOJA carried out site surveys and drafted a preliminary design of the check dams. A MOJA's storehouse was used to store straw mats and fence during the winter. Moreover, MOJA is constructing 2 more gabion check dams at the upper Masuleh basin to reinforce the check dams constructed through the pilot activity.

Graziers and local residents also cooperated in the activity by keeping their livestock off the activity sites. This was a major concern because the recovery of grass vegetation was a key element of the proposed erosion control activity.

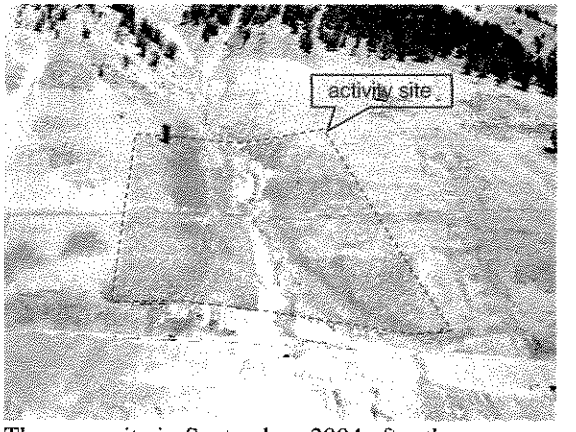
Masuleh Town cooperated in the activity by giving permission to carry out the activity in its jurisdiction, and also allowed the study to erect a signboard at a site near the main parking lot.

2) Technical Effectiveness

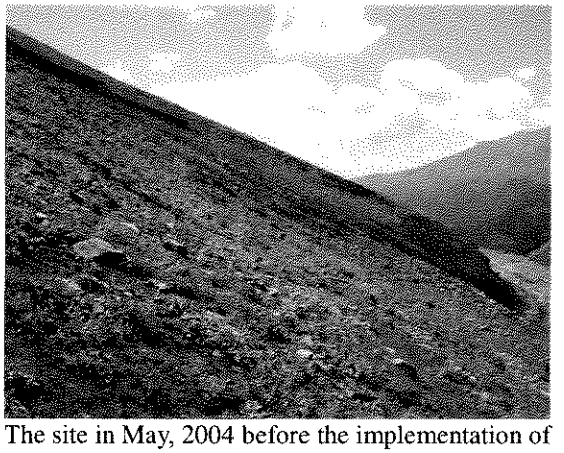
It is still premature to evaluate the technical effectiveness of the erosion control measures, as it takes a long time, years or even decades, before the benefits of the erosion control measures and reforestation become apparent.

Erosion Control with Fencing, Seeding, Straw Matting and Gabion Check Dams: Figure 3.3.18 shows the vegetation recovery at the activity site. The combination of fencing, seeding and straw matting helped control surface erosion. In addition to the alfalfa artificially seeded, various wild plants grew at the sites. The area will be thickly covered by vegetation in the next season as long as livestock are kept off. The effectiveness of the gabion check dams will be monitored by MOJA.

The site in May, 2004 before the implementation of measures.



The same site in September, 2004 after the implementation of the measures. The difference in vegetation cover in the activity site and outside is visible.



The site in May, 2004 before the implementation of the measures.

The same site in August, 2004 after the implementation of the measures. Recovery of vegetation is evident.

Figure 3.3.18 Vegetation Recovery at the Upper Masuleh Activity Site

Tree Planting: Figure 3.3.19 shows the tree planting site in the Masuleh town before and after the work. There has been a marked recovery of vegetation at the site in just a few months, which was attributed to the fencing (rather than tree planting). Clearly grazing pressure by cows is quite strong in this area, and as long as grazing is controlled, a rapid recovery of vegetation can be anticipated. The survival rate of the seedlings was reasonably good at about 70-80% in the initial 8 months or so. It would take a long time before the planted trees become a forest.

