

II. Priority Project

CHAPTER 1 SELECTION OF PRIORITY PROJECTS RELATED WITH IRRIGATION DEVELOPMENT PLAN

1-1 SELECTION PROCESS OF THE PRIORITY PROJECTS

In order to increase rice production, it is required to lead the policies, namely, “Production Incentive Stimulating Policy” aiming at motivation increase of rice production farmers, together with the “Productivity Improvement Supporting Policy”. Although these programs are expected to be developed to nationwide level as the integrated project, the many constraints and issues need to be solved. Hence, some projects to resolve the issues should be conducted in urgency or pilot, prior to development at nationwide. These pilot project and/or activity are selected as the priority projects. Five projects as the priority project are proposed for the purpose of nationwide expansion of the proposed priority project. Planning level of the priority projects is expected to be pre-feasibility level. If the technical cooperation project is proposed as a priority project, its level is to be preliminary evaluation level.

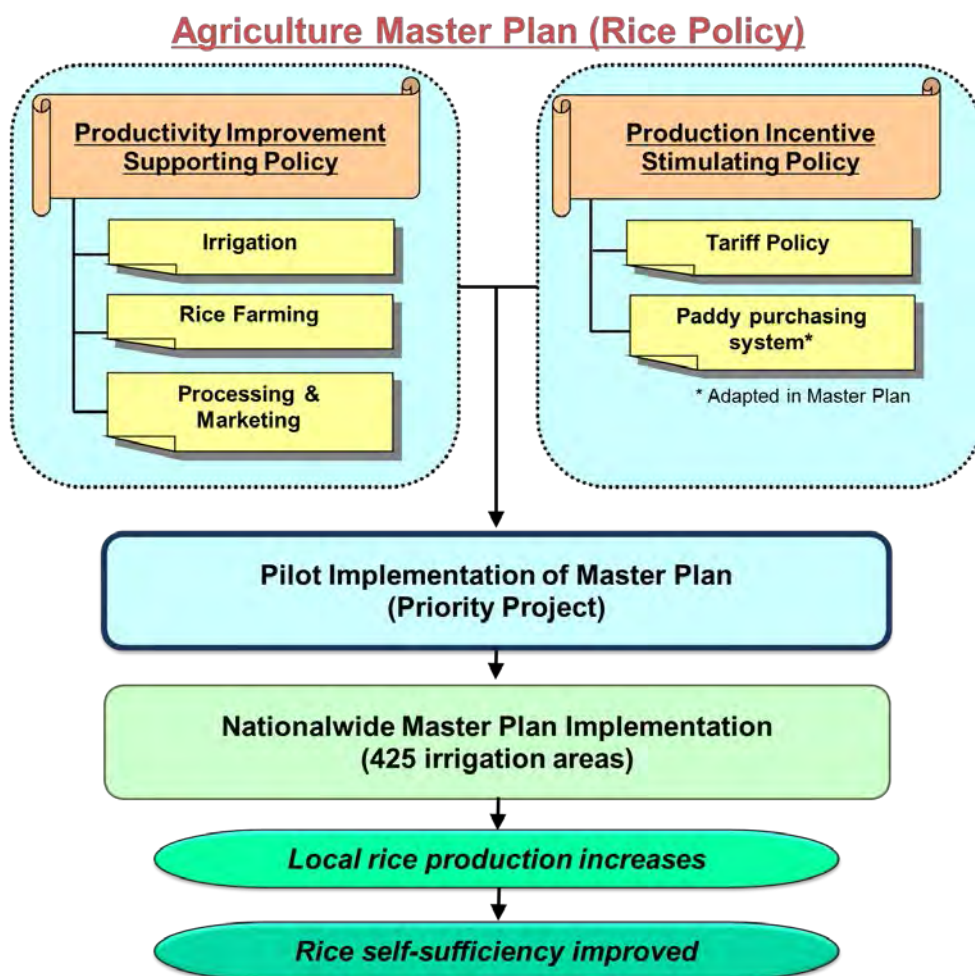


Figure 1-1-1 Chart of Priority Project on Agricultural Master Plan

1-2 PLAN OF APPROACH TO SELECTING THE PRIORITY PROJECTS

The following criteria are prepared to select the priority projects.

(1) Consistency with the Master Plan

It is required to apply the two policies, namely, “Production Incentive Stimulating Policy” aiming at enhancement of motivation of rice production farmers, and “Productivity Improvement Supporting

Policy”. Increase of rice production is maximized by integration of both policies. Considering future development of the master plan, any plans and/or measures to realize the “Production Incentive Stimulating Policy” should be prioritized as the priority project. To achieve the production increase target, the master plan is designed to apply those policies to the irrigation schemes in the rice bowl area and the subsistent farming area. Priority projects are embodied based on the both policies mentioned above in consistent with the purpose of master plan.

(2) Preparation of the action plan to go forward the production incentive stimulating policy is selected as the priority projects.

Production incentive stimulating policy is closely related with political matter.

For achievement of the rice production increase by means of the proposed paddy purchasing system, which is proposed as the prioritized scenario-2, it is important to cope with the problems/ subjects arisen in the operation of the MCIE’s purchasing system so far. At first, consensus between MAF and MCIE is to be obtained, and after that, it is recommended to wrestle with various issues in order to embody the implementation policy.

Participating in the paddy purchasing system is a new challenging work for MAF. It is requested to MAF to clarify the general planning process to contribute the increase rice production and to learn lessons and issues from the MCIE’s system, so that MAF could analyze them and show a direction for improvement of rice production.

Accordingly, an action plan preparation for embodiment of the rice purchasing policy is proposed as one of the priority projects. However, looking at the present MAF organization structure, the planning work is big challenge. Therefore, technical support by donors is assumedly important.

(3) Priority is given to local commercial rice production.

It is expected that synergistic effect for rice production increase by implementation of the two policies is brought about. For the purpose of domestic rice production increase, some priority projects to embody the policy effectively, namely, "Productivity Improvement Supporting Policy", have to be selected.

The target of the master plan is production increase of local commercial rice and self-sufficient rice, in the rice bowl area and subsistent farming area, respectively. Simultaneously, related with the country’s future agricultural development direction, Timor-Leste is aiming at shifting from current subsistent farming to commercial based farming. Taking account of such future development direction, it is urgent to increase competitiveness of the domestically produced rice against imported one. For realization such situation, it is necessary to create and promote commercial sense of rice farmers. Accordingly, a priority project for "**the project for commercial rice production area**" in rice bowl area is selected from related projects.

(4) Higher commercial agriculture development potential area is selected as the priority project areas.

From the viewpoints of the (3), for the priority project to increase local commercial rice production in the rice bowl area, the project areas are selected from the possible areas where rice farmers will be able to practice commercial rice farming. To do so, higher commercial agriculture development potential areas are selected. In the areas, a series of rice production activities from cropping to marketing will be conducted aiming at commercialization of domestically produced rice. For effective priority project implementation, it is required to accelerate the commercialization of the local rice by improving current on-going activities from rice planting to processing/ marketing. It is expected that the priority projects can increase local commercial rice production. Priority project areas should be

selected from the areas where such expectation would be brought immediately. Higher priority is given to the areas where commercial rice production has been already tackled or its potential is high.

(5) Pilot trial is put on the priority projects.

Considering future project development, priority projects are expected to involve the pilot activities which might be brought from the development process to materialize the proposed projects. It is important to reflect the outcomes from the priority project implementation on the similar project areas and feedback them to the next projects. Incorporating making pilot trials into the priority project is crucial for achieving the master plan's target. For further development of the master plan, concretely, it is important to bring the lessons learnt from the past MAF's irrigation rehabilitation projects and the other related donors' crop productivity improvement activities and to reflect them in the priority projects. Pilot trials brought from the past projects should be put on the priority projects.

For example, it is pointed out that most of all MAF's irrigation rehabilitation projects face with common problems such as unstable intake water from the river, sedimentation on the irrigation facilities/ irrigated farmland and frequent change of river course. It is important to include any trials in the priority projects to solve such problems for future development. Such trials are planned to be implemented in the priority project.

Related with the priority projects in rice bowl areas, target area of the priority project are selected from the irrigation schemes in the rice bowl area, as mentioned above the sections (3) and (4). On the other hand, for the subsistent farming area, it is needed to apply the proposed programs/ projects into any irrigation schemes selected from in the subsistent farming area. In the selected schemes, a pilot trial to ensure the rice production for farmer's self-home consumption and to realize the crop diversification should be conducted. Outcomes from the projects are expected to be transferred to other similar areas. Target area for "**the project for the subsistent farming area for increasing rice production**" will be selected from the areas where faced with common difficulty in cropping and marketing.

Considering the selection criteria as mentioned above (1) to (5) and the development purpose of the master plan for increasing rice production, the priority projects are formulated; "Promotion project for local commercial rice production in rice bowl area" in three (3) priority areas, and "Promotion project for strengthening food production in subsistent farming area" in one (1) priority area.

(6) Social impact should be incorporated into the feasibility study of the priority projects.

Past irrigation rehabilitation projects were formulated based on the uniform planning and designing with large investment under the over expectation of cropping system. Considering the scale of improved facilities, and irrigation area, it might be judged that economic feasibility of these projects is low. It would be hard to get economic feasibility so long as the large investment with over cropping plan and cheap rice import is not improved. In the irrigation rehabilitation planning, investment to improve the facilities should be planned from the economically feasible viewpoints. However, it is expected to be hard to get a certain level of economic validity in the area where natural condition such as the run off characteristic is not suitable for irrigation water intake and distribution.

In general project planning process, evaluation of economic feasibility is the most important factor. Considering the possible economic feasibility of selected priority projects, it is judged that the feasibility is low from the past similar irrigation rehabilitation projects. Nevertheless, it should be emphasized that rice and other food crop production as targeted in the priority projects is the basic requirement for self-food security and self-support of rice farmers. Feasibility of the priority project should not be judged from only economic feasibility. Indirect effects such as alleviation of flood damage, conservation of farm land, recharge of water resource, supply of domestic water, conservation of natural environment and succession of community culture, should be incorporated into analyzing

the feasibility prospect. In the priority projects, it is considered that such indirect effects are assessed as non-economic impacts.

(7) Social and environmental consideration

Social and environment consideration is preliminary considered in selecting the priority project areas and designing to apply the programs/ projects. Selection of the priority project and its target areas is conducted not to cause or to minimize negative impacts on the physical and social environment.

1-3 SELECTION OF THE PRIORITY PROJECT AREAS

1-3-1 Basic Policy for Selection of the Priority Project Areas

1. Development strategies, “Irrigation system is improved” (irrigation potential), “Crop productivity is improved” (paddy productivity) and “Processing and marketing process of local rice is improved” (market development potential) are practiced in the selected priority project areas. Selection is done by assessing the present irrigation schemes from the three aspects mentioned above, namely, irrigation potential, paddy productivity and market development potential.

2. The target areas, namely, 1) commercial rice production area and 2) subsistent farming area for increasing rice production area selected taking into consideration into followings points;

Commercial rice production area	Considering irrigation potential viewpoint, targeted project area (irrigation scheme) is required to be a certain size of irrigation area. From the viewpoints of paddy productivity and market potential, it is desirable through the priority project implementation that rice production is increased and produced rice is actively marketed as commercial rice in the regional rice market range.
Subsistent farming area for increasing rice production	Ensuring irrigation water is crucial for maintaining sustainable rice farming in the subsistent farming area. To select the priority project areas, focus is put on the evaluation of irrigation potential. In addition, topography is also considered in the selection process.

3. Selection as following way

- i) Arrange the long list of candidate irrigation schemes from 425 by qualitative evaluation of irrigation function
- ii) Preparation of the short list of candidate irrigation schemes for each of priority areas, namely, the commercial rice production area and the subsistent farming area for increasing rice production area, by narrowing down of the long list in terms of area size, relation with on-going irrigation projects by MAF
- iii) Evaluation of listed irrigation scheme on short list from the viewpoints of paddy productivity and market potential, then they are selected and identified as priority areas, the commercial rice production area and the subsistent farming area for increasing rice production area

1-3-2 Long List of Candidate Irrigation Scheme from Irrigation Situation

(1) Selection of irrigation scheme

Candidate areas of the priority projects are selected to generate the large impact for increase of rice production by recovering the irrigation function. 90% of irrigation scheme in Timor-Leste covers less than 500ha of irrigation area, which are regarded as small and middle size in the country. In the selection, it might be considered whether single scheme is integrated into plural ones. For integrating the schemes, physical condition of the target areas should be examined. Possible areas are located in the downstream areas where it is possible to make intake water and its distribution is stable in the hydraulic aspect. Present/planned MAF rehabilitation projects in the downstream area has involved in

the integration. Judging from the topographic condition surrounding the irrigation schemes, possible areas where the irrigation schemes could be integrated are considered to be limited.

In the case of the MAF rehabilitation projects, as the result of the integration of the schemes, designed intake discharge became expanded. Large scale weir to take water was designed to meet with this discharge. Structure of the weir is generally prone to be damaged by flooding water with stone. As the results, maintenance work becomes big burden. However, it is hard to fix the damaged one under the limited budget. Large investment is required to provide the weir strong enough for flooding. Under the financial limitation and economic validity, it is hard to cope with the present flooding in terms of technical matters.

Considering these situations, priority project areas are selected on a scheme basis. As for the integration, if any suitable schemes would be found, integration is planned at planning of priority project after the selection of scheme.

(2) Arrangement of the long list based on qualitative evaluation of existing irrigation functions

Detail of the long list preparation mentioned above is as follows;

i) Qualitative evaluation of existing irrigation functions

Basic data of existing 425 irrigation schemes collected through the inventory survey are used. Based on the data, present situation of the irrigation facility of each irrigation scheme can be evaluated qualitatively and they are ranked into three levels, namely, A, B and C. Ranking is done by setting and using of proposed indicators. Among the three levels, the rank- A is regarded as the lowest function's irrigation scheme and they are identified as the candidate of long list.

Situation of each irrigation scheme is evaluated and classified by indicators as the qualitative evaluation. Since this evaluation is made based on the inventory survey conducted through the interview survey and/or rough site observation, it should be confirmed whether the situation obtained from this qualitative evaluation is appropriate. To do so, it is required to judge the necessity of concrete measures through detail survey. Therefore, following evaluation indicator are proposed as shown below:

Qualitative evaluation (irrigation scheme)

Rank A: Scheme which urgently needs to conduct detail survey in order to judge on whether the concrete measures should be taken. **(100 pt to 70 pt)**

Rank B: Scheme which needs to conduct detail survey in order to judge on whether the concrete measures should be taken. **(below 70 pt to 50 pt)**

Rank C: Scheme which needs to examine the necessity of detail survey with monitoring **(below 50 pt)**

Table 1-3-1 Indicators and Evaluation Method for Qualitative Evaluation in the 1st Step Evaluation

Indicator	Evaluation	Points	Remarks
1. Extreme water shortage and difficult to maintain intake water level	Irrigation water cannot be supplied completely or supplied insufficiently to irrigation command area.	40 pt	More than twice of minimum points, since intake workability is regarded as the most serious subject.
2. Intake and water flow prevented by Sedimentation	Intake from river and canal water flow are temporary obstructed by sedimentation	20 pt	Twice of minimum point is given, irrigation can be done depending on this condition.
3. Damage on structure (including malfunction of the facilities)	Structures are damaged and deteriorated. Gate is not operational. Reduce of intake water is observed.	20 pt	Ditto
4. Frequency of flood damage	By flooding, damaged in every year and land washing out of farmland often occurs.	10 pt	
5. Size of area	This item is not for problem on facilities, but the rehabilitation or improvement of large scheme will	10 pt	

	give large impact. More than 100 ha and over should be targeted.		
Qualitative Evaluation	(Maximum acquired points)		100 pt
	Rank A: Schemes which urgently need to conduct detail survey in order to judge on whether the concrete measures should be taken.		acquired points : 100 pt to 70 pt
	Rank B: Schemes which need to conduct detail survey in order to judge on whether the concrete measures should be taken.		acquired points: below 70 pt to 50 pt
	Rank C: Schemes which need to conduct the examination for detail survey with monitoring		acquired points: below 50 pt

Result of qualitative evaluation of each irrigation scheme based on the above method is shown in Table 1-3-2. 74 irrigation scheme is selected on long list. (Refer to Table 1-3-2). Long list for each district show on Table 1-3-3, and location show on Figure 1-3-1.

Table 1-3-2 Result of Qualitative Evaluation of Each Irrigation Scheme

District	Number of scheme	Evaluation					Irrigated area for each evaluation			
		Rank A	Rank B	Rank C	A100	A50	Rank A (ha)	Rank B (ha)	Rank C (ha)	Total (ha)
Aileu	9	5	3	1	0	1	156	81	30	267
Ainaro	15	5	1	9	4	0	416	388	344	1,148
Baucau	152	17	70	65	7	0	1,052	4,819	3,156	9,027
Bobonaro	29	10	9	10	5	1	2,888	466	1,539	4,893
Cova Lima	19	2	4	13	1	1	215	1,316	1,151	2,682
Dili	2	2	0	0	0	0	48	0	0	48
Ermera	14	6	4	4	2	0	281	549	355	1,185
Lautém	47	10	13	24	3	0	339	1,532	991	2,862
Liquiçá	7	2	2	3	1	0	184	341	161	686
Manatuto	54	7	24	23	2	2	402	2,614	1,459	4,475
Manufahi	11	0	7	4	0	0	0	1,368	164	1,532
Viqueque	40	7	16	17	4	1	1,571	1,472	1,353	4,396
Oecussi	26	1	3	22	0	0	37	60	1,061	1,158
total	425	74	156	195	29	6	7,589	15,006	11,764	34,359

Remarks: A100 shows that the irrigation area is more than 100ha of Rank A. A50 shows that the irrigation area is below 100ha to 50 ha of Rank A. Refer to 1-3-3 (1) for detail.

The summary of above evaluation is shown on table below.

- There is certain difference of the urgency for detail survey between rank A and rank B. The number of schemes, which are categorized into both those ranks accounts for 54 % of all schemes and its irrigation area is conformity with 2,200 ha, which occupies 65 % of all scheme areas.
- As the overall trend, rank A is mainly observed in Baucau district. The district has the largest irrigation area and the biggest number of irrigation schemes in the country. The number of the classified into the rank A is increased in proportion to the number of schemes. In Baucau, almost all irrigation schemes are classified to the "Traditional scheme", the number is 149. These areas are assumed to suffer from difficult water distribution to service area and obstruction of taking water from river due to lowering river bed.
- Following the Baucau, the number of Rank A in Bobonaro district is the second biggest number, but the total area of irrigation schemes with around 3,000 ha is more than that in Baucau. (Maliana II scheme of 1,700 ha is included in Bobonaro).