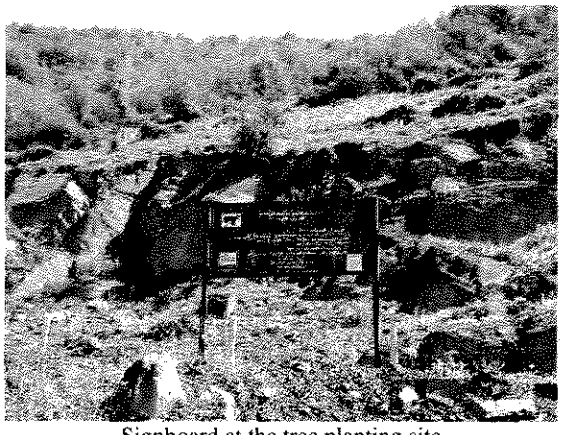
The tree planting site before fencing/tree planting in Dec. 2003

The same site after fencing/tree planting in May, 2004.

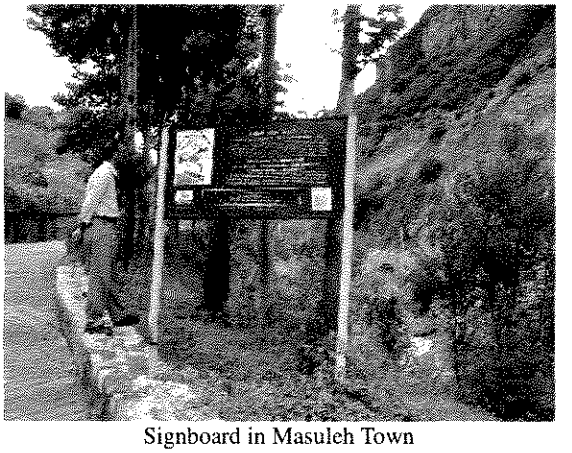
Figure 3.3.19 Vegetation Recovery at the Tree Planting Site in Masuleh Town

3) Educational Benefit

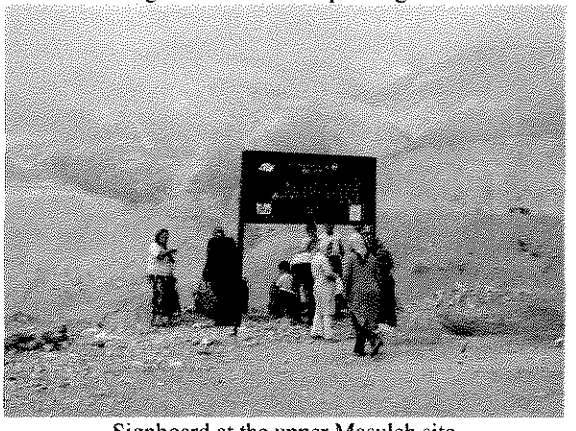
In order to make sure that the local residents, graziers, and other stakeholders understand the pilot activity and importance of watershed management, 5 signboards were erected, and 1,000 copies of a leaflet were printed and distributed at two tree planting ceremonies in September, 2004. The message of the pilot activity was widely received among the local residents.