Table 1-3-3 Long List (1/2)

District	Ref No	Scheme	District	Subdist	Sect	Scheme history		Aided Area(%)	Original Area(%)	Household	Problem				Point	Evaluation	Priority in Performance	
						Constr.yr	Rehab.yr				Shed of water/ Otek of water	Prob of water not keeping waterflow	Damage of slu	Flooded			≥ 80%	≥ 90%
Alau	1b25	FAIRUGGA	Alau	Alau	FAIRUGGA	1980s	2013	54	50	36	•	•	•	•	90	A	#60	
	1b38R	SELOI CROUK	Alau	Alau	SELOI CROUK	1990s	2009	37	20	90	•	•	•	•	70	A		
	1b58R	ASIRMO	Alau	Alau	ASIRMO	2000s	2013	30	80	65	•	•	•	•	90	A		
	1b68R	FAHIRA	Alau	Alau	FAHIRA	1980s	2013	20	40	35	•	•	•	•	90	A		
	1b78R	SABORA	Alau	Alau	Sabora	2010s	2012	15	50	82	•	•	•	•	90	A		
Amuru	2c15	RAMBERE	Amuru	Huku Udo	LEDUMA	2010s		101	245	287	•	•	•	•	90	A	A100	
	2c38R	KAWULUKU	Amuru	Amuru	CASSA	2010s		286	629	350	•	•	•	•	90	A	A100	
	2c78R	AKANDU KELE	Amuru	Amuru	CASSA	unknown	2013	27	629	350	•	•	•	•	80	A		
	2c118R	BOMUK	Amuru	Huku Udo	LEDUMA	unknown		include: 5"	900	300	•	•	•	•	90	A	A100	
	2c118R	AUMKIAHUM	Amuru	Huku Udo	LEDUMA	2010s		include: 1"	245	287	•	•	•	•	90	A	A100	
Baucau	4a15S	SICAL DOMM (SOSSEGE)	Baucau	Baucau	SICAL DOMM DE CIMA	1990s		207	540	230	•	•	•	•	100	A	A100	
	4a28R	TIKA LARI	Baucau	Queleca	LASORUAI DE CIMA	unknown		113	120	80	•	•	•	•	80	A	A100	
	4a28R	UNDEBA	Baucau	Queleca	LASORUAI DE CIMA	unknown		include: 24"	74	80	•	•	•	•	80	A	A100	
	4a28R	SIRIMAMA	Baucau	Laga	LEAGUA	Before 1970		35	30	38	•	•	•	•	80	A		
	4a38R	SANUFU	Baucau	Laga	SANALARI	unknown		100	30	162	•	•	•	•	80	A	A100	
	4a38R	BANGARA	Baucau	Laga	TEQUINOMATA	unknown		43	70	40	•	•	•	•	90	A		
	4a38R	SODANIN	Baucau	Laga	Nunro	Before 1970		28	130	42	•	•	•	•	80	A		
	4a38R	SEBEJU (SABUNAN)	Baucau	Baucau	GATIMU	Before 1970		20	330	220	•	•	•	•	70	A		
	4a38R	SEBEJU(SAMALARI)	Baucau	Baucau	SAMALARI	Before 1970		include: 59"	330	220	•	•	•	•	80	A		
	4a38R	WUOI LALEA	Baucau	Baucau	GATIMU	2010s		149	80	51	•	•	•	•	70	A	A100	
	4a38R	Molegale (Molegale/Lalea west)	Baucau	Venacoce	Venacoce-Vila	unknown		include: 92"	480	170	•	•	•	•	90	A		
	4a38R	Lurudatu	Baucau	Venacoce	Venacoce	unknown		19	140	25	•	•	•	•	90	A		
	4a38R	MAMILAMA IROBU	Baucau	Baucau	WUUI	Before 1970		include: 75"	35	13	•	•	•	•	70	A		
	4a38R	HAEZELA	Baucau	Venacole	WU LANA	2000s	2008	145	20	25	•	•	•	•	100	A	A100	
	4a38R	Lopetigul II	Baucau	Bogasu	Lurakole	Before 1970		include: 129"	347	227	•	•	•	•	70	A		
4a38R7	Lob Gale	Baucau	Laga	ATELARI	Before 1970		168	70	230	•	•	•	•	90	A	A100		
4a38R8	Gabai	Baucau	Venacoce	Unakuri	Before 1970		25	25	20	•	•	•	•	70	A			
Bobonaro	1e15S	HAELEOU	Bobonaro	Mafeno	RITABOU	2000s		364	345	103	•	•	•	•	100	A	A100	
	1e15S	MALIMU II	Bobonaro	Mafeno	TAPO MEMO	1980s	2012	1700	1500	338	•	•	•	•	100	A	A100	
	1e15S	MANCO	Bobonaro	Culaco	MILIGO	1990s	2004	208	203	203	•	•	•	•	100	A	A100	
	1e15R	DAE	Bobonaro	Mafeno	RITABOU	unknown		31	72	50	•	•	•	•	70	A		
	1e28R	PAIELO	Bobonaro	Mafeno	RITABOU	unknown		60	78	44	•	•	•	•	70	A	#60	
	1e28R	RIFASU GADIN	Bobonaro	Mafeno	RITABOU	unknown		2	70	21	•	•	•	•	70	A		
	1e28R	CIBOH	Bobonaro	Mafeno	TAPO MEMO	2000s	2012	include: 6"	98	50	•	•	•	•	100	A		
	1e28R	MUNARA	Bobonaro	Bobonaro	TAPO MEMO	1990s	2004	227	225	78	•	•	•	•	80	A	A100	
	1e28R	BUGAS	Bobonaro	Bobonaro	TEBAGUI	2000s	2012	12	30	50	•	•	•	•	90	A		
	1e38R1	MUAU	Bobonaro	Mafeno	RITABOU	unknown		284	69	25	•	•	•	•	80	A	A100	
Coralima	2b28C	LOMEA	Coralima	Susi	BECCO	1980s		158	560	156	•	•	•	•	100	A	A100	
	2b38R	MOLEA II	Coralima	Zuandi	RAMERA	1990s		57	75	444	•	•	•	•	80	A	#60	
DI	1a15S	Lodokoku	DI	Dau Abbon	Cocoro	1970s		10	75	20	•	•	•	•	90	A		
	1a38R1	Hem	DI	Crudo Rai II	Hem	2000s	2001	38	50	50	•	•	•	•	90	A		
Ermera	1d15S	LAUJA	Ermera	Ermera	LAUJA	1980s	2012	129	2	25	•	•	•	•	80	A	A100	
	1d15S	GIENO	Ermera	Ermera	LAUJA	1980s		25	2	25	•	•	•	•	90	A		
	1d25S	SIRUI	Ermera	Atube	LAUDONU	Before 1970s		100	15	46	•	•	•	•	100	A	A100	
	1d38R	MERRIPULI	Ermera	Atube	LAUDONU	Before 1970s		11	46	28	•	•	•	•	70	A		
	1d38R	ABEJ	Ermera	Atube	LAUDONU	Before 1970s		include: 3"	180	•	•	•	•	•	70	A		
1d38R	MANUGUA	Ermera	Haklo	AIELO	Before 1970s		16	72	50	•	•	•	•	90	A			
Lautem	0a38R	HABERE	Lautem	Ikamar	TIKULO	2000s	2007	156	180	110	•	•	•	•	80	A	A100	
	0a38R	AFUNBERE	Lautem	Ikamar	ILIONARI	Before 1970		14	20	15	•	•	•	•	70	A		
	0a38R	VENOSI	Lautem	Ikamar	ILIONARI	Before 1970		include: 5"	80	38	•	•	•	•	100	A	A100	
	0a38R	FAHEBERE	Lautem	Ikamar	ILIONARI	Before 1970		include: 6"	45	37	•	•	•	•	80	A		
	0a38R	ROFO	Lautem	Ikamar	AUEBERE	Before 1970		4	14	17	•	•	•	•	70	A		
	0a38R	HOCARA	Lautem	Lautem	SERELAU	Before 1970		17	100	60	•	•	•	•	90	A		
	0a38R	IPANEN	Lautem	Luro	LURO	Before 1970		4	15	15	•	•	•	•	90	A		
	0a38R	ADOKERE	Lautem	Luro	LURO	Before 1970		3	35	60	•	•	•	•	90	A		
	0a38R	AMAHARA	Lautem	Luro	LURO	Before 1970		141	35	35	•	•	•	•	100	A	A100	
	0a38R	MAURUI	Lautem	Luro	KOTAMURU	Before 1970		include: 10"	9	12	•	•	•	•	90	A		

Table1-3-3 Long List (2/2)

District	Ref. No.	Scheme	District	Subdis.	Sect.	Scheme history		Actual Area(hect)	Original Area(hect)	House hold	Problem				Point	Evaluation	Priority with resources	
						Cons. y	Rehab. y				Short of water/ Obstr. of water	Path of water not keeping water for	Damage of slu	Flood/ditch			≥ 40ha	≥ 20ha
Liqigá	1c-2S	GICU RELELO	Liqigá	Maubara	GICU	1980s	2011	157	477	457	•	•	•	•	70	A	A100	
	1e-6TR	BAMEBAR	Liqigá	Maubara	LEDELA	Before 1970		27	30	150	•	•	•	•	90	A	A100	
Meraulo	3e-4S	NALAJURUM	Meraulo	MANAURUO	ALUJ	Before 1970	2009	101	150	250	•	•	•	•	100	A	A100	
	3e-4ER	REBUKED	Meraulo	LACLO	UNA KADJAK	Before 1970		20	60	46	•	•	•	•	90	A	A100	
	3e-4ER	MALOFIK	Meraulo	LACLO	LACO MESAC	Before 1970		51	200	70	•	•	•	•	70	A	A100	#50
	3e-5TR	LAMEFA	Meraulo	Laco	LACO MESAC	Before 1970	2011	15	25	20	•	•	•	•	90	A	A100	
	3e-5ER	HABUJONMAN (Lac Ina)	Meraulo	LACLO	LACO MESAC	Before 1970		15	100	40	•	•	•	•	90	A	A100	
	3e-5ER	AFANDU	Meraulo	LACLO	LACO MESAC	Before 1970		80	50	15	•	•	•	•	90	A	A100	#50
	3e-5ER	PONTE OKOS SAU	Meraulo	MANAURUO	SAU	Before 1970	2004	120	50	70	•	•	•	•	100	A	A100	
Viqueque	5e-2C	UARDIARI I	Viqueque	Widai	MANHICI	1990s		1030	86	112	•	•	•	•	90	A	A100	
	5e-3C	UARDIARI II	Viqueque	Widai	MANHICI	1990s		include 2"	51	65	•	•	•	•	80	A	A100	
	5e-4C	UARDIARI III	Viqueque	Uikuri	AFALICAI ULIMAE	2010s	2011	include 2"	1,400	6,900	•	•	•	•	80	A	A100	
	5e-7S	SAKETO	Viqueque	Widai	MANHICI	1990s		412	86	112	•	•	•	•	90	A	A100	
	5e-8S	BIBUJU	Viqueque	Ocoo	UNGEIA	2000s		50	109	396	•	•	•	•	90	A	A100	#50
Viqueque	5e-2ER	BARRODIO	Viqueque	Widai	BARBUJU	2000s		40	80	68	•	•	•	•	90	A	A100	
	5e-3ER	FURDUU	Viqueque	Ocoo	UARDIARI	1990s		39	34	78	•	•	•	•	80	A	A100	
Oecusse	7e-1C	ROMO	Oecusse	Pante Mesacor	CUNIA	1980s	2007	37	15	100	•	•	•	•	90	A	A100	

-Districts of Aileu and Ermera, which are located in mountainous area, have high ratio of the rank A compared with over districts ratio of the rank A. However, the orders of total irrigation areas are 12th and 10th of 13 districts. Dili district has the smallest area and number of the irrigation schemes.

- Out of those districts Ainara, Covalima, Manatuto, Manufahi, Viqueque where located in low-lying plane area in the southern country, districts of Ainara, Cova Lima and Manufahi are implementing large scale irrigation rehabilitation projects by MAF. These projects are included in the rank A which surveyed in inventory survey (referred to the Table 1-3-4).

- Rank A in Oecusse includes the MAF’s irrigation projects as mentioned above (referred to the Table 1-3-4). Ratio of the rank C in Oecusse is comparatively high. Reason is considered that water source of these schemes are supplied from not direct intake from river but spring, therefore, intake facility is comparatively functional and stable.

Table 1-3-4 Relation with Evaluated Irrigation Schemes and Implementing Projects by MAF

District	Reference No.*	Name of irrigation scheme	Progress
Ainara	2-c-1S	Raibere	Under construction
Ainara	2-c-5TR ,10TR	Oebaba	Under construction
Baucau	4-a-3S	Seiçal (a part of Watuwa/ Samalari)	Study (basic design)
Bobonaro	1-e-6S	Maliana II	Study (basic design)
Cova Lima	2-b-2TC	Culuam /Lomea II	Under construction
Viqueque	5-a-2TC ,3TC ,4TC	Bebui	Completion
Viqueque	5-a-7S	Saketo	Study (basic design))
Lautém	6-a-10TR	Vensoi	Study (basic design)
Baucau	—	Bluto	Under construction (JICA:G/A)

Remarks: Reference No. shows the irrigation scheme number indicated in the inventory survey.

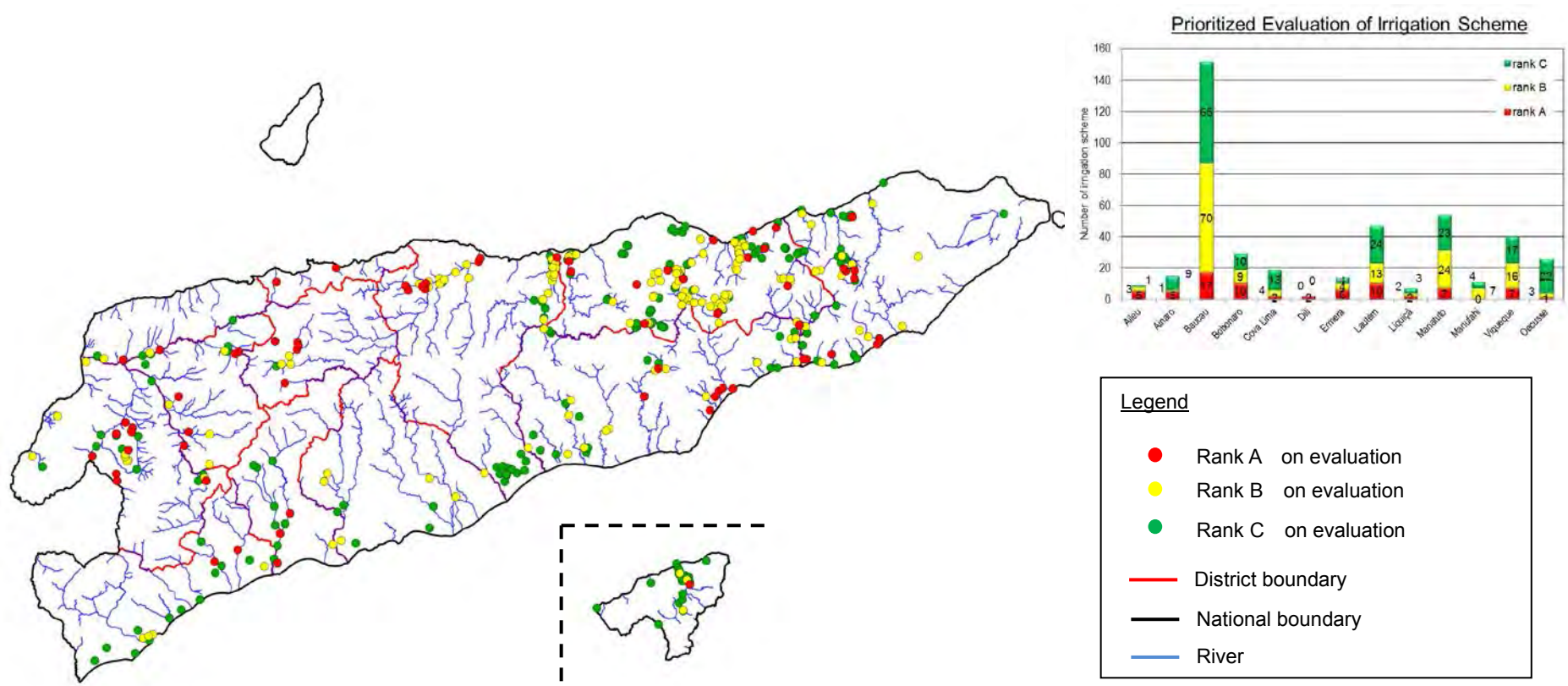


Figure 1-3-1 Location of Irrigation Scheme on Long List

1-3-3 Short List of Candidate Irrigation Scheme

(1) Screening by irrigation area for long list

74 of cited irrigation scheme in long list are screened for the commercial rice production area and the subsistent farming area for increasing rice production. In the both of screening, the area of irrigation scheme is evaluated as indicator. The indicator of area therefore is defined to 100 ha and 50 ha, and irrigation schemes are classified based on them as short list. (More than 50 ha are targeted on short list at the view point of the project impact)

A100: Scheme which is classified as the rank A, and irrigation area size is 100 ha or up.

⇒ **Candidate for commercial rice production area**

A50 : Scheme which is classified as the rank A, and irrigation area size is from 50 ha to 100 ha.

⇒ **Candidate for subsistent farming area**

A100 is 29 schemes and A50 is 6 schemes, which amount to 35 schemes as candidates. Table 1-3-5 shows the candidates of irrigation scheme of each district, and Figure 1-3-2 shows the location of them.

Table 1-3-5 Candidates Irrigation Scheme by Area Size

District	Ref. No.	Scheme	District	Sub-district	Suez	Scheme history		Actual Area(ha)	Original Area(ha)	House hold	Pattern				Part	Evaluation	Priority with area size	
						Cons.L.y	Rehab.y				Short of water / Cusec / number	Path of water and keeping under bar.	Damage of silt	Flood/direct			≥100ha	≥50ha
Ainaro	1a-25	FABUGOSA	Ainaro	Ainaro	FABUGOSA	1980s	2013	54	50	36	•	•	•	•	90	A		A50
	2a-45	RMBERE	Ainaro	Halo-Udo	LEDUMA	2010s		101	245	287	•	•	•	•	90	A	A100	
	2a-5R	KAKEJIAKU	Ainaro	Ainaro	CASSA	2010s		288	629	350	•	•	•	•	90	A	A100	
	2a-5RR	BOMUK	Ainaro	Halo-Udo	LEDUMA	unknown		include "5"	900	300	•	•	•	•	90	A	A100	
	2a-11TR	AIDMIAIRAN	Ainaro	Halo-Udo	LEDUMA	2010s		include "1"	245	287	•	•	•	•	90	A	A100	
Baucau	4a-3E	SEKALDOWN (SOSGEGE)	Baucau	Baucau	SEKALDOWN DE CIMA	1990s		207	540	230	•	•	•	•	100	A	A100	
	4a-4TR	TBA LAH	Baucau	Quelice	LASOIRAJ DE CIMA	unknown		113	120	80	•	•	•	•	80	A	A100	
	4a-2WR	UNIMBA	Baucau	Quelice	LASOIRAJ DE CIMA	unknown		include "24"	74	80	•	•	•	•	80	A	A100	
	4a-3RR	BANFU	Baucau	Laga	SAMALAS	unknown		100	30	162	•	•	•	•	80	A	A100	
	4a-4TR	WUOLILALEA	Baucau	Baucau	GAFONU	2010s		149	80	51	•	•	•	•	70	A	A100	
	4a-10RR	HAEGLALA	Baucau	Venabé	WU LAHA	2000s	2008	145	20	25	•	•	•	•	100	A	A100	
	4a-10b7	Lobo-Gala	Baucau	Laga	ANEIAR	Before 1970		168	70	230	•	•	•	•	90	A	A100	
Dorlicoro	1a-5S	HALECOU	Dorlicoro	Midiana	REBOU	2000s		364	345	103	•	•	•	•	100	A	A100	
	1a-6S	MAIMANA II	Dorlicoro	Midiana	TAPO MEMO	1980s	2012	1700	1,500	338	•	•	•	•	100	A	A100	
	1a-8S	MARCO	Dorlicoro	Cudico	MURGO	1990s	2004	208	325	203	•	•	•	•	100	A	A100	
	1a-2RR	PAIELO	Dorlicoro	Midiana	REBOU	unknown		60	78	44	•	•	•	•	70	A		A50
	1a-2RR	NUNURA	Dorlicoro	Dorlicoro	TAPO MEMO	1990s	2004	227	225	78	•	•	•	•	80	A	A100	
	1a-10d1	MULAU	Dorlicoro	Midiana	REBOU	unknown		284	69	25	•	•	•	•	80	A	A100	
Coralima	2b-2RC	LOMEA	Coralima	Sua	BECCO	1980s		158	560	156	•	•	•	•	100	A	A100	
	2b-3RR	MOLA II	Coralima	Zunabé	RUMER	1990s		57	75	444	•	•	•	•	80	A		A50
Ermera	1a-4S	LAUALA	Ermera	Ermera	LAUALA	1980s	2012	129	2	25	•	•	•	•	80	A	A100	
	1a-7S	SIRUI	Ermera	Atahe	LAUBONU	Before 1970s		100	15	46	•	•	•	•	100	A	A100	
Lautem	8a-5RR	RANDEE	Lautem	Maner	TEBLO	2000s	2007	156	180	110	•	•	•	•	80	A	A100	
	8a-6RR	VENCOSI	Lautem	Maner	RIOMARI	Before 1970		include "5"	80	38	•	•	•	•	100	A	A100	
	8a-6RR	AMAIHRA	Lautem	Luro	LURO	Before 1970		141	35	35	•	•	•	•	100	A	A100	
Lepapa	1a-2S	GICU HOLELO	Lepapa	Mudama	GICU	1980s	2011	157	477	457	•	•	•	•	70	A	A100	
Mota'ulu	3a-4S	MAIAHUN	Mota'ulu	MANARUO	ARHU	Before 1970	2009	101	150	250	•	•	•	•	100	A	A100	
	3a-4RR	MAICROK (Mur-Motok + Boescha)	Mota'ulu	LACLO	LACO MESAC	Before 1970		51	200	70	•	•	•	•	70	A		A50
	3a-5RR	AROU	Mota'ulu	LACLO	LACO MESAC	Before 1970		80	50	15	•	•	•	•	90	A		A50
	3a-5RR	PONIC OKLOS SAU	Mota'ulu	MANARUO	SAU	Before 1970	2004	120	50	70	•	•	•	•	100	A	A100	
Viqueque	5a-2RC	UNUOLARI I	Viqueque	Widai	NANHOI	1980s		1030	86	112	•	•	•	•	90	A	A100	
	5a-3RC	UNUOLARI II	Viqueque	Widai	NANHOI	1990s		include "2"	51	65	•	•	•	•	80	A	A100	
	5a-4RC	UNUOLARI III	Viqueque	Uakiri	AFALOKAI ULWAME	2010s	2011	include "2"	1,400	6,900	•	•	•	•	80	A	A100	
	5a-7S	SAKETO	Viqueque	Widai	NANHOI	1990s		412	86	112	•	•	•	•	90	A	A100	
	5a-8S	BINALIU	Viqueque	Ossa	UAGEIN	2000s		50	109	396	•	•	•	•	90	A		A50

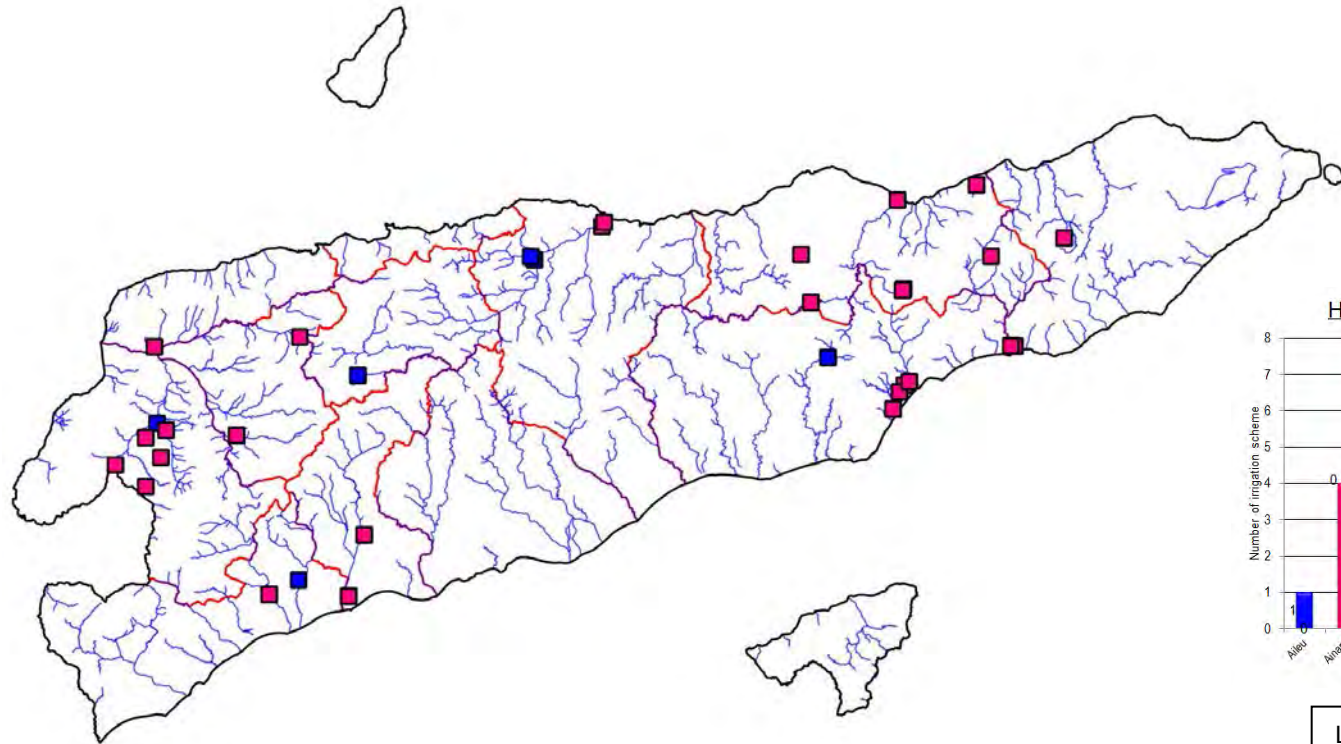
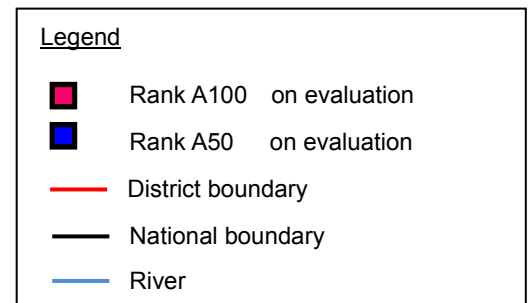
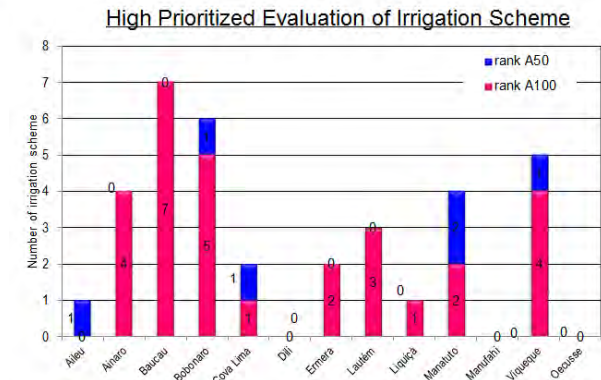


Figure 1-3-2 Candidates Irrigation Scheme by Area Size



Remarks: A100 shows that the irrigation area is more than 100ha of Rank A. A50 shows that the irrigation area is below 100ha to 50 ha of Rank A. Refer to 1-3-3 (1) for detail.

(2) Arrangement of short list

A short list is arranged by screening of the 35 irrigation schemes in the long list. The implemented or on-going projects by MAF are excluded in the evaluation (refer to table 1-3-4). In principle, the projects by MAF is excluded as well, but the supplemental or interactive impact indirectly to their project could be taken into consideration as targeted irrigation scheme. In addition, evaluation in order to make short list takes into account topographic and environmental situation. As a result of evaluation, 11 schemes as "Candidate for commercial rice production area" and "6 schemes as Candidate for subsistent farming area", 17 areas in total are selected (the short list).

Table 1-3-6 Screening of the Candidate for Priority Project Areas

Legend: ⊙; Candidate priority area for Commercial Rice Production Area

○; Candidate priority area for Subsistent Farming Area

District	Name of scheme	Reference #	A100	A50	Area (ha)	Evaluation	Reason of evaluation
Aileu	FATUBOSA	1-b-2S		•	54	○	Scheme suffers from insufficient intake water, not controlled flood intrusion because of no gates. This scheme is classified as a candidate for subsistent farming area, but, evaluated to be low priority because possible rehabilitation is small scale, only put on gate.
Ainaro	RAIBERE	2-c-1S	•		101	—	Scheme is excluded from candidate, because it is under construction by MAF.
	BONU(K)Oebaba)	2-c-10TR	•				
	KAKEULAKU(Oeba ba)	2-c-5TR	•		288	—	Scheme is excluded from candidate, because it is under construction by MAF.
	AIDAKLARAN	2-c-11TR	•				
Baucau	SEICAL DOWN	4-a-3S	•		207	—	Scheme is excluded from candidate, because it is under studying for rehabilitation works by MAF. (included 10 irrigation scheme feasibility study)
	TIBA LARI	4-a-24TR	•		113	○ (as subsistent farming area)	Although those schemes are selected as the candidate for local commercial rice production area, their locations are in middle mountainous area geographically. Hence they are suitable to evaluate as candidate for subsistent farming area.
	UAIDABA	4-a-25TR	•				
	BATAFU	4-a-30TR	•		100	⊙	Those schemes are evaluated as candidate for local commercial rice production area. (Reference # of 74TR and 110TR is located near the national road)
	WAIOLI-LALEA	4-a-74TR	•		149	⊙	
	HAEQALA	4-a-110TR	•		145	⊙	
	Lo'o-Gata	4-a-Add-7	•		168	⊙	
Bobonaro	HALECOU	1-e-5S	•		364	⊙	Scheme is evaluated as candidate for local commercial rice production area.
	MALIANA II	1-e-6S	•		1,700	—	Scheme is excluded from candidate, because it is under studying for rehabilitation works by MAF. (included 10 irrigation

District	Name of scheme	Reference #	A100	A50	Area (ha)	Evaluation	Reason of evaluation
							scheme feasibility study)
	MARCO	1-e-8S	•		208	⊙	Scheme is evaluated as candidate for local commercial rice production area.
	PAILELO	1-e-20TR		•	60	—	Although scheme is selected as a candidate for subsistent farming area, the location is near the Maliana area where it is considered to be the local commercial rice production area (rice bowl area). Hence scheme is excluded from a candidate for subsistent farming area.
	NUNURA	1-e-23TR	•		227	⊙	Schemes are evaluated as the candidate for local commercial rice production area.
	MULA'U	1-e-Add-1	•		284	⊙	
Cova Lima	LOMEA(Culuam/Lo meall)	2-b-2TC	•		158	—	Scheme is excluded from a candidate, because it is under construction by MAF.
	MOLA II	2-b-13TR		•	57	—	Although scheme is selected as a candidate for subsistent farming area, the location is within the marketing area in Covalima (rice bowl area). Hence, scheme is excluded from subsistent farming area
Ermera	LAUALA	1-d-4S	•		129	—	Although schemes are selected as local commercial rice production area due to the area size, they are located geographically in middle mountainous area apart from the marketing range. Hence these are excluded from candidate for local commercial rice production area.
	SIRUI	1-d-7S	•		100	—	
Lautém	IRABERE	6-a-5TR	•		156	—	
	VENOSI	6-a-10TR	•			—	
	AMAHIRA	6-a-49TR	•		141	—	
Liquiça	GICU IRLELO	1-c-2S	•		157	—	
Manatuto	MALARAHUN	3-a-4S	•		101	⊙	Schemes are evaluated as candidate for local commercial rice production area.
	PONTE OKOSSAU	3-a-55TR	•		120	⊙	
	MALOROK	3-a-44TR		•	51	○	Schemes are evaluated as candidate for subsistent farming area.
	ARADU	3-a-53TR		•	80	○	
Viqueque	UATORA(I), (Bebui)	5-a-2TC	•		1,030	—	Headworks and main canal of these schemes are constructed completely by MAF. But, problem to remove sedimentation is still remained. Although flash gate is already installed, gate operation skill is not settled. To avoid miss operation, training is needed. This problem is not linked with the irrigation rehabilitation project. These schemes are excluded from the
	UATORA(II), (Bebui)	5-a-3TC	•			—	
	UATORA(III), (Bebui)	5-a-4TC	•			—	

District	Name of scheme	Reference #	A100	A50	Area (ha)	Evaluation	Reason of evaluation
							candidate.
	SAKETO (BELIA DOWN)	5-a-7S	•		412	◎	Although scheme is under studying for bank protection work by MAF (included in 10 irrigation scheme feasibility study), this service area suffers from difficult delivering water because the bed of secondary canal is located lower elevation than the paddy field. Irrigation water cannot be supplied to adjacent paddy field, although headworks and main canal is functional. The rehabilitation project in service area is not directly linked with the contents of MAFs project under studying, hence, this scheme is evaluated as a candidate for local commercial rice production area.
	BIKALIU	5-a-8S		•	50	◎	In this scheme, the weir was constructed by local contractor in 2011, but, it had broken by flood in the same year. The irrigation water cannot be taken. The service area becomes abundant currently. Urgent rehabilitation is needed. Scheme is evaluated as a candidate for subsistent farming area.

1-3-4 Selection of Priority Area

After the preparation of the short list, views of market development potential and paddy cropping potential are incorporated for the final selection of priority project areas.

(1) Evaluation of the candidate areas from the viewpoint of market development potential

Market development potential should be evaluated in the wide regional marketing ranges formed by the location of major city/ town and the marketplace in the districts and the countrywide road network. Candidate areas should be selected considering such potential in terms of regional rice market range. In the selection, it is important to study the market environment of whether the candidate area is located in the active rice market range. Accordingly, as the first approach, current regional rice market range is identified and its market development potential is evaluated.

Rice bargain is done in the regional rice market range. Nine (9) rice market ranges is identified in the country as the center of rice market, by a survey of the regional road network in and around rice bowl area, as shown in Table 1-3-7. Out of them, the Betano-Clacuc is not consistent with rice bowl area. So that, eight (8) market ranges are selected for further evaluation.

Five (5) indicators are prepared to assess the market development potential of the eight (8) regional rice market range (see Table 1-3-8). Each indicator has four levels, namely, from 3 point for the highest to 0 point of the lowest one.

Table 1-3-7 Expected Rice Market Range and Rice Bowl Area

District	Regional Rice Market Range	Consistency with Rice Bowl Area
Bobonaro	Maliana-Cailaco	•
Baucau	Vemasse	•
	Secar-Samalari-Laga	•
Covalima	Beco	•
Ainaro-Covalima	Cassa-Oebaba	•
Manufahi	Betano-Clacuc	—
Manatuto	Laclo	•
Viqueque	Uatolari-Uatocarabau	•
Oecusse	Tono	•

Table 1-3-8 Evaluation Indicators for Market Development Potential

Indicators	Evaluation method	Rating point (score)
1. Collection capacity of local rice	Collection capacity of local rice is dependent on the working rice mill. As the number of rice mill increase, its capacity is expected to be higher. The number of rice mill is assessed as the collection capacity which may indicate intensity of development potential of the regional market range.	<The number of rice mill> 3pt: from 9 to 11 2pt: 6 to 8 1pt: 3 to 5 0pt: 0 to 2
2. Scale of rice consumption in the market range	The amount of rice consumption is increased in proportion to the food consumption population in the market range. As the rice consumption is increased, rice market development potential becomes high. It is assessed based on the district population, since it is difficult to estimate exactly the population in the market range.	<Consumptive population (district population)> 3pt: from 100,001 to 120,000 2pt: 80,001 to 100,000 1pt: 60,001 to 80,000 0pt: 40,001 to 60,000
3. Price competitive advantage with import rice	Market price of the imported rice is fluctuated dependent on the transportation hours. As the marketplace is far from Dili, price competition of the local rice has higher advantage. It is assessed by the transportation hours from Dili to the marketplace located as the center of the market range.	<Transportation hours from Dili> 3pt: from 7.6 to 10.0 hours 2pt: 5.1 to 7.5 1pt: 2.6 to 5.0 0pt: 0.1 to 2.5
4. Geographical and social condition of the market range	Future market development potential is largely dependent on existing storehouse. It is assessed by surveying whether there is a storehouse in the market range.	<Existing storehouse> 1pt: Storehouse exists 0pt: No storehouse exists
5. Trading of local rice within the market range.	Local rice is directly traded in the marketplace and/or at the farm gate. Market development potential is considered to be high if there is the market range where selling and buying of local rice are active. Current trading scale of local rice is relatively assessed based on the interview survey with related sellers and traders in the marketplace	<Trading scale> 3pt: Relatively large 2pt: Relatively moderate 1pt: Relatively small 0pt: Relatively very small

Assessment of each regional market range is shown in Table 1-3-9.

Table 1-3-9 Assessment of Market Development Potential in the Regional Market Area

Indicators	1.	2.	3.	4.	5.	Market development potential		
	Collection	Local rice consumption	Price competition	Location condition	Trading of local rice	Total score	Assessment	
Regional market range	Rice mill(the number)	Consumptive population(district population)	Transportation hours from Dili	Existence of Storehouse	Trading scale (marketplace)			
Maliana-Cailaco (Bobonaro)	3pt (11)	2pt (92,049)	2pt (5.5 hours)	1pt (Exists)	3pt (Maliana)	14pt	A	High ↑ ↓ Small
Uatolari-Uatocarabau (Viqueque)	3pt (10)	1pt (70,036)	3pt (10.0)	1pt (Exists)	1pt (Viqueque)	12pt		
Tono (Oecusse)	2pt (8)*1	1pt (64,025)*2	3pt (9.0)*4	0pt (Not)	2pt (Tono)	11pt		
Secar-Samalari-Laga (Baucau)	2pt (8)	3pt (111,694)	1pt (4.5)	1pt (Exists)	3pt (Baucau)	11pt		
Laclo (Manatuto)	2pt (6)	0pt (42,742)	0pt (1.0)	1pt (Exists)	1pt (Manatuto)	5pt	B	
Vemassee (Baucau)	0pt (2)	3pt (111,694)	0pt (1.5)	0pt (Not)	1pt (Vemassee)	6pt		
Beco (Covalima)	0pt (1)	0pt (59,455)	2pt (7.0)	0pt (Not)	1pt (Suai)	3pt	C	
Betano-Clacuc (Manufahi)	0pt -	0pt (48,628)	2pt (6.0)	0pt (Not)	0pt (Same)	3pt		
Cassa-Oebaba (Ainaro-Covalima)	0pt -	0pt (59,175)*3	2pt (5.5)	0pt (Not)	0pt (Ainaro)	2pt		

Remark: *1: Tono (Oecusse); included private operation mobile 5 rice mill.

*2: Oecusse; excepted population of west Timor, although it might be probably included based on district location.

*3: Cassa-Oebaba; included only Ainaro's population based on the location and social conditions.

*4: Oecussi; included the time for customs clearance.

Note: District population comes from population census (2019). Related information was collected through the survey by the project team.

The evaluation of the market development potential of each market range is summarized as follows:

- The market range of the Maliana-Cailaco and the Secar-Samalari-Laga has relatively higher market development potential considering the evaluation of indicators such as the number rice mill, consumptive population and trading scale of local rice.
- Although the Uatolari-Uatocarabau and the Tono have relatively smaller potentials than those of the two market ranges mentioned above considering the both consumptive population and trading scale, although the indicator of the number of rice mill is the same level. On the other hand, price of local rice is competitive with imported one considering the longer transportation hours.
- The market ranges, Beco, Betano-Clacuc and Cassa-Oebaba, located in the southwest region have relatively smaller development potential than the others, considering the indicators such as less consumptive population and number of rice mill, and smaller trading scale.

(2) Evaluation of the candidate areas from the viewpoint of paddy cropping potential

Rice farming is generally developed in line with the national and district development direction. Paddy cropping potential is evaluated at the district level, not individual irrigation scheme level. In the evaluation, the targeted area should be taken into consideration in relation with "Rice Bowel Area" and "Commercial Rice Production Area". These relation and potential are evaluated by comparison between irrigation scheme listed on short list and "Rice Bowel Area" where they are five (5) areas comprised of Bobonaro, Baucau/Manatsuto, Ainaro/Covalima, Viqueque and Oecusse district.

Four indicators are designed for the assessment. Those indicators are the number of rice farmers, percentage of application of new farming technique recommended by MAF such as ICM and SRI, accessibility to the high quality seeds and the utilization of farm tractor. Same rating method is used as the assessment of market development potential, namely, from three (3) to zero (0) as shown in Table 1-3-10.

Table 1-3-10 Assessment Indicators for Local Commercial Rice Cropping Potential

Indicators	Evaluation method	Rating point (score)
1. The number of rice farmers	As the number of rice farmers increases, rice production potential becomes higher. Proportion of the number of paddy cropping farmhouse in the rice bowl area to the district's household is rated. As it is the larger, the potential might be higher.	<Proportion of paddy cropping farm household in the rice bowl area to the district's household (percent)> 3pt: from 64.0 to 78.9% 2pt: 49.0 to 63.9% 1pt: 34.0 to 48.9% 0pt: 19.0 to 33.9%
2. Application of MAF's recommended farming method (ICM/ SRI)	If there exist rice farmers and extension workers applying MAF's recommended farming method have higher motivation to paddy cultivation, production potential, increase of yield might be higher. Proportion of cropping area where MAF's recommended farming method to the district's paddy cropping area is estimated. As its proportion shows the higher percent, the production potential is considered to be higher.	<Proportion of the cropping area applied by MAF's recommended farming method (percent)> 3pt: from 9.1 to 12.0% 2pt: 6.1 to 9.0% 1pt: 3.1 to 6.0% 0pt: 0.1 to 3.0%
3. Easiness of access to the high quality seed	Seed production farmers groups are distributed in and around areas where paddy cultivation is active. If the areas have easy access to the seed, paddy production is expected to increase in quantity and quality. The number of seed production farmers groups to the 1,000 paddy cropping farmers is estimated. As the number is larger, access to the high quality seed becomes more easily.	<The number of seed production farmers groups to the 1,000 paddy cropping farmers> 3pt: from 6.1 to 8.0 2pt: 4.1 to 6.0 1pt: 2.1 to 4.0 0pt: 0.1~2.0
4. Utilization of farm tractor	Rice farmers generally face with the shortage problem of labor force. Using hand tractor could help to plow the fields for the peak season of labor force requirement. Cropping area might be expanded easily if the tractor would be useable. The number of hand tractor owned by one rice farm household is rated. As the number is the larger, cropping potential is the higher.	<The number of the tractor owned by one rice farm household> 3pt: form 0.76 to 1.00 tractors 2pt: 0.51 to 0.75 1pt: 0.26 to 0.50 0pt: 0.01 to 0.25

Note: Source of the used data is the NDAH, SoL and district directorate, and 2010 population census.

Paddy production potential in the rice bowl area is assessed by rating is as shown in Table 1-3-11.

Table 1-3-11 Assessment of Paddy Cropping Potential in the Rice Bowl Areas

Rice bowl area (related districts)	Major variety of paddy cropped	1. Proportion of paddy cropping farm household	2. Application of MAF's recommend farming method	3. The number of seed production farmers' groups per 1,000 rice farm household	4. The number of hand tractors per one rice farm household.	Paddy cropping potential	
						Total score	Assessment
BAUCAU / MANATUTO	IR64, Nakroma, Hybrid	1pt ----- (40.4%)	2pt ----- (7.0%)	3pt ----- (7.5)	1pt ----- (0.4unit)	7pts	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border-left: 1px dashed black; border-right: 1px dashed black; padding: 0 5px; margin-right: 5px;">A</div> <div style="text-align: center; margin-right: 5px;"> ↑ High </div> <div style="border-left: 1px dashed black; border-right: 1px dashed black; padding: 0 5px; margin-left: 5px;">B</div> <div style="text-align: center; margin-left: 5px;"> ↓ Small </div> </div>
BOBONARO	IR64, Nakroma, Ciharang	0pt ----- (30.9%)	3pt ----- (11.5%)	2pt ----- (5.9)	1pt ----- (0.5)	6pts	
AINARO / COVALIMA	IR64, Nakroma	0pt ----- (19.1%)	0pt ----- (0.8%)	1pt ----- (4.0)	3pt ----- (1.0)	4pts	
OECUSSI	Membramo	3pt ----- (78.0%)	1pt ----- (5.4%)	0pt ----- (0.4)	0pt ----- (0.2)	4pts	
VIQUEQUE	IR64, Red rice, Black rice	1pt ----- (42.6%)	0pt ----- (0.6%)	1pt ----- (2.2)	1pt ----- (0.5)	3pts	

Note: Estimation is based on the data/ information from NDAH, District Directorate and SoL, and Population Census 2010.