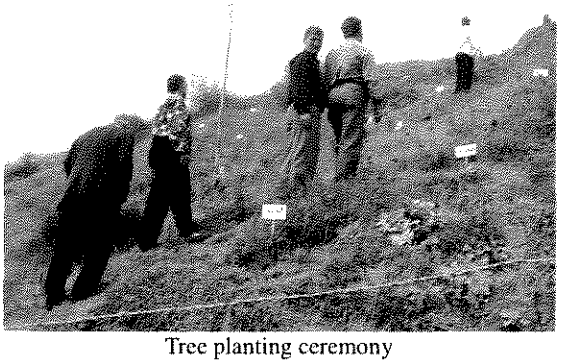
Signboard at the tree planting site



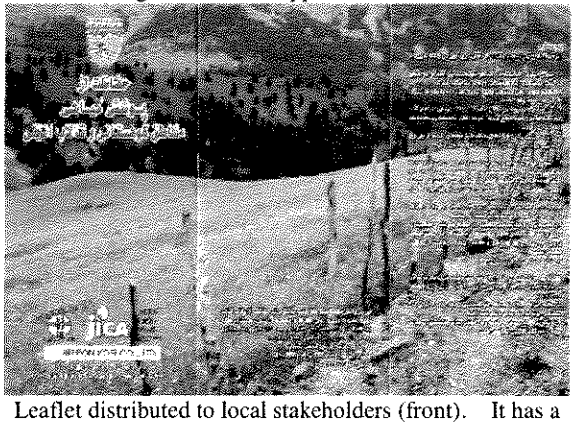
Signboard in Masuleh Town



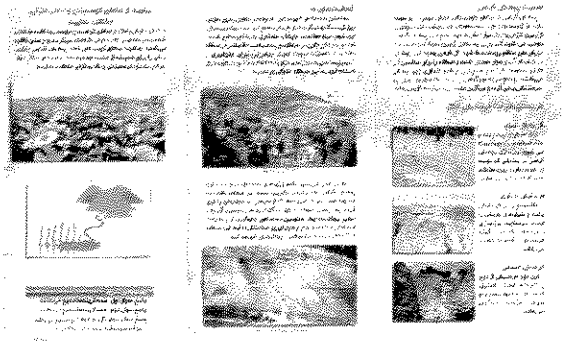
Signboard at the upper Masuleh site



Tree planting ceremony



Leaflet distributed to local stakeholders (front). It has a number of quizzes about what people can do to prevent erosion.



Leaflet distributed to local stakeholders (back). It explains the progression of erosion and how the proposed measures prevent erosion and contribute to conservation of the wetland.

Figure 3.3.20 Environmental Education through Pilot Activity

4) Sustainability

The tested measures, namely fencing, seeding, straw matting, constructing gabion check dams, and tree planting are considered as conventional technologies, and they do not involve any difficult technologies.

There are many signs that this pilot activity is highly sustainable, and readily applicable to the area. For example, the Masuleh town government reforested areas adjacent to the tree planting site after seeing the success of the activity. MOJA constructed two gabion check dams at the upper Masuleh site to reinforce the check dams constructed in this activity.

The main sustainability issue is the cooperation or participation of local residents, in particular, graziers. If graziers do not see the point of rehabilitating rangelands, or if they had no option but let their livestock graze in a project site to survive, the project will fail. It is thus suggested to train graziers, and employ them in erosion control projects so that graziers learn how to protect the rangeland from erosion, and also become less reliant on grazing activities. This is elaborated in the Watershed Management Plan.

3.3.5 Community Wastewater Treatment System Development

(1) Introduction

For conservation of the Anzali wetland, suitable wastewater treatment is required for residents in the basin of the wetland. In major urban areas such as Rasht and Anzali, new sewerage development projects will be implemented. However, small communities can hardly have an expensive treatment facility, because of financial reasons. The JICA Study Team therefore proposes a pilot activity on a low cost wastewater treatment system, which is called a community wastewater treatment system.

The objectives of the works are 1) Confirmation of the technical applicability of the proposed community wastewater treatment system and 2) Public awareness of the necessity of wastewater treatment for conservation of the Anzali Wetland. The main activities were carried out by the Iranian counterpart and the JICA Study Team.

1) Design and construction of the community wastewater treatment system
2) Evaluation of technical applicability of the treatment system, based on the monitoring results
3) Public awareness of the necessity of wastewater treatment by using signboards.
4) Technology transfer.

(2) Principal Features of the Community Wastewater Treatment Facilities

The system layout of proposed wastewater treatment system is as shown in Figure 3.3.21. The location of the Works is near Modaress Street in Masal Municipality