Evaluation result of the related districts with the rice bowl areas is summarized as follows.

- Looking at the comprehensive paddy cropping conditions in Baucau and Manatuto districts, the number of the rice farmers is relatively large compared with those in other districts and application intensity of MAF's recommended farming method is high. Access to the high quality seeds is also easier than the others since organizing the seed production farmers' groups are promoted in the districts. Those two districts have relatively large advantage.
- Farmers groups are organized in cooperation with extension workers in Bobonaro district. Farming applying ICM and the SRI is also promoted by the farmers groups. The farmers and extension workers are ready to receive new paddy cropping skill such as the ICM and the SRI. Considering the above, paddy cropping potential of the Baucau, Manatuto and Bobonaro districts is judged to be high.
- In the other three rice bowl areas, which are located in the four related districts, the cropping potentiality is relatively lower than that in the three high potential districts as mentioned above. In some areas of Viqueque and Oecusse districts, rice variety of Membramo and red/ black rice which Timorese are favorable to its taste are produced. Especially, red rice and black rice are sold in the major marketplace at higher price by from 20% to 50% than the normal rice. These are considered as the value added rice. From the market development viewpoints, they are considered to have high paddy cropping potential.

(3) Priority projects and selection of the priority projects areas

i) Priority project areas for the "Promotion project for commercial rice production in rice bowl area"

Of 11 Irrigation areas (irrigation schemes) selected as candidate in terms of market development potential and paddy cropping potential, are listed in Table 1-3-12, together with size of the area, the market development potential and the paddy cropping potential.

Table 1-3-12 Screening of the Priority Projects Areas for the Rice Bowl Area

District	Irrigation scheme (Irrigation area)	Reference number	Size of the Area (ha)	Ranking the size of the area	Market development potential	Paddy cropping potential	Remarks (Prioritized rank made by the district)
Baucau	BATAFU	4-a-30TR	100	11	A	A	
	WAIOLI-LALEA	4-a-74TR	149	7	-	A	
	HAEQALA	4-a-110TR	145	8	-	A	
	Lo'o-Gata	4-a-Add-7	168	6	-	A	
Bobonaro	HALECOU	1-e-5S	364	2	A	A	1st
	MARCO	1-e-8S	208	5	A	A	2nd
	NUNURA*1)	1-e-23TR	227	4	A	A	3rd
	MULA'U	1-e-Add-1	284	3	A	A	4th
Manatuto	MALARAHUN	3-a-4S	101	10	B	A	
	PONTE OKOSSAU	3-a-55TR	120	9	B	A	
Viqueque	SAKETO	5-a-7S	412	1	A	C	

Note *1) To go forward the priority project for the candidate irrigation scheme "NUNURA" in Bobonaro district, it is required to make agreement with Indonesia, since intake river is the international river bordered with Indonesia. MAF is developing the "10 irrigation Schemes and Preliminary Study for 15 Rivers", in which the Maliana II is listed as one of the project area for the irrigation rehabilitation project. Intake water is taken from the same international river. MAF requested the necessity of discussion to the Ministry of Foreign Affairs Cooperation, Indonesia in February 2013. But, no reply received yet. Discussion progress may influence the proceeding as the priority project candidate. Considering such political situation, the scheme is excluded from the selection.

The irrigation area size of the candidate priority projects in Bobonaro and Viqueque districts is relatively large. Especially, there are the plural irrigation schemes which cover more than 200 ha. In Bobonaro district, prior to the screening, an interview survey with the district staff was conducted to discuss the selection possibility and to conform the district's intention to prioritize to the four candidates. As the discussion result, prioritized ranking is made as shown in the Table 1-3-12 at remarks.

Selected priority project candidates were narrowed down based on the size of irrigation area, evaluation of the market development potential and the paddy cropping potential. As the overall evaluation, the following three irrigation schemes are selected as the propriety project areas for the "Promotion project for local commercial rice production in rice bowl area".

<Promotion project for local commercial rice production in rice bowl area>

- **Halecou irrigation scheme in Bobonaro district**
- **Saketo irrigation scheme in Viqueque district**

The candidate areas selected from the Bobonaro district are located mainly centering in the Maliana sub-districts. Those candidate areas may have high commercial rice production potential considering the various aspects of the size of irrigation area, future prospect of the market development and the paddy cropping as boundary development area in SDP. In addition to those areas, the large irrigation scheme is located in the Maliana sub-districts. Then, the group of such irrigation schemes may be considered as one of the priority project areas. So that, it aims to improve the paddy cropping and marketing condition of local commercial rice.

<Priority project for improving the local commercial rice processing and marketing system>

- **Group of the irrigation schemes in Bobonaro district**

ii) Priority project areas for the "Promotion project for strengthening food production in subsistent farming area"

Selected candidate areas (irrigation schemes) of the priority project for the Promotion project for strengthening food production in subsistent farming area are listed in the Table 1-3-6. To narrow the candidates down to one scheme, only one selection criteria whether irrigation water can be ensured is provided. Present situation of the water source is surveyed for each candidate, which is summarized in the Table 1-3-13.

Table 1-3-13 Priority Project Candidates for the Subsistent Farming Area

District	Irrigation scheme name	Reference number*	Area (ha)	Water source	Remark
Aileu	FATUBOSA	1-b-2S	54	Possible water source throughout the year (river and spring water)	There is no control gate. Problem is to control the intake flow, especially in flooding season. Based on the survey, possible solution is only to provide the gate. Provision of gate is considered to be the small scale rehabilitation project. Priority is lower than the other candidates
Baucau	TIBALARI	4-a-24TR	113	Very limited water flow in dry season	
	UAIDABA	4-a-25TR			
Manatuto	MALOROK	3-a-44TR	51	Very limited water flow in dry season	
	ARADU	3-a-53TR	80	The pond dried up	
Viqueque	BIKALIU	5-a-8S	50	Possible water source throughout the year (river and spring water)	Intake weir was constructed, but collapsed by the flood. Paddy fields are abandoned due to no intake water for paddy dropping. The scheme is needed to rehabilitate urgently.

Note:* Inventory survey

Based on the inventory survey, the water source of the FATUBOSA scheme in Aileu district and the BIKALIU scheme in Viqueque district is relatively stable. Both two irrigation schemes are preliminary selected as the candidate areas for priority projects. They are located in the mountainous areas, far from the main roads. For further consideration, present irrigation farming is observed as follows.

- As for the FATUBOSA of Aileu district, although it is hard to control the intake water due to the gate destroyed, intake itself is freely taken. Paddy is produced once per year. Small scale vegetable cropping and inland fishery are presently practiced.
- Concerning the BIKALIU of Viqueque district, paddy had been cultivated until 2011. Intake weir was constructed in 2011, but, it was destroyed by the flood in that year. Due to no water, paddy is not cultivated at present. Under the condition that small amount intake water can be ensured, vegetable and inland fishery are practiced in some limited area. Produced vegetable is sold to middle man.

Considering the prospect of generating the project effects and significance as the pilot project and urgency, the following scheme is selected.

<Promotion project for strengthening food production in subsistent farming area>

- **BIKALIU irrigation scheme in Viqueque district**

1-4 SELECTION OF THE PRIORITY PROJECTS

Based on the selection process as described above, the following five priority projects and projects areas are selected.

Production incentive stimulating supporting policy	Preparation of action plan for realizing the MAF paddy purchasing system
Productivity improvement supporting policy	Priority project areas
- Promotion project for local commercial rice production in rice bowl area	Halecou irrigation schemes in Bobonaro district Saketo irrigation scheme in Viqueque district
- Pilot project for improving the local commercial rice processing and marketing system	Group of the irrigation schemes in Bobonaro district
- Promotion project for strengthening food production in subsistent farming area	BIKALIU irrigation scheme in Viqueque district

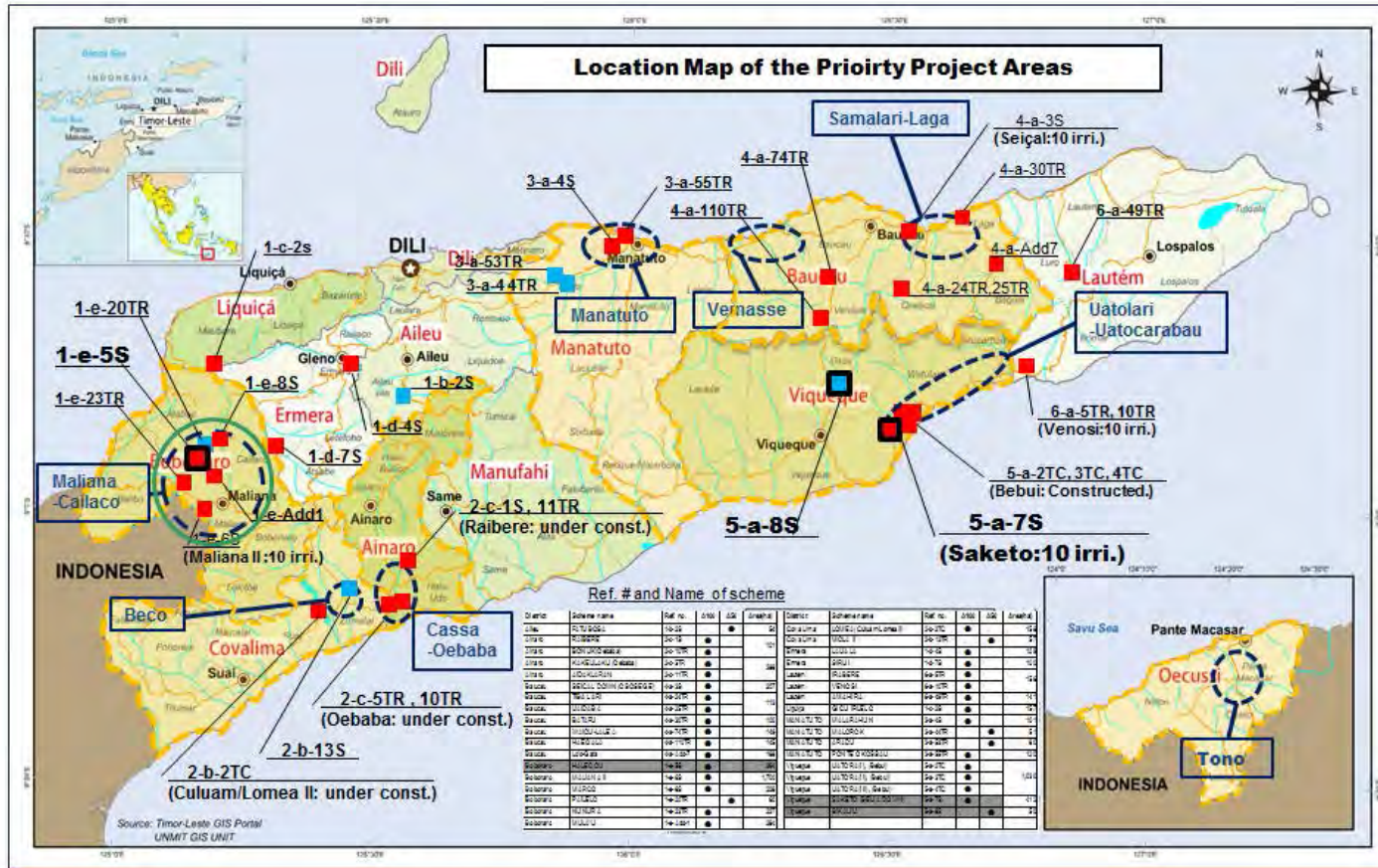
1-5 BASIC POLICY FOR PRIORITY PROJECT PREPARATION

Selected areas for priority project are based on the two policies, namely, “Productivity Improvement Supporting Policy” and “Production Incentive Stimulating Policy” as shown following table. “Productivity Improvement Supporting Policy” applies the program/project depending on feature of area. Selected priority areas have a high potential for the paddy cropping and market development as mentioned, therefore, they can become a model to expand the development process to other similar areas in Timor-Leste.

Table 1-5-1 Basic Policy of Action Plan for Priority Project

Priority Project	Development model	Development direction	Production Incentive Stimulating Policy		Productivity Improvement Supporting Policy		
			Tariff Policy	Paddy purchasing system	Irrigation	Paddy productivity	Processing & Marketing
1 Preparation of action plan for improving paddy purchasing system	Improvement model of paddy purchasing system	<i>Improve the paddy purchasing system so that rice farmers can expand paddy production.</i>		*			
2 Promotion project for local rice production in Halecou irrigation scheme in Bobonaro district	Local rice production/ market promotion model in rice market wide range area	<i>Provide production and market conditions so that rice farmers can move into commercial rice production.</i>		*	*	*	*
3 Promotion project for local rice production in Saketo irrigation scheme in Viqueque district	Local rice production/ market promotion model in remote area from large rice market	<i>Provide production and market conditions so that rice farmers can move into commercial rice production.</i>		*	*	*	*
4 Local rice market improvement project in Malliana wide area in Bobonaro district	Local rice market improvement model	<i>Strengthen local rice market channel through improving rice quality, realizing low cost supply chain and motivating rice farmers.</i>		*		*	*
5 Promotion project for strengthening food production in Bikaliu irrigation scheme in Viqueque district	Strengthening model for self sufficient agriculture	<i>Ensure food security in household level through strengthening food production and integrated farming.</i>			*	*	

* : Applied in the Priority Project



CHAPTER 2 FORMULATION OF THE ACTION PLAN FOR THE IMPROVEMENT OF THE PADDY PURCHASING SYSTEM

2-1 SITUATION OF THE PADDY PURCHASING BY MCIE

2-1-1 Current Situation of the Purchasing of Agriculture Produce by MCIE

MCIE targeted¹ paddy and maize and conducted the purchasing of agriculture produce in fiscal 2014. The plan of the purchasing amount and the purchasing price are shown below. The purchasing price from a rice farmer is US\$ 0.54 /kg, which is a unit sales price of the farmers. MCIE purchases the paddy from the collectors at US\$ 0.59 /kg, adding US\$ 0.05 /kg for the collecting fee of the collectors.

Table 2-1-1 Purchasing Plan of Agriculture Produce by MCIE in Fiscal 2014

Agriculture produce	Purchasing amount (ton)	Unit sales price of farmers (US\$/ton)	Unit purchasing price by MCIE (US\$/ton)	Purchasing budget (US\$)
Rice (Paddy)	2,400	540	590	1,416,000
Maize	78	310	340	26,520
Total	2,478	533	582	1,442,520

Source: MCIE

Actual purchased amount of paddy is 1,957 ton, which is 2.7 % of the total production of paddy in 2013, 84,085 ton. The purchase from farmers is conducted by nine companies and four cooperatives, which were selected by bidding². MCIE collects the purchased agriculture produce into warehouses in three places of the whole country, which are located in Dili, Maubisse and Maliana. The purchase doesn't care about the varieties of paddy. Every paddy, which is recognized as domestic rice, is purchased, regardless of varieties,

Purchased agriculture produce is applied for i) school feeding, ii) support for victims and iii) support for poor and needy people. The number of the staff for the purchasing of MCIE is shown in the next table. In terms of the quality of paddy, sampling inspection is conducted at the entrance of the warehouses but measuring equipment is not used for the inspection. The inspectors just check by their eyes whether the paddy is dried and the foreign matter is not many.

Table 2-1-2 Number of MCIE Staff for the Agriculture Produce Purchasing

Office/ Warehouse	Related staff including inspectors	Number of inspectors
Dili	21	4
Maubisse	10	2
Maliana	4	1
Total	35	7

Source: MCIE

2-1-2 Related Role to the Paddy Purchasing of KONSSANTIL

It is decided that related agencies are to discuss issues of the paddy purchasing; however, practical consultation has not yet conducted so far. The purchasing plan is made substantially by MCIE. A rice technical committee³, established in KONSSANTIL in November 2014, is going to have practical discussion on the paddy purchasing. But staff in charge of the committee in the related agencies was not yet fixed and the committee did not yet finish the formulation of their action plan⁴ in 2015 as of

¹ Red bean was purchased other than rice and maize in 2013. Coconut oil was used to be purchased before 2009.

² 24 companies and 30 cooperatives tendered for the bidding.

³ KONSSANTIL has two technical committees; one is the rice technical committee and another is school feeding technical committee.

⁴ KONSSANTIL plans to hold a working-level meeting every month and a minister-level meeting every other month.

the second meeting in January 2015.

2-1-3 Problems to Be Solved of the Paddy Purchasing by MCIE

Problems to be solved of the existing paddy purchase by MCIE are arranged in the following three points. As for the high purchasing price of ②, the price seems to be set high though it was reviewed widely in 2014.

- ① The purchasing volume is small and rice producers who can use the purchasing system are low.
- ② The purchasing price is comparatively high, which makes rice farmers who cannot use the purchasing system expect high-price sales. But the actual sales price is lower than the expecting price, which does not create motivation to increase the production.
- ③ There is no motivation to improve the quality of paddy since the existing system does not grade them and buys quality paddy and shoddy paddy at the same price.

MCIE established a new independent agency in 2015 for the purchasing of domestic agriculture produce and import of foreign agriculture produce. The new agency, called National Logistic Center (NLC), had succeeded to the purchasing system and the import system of MCIE, and started their business on the purchasing of agriculture produce in fiscal 2015.

2-2 IMPROVEMENT PLAN OF THE PADDY PURCHASING SYSTEM

2-2-1 Increasing the Purchasing Volume and Improving the Quality of Paddy

As the production incentive stimulating policy, which increases production incentive of rice farmers through securing the sales destination of domestic rice, it is necessary for increasing the volume of the paddy purchasing until the amount that the rice producers want to sell. The rice producers can increase their price competition power against the imported rice through improvement of the productivity and reduction of the production cost while the sales destination is secured by the policy of paddy purchasing.

On the other hand, not only price reduction of paddy but quality improvement is also one of the essentials for gaining the competition power against the imported rice. The existing purchasing system scarcely creates the producers' incentive to improve the quality of paddy since all produce is purchased at the same price regardless of the quality. Therefore, the improvement of paddy purchasing system is going to introduce "quality brand", which buys quality paddy at higher price than ordinary price.

2-2-2 Points of the Improvement

Points of the improvement of the paddy purchasing system are arranged in the following table. The existing system of the agriculture produce purchasing by MCIE have aimed to promote the distribution of the domestic agriculture produce. In addition to the distributional promotion of rice, the improvement of the paddy purchasing system is going to aim "the production promotion" at the same time.

Table 2-2-1 Points of the Improvement of the Paddy Purchasing System

	Current System	Improved System
(1) Core Objective	Alleviation of consumer price escalation and distribution to school feeding, disaster victims and vulnerable groups	Promotion of rice production to a certain level by creating incentives for rice farmers in addition to the left objective
(2) Products	Imported rice, local paddy, maize (beans, coconut oil in 2008)	Quality local paddy only
(3) Scale	2,000 mt of paddy and 78 mt of maize in 2014	Peak volume of the purchasing is 24,000 MT/year

	Current System	Improved System
(4) Set of the paddy price	Set by MCIE, considering limited production cost [\$ 0.54/kg in 2014]	Set by KONSSANTIL, considering the market price and the production cost [\$ 0.50/kg ?]
(5) Operation Body	MCIE - NLC (National Logistic Center)	Collaboration between MAF and MCIE - NLC
(6) Outflow of Rice	School feeding, Disaster victims, Community charity	School feeding, Strategic reserve, Disaster victims, Community charity, etc.
(7) Quality Control	- No quality standard - All paddy is treated as the same way	- Introduction of quality standards on paddy and milled rice - Introduction of quality brand with a premium price
(8) Inspection System	MCIE inspectors check paddy only by their eyes	Should be conducted by trained inspectors with the introduction of measuring instruments
(9) Specific Varieties	None	MAF recommended varieties with seed procurement and distribution
(10) Storage Period	Quarterly evaluation of the amount of storage	Decided by the Rice Technical Committee of KONSSANTIL
(11) Storage/ Milling	Consigns to private rice millers without inspection	Consigns to private rice millers with appropriate inspection

Source: JICA Study Team

2-2-3 Collaboration Policy of MAF and MCIE

The purpose of this improvement is the implementation of Government's purchasing of paddy for the securing the sales destination of the domestic rice from the view point of the production promotion of rice. The purchasing policy of agriculture produce is in charge of MCIE since there is a demarcation between MAF and MCIE; MAF is in charge of the agriculture production and MCIE is in charge of the distribution of the agriculture produce. However, it is necessary for the realization of the production promotion to consider sales and distributional activities as well as production activities, which is the destination of agriculture produce, because the production and the distribution is one activity. We cannot find a way of the production promotion and the distribution promotion until considering the production and the distribution together in accordance with actual activities of the producers and the distributors.

Organizational reform, such as jurisdiction review of MAF/ MCIE or review of the competent authorities of NLC, is considered as a way, from the view point of comprehensive promotion of the production and the distribution. However, MAF has to find a countermeasure as soon as possible to stop the current trend in decreasing of rice planted area. The improvement of the paddy purchasing system is an urgent matter. MAF has to start possible countermeasures promptly under the existing system/ organization. MAF will proceed necessary improvement, applying the existing purchasing system of MCIE; that is, cooperation between MAF and MCIE is a realistic measure.

2-2-4 Problems to Be Solved for the System Improvement

Problems to be overcome for the improvement of the paddy purchasing system and those countermeasures are summarised into the following three points.

- ① Cooperation between MAF and MCIE: MAF's understanding of the Agriculture Master Plan and application of KONSSANTIL
- ② Improvement of domestic milling capacity: construction of rice centers, supported by donors
- ③ Business promotion of rice milling and distribution: promotion and strengthening of milling and distribution industries on Public Private Partnership

(1) Cooperation between MAF and MCIE

A lot of adjustment and capacity building of MAF staff are required in the practical cooperation

though it is realistic that the improvement of the paddy purchase is implemented as a cooperation policy between MAF and MCIE. For example, MCIE will request MAF to provide related information of rice production for making the purchasing plan. It is a problem to be solved for MAF to provide such information properly and promptly.

MCIE has conducted the paddy purchase so far. That is a major task of the Ministry. Therefore, MAF adopts a clear-cut attitude that the paddy purchasing is a job of MCIE. After this, whether MAF will recognize the importance of the paddy purchase through the understanding of the Agriculture Master Plan holds the key to the success of the cooperation between the two Ministries. Meetings of KONSSANTIL can be applied for discussion with MCIE and the provision of information on rice production.

(2) Improvement of the domestic milling capacity

The maximum volume of the paddy purchasing a year by MCIE is 3,700 ton in 2009. MCIE recognizes the reason why the purchasing volume has been held low so far is due to the low milling capacity⁵ of the domestic millers⁶. As of March 2015, paddy that was harvested in three years ago remains in warehouses of MCIE without milling though they newly purchased about 2,000 ton of paddy in 2014 above mentioned. It is considered that this situation shows large-scale milling business has not grown up under the stagnancy of production and distribution of domestic rice.

Hence, MCIE considers that constructions of facilities that have high milling capacity are necessary for the increase of the purchasing amount. They have a plan in 2015, which will set up large-scale rice centers in three places in the whole country, where are Maliana, Manatuto and Viqueque, applying support of China. The construction of those rice centers will be possible by their own budget of the country; however, it is considered to be a wise policy to apply a support of donors including the know-how to operate those facilities since large-scale milling business does not exist now in the country.

(3) Promotion of milling and distribution business

In the improvement of the paddy purchasing system, though wide increase is intended, the purchase by the Government is a tentative policy not a permanent one. The purchasing volume is going to be escalated and reach the peak, and phase down until the minimum level after that. During the period of the implementation of the Government purchasing, the production sector and the processing and distribution sector have to make their big-scaled business feasible through the increase of the productivity and the quality and cost reduction of the production sector, and the increase of the efficiency and the technique of the milling and the distribution of the processing and the distribution sector. In this growing process of the millers and the distributors, which will succeed the milling and the distribution after the peak, the withdrawal strategy of the paddy purchasing system is that the purchasing by the Government will be transferred gradually to the private sector.

In order to achieve the withdraw strategy, it is required to promote the future transfer of the milling and the distribution to the private sector through applying of human and material resources in the private sector as much as possible even if the public sector starts the paddy purchasing project. As a project model of the promotion of rice milling and distribution in public-private partnership, the strengthening project of the domestic commercial rice distribution, which is proposed as one of the priority projects, can be raised. The model project is planned to be conducted through supporting local

⁵ This milling capacity is measured by the milling amount per specific period.

⁶ The low milling capacity is considered to be the bottleneck of the paddy purchasing project since there are only a few milling companies which can accept an order of paddy in hundreds ton in the whole country.

millers who have will to expand their business, and bring up the successors of the paddy purchasing by OJT.

2-3 IMPROVEMENT TACTICS OF THE PADDY PURCHASING SYSTEM

2-3-1 Improvement of the Paddy Purchasing System

This clause proposes the improvement plan of the paddy purchasing system, now conducted by MCIE, from the view point of the promotion of the rice production. The outline of the improvement plan is shown in the next table and the improvement points are described below. Moreover, it is necessary for enough discussion with MCIE before the beginning of the activities since the improvement plan was formulated before the commencement of their collaboration.

Table 2-3-1 Improvement of the Paddy Purchasing System

Items	Contents	
<u>1) Objectives</u>	a) To improve the existing purchase system to increase rice production through the discussion in the Rice Technical Committee of KONSSANTIL b) To lift the cultivating motivation of rice farmers and the commodity value of paddy through purchasing the produce of the pilot projects	
<u>2) Implementing Organizations</u>	MAF: Secretariat of Foods Security and sovereignty, Nutritional and Cooperation, ND for Agribusiness, ND of Agriculture and Horticulture MCIE: ND of Commerce, NLC, Cabinet of Economic and Policy Coordination	
<u>3) Improvement Points</u>	a) Setting a reasonable price of paddy purchase b) Introduction of quality standards with necessary inspection instruments c) Purchasing paddy from the pilot projects	
<u>4) Activities</u>	< MAF >	< MCIE >
	a) Review of the pricing, especially in collection and usage of the production cost b) Formulating quality standards on paddy and milled rice c) Making a purchase plan for the pilot projects d) Training inspectors in accordance with the quality standards	a) Review of the pricing, especially in collection and usage of the market price b) Review of the recipient inspection and introducing grain moisture meters c) Securing the budget of the purchase d) Posting trained inspectors and conducting the purchasing from the pilot projects

Source: The JICA Project Team

(1) Justification of the purchasing price of paddy

The purchasing price of MCIE in 2013 was US\$ 0.90 /kg though the price in 2014 was US\$ 0.59 /kg, whose sales price of farmers was US\$ 0.54 /kg⁷. MCIE has decided the purchasing price so far, based on the production cost. However, they seemed not to be able to collect enough data for the consideration of the unified purchasing price in the whole country. Therefore, MCIE has request for MAF to provide information on the production cost.

Using the result of the Farmers Socio-Economic Survey in this Project, the production cost including family labor and the market price are arranged in the next table. The difference of the labor input causes the big difference of the production costs in the project sites since the labor input occupies big proportion of the production cost. Therefore, at least, the production cost and the market price in the target area of the purchasing should be collected. In terms of the price information, a dividing role that

⁷ The difference between the paddy purchasing price and the farmers' sales price in the paddy purchasing by MCIE is the cost of the collection and the transportation. See "2-1. Situation of the Paddy Purchasing by MCIE", page 2-1.

MAF collects production cost data and MCIE collects market price data can be considered.

Table 2-3-2 Production Cost and Market Price of Paddy

Priority Project Sites	Production Cost (\$/kg)	Market Price (\$/kg)
Halecou	0.31	0.53
Saketo	0.48	0.43
Bikaliu	0.96	0.70
Average	0.58	0.55

Source: Farmers Socio-Economic Survey

An appropriate purchasing price of the paddy is considered a little more than the production cost since the purpose of the paddy purchasing is to increase production motivation of the rice farmers. The purchasing unit price from the farmers in 2014, US\$ 0.54 /kg is considered not to be beside the proper purchasing price so far because it is higher than the production cost in Halecou, whose production condition is better than other priority project sites, and the same level of its market price.

The labor cost can be reduced through the increasing the working efficiency by farming mechanization, etc. It is considered the production cost can be reduced around US\$ 0.50 /kg since the paddy purchasing is conducted in areas whose production condition is comparatively good, and the purchasing price of a milling and distribution dealer in Baucau is US\$ 0.40 /kg.

The survey of the production cost requires collecting data at least around 30 items about the outline and the farming input of the production, which takes time to collect, arrange and analyse those data. The production cost consists of the purchasing cost of the input and the self-supply cost, which includes family labor cost, cost of seed rice, and costs paid by paddy but the family labor cost occupies more than half⁸ of the production cost. Hence, calculating only family labor cost, the unit labor cost times the quantity, is considered an easy and realistic method, deciding the purchasing cost is about US\$ 0.20 /kg.

Table 2-3-3 The Purchasing Cost and the Self-supply Cost of the Paddy Production Cost in the Priority Project Sites

Priority Project Sites	Purchasing Cost (\$/kg)	Self-supply Cost (\$/kg)	Production Cost (\$/kg)
Halecou	0.14	0.17	0.31
Saketo	0.22	0.26	0.48
Bicaliu	0.16	0.80	0.96
Average	0.17	0.41	0.58

Source: Farmers Socio-Economic Survey

(2) Introduction of the quality standard and inspection equipment

To improve the existing receipt check by eyes to objective receipt inspection, it is necessary for formulating the quality standard. It is required to set the standard of the content ratio of moisture, foreign matters, sterile rice, broken rice, etc. for paddy and milled rice, respectively. In terms of the study method, it is considered that MAF proposes ideal ratios based on the practices in foreign countries and MCIE proposes realistic ratios based on the actual situation, after those proposals, the standard will be decided, comparing the both ratios.

Also, basic inspection equipment, such as a scale, should be checked in NLC and repaired/ replenished since those instruments are indispensable for the inspection. According to the interview with MCIE in November 2014, no moisture content meter was introduced. After the set up of the quality standard, necessary inspection equipment and their proper usage have to be introduced into NLC as soon as possible.

⁸ In the case of the three sites of the priority project, the family labor cost, which is the biggest one in the production cost, occupies 40 - 70 % of the whole production cost.

(3) Paddy purchasing from the pilot project sites

Though rice production, milling and distribution are most important activities for MAF and MCIE, the chain flow of the activities and the jurisdiction of the two Ministries have been cut. Therefore, the collaboration of the two Ministries has never been aimed so far. The promotion of rice production by MAF and the paddy purchasing by MCIE have been entirely conducted separately. Normally, paddy supported by MAF is purchased by MCIE, and desirable effect for the producers, millers and distributors had to be expected for both sides; securing sales destination for the producers and stable provision of the raw material/ the commodities for the millers/ the distributors.

In the future firstly, MAF is going to implement the pilot projects for the expansion of the promotion of rice production based on the Agriculture Master Plan. Hence, the areas where MAF conducts/ plans the pilot projects should be designated to the paddy purchasing target areas. On the other hand, MCIE will proceed the paddy purchasing, using five distribution centers, which includes the existing three centers of Dili, Maubisse and Maliana, and the new two centers of Manatuto and Viqueque where newly rice centers are planed to be introduced.

2-3-2 Expansion of the Paddy Purchasing System

When the improvement plan for the existing paddy purchasing system is in sight, MAF and MCIE will aim to expand the purchasing amount and to improve the paddy quality. The outline of the expansion plan is shown in the next table, and the points of the expansion are described below the table.

Table 2-3-4 Expansion Plan of the Paddy Purchasing System

Items	Contents	
<u>1) Objectives</u>	To lift the cultivating motivation of rice farmers through securing sales destination with appropriate price	
<u>2) Implementing Organizations</u>	MAF: Secretariat of Foods Security and sovereignty, Nutritional and Cooperation, ND for Agribusiness, ND of Agriculture and Horticulture MCIE: ND of Commerce, NLC, Cabinet of Economic and Policy Coordination	
<u>3) Expansion Points</u>	a) Purchase from the rice increasing projects conducted by MAF b) Introduction of a quality brand into the paddy production and marketing c) Peak volume of the purchase will reach 24,000 MT/year, whose purchasing cost is \$ 12 million at \$ 0.50/kg. d) The expansion of the paddy purchase is temporary and the volume will be reduced to 7,400 MT/year until around 2030.	
<u>4) Activities</u>	< MAF >	< MCIE >
	a) Review of the pricing, especially in the usage of the production cost in target areas b) Formulating a quality standard for quality paddy brand c) Making a purchase plan for the rice increasing projects d) Training inspectors in accordance with the quality standards	a) Review of the pricing, especially in collection and usage of the market price in target areas b) Review of the recipient inspection and introducing the category of a quality paddy c) Securing the budget for the implementation of the paddy purchase d) Posting trained inspectors and conducting the purchase from the rice increasing projects

Source: JICA Project Team

(1) Paddy purchasing from the promotion project site of rice cultivation

Following the improvement of the paddy purchasing system, the paddy purchasing will be conducted in the MAF promotion project site of rice cultivation. In accordance with the progress of the promotion project of rice cultivation, the case that the project sites are far from the collecting point of

MCIE and the case that the purchasing amount exceeds the dealing capacity of the collecting point. In those cases, utilization of warehouses of each district or distributors or construction of new collecting point can be considered but new investment in plant and equipment for the paddy purchasing should be avoided as much as possible, considering that the paddy purchasing is a temporary policy.

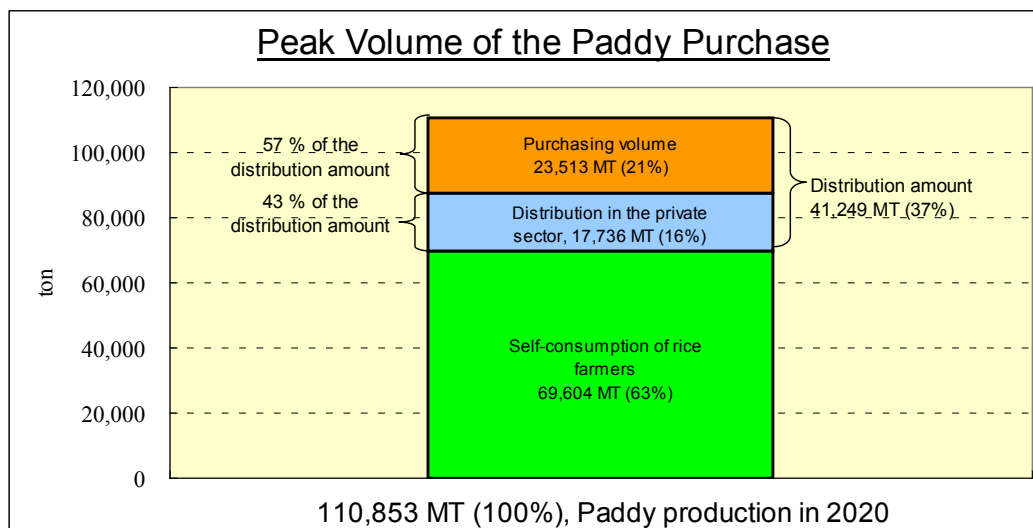
After the implementation of the promotion project of rice cultivation, it should not consider new investment in plant and equipment for the paddy purchasing. At the planning stage of the promotion project of rice cultivation, MAF should show the plan to MCIE, and make the purchasing plan of paddy, produced in the project site, in collaboration with MCIE. It is important to secure the shipping destination firstly and then secondary to increase the production, not to look for the shipping destination after the increasing of the production.

(2) Introduction of a quality rice brand

As well as formulation of the quality standard, MAF and MCIE will formulate the standard of the quality rice brand for the paddy and the milled rice, respectively, and set higher price than ordinary rice. The objective of the introduction of a quality rice brand is to increase the quality of the whole domestic rice. Therefore, the target is not high-quality rice brand like a niche brand but “a quality rice brand”, which can be treated by ordinary farmers and millers. The target customers are neither foreigners nor rich people. The price is acceptable for ordinary consumers. The target of the brand is “a little bit tasty and safety domestic rice though the price is comparatively high”, which is aimed through proper moisture, low ratio of foreign matters, and freshness management.

(3) Peak volume of the paddy purchasing

The peak purchasing volume was calculated as a test here, applying 110,853 ton of the estimated paddy production in 2020, which is the moderate case of the Scenario-2 in the Agriculture Master Plan. First, consumption of rice farmers was calculated as 63 % of the production, applying the household ratio. The remaining of 37 % will be distributed. Within the distribution amount, the distribution in the private sector was calculated at 43 %, using the result of the Farmers Socio-Economic Survey. The remaining 57 % of the distribution amount of 24,000 ton, which is equivalent to 21 % of the production amount, was calculated as the purchasing amount by the Government.



Source: JICA Project Team

Figure 2-3-1 Peak Volume of the Paddy Purchase

(4) A model plan of the paddy purchasing volume

The next figure shows a model of the purchasing plan, assuming the peak volume is in 2020 - 2024. In

CHAPTER 3 PRIORITY PROJECT FOR LOCAL RICE PRODUCTION IN HALECOU IRRIGATION SCHEME IN BOBONARO DISTRICT

3-1 OUTLINE OF IRRIGATION SCHEME

Halecou irrigation scheme intakes irrigation water from the Nunura River at the north of irrigation scheme. Although the scheme had been originally started with small farmers, the settlement by Indonesians era, 1970s, make present irrigation scheme. The scheme covers small hills around south area and most of the villages are located on the top of hills. At south-east, Kororuli stream which is usually in rain season is used by some farmers.

Nunura River is through Indonesian land. This river is one of rare largest river which has stable water volume through the year. Therefore farmers in scheme are used to cultivate the crops in dry season which perform stable water stream without flood affect.

Farmers lives into three villages around beneficiary area, Halecou, Moleana, Hataz. Of the village, Hataz is opposite area for Nunura River. They are used to come cross the river for farmers' works and have temporary workshop in beneficiary area for accommodation and stay there to work in busy season.

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The irrigation facilities in beneficiary area are an intake gate which is invested by WB in 2002 and 1.4 km canal which is consisted of wet masonry and leading canal. These facilities have troubles of delivery to beneficiary area due to food affect, low function of intake by lower river bed in recent year and obstruction of flow in canal. In particular, another earth canal along leading canal is excavated in order to irrigate to middle and downstream area. Famers have trouble of intake water and proper delivery from these situations.

3-1-1 Location and Topographic Condition

The location and situation in Halecou irrigation scheme are shown as following figure.

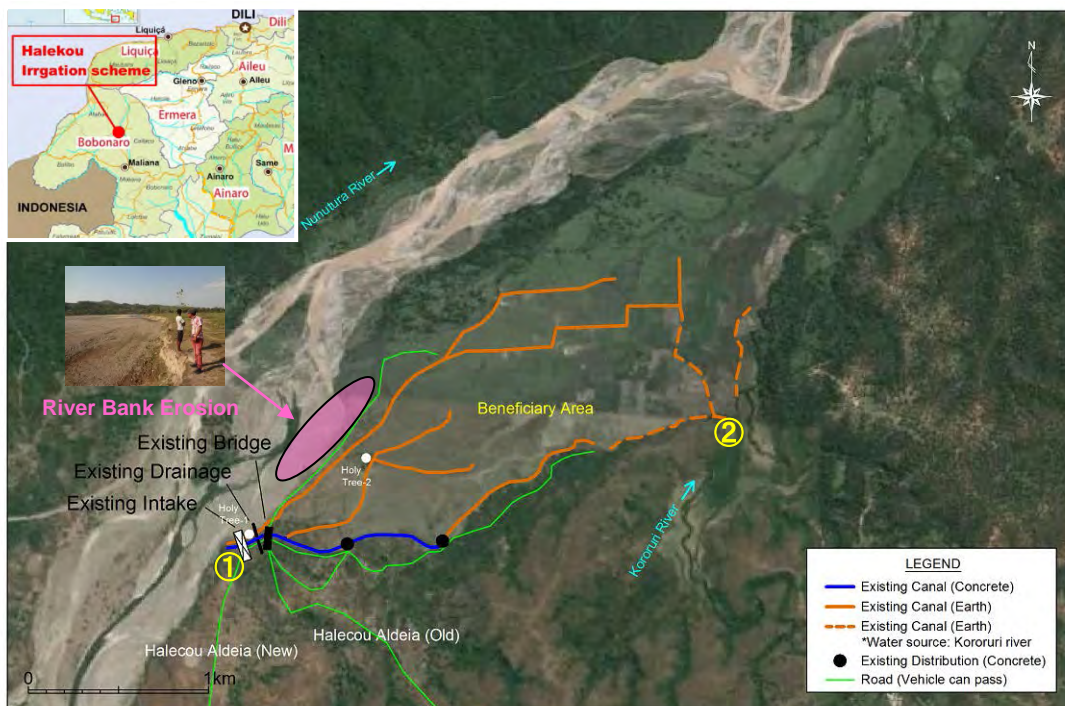


Figure 3-1-1 Location and Situation in Scheme

3-1-2 Water Resources

(1) Outline of main water source and its catchment area

Main water source for target beneficiary area is Nunura River and its catchment area at planned intake point is around 1,170 km² (show Figure 3-1-2). Since huge area of catchment area is located within Indonesian territory, discharge amount of Nunura River at planned intake point is affected by development activities within this area (water use condition within Indonesian territory is not surveyed).

Within the upstream area of Halecou irrigation scheme, some irrigation schemes, such as Maliana II, are there and total beneficiary area of them is 1,937 ha (result of inventory survey). Discharge amount of Nunura River at planned intake point is affected by development activities for these areas as well.

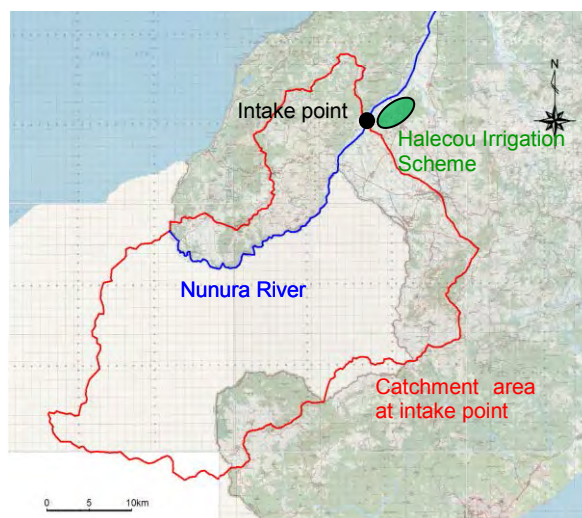


Figure 3-1-2 Catchment Area at Intake Point

(2) Water sources around beneficiary area

At present, beneficiary area is irrigated by water from Nunura River and Kororuri River which runs from south to north along the eastern edge of beneficiary area.