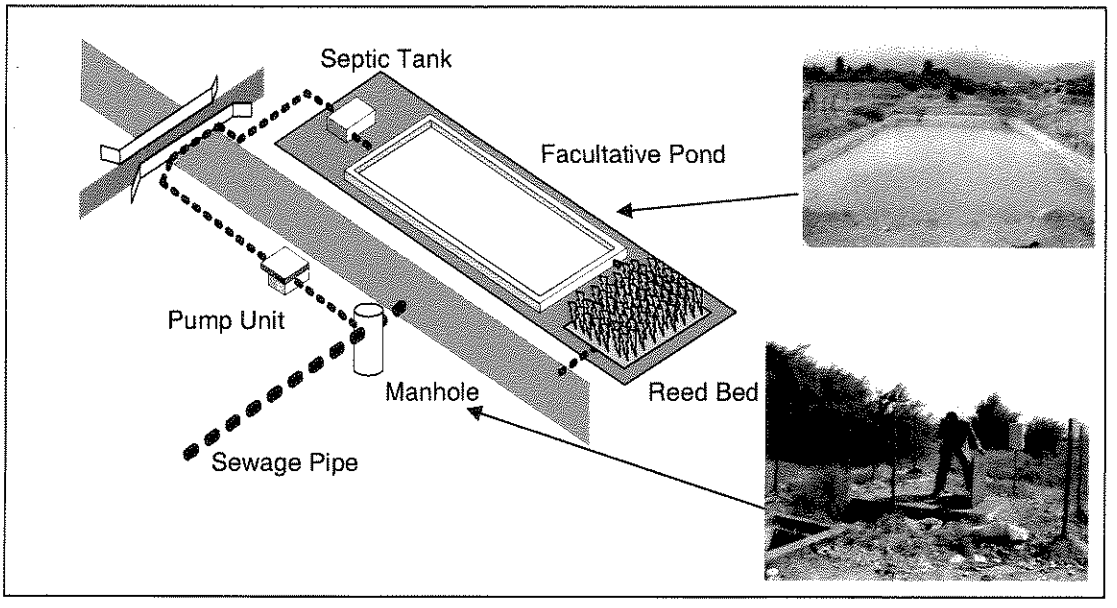


Figure 3.3.21 Outline of Community Wastewater Treatment System at the Site

Table 3.3.12 Specifications of the Community Wastewater Treatment System

Facilities	Specification
1) Manhole Pit	The Manhole Pit shall be constructed for the purpose of installation of two submersible pumps and connection with the existing sewer pipe. Size: W: 1.0 m, L: 1.0 m, Depth: 2.0 m Material: Brick and Concrete Dia. 5 inch, PVC pipe between Existing Manhole and the Manhole Pit
2) Submersible Pumps	The Submersible Pumps shall be installed to transfer wastewater from the Manhole pit to the Septic Tank. Type: Submersible wastewater pump Capacity: not less than 20 ℓ/min Pump Head: not less than 7.0 m Material: Stainless Number of Pumps 2 units Attached Equipment A switch board and a timer control system
3)Connection Pipe	Connection pipe shall be installed for the connection between the outlet of the Manhole Pit and the inlet of the Septic Tank Material: PVC, Dia.: 2 inches, Length: 500 m The pipe shall be installed more than 30 cm underground.
4) Septic Tank	The Septic Tank shall work as a sedimentation process and an anaerobic treatment process on the wastewater. Volume: 30 m^3 Size: L: 5.0 m, W: 3.0 m, H: 2.3m Material: Reinforced Concrete Thickness of Concrete:15 cm 5 inch PVC Pipe shall be installed to connect with the Facultative Pond
4) Facultative Pond	Construction works of the Facultative Pond consist of soil excavation, embankment, installation of concrete slab and pipes. Size: L: 20 m, W: 10 m, Depth: Water Depth:1.5 m, Free Board 0.5m Slope of Sides: 1 : 2.0 Protection Slab: W: 50 cm, Thickness: 5 cm, L: 60m (Concrete) Soil Compaction: Soil compaction shall be carried out three times overall on the Facultative Pond by mechanical compaction machine.
5) Reed Bed	Construction works of the Reed Bed consist of soil excavation, embankment, installation of pipes, and planting of reeds. Area: L: 10 m, W: 5 m, Depth: Water Depth:0.5 m, Free Board 0.5m Slope of Sides: 1 : 2.0 Planting Reeds (50 m^2)
6) Fence	Fence-1 (around the Manhole Pit) Length: 10 m, Height: 1.5 m (Seven Poles with Four Wire Lines and One Door) Fence-2 (around the Septic Tank, Facultative Pond and Reed Bed) Length: 70 m, Height: 1.5 m (Fifty Poles with Four Wire Lines with One Door)

(2) Progress of Activities

The 3.3.13 shows the overall progress of the activities.

Table 3.3.13 Progress of Pilot Activity on Community Wastewater System Development

Work Item	2003				2004									
	9	10	11	12	1	2	3	4	5	6	7	8	9	10
1. Study & Design	━	━	━	━	━									
2. Construction						━	━	━						
3. Operation									━	━	━	━	━	━
4. Monitoring												* *	*	
5. Report & Manual Preparation													━	━

1) Study and Design

The community wastewater treatment system should meet several criteria: 1) cheap construction cost, 2) easy maintenance, 3) reasonable treatment level. The following three alternatives were discussed from a technical view point and cost effectiveness. A number of meetings have been held with DOE, GWWC and RWWC.

Alternative-1: "Septic Tank" + "Facultative Pond"
Alternative-2: "Imhoff type Septic Tank" + "Sand Filter"
Alternative-3: "Septic Tank" + "Reed Bed"
Alternative-4: "Septic Tank" + "Facultative Pond" + "Reed Bed"

Alternative-4 is proposed, because it is the most effective treatment process, even though the construction cost is little bit more expensive than the others. Detailed design of the wastewater treatment system has been carried out by a local contractor under supervision of Iranian counterparts and the JICA Study Team.

2) Construction

Construction of the wastewater treatment system has been carried out between February and April, 2004 under supervision of the JICA Study Team. In order to prevent leakage from the facultative pond, a plastic sheet was installed over the entire facultative pond in July 2003.

Figure 3.3.22 Construction of the Community Wastewater Treatment System

3) Operation and Monitoring

After completion of the Project, the operation of the system was commenced in May 2004. For monitoring of the effectiveness of the operation, water sampling and analysis were carried out on 2nd, 25th August and 25th September 2004. The sampling points were 1) the Manhole Pit, 2) outlet of the Septic Tank, 3) outlet of Facultative Pond, 4) outlet of Reed Bed, and items of water quality analysis were 1) BOD, 2) COD, 3) T-N, 4) T-P. The results of the water quality analysis are as shown below.

Table 3.3.14 Water Quality Data of the Wastewater Treatment Plant

No.	Sampling point	BOD (mg/L)	COD (mg/L)	TN (mg/L)	TP (mg/L)
2 August, 2004					
1	Manhole pit	37	94	2.5	3.36
2	outlet of the septic tank	19	68	2.3	3.23
3	outlet of facultative pond	12	33	2.3	1.23
4	Outlet of reed bed.	7.5	28	2.2	1.29
25 August, 2004					
1	Manhole pit	46	140	3.5	3.72
2	outlet of the septic tank	28	79	2.6	3.16
3	outlet of facultative pond	16	45	1.5	1.834
4	Outlet of reed bed.	12	26	1.1	1.753
25 September, 2004					
1	Manhole pit	48	110	4.712	2.073
2	outlet of the septic tank	26	60	4.01	1.374
3	outlet of facultative pond	10	24	1.769	0.72
4	Outlet of reed bed.	4.5	10	0.823	0.619

Source: JICA Study Team (2004)

(4) Final Evaluation

1) Participation and Commitment

The main stakeholders involved in these pilot activities were DOE, GWWC, RWWC and Municipalities staff. They jointed many discussions on the suitable type of wastewater treatment system and selection of the activity site. Masal municipality

provided the site for the community wastewater treatment system and electric power supply for the pump. GWWC attached maintenance staff for the system.

2) Technical Effectiveness

Evaluation of technical applicability of the treatment system was carried out, based on the monitoring results. Figure 3.3.23 shows the reduction of BOD, COD, T-N and T-P through the treatment process. The proposed wastewater treatment system is proved to be effective to reduce water pollution load discharged into the river.