Water amount from Nunura River is controlled by intake gates. However since there are no scouring sluices, sometimes it was difficult to open these gates due to sedimentation in front. While another canal called as emergency canal was constructed along existing main canal to take water from Nunura River in case intake gates cannot be open. However water amount cannot be controlled because intake structure is traditional type, no gates.

Intake structure from Kororuri River is traditional type, raise up water level by weir made of woods and grass and guide water to the canal, therefore water amount from this river cannot be controlled.



Intake facility from Nunura River



Intake point at Kororuri River

Figure 3-1-3 Intake Facilities

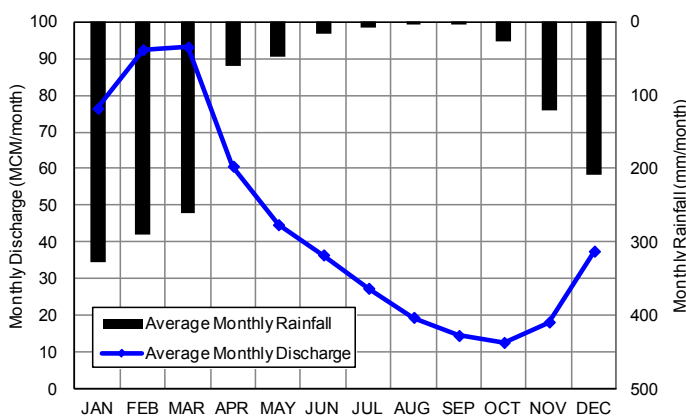
(3) Flood condition

Alignment of Nunura River’s main stream has been changed and river bed degradation has been occurred as well. Past time, the main stream of Nunura River was only one but it was split into two around 10 years ago. The main stream mainly runs the right bank side but its alignment changes by flood.

Bank of Nunura River around intake facility has been eroded and this causes soil sedimentation in front of intake gates. Due to heavy soil sedimentation, from 2010 to 2013 it was impossible to open intake gates.

(4) Water resources amount

Monthly discharge of Nunura River at planned intake point with rainfall amount at beneficiary area is shown in the Figure 3-1-4. Since there are no rainfall observation stations within beneficiary area, rainfall amount in the figure is record of Balibo observation station which natural condition is considered as similar as beneficiary area of Halecou irrigation scheme. While since discharge amount of Kororuri River is small, water from this river will be utilized as supplemental one after establishment of irrigation facility therefore that amount is not taken into account for planning.



Average Monthly Rainfall

Average of Rainfall at Balibo station from 1955 to 1974

Average Monthly Discharge

Calculated utilizing analyzed discharge of Bebai river
*Nunura river is one of branch rivers of Bebai river.

Source: ADB: TA409, August 2004, Assessment of water availability and water demand in Timor-Leste at river basin level

Figure 3-1-4 Monthly Discharge Amount at Planned Intake Point and Rainfall amount at Beneficiary Area

3-1-3 Land Use

Huge area is occupied by paddy field and upland is very limited. There are temporary huts for rest within beneficiary area but no residential houses except gate keeper’s house next to existing intake facility. Beneficiaries are living in the Aldeias nearby beneficiary area and some beneficiaries are living in Aldeia Hatas located at the opposite bank of Nunura River.

3-1-4 Agricultural Infrastructure

(1) Access road

A vehicle can approach to beneficiary area and roads which a vehicle can pass run along the southern edge of beneficiary area and along Nunura River. However those roads are not extended to inside of beneficiary area.

(2) Electric power supply

No public electric power is supplied to beneficiary area but Aldeias which beneficiaries are living have.

(3) Water supply

No public water is supplied to beneficiary area but Aldeias which beneficiaries are living have common faucets. The water source of faucets is located near Maliana city and water is supplied through pipeline. Water supply is managed by GFM (Group for Facility Management) but not available 24 hours. Water is used for domestic use mainly while river water of Nunura River is used for cloth washing occasionally.

At Aldeia Hatas located at the opposite bank of Nunura River from beneficiary area have common faucets for each 4 or 5 households. Water source is spring located 6km from Aldeia.

3-1-5 Problem about Agricultural Production of Beneficiary Farmers

(1) Problems about agricultural production of beneficiary farmers based on the Farmers’ socio-economic survey

The target of Farmers’ socio-economic survey was one hundred of beneficiary farmers of Halecou beneficiary farmers. The most important problem is shortage of irrigation water. Although irrigation schemes of Halecou irrigation scheme are constructed in 2008, it is difficult to cultivate in dry season because of sedimentation of canal.

Almost of all farmers have a problem of low yield of crops because they use seed from home seed-raising for a long time. Moreover the amount of input material such as fertilizer is limited. In addition, they also face problems about damage of pest, disease such as blast and rice bug, wild animals and weed.

Farmers of Halecou sold surplus of rice while they purchase rice from market. There are few

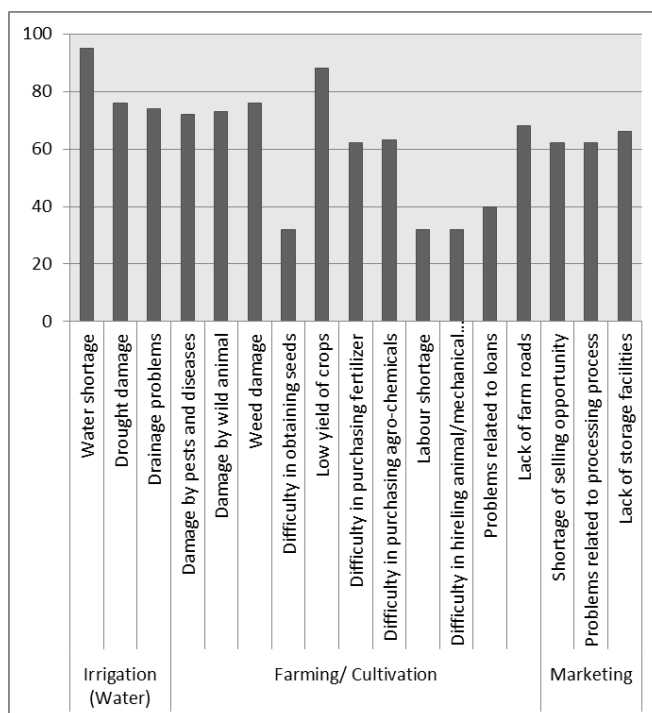


Figure 3-1-5 Problem about Agricultural Producing of Beneficiary Farmers

ways of transportation to Maliana city with the big market, and there is little number traders coming for buying rice to Halecou village. Half of farmers have a problem with shortage of opportunities of selling products.

(2) Prioritizing the problem at workshop of stakeholder

Workshop¹ was carried out with stakeholders of Halecou irrigation scheme such as extension workers, village representatives and interested persons of rice processing. The eight issues about rice production of Timor-Leste were extracted in Master Plan. The order of priority about eight issues based on discussion of participants is listed in Table 3-1-1.

Table 3-1-1 Prioritizing of the Problem at Workshop of Stakeholder

Priority	Project
1	Pest and disease control
2	Integrated farming
3	Quality seed
4	Manure management
5	Agricultural fund
6	Cultivation method
7	Local resource
8	Mechanization

They put the highest priorities on ‘Establishment of agricultural fund system’. Next, ‘Strengthening program for pest and disease control’ and ‘Establishment and dissemination program of manure management technique’ were prioritized. The farmers sold surplus rice so far, however they don’t reach to stably get enough fund to increase productivity and sales promotion buying agricultural materials. The opinion about necessity of agricultural fund shows that farmers and concerned people have a commercial awareness for expansion of farming.

3-2 ACTUAL SITUATION OF IRRIGATION SCHEME

3-2-1 Irrigation Area and Households

Area of irrigation scheme is observed approximately 360 ha from interview at site and checked by satellite pictures. This irrigation area includes abandoned area and levees. About 70% of area is assumed as planed irrigation area from the observation of site survey.

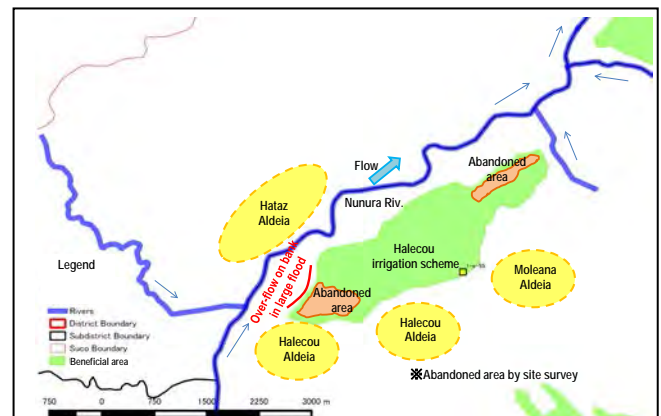


Figure 3-2-1 Situation of Beneficiary Area

Three Aldeia are in scheme and targeted farmers are 103 households. According to the interview at site, at west area of scheme near the river has damage in big flood, which cause flooded area by over-flow on the bank. Water depth of flooded area is almost 50cm from the site interview which is subject to flood situation.

3-2-2 Intake and Diversion of Water in Irrigation Scheme

(1) Current situation of intake facility and rehabilitation record

Rehabilitation record of Halecou is identified firstly in 2002, which is invested by WB. After 2002, other related facility was constructed around this rehabilitated structure. Table 3-2-1 shows the components and cost of these rehabilitation works. At invested by WB, contractor is Chinese. The other rehabilitation works is conducted by MAF and contractor is local in Maliana.

According to records, targeted facilities in these rehabilitations are from head intake to intake gate and downstream canal from intake gate, 1.4km.

The major issue of current intake focuses in two matter as followings;

¹ Workshop was carried out on 10th October 2014 at Maliana city.

Table 3-2-1 Rehabilitation Record of Halecou Irrigation Scheme

Year	Components	Remarks
2002	Const. works of Intake gate and canal of 1.4 km at downstream from gate (Const. cost : US\$ 842,331)	Invested by WB Contractor by Chinese
2004	Const. works of outlet facility for seasonal stream at intake gate (Const. cost : US\$ 8,250)	Contractor by Maliana through MAF
2009	Const. works of canal from head of intake to intake gate (Const. cost : US\$ 82,519)	Contractor by Maliana through MAF

1) Flow obstruction due to sedimentation at intake without flash gate

Existing intake gates are operated to close in flood, but these gates is located at downstream of 100m from head intake. Therefore flood flow come into canal and reach up to gates. After the flood, water into canal is getting withdrawn. In this process it causes the sedimentation. Depth of sedimentation usually becomes 50cm by this frequent process. Therefore even if farmers attempt to intake river water after flood, sedimentation in canal give the prevention for intake which cause reduce the available water and/or impossible.



Picture : Situation of sedimentation in front of intake-gate (Feb. 2014)

2) Flow obstruction due to fractural meander of river stream

Intake and river stream are chronically away between each other, due to the fractural meander of river stream, which cause to an impossibility of intake. The width of Nunura River is so wide and 300 ~ 400m width is observed at upstream and downstream while the width of river in normal is observed to 20~30m. In normal situation, river stream largely head toward the exiting head intake, however, land-form and sediment force to change by large flood at once or twice in year, it is followed by disparity between intake and river stream. In case of this situation, MAF of Bonbonaro district is used to conduct the recovery of stream with trimming of river bed.

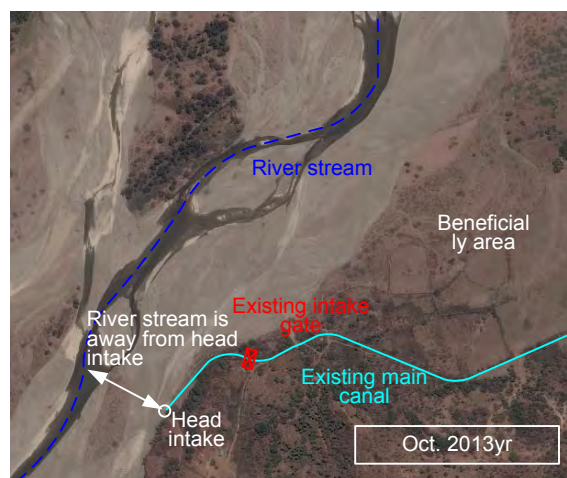
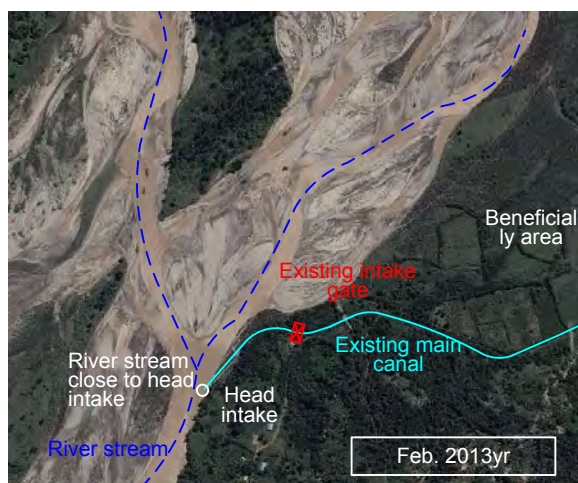


Figure 3-2-2 Location between River Stream and Head Intake

(2) Situation of canal in beneficiary area

The canal in beneficiary area is consisted of 1.5km by wet-masonry or masonry and the other is earth canal. 1.5km by wet-masonry or masonry deliver irrigation water up to one-third area at upstream for beneficiary area, the other area is delivered by earth canal. The problems of canal in beneficiary area are almost caused by unsuitable level between canal alignment and canal bed level. In general, layout of canal line is selected in upland area in comparison with other area in beneficiary, and irrigation water is available to distribution to lowland area. But actual situation of canal is planned only to along original topography. Therefore these careless planning make proper irrigation difficult, which are observed in here and there.

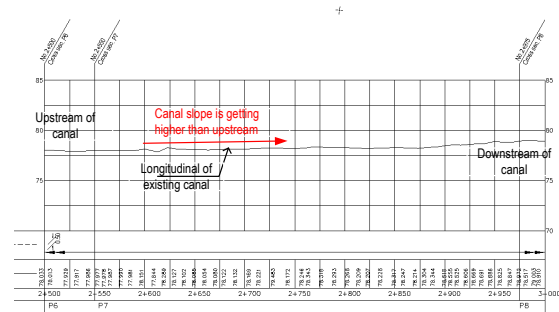


Figure 3-2-3 Canal Longitudinal at 2.5 km Distance from Intake Gate

Figure 3-2-3 is longitudinal section of canal at 2.5 km distance from intake gate. In this section, canal bed is gradually higher than upstream, which cause an adverse flow situation to downstream area.

3-2-3 Operation and Maintenance of Irrigation Facilities

(1) Water users group

Wet season paddy cultivation was practiced with irrigation by the traditional intake and the earth canal in the period under the Indonesia rule. After the independence, the drastic reform of the irrigation facilities was undertaken in 2002. The WUA was established by the guidance and support of the district agriculture office in 2005. Most of the irrigation service area of 360 ha belongs to Aldeia Halecou, but the downstream end of the main canal reaches to Aldeia Moleana. And a part of the irrigation service area of 360 ha is cultivated by the farmers of Suco Hataz who commute to the paddy field. However, at present all members of the WUA are farmers of Aldeia Halecou. The board members and staff of the WUA, as shown in the Table 3-2-2, are selected through the election.

Table 3-2-2 Officers of WUA

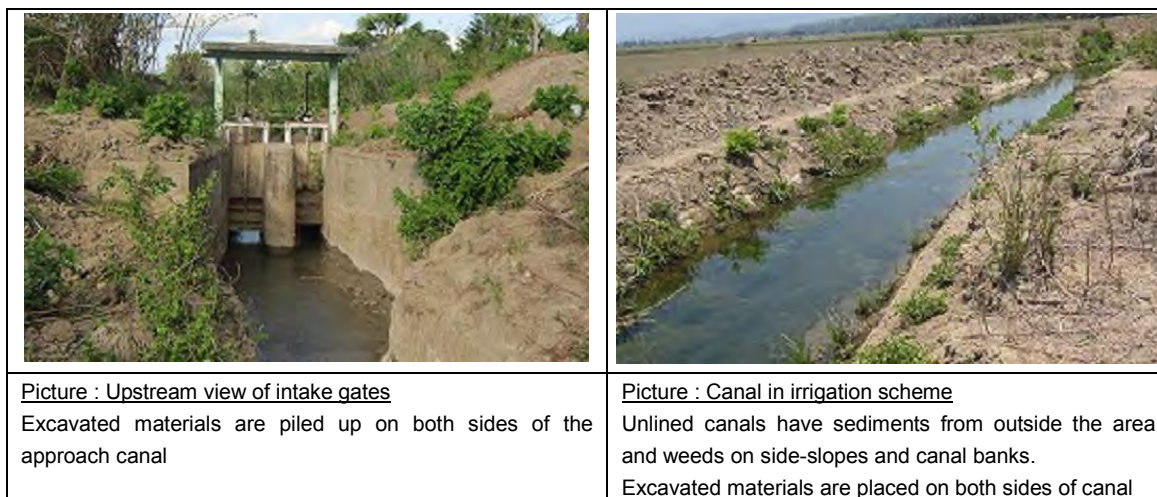
Officer	Number
President	1
Vice-president	1
Secretary	1
Treasurer	1
Gatekeeper	3

The president, Mr. Tome Tavares, was elected for the first time in this year. He is very much willing to practice the double cropping of paddy for increased production.

The treasurer of WUA has been selected as a WUA board member. However, neither WUA membership fee nor water charge has been ever collected. The president intends to collect water charge and purchase O&M machinery and equipment, recording equipment and stationary and further to pay some rewards to WUA board members and staff when the double cropping is started.

(2) Present situation of operation and maintenance

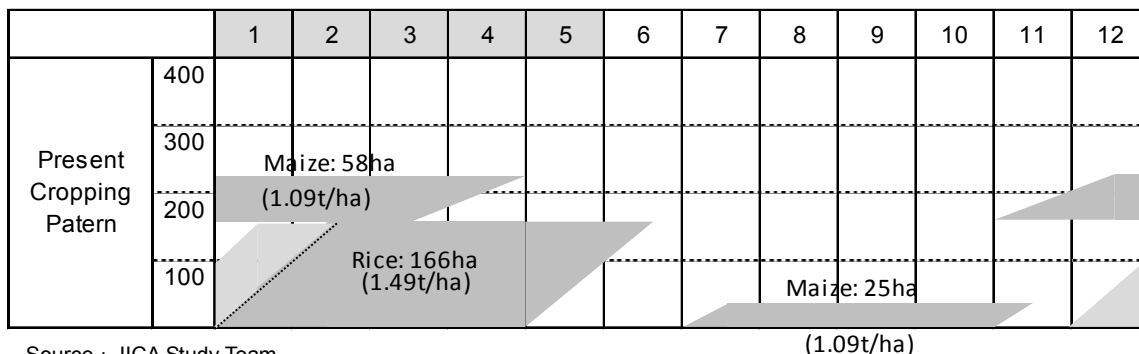
Desilting of the irrigation facilities are conducted prior to the dry season cultivation every year. Since it is particularly hard to remove sediments around the intake structures by humans, it is done by an excavator of the district agriculture office, although it is not every year. Four-day cleaning of the main and other canals is implemented, as a general rule, by not only WUA members but also all farmers who own farmlands in the irrigation service area.



3-3 CURRENT FARMING CONDITION

3-3-1 The Situation of Crop Production

Cultivated area and yield of Halecou irrigation scheme which is resulted from Farmers’ socio-economic survey are showed in Figure 3-3-1. In rainy season, upstream of Halecou irrigation scheme is flooded from river flow. Currently farmers cannot cultivate the rice in dry season because soil of canal is not excavated. Maize is cultivated in downstream by rainfall and river water from Coloruli River and Veabubu River. There are no farmers who rent a paddy field from other farmers in this beneficiary area.



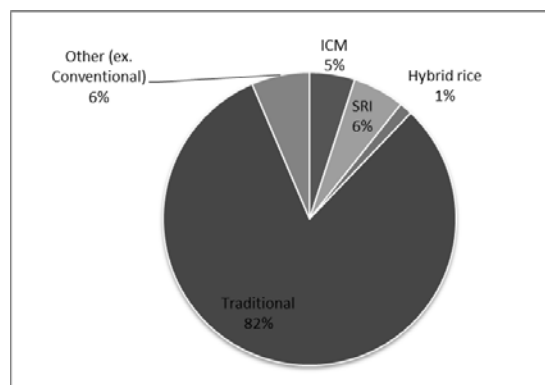
Source : JICA Study Team

Figure 3-3-1 Present Cropping Pattern

3-3-2 Production Activities

(1) Rice

Figure 3-3-2 shows the percentage of farmers who implement the cultivation method such as ICM. The ICM was disseminated in Bobonaro District before. From 2013 SRI is introduced and tried in some farmers’ paddy field in Halecou. However over 88% farmers cultivate rice by traditional way, direct seedling, or conventional way, random transplanting, still now.