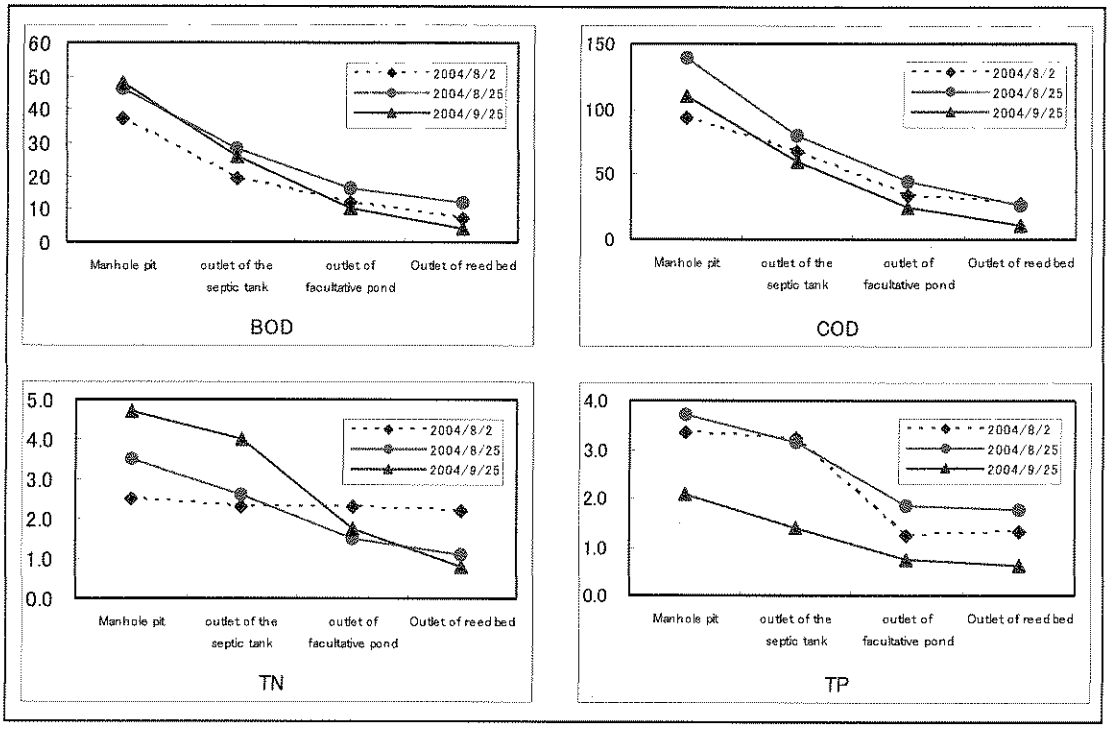


Figure 3.3.23 Water Quality Record in Treatment Process

As shown Figure 3.3.24, large amounts of algae have grown in the facultative pond. The algae are removed by man power using nets at present, because the algae include a large amount of organic and nutrient matter. More effective measures for removal of algae shall be considered.

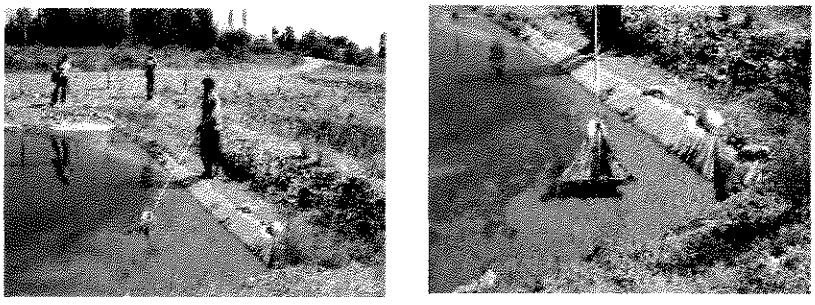


Figure 3.3.24 Large Amount of Algae

3) Educational Benefit

Through the discussions for selection of a suitable wastewater treatment process, the stakeholders learned a lot about technical issues on treatment processes. After commencement of the operation, a number of staff from DOE, GWWC, RWWC and Masal Municipality visited the site to see the actual structure and operation of the community wastewater treatment system. The staff of GWWC and RWWC Guilan will have experience to operate the treatment facility.

For the purpose of the public awareness for community people on the necessity of wastewater treatment, a signboard was installed as shown in Figure 3.3.25.

Figure 3.3.25 Signboard for Community Wastewater Treatment System

4) Sustainability

RWWC has a plan for installation of community wastewater treatment system in seven villages in the basin of the wetland. The sustainability depends on continuous investment and suitable operation of the treatment system. The experiences with

the activity are expected to contribute to the sustainable operation of new community wastewater treatment systems, and the suitable operation will boost more investment for installation of the treatment system.

3.3.6 Research on Water Purification Capacity of the Reed Bed

(1) Objectives

It is believed that the macrophytes contribute to water quality purification in the Anzali Wetland. However, the function of macrophytes has not been evaluated quantitatively in the Anzali Wetland. Research work on the water purification capacity of constructed wetland was therefore proposed for the pilot activity. In addition to the research work, the reed bed will be used for environmental education for visitors to the Environmental Education Center constructed under the Wetland Education Program.

(2) Principal Feature of Reed Bed

The reed bed was constructed 200 m from the DOE Selke Guard Station on the environmental walking path constructed under the Environmental Education Program in the JICA Study. The proposed layout is as shown in Figure 3.3.26. The specifications of the reed bed are as described in Table 3.3.15.