Source: JICA Study Team

Figure 3-3-2 The Percentage of Cultivated Area Applying Improved Cultivation Method

cultivation method yet.

The reason of implementing ICM or SRI is that farmers are taught by extension worker, production is increased and so on. Although dissemination of ICM or SRI is just started, so dissemination is not reached at dissemination. Some farmers continue to practice ICM or SRI because of the increase of production. It is important to visually show effect of technique to farmers.

Work situation is of farmers which resulted from Farmers' Socio-Economic Survey is showed in Table 3-3-1. Men prepare paddy field by seedling, although, activities from seedling to cultivation are conducted by men and women. Farmers hired some workers from neighbors for transportation, weeding, cultivation, threshing and bagging.

According to the situation of farming described above, problems of low yield are extensive cultivation method, using own seed for a long time, small input of fertilizer or organic fertilizer, unsatisfactory solution for pest and disease.

Table 3-3-1 Work Condition of Rice Cultivation of Halecou Irrigation Scheme

Activity	Work Situation	Role
Plowing	By human power using agricultural equipment.	M
Harrowing	99% of farmers use a hand tractor. (70% of farmers rent a hand tractor from neighboring farmers.)	M
Seeding/ Nursery preparation	80% of farmers plant rice by directly seeding. Some farmers make a nursery.	M/F
Transplanting	20% of farmers transplant. They hire some labor for transplanting.	M/F
Fertilizing	10% of farmers practice fertilizing. More than half of them use a organic compost made by dung of buffalo. It is difficult to purchase chemical fertilizer.	M
Application of agro-chemicals	20-35% of farmers apply agro-chemicals. They purchase it at store of Maliana city.	M
Weeding	Weeding by hand, they don't use weeder. Some farmers hire labors.	M/F
Irrigating	Cleaning the canal.	M
Harvesting	Hiring some labors.	M/F
Threshing and bagging	80% of farmers rent a threshing machine. It is a custom to repay by kind.	M/F
Transportation / Storing	Some farmers hire track or buffalo for transportation. They store rice production in the vinyl sack or basket.	M

Source: JICA Study Team

(2) Maize

Farmers cultivate maize with conventional method. It is the reason for low yield that only small quantities of chemical fertilizer and compost are used by farmers and unsatisfactory solution for pest and disease.

Table 3-3-2 Work Condition of Maize Cultivation of Halecou Irrigation Scheme

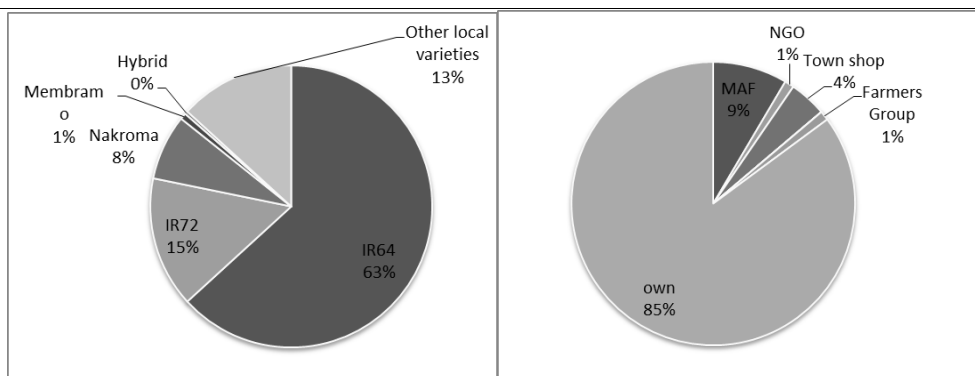
Activity	Work Situation	Role
Plowing	By human power using agricultural equipment.	M
Seeding	Rndom planting. Some of them is low planting.	F
Feertilizing	No practiced	—
Application of agro-chemicals	No practiced	—
Weeding	Some farmers hire labors. They weed by hand.	MF
Irrigating	Rainfall	—
Harvesting		MF
Threshing and bagging	Farmers thresh by hand.	MF
Transportation / Storing	Farmers transport by themselves.	M

Source: JICA Study Team

3-3-3 Input Materials

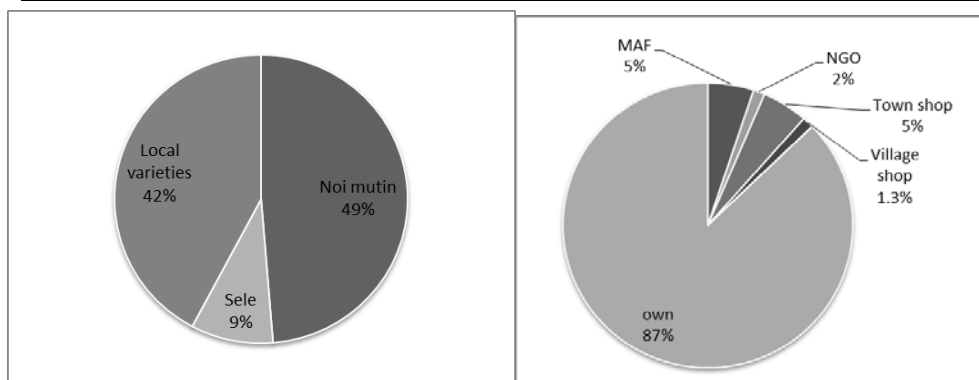
(1) Seed

IR64 are cultivated by 63% of farmers and 85% of farmers planted seed they had saved from a previous harvest (see Figure 3-3-3). Nakroma was supplied from MAF to only nine percentages of farmers by free. On the other hand more than half of farmers cultivate Sele or Noi mutin recommended by MAF.



Source: JICA Study Team

Figure 3-3-3 Percentage of Cultivated Area each Rice Varieties (Left) and Source of Seed (Right)



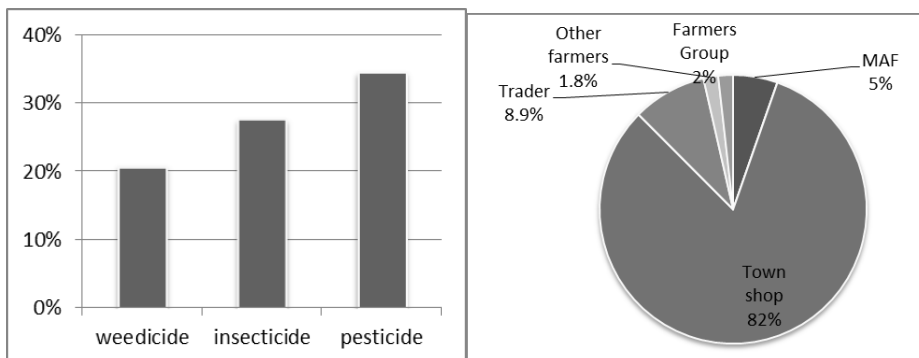
Source: JICA Study Team

Figure 3-3-4 Percentage of Cultivated Area each Maize Varieties (Left) and Source of Seed (Right)

It is necessary to periodically purchase certified seed which is produced by CSP; Commercial Seed Producer, because renewing of seed have an influence on increasing yield and quality. SoL support farmers group to establish CSP. In Bobonaro district, there are two CSPs registered to MAF. They already started to produce rice seed by planting certified seed from MAF.

(2) Chemical fertilizer, agro-chemical and compost

Only five households per one hundred households of Halecou irrigation scheme applied chemical fertilizer or organic compost to paddy fields. Not only free handout from MAF, but also they purchase chemical fertilizer at local shop or local market of Maliana city. Otherwise, Figure 3-3-5 shows that from 20 to 35 % of households purchase agro-chemicals such as herbicide, insecticide and fungicide. These agro-chemicals are purchased in the local shop or local market of Maliana, It is easier to purchase these input materials than other district because that they are imported from Indonesia, although Farmers cannot get any information about input materials such as instruction of using, timing and quantity, so they don't know collect way to use them.



Source: JICA Study Team

Figure 3-3-5 Percentage of Farmers Utilizing Agro-chemical and Its Source

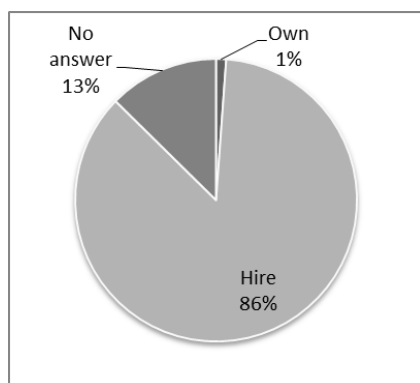
3-4 CURRENT SITUATION OF PROCESSING AND MARKETING

3-4-1 Farmers' Post-Harvest Treatment

(1) Rice

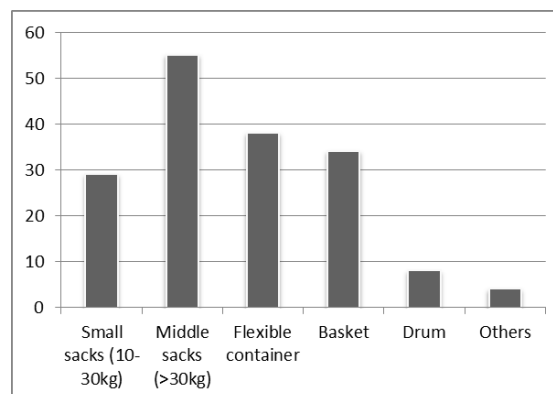
After harvesting, farmer threshes at the paddy field. According to Aldeia chief, around ten threshing machines are used in this area. Based on the Farmers' Socio-Economic Survey, 86% of farmers rent it from neighboring farmers. It is a custom to repay by paddy with ten percent of production.

After threshing, they transplant paddy to home by manual, motorbike, track or domestic animals such as buffalo or horse. Many of farmers store paddy with vinyl sack which size is various. Some farmers store paddy by basket. Farmers of Aldeia Hataz store paddy for selling at small warehouse and transport paddy of self-consumption to home in opposite shore.



Source: JICA Study Team

Figure 3-4-1 Using Situation of Threshing Machine



Source: JICA Study Team

Figure 3-4-2 Storing Method of Paddy

(2) Maize

Many farmers dry maize hanging on beam of house and then they thresh them by hand. They store maize by vinyl sack or basket.

3-4-2 Post-Harvest and Marketing of Rice

The works of post-harvest of rice produced in Halecou Irrigation Scheme consist of paddy threshing in fields, solar drying in fields, bagging in sacks, transporting, storing in farmers' houses/ traditional warehouses, solar drying on the grounds of farmers' houses and milling depending on consumption in villages. In three (3) villages, four (4) rice mills are operated, which recovery ratios are estimated at 53-55% by Satake made machines or 50-52% in Chinese made machines.

The rice milling recovery ratio can be achieved at more than 60% based on the practices by IRCP2 in Manatuto. The lower recovery ratio is caused by mixed varieties with different shapes, insufficient irrigation water during flowering and ripening phases, unsuitable combination of engine rotating speed output and rice mill required speed, poor performance of Chinese made copied machines and lack of replacement of rubber rolls (the spare parts of the milling part).

According to Farmers' Socio-Economic Survey conducted by the Team, the yield is 1.49 ton/ha-paddy, which is extremely low, comparing to MAF statistic data, 3.25-3.80 ton/ha-paddy (2010-2012). The major constrains are unstable irrigation water supply and extensive farming methods. The paddy production in the scheme is estimated at 247 ton/ha-paddy from 166ha of the planting areas. However, the villagers purchase 20.8 ton -rice in 2014 out of the villages, since the production volume cannot meet the local demands.

The survey results indicate the following conditions:

- It accounts for 94.6% of paddy production for self-consumption, seed uses and repayment of input costs.
- Of which 94.6%, it consists of 89.4% for self-consumption and 5.2% for seed uses. This figure of seed applying at 77kg/ha comparing to 35 kg/ha in the standard farming model of MAF indicates low germination rate at less than half of the standard model.
- In general, the parts of paddy production are used for land tenant in kind and repayment of cash credits, farm inputs and labor wages in Timor-Leste. However, the land tenant and repayment are quite rare in this scheme. The irrigation water fee is not charged due to non-functional irrigation facilities.
- The outflows of paddy and milled rice are estimated at 5.4% of production, of which 3.8% are milled in the villages and sold at Maliana Market. The transaction to the local residences and the relatives are accounted at 1.4%. Presently, the locally-produce paddy is mostly consumed within local communities. The consumption rate of milled rice is huge at 177 kg/person/year comparing to the average in the country at 106 kg/person/year (2014).

3-5 RURAL SOCIETY AND FARMERS' ECONOMY

3-5-1 Organization of Rural Society

(1) Structure of Rural Society

Halecou and Moleana Aldeia belong to Ritabou Suco, and Hataz Aldeia belongs to Atabae Suco. There is an Aldeia chief in an Aldeia, and then he presides over the Aldeia. There is a Suco council. The member of suco council are Suco chief, secretary, accountant, every chiefs of Aldeia, leader of youth, traditional leader of farmers, veteran and leader of religion. They have a council meeting every month, and they discuss about problem and solution of village.

As for the Aldeia chief, traditional leader of farmers and the person who is trusted by residents are often chosen, however Suco chief is often chosen democratically by election. And then it is important to establish the relation with not only Suco chief but also Aldeia chief.

(2) Traditional Ceremony

Christianity is practiced in widely in Timor-Leste, however many persons still believe the cult of split which enshrines a large tree and a large stone as a holy tree and holy stone. They carry out ceremonies for holly. If they need to cut or move holy tree and holy stone, they carry out a ceremony to offer sacrifice, cigarette and coin and so on, and pray.

3-5-2 Gender

There is a tendency that works to be shouldered by men and women are divided in Halecou site, the trend is not very clear, though. For example, women mainly cover rice planting, harvesting, post-harvest activities, while men do land preparation and nursery preparation. However, there are some farming activities that both men and women participate in. Men's working hours for rice production is much longer than those of women, around twice, on the other hand, working hours of men and women for cassava and maize production are almost same.

Livestock rearing and sale of livestock are mainly done by men, however, incomes from both livestock and crop production are managed by women at homes in many cases. On the other hand, non-farming income is controlled by men mainly. Concerning water fetching and firewood collection, women and children generally cover the works. Roles of men and women in Halecou site is as shown below:

Table 3-5-1 Roles of Men and Women in Halecou Site

Works	Men*	Women*	Children*
Sale			
Sale of Rice and Maize	16	45	-
Sale of Vegetables	8	36	-
Sale of Livestock	44	19	-
Income Control			
Income Control by Sale of Rice and Maize	5	58	-
Income Control by Sale of Vegetables	4	39	-
Income Control by Sale of Livestock	22	51	-
Non-farm Income Control	20	34	-
Housework			
Drinking Water Fetching	25	76	65
Firewood Collection	49	87	83

Remarks 1 (*): The number in the table mentioned above indicate number of respondents.
2: multiple answers.

Source: JICA Study Team (Socio-economic survey), 2015

3-5-3 Farmhouse Economy

(1) Income of the farmhouse

The average of the household income is arranged in the next table, sorting it into agriculture income and non-agriculture income, based on the family budget data of 100 household in Halecou, collected in the Farmers Socio-Economic Survey. Self-consumption of agriculture produce was converted to money by market price and appropriated for the budget. The average annual income in Halecou is about US\$ 2,300, whose portion of the agriculture income is 74 %.

Table 3-5-2 Average Household Income in Halecou

Items		Income (US\$/HH)	Ratio (%)
Agriculture income	Rice cultivation	578.3	25.6
	Maize cultivation	352.3	15.6
	Cassava cultivation	273.7	12.1
	Vegetables cultivation	30.7	1.4
	Livestock rearing	384.9	17.0
	Wages from working on other farm	53.3	2.4
	Leasing for draft animals	27.6	1.2
Subtotal		1,700.8	75.2
Non-agriculture income	Salary from other occupations (government official, driver, company employee, etc.)	85.6	3.8
	Wages as casual worker	93.3	4.1
	Earnings from business (boutique, restaurant, three wheeler, taxi, etc.)	137.5	6.1
	Receipt of gifts and remittance from relatives and others	3.8	0.2
	Other non-agriculture income	242.1	10.7
Subtotal		562.3	24.8
Total		2,263.1	100.0

Source: JICA Study Team

(2) Expenditure of the farmhouse

Next, the average of household expenditure is arranged in the next table. “Agriculture input of Rice” is US\$ 375, which is the biggest item and occupies 22 % of the total expenditure. The following biggest items are “Expenses for ceremonial occasions”, US\$ 295 (17%), “Clothing”, US\$ 103 (6%), “Rice”, US\$ 89 (5%) and “Tobacco and cigarettes”, US\$ 81 (5%).

Table 3-5-3 Average Household Expenditure in Halecou

Items	Expenditure (US\$/HH)	Ratio (%)	Items	Expenditure (US\$/HH)	Ratio (%)
Agriculture input of Rice	375.3	22.2	Spice & other foods	12.8	0.8
Agriculture input of Maize	67.1	4.0	Tobacco and cigarettes	80.8	4.8
Agriculture input of Cassava	4.8	0.3	Soap, shampoo, etc.	56.3	3.3
Agriculture input of Vegetables	0.2	0.0	Electricity charges	11.8	0.7
Agriculture input of Livestock	2.0	0.1	Expenses for firewood, cooking fuel and LP-gas	3.2	0.2
Agriculture input of Others	0.0	0.0	Expenses for lighting fuel	3.7	0.2
Rice	89.4	5.3	Household furnishing and equipment	46.9	2.8
Maize	12.8	0.8	Repair and maintenance of house	24.0	1.4
Cereals other than rice & maize	0.0	0.0	Clothing	103.1	6.1
Tubers and Roots	0.8	0.0	Medical care	19.0	1.1
Fish	15.0	0.9	Education	69.4	4.1
Meat and eggs	20.6	1.2	Recreation	10.8	0.6
Vegetables	75.3	4.4	Expenses for ceremonial occasions	295.0	17.4
Flour	6.5	0.4	Transportation and communication	37.7	2.2
Bread	33.1	2.0	Remittance to relatives	22.5	1.3
Tea and coffee	45.9	2.7	Land and house rent	0.5	0.0
Milk (powder) & yogurt	10.6	0.6	Taxes	0.6	0.0
Liquor and soft drinks	17.3	1.0	Loan repayment	8.0	0.5
Cooking oil & coconuts	56.9	3.4	Others	39.0	2.3
Sugar and salt	15.5	0.9	Total	1,694.2	100.0

Source: JICA Study Team

3-6 GENERAL DESCRIPTION OF PRIORITY PROJECT IN HALECOU

The proposed priority project in Halecou is composed of three main components, namely, 1) Irrigation system improvement, 2) Crop production increase and 3) Improvement of processing/marketing system. Halecou site is categorized into “rice bowl area”, therefore, the priority project in the site focus on enhancement of commercial rice production. However, only proposed priority project implementation is not sufficient for achievement of the project objective, and the measures for motivation increase of rice production, which is mentioned in Chapter 2, should be taken. The proposed project objective, expected outputs, main activities are as shown below:

[Project Objective]

Volume of sale of domestically produced rice is increased. (Indicator: 942 tons of domestically produced rice is sold annually.)

[Outputs]

- Harvested area of rice is increased.
- Yield of rice is increased.
- Quality of rice is improved.
- Customers of domestically produced rice are secured.

[Main Activities]

Component 1: Irrigation System Improvement

- Bank protection for farmland /irrigation facility conservation
- Securement of irrigation water

Component 2: Crop Production Increase

- Securement of quality seeds
- Securement of agricultural materials
- Promotion of pest and disease management
- Extension of rice production techniques

Component 3: Improvement of Processing/Marketing System

- Improvement of techniques of post-harvest /processing
- Sale of domestically produced rice to MCIE and Technical Agriculture School of Moleana
- Direct sale of rice to consumers
- Sale of rice to rice millers
- Establishment of a group of rice production farmers and training implementation.