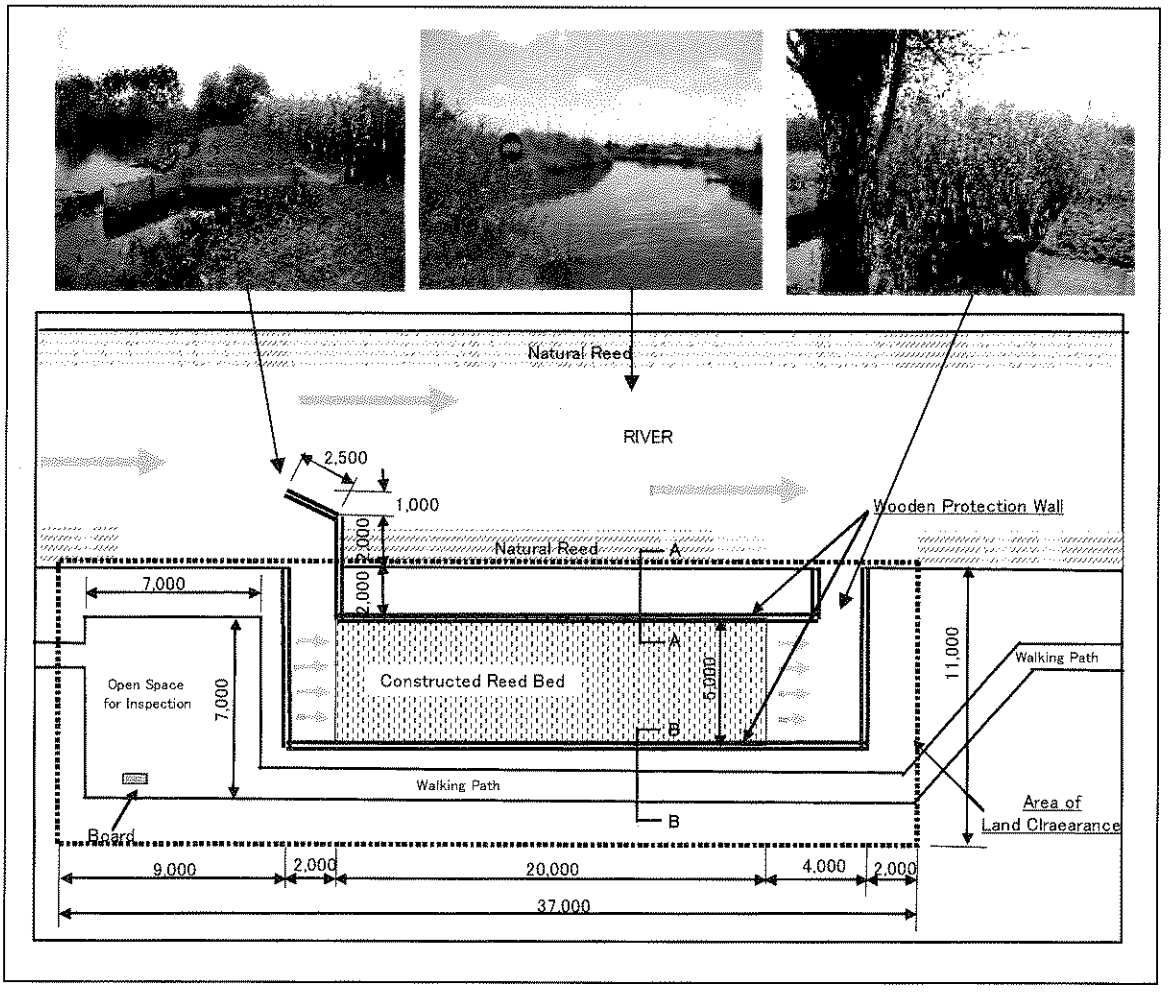


Figure 3.3.26 Outline of Reed Bed at the Site

Table 3.3.15 Specifications of the Reed Bed

Facilities	Specification
1) Reed Bed	Construction works of the reed bed consist of soil excavation, installation of wood plate and reed planting. (Area: L: 20 m, W: 5 m, Water Depth: 0.8 m, Free Board: 0.3m) Reed was transferred from the wetland. The reed bed was filled with the reed at almost the same density as the natural condition in the wetland.
2) Inlet Structure	Construction works for the inlet structure consist of soil excavation, and installation of wood plate. (Area: 18 m^2, Water Depth: 0.8 m, Free Board: 0.3m) An inlet wooden wall shall be installed in the River. Height: 150 cm, Thickness: 3 cm, L: 4.5 m
3) Outlet Structure	Construction works of the outlet structure consist of soil excavation, and installation of wood plate. (Area: 24 m^2, Water Depth: 0.8 m, Free Board: 0.3m)
4) Wooden Protection Wall	A wooden protection wall was installed along the boundary of the reed bed, the Inlet structure and the outlet structure with wood pegs for support. Height: 80 cm, Thickness: 3 cm, Length: 55 m in total The wood pegs were installed at intervals of 1.5 m along the wooden protection wall. Size: 7 cm x 7cm x 200 cm

(3) Progress of the Activity

The 3.3.16 shows the overall progress of the activities.

Table 3.3.16 Progress of Pilot Activity

Work Item	2003				2004									
	9	10	11	12	1	2	3	4	5	6	7	8	9	10
1. Study & Design			▬											
2. Construction											▬	▬		
3. Operation													▬	▬
4. Monitoring													*	*
5. Manual & Report Preparation														▬

1) Study and Design

The concept of the activity was agreed with DOE at the beginning of the Study. There were several discussions with DOE for selection of the site location for the activity. From the view point of effectiveness of environmental education, the site was selected on the environmental walking path used for the Environmental Education Program near DOE Selke Guard Station. The design was carried out to meet the site conditions.

2) Construction Works

The construction was carried out between July and August, 2004 under supervision of the JICA Study Team.

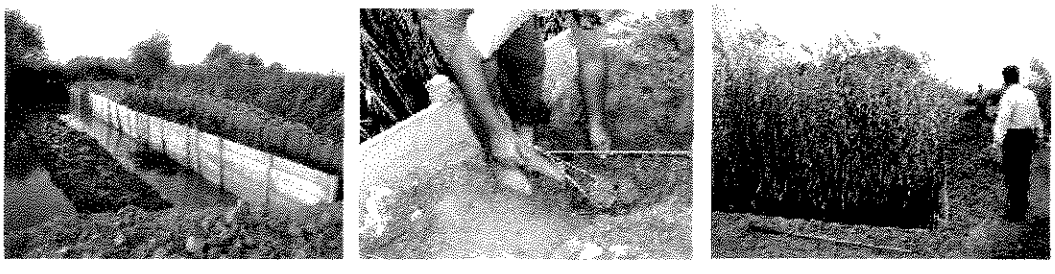


Figure 3.3.27 Reed Bed during Construction

3) Operation and Monitoring

After completion of the construction in September, 2004, the reed bed commenced to operate. For monitoring of the effectiveness of the operation, water sampling and analysis were carried out on October and November 2004. There were three

sampling points: at the inlet, middle, and the outlet of the Reed Bed, and items of water quality analysis were 1) BOD, 2) COD, 3) T-N, 4) T-P. The results of the water quality analysis are as shown below.

Table 3.3.17 Water Quality Data of the Wastewater Treatment Plant

No.	Sampling Point	BOD (mg/L)	COD (mg/L)	TN (mg/L)	TP (mg/L)
October, 2004					
1	Inlet	6	13	2.3	0.18
2	Middle	6	12	3.0	0.16
3	Outlet	4	9	1.6	0.15
November, 2004					
1	Inlet	5	13	1.7	0.15
2	Middle	3	12	1.5	0.15
3	Outlet	2	9	1.3	0.13

Source: JICA Study Team (2004)

(4) Evaluation

1) Participation and Commitment

All of the activities, such as the site selection and the design works were carried out in cooperation with DOE. DOE provided the site for the reed bed, and give assistance for the construction works.

2) Technical Effectiveness

Because the reed bed has been operated for only limited period and water quality survey was carried out only two times, the technical evaluation has not been completed. As the results of the water quality survey shown in Table 3.3.17, the water purification function is identified as small. The monitoring shall be continued until reaching a conclusion.

3) Education Benefit

The reed bed has not been used for education purpose. The signboard as shown in Figure 3.3.28, was installed for a lecture on the ecosystem of macrophytes in the Anzali Wetland. After commencement of the education program in the Environmental Education Center, many children and young people will have lectures at the site.