Overall structure of the priority project in Halecou is illustrated as shown below:

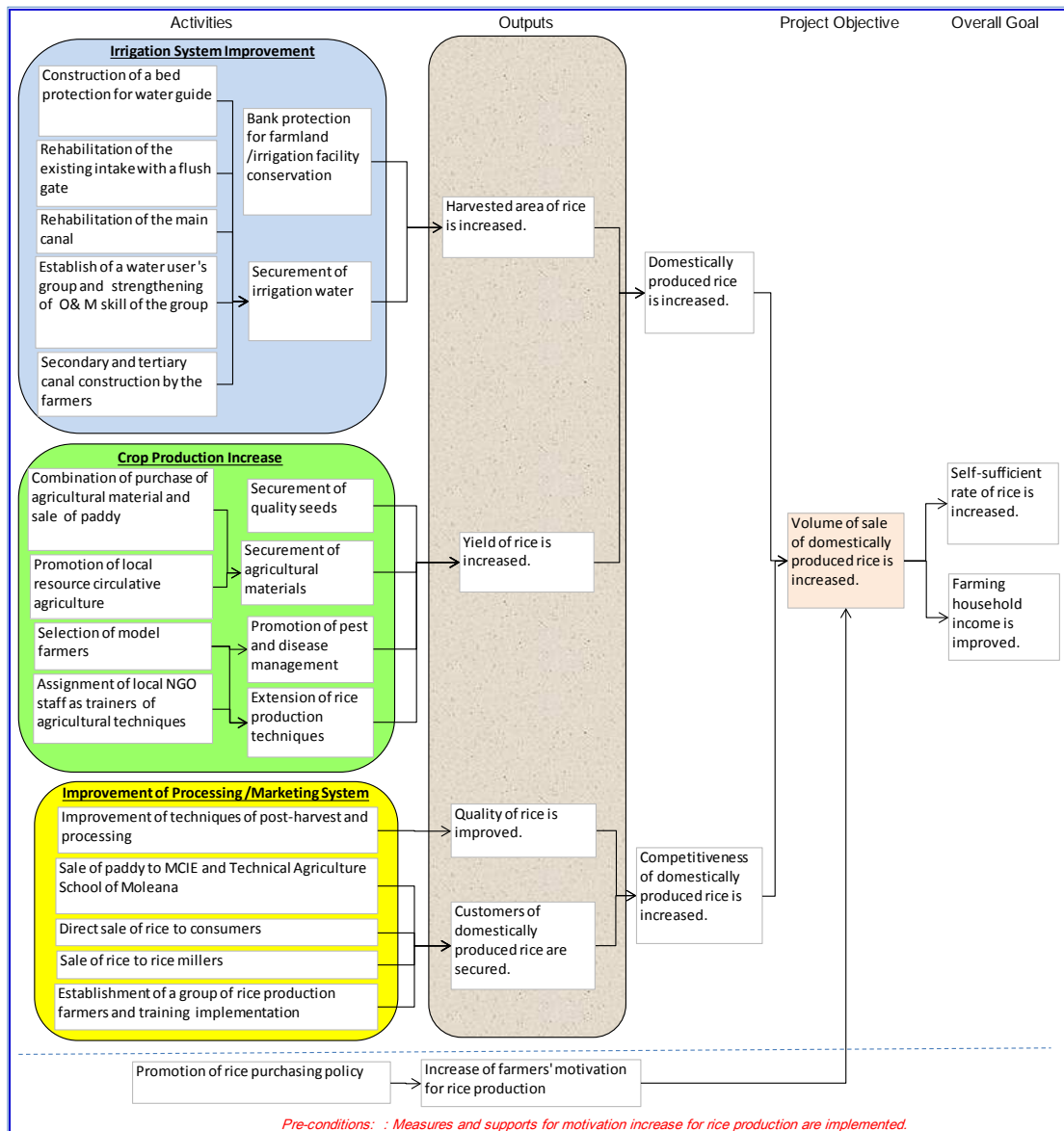


Figure 3-6-1 Overall Structure of the Priority Project in Halecou

3-7 IMPROVEMENT OF IRRIGATION SYSTEM

An actual situation of Halecou irrigation scheme and possible water from river are observed and rehabilitation plan for irrigation system is examined.

3-7-1 Water Resource Development Plan

After establishment of irrigation facility, two time cropping will be available. Both present and

planned cropping pattern after establishment of facility are shown in the Figure 3-7-1.

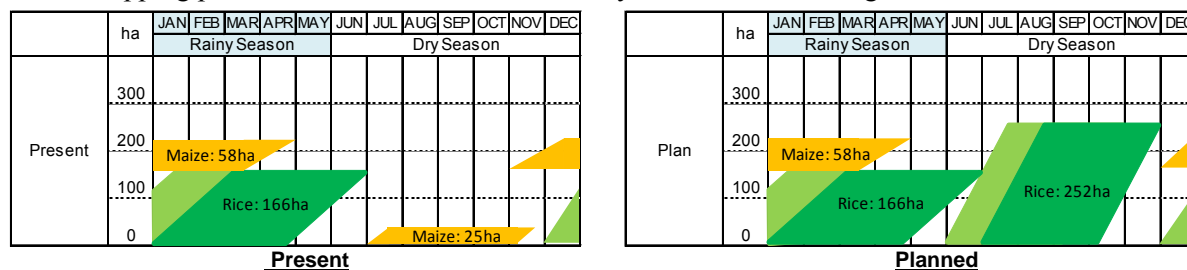


Figure 3-7-1 Cropping Pattern

The condition and results of water balance analysis based on the planned cropping pattern are shown in the Table 3-7-1 and Figure 3-7-2. As a result, available water amount from river is more than the amount of irrigation water requirement every month. This means the water amount at the intake point is enough to irrigate all the planned beneficiary area.

Table 3-7-1 Condition of Water Balance Analysis

Items		Specification	Remarks
River discharge	River name	Nunura River	
	Data source	Bebai river (Average of 1952-1974)	Data from ADB report*2
	Catchment area at intake point	1,173 km2	
Rainfall	Data of data	Balibo (Average of 1955-1974)	Data from RSPAS ANU
	Efficient rainfall	80% of rainfall (maximum 250mm)	
Halecou Irrigation Scheme	Rice	Rainy Season	166 ha
		Dry Season	252 ha
		Percoration	3 mm/day
		Standing and puddling water	300 mm
		Interim water requirement	50 mm
	Maize	Rainy Season	58 ha
Dry Season		0 ha	
Irrigation schemes in the upstream basin*1	Name and Area of beneficiary area	MALIANA II	1700 ha
		NUNURA	227 ha
		LEOLIMA	10 ha
		Total	1,937 ha
	Irrigation area	Rainy Season	1,937 ha
		Dry Season	969 ha
	Cropping pattern	Same as Halecou Irrigation Scheme	
Other water demand	Drinking water and water for live stock		
Intake efficeincy	0.3		
Irrigation Efficiency	0.55		

*1: Upstream irrigation scheme; Maliana II (1-e-6S), Nunura(1-e-23TR),Leolima(1-e-25TR) (*1-e-22TR Ciboh is a part of Maliana II)

*2: ADB: TA409, August 2004, Assessment of water availability and water demand in Timor-Leste at river basin level

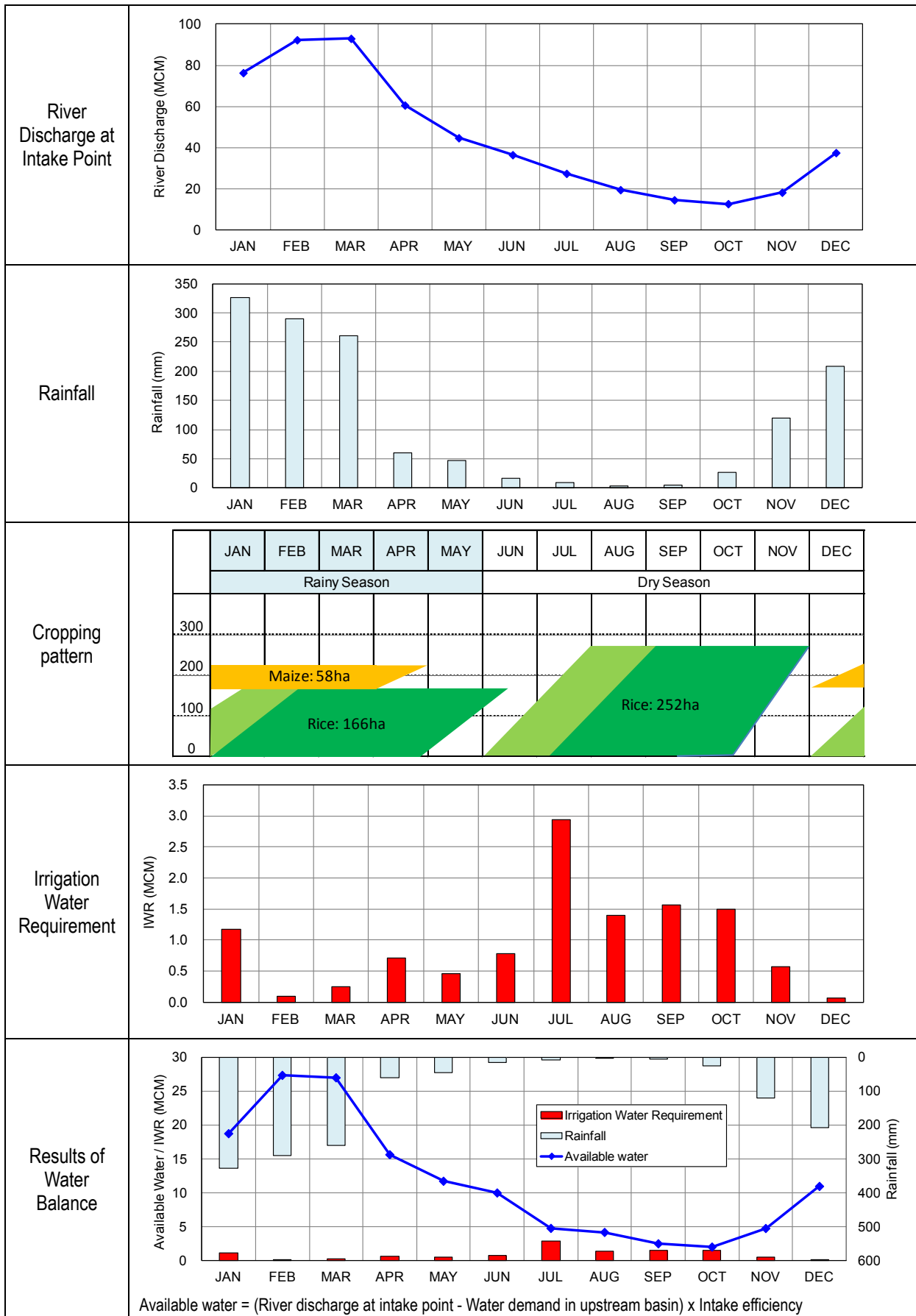


Figure 3-7-2 Results of Water Balance Analysis

3-7-2 Improvement of Intake Facility at River

Rehabilitation of intake facility is planned to purpose of the improvement of issue of facility and function. Three issues are focused from site survey as followings;

- 1) Obstruction of taking water is caused by sedimentation, due to lack of flash gate at downstream of head intake.
- 2) Meander of river stream of Nunura cause to be away from head intake
- 3) Careless plan for canal line and bed level make difficult to proper distribution of water to beneficiary area

In particular, above number of 2) could be taken into account alternative plan for securing river stream or made ease, which are subject to construction size and cost. These alternative planes should be examined in comparison with advantage and disadvantage. To solve or take measure for above issue, following alternatives are suggested (refer to table 3-7-3). In the examination, best plan should be selected with taking into account project evaluation.

A planned intake volume is calculated from "3-6-1 Development of water source", which shows 1.1 m³/s as maximum required water volume for the planned cropping pattern. 1.5m³/s should be the planed intake volume with taking account hydraulic loss for 1.1m³/s.

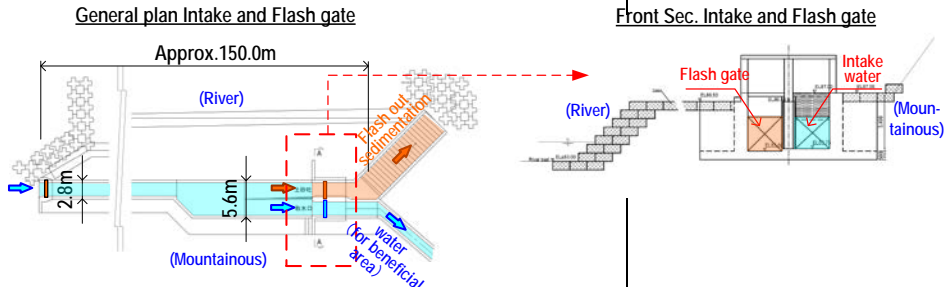
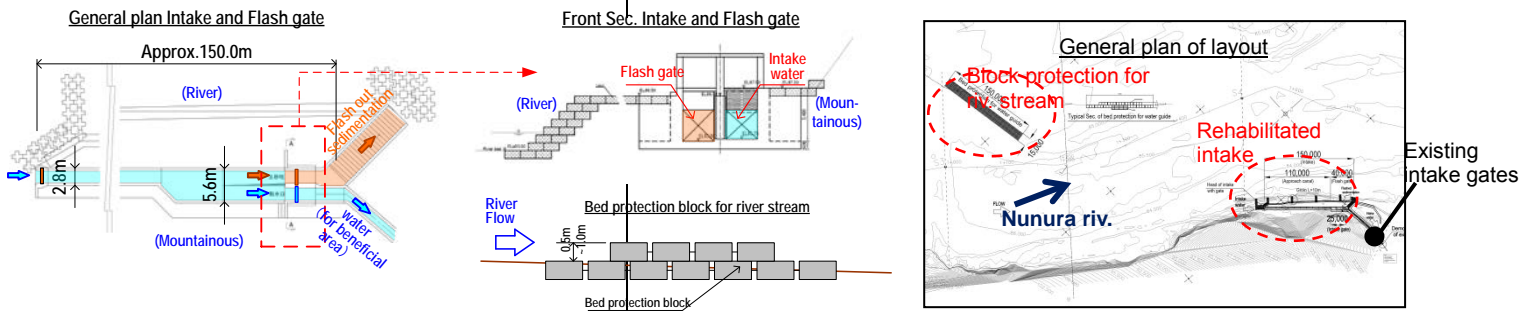
Table 3-7-2 Planned Required Water for Every Month

Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Required Water (m ³ /s)	0.51	0.04	0.14	0.29	0.20	0.30	1.10 →1.5	0.52	0.65	0.51	0.23	0.06

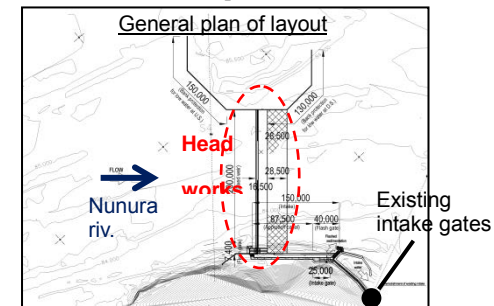
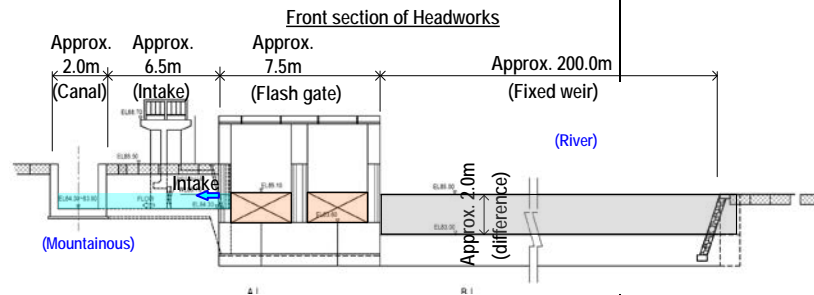
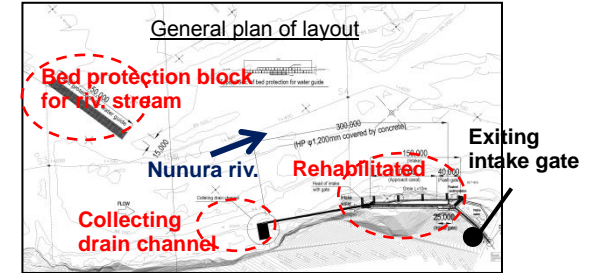
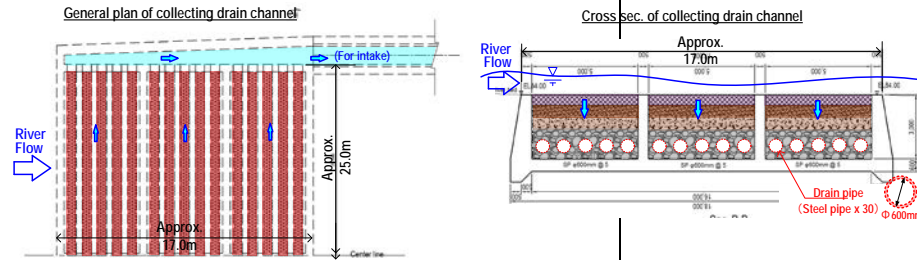
A planned canal alignment should be taken into consideration the leveling of original land-form on planned alignment based on topographic survey. In general, a slope of canal is designed by existing canal slope, but, in rehabilitation plan, the design slope should be almost 1/500 as minimum. The drop works could be designed to keep proper canal slope, if stable slope does not keep it.

A Flood discharge in Nunura River is assumed to about 2,600 m³/s in 100 yr flood, which is calculated as reference by monthly rain fall from 1952 to 1973 in ADB project.

Table 3-7-3 Alternative Plans of Rehabilitation of Facility

Issue of facility	Rehabilitation plan	Advantage and disadvantage
<p>① Obstruction of taking water is caused by sedimentation, due to lack of flash gate at downstream of head intake</p>	<p>A sedimentation pond and flash gates should be located around intake. These facility does not placed near the head intake but at 150m downstream from existing head intake where intake water is diverted into two canal, for flash and for beneficiary area</p> 	<p>A sedimentation of existing intake is usually taken away by excavator or man-power, due to lack of canal for flash. Therefore this issue can be solved by construction of flash gate. In addition, canal is separated into two canal which is flash out to river and beneficiary area, which cause the alleviation of sedimentation in canal in flood, provided that gate for flash keep open. In the condition of this situation a flood flow in canal will keep move and can expect to take away sedimentation with flow.</p> <p>These sedimentation ,however, is difficult to remove completely, the farmers need to take it away by themselves, if sedimentation volume is over the flash capacity.</p>
<p>to ② Meander of river stream of Nunura cause to be away from head intake</p>	<p>■Plan 1 A bed protection blocks in order to be stable river bed is located around head intake which is equipped with the flash gates facility. In addition, the bed protection blocks for guide of river stream is located at upstream of 500m distance from head intake to close the river stream to head intake.</p> 	<p>An impossibility of taking water is alleviated by secured river bed around head intake. The Bed protection block for river stream is expected to reduce the cost on excavation works for river stream, which block make stream head to intake.</p> <p>However, these blocks does not make effect directly for situation, but these are expected to indirect effect. Hence a possibility of effect on above structure is subject to change in the condition.</p> <p>A construction cost is the lowest in three alternative plans, while it is include the maintenance cost in more or less.</p>

	<p>■Plan 2</p> <p>In addition to plan 1, a collecting drain channel is stationed under the river bed, which has multiple holes in pipes to collect underground water.</p>	<p>In addition to effect of plan 1, the underground water can be intake as well as surface water on river.</p> <p>However, these blocks does not make effect directly for situation, but these are expected to indirect effect. Hence a possibility of effect on above structure is subject to change in the condition.</p> <p>A construction cost is middle in three alternative plans, while it is include the maintenance cost in more or less.</p>
	<p>Plan 3</p> <p>A fixed weir as headworks which is across river is constructed to secure intake water by stable river bed.</p>	<p>A fixed weir which is usually planned in Timor-Leste is applied and operated. Fixed weir keep stable river bed which lead to reduce the changeable stream.</p> <p>However, the constructed weir could be given an effect to river bed at upstream, the intake situation should be carefully observed whether the stream surely head to intake.</p> <p>A construction cost is the highest in three alternative plans, while it is low maintenance risk.</p>
<p>③ Careless plan for canal line and bed level make difficult to proper distribution of water to beneficiary area</p>	<p>An existing canal slope should be revised to proper one. A wet masonry and drop works could be located to keep stable water flow on necessity.</p> <p>Planned canal slope should be 1/2,000~1/1,000 from the view point of existing situation of canal bed.</p>	<p>The materials of canal should be prevailing ones which are available to obtain by farmers so that they can easily obtain. However, at design stage the experts and support by MAF are needed.</p>



3-7-3 Establishment of WUA and Strengthening O/M Structure

(1) Establishment of WUA

In this irrigation scheme, the irrigation facilities were completed in 2002 and the WUA was authorized in 2005. It is only farm households in Aldeia Halecou that join in WUA activities.

On the opportunity when the rehabilitation of irrigation facilities and the expansion of irrigation area are completed, it is necessary to regenerate the WUA that has all farmers in the irrigation service area to be registered.

1) Registration of member farmers

The registration of WUA membership should be extended to those non-member farmers who are practicing cultivation in the irrigation service area at present and those farmers in the expanded irrigation service area.

2) Change of outline of irrigation scheme

When the irrigation service area is expanded or decreased, and when the irrigation facilities are drastically changed, the articles of the association must be change in the general assembly of the WUA. These facts together with the change of the membership must be informed to the district office and the registration of the district administration must be renewed.

(2) Strengthening O/M structure

1) O/M Structure

There are basically four stratum in the WUA structure.

- a) Officers
- b) Suco organization
- c) Secondary canal organization
- d) Member farmers

The Operational structure of the four stratum is shown in Figure 3-7-3. At present, auditor is not elected in the Halecou WUA. It will become an important office and should be included in the article of the WUA when the rehabilitation of the irrigation facilities are completed and members of the WUA increase and water fee is collected.

The irrigation officers and extension officers are merely advisors to the WUA and they don't have any responsibility or power on the decision of the WUA matters.

2) Role and Responsibility

- a) Officers-----President, Vice president, Secretary, Treasurer. President chairs Cropping Calendar Committee, Operation Committee and Maintenance Committee. Secretary chairs Record and Property Committee. Treasurer chairs Finance Committee. The role and function of the committees are shown in Table 3-7-4.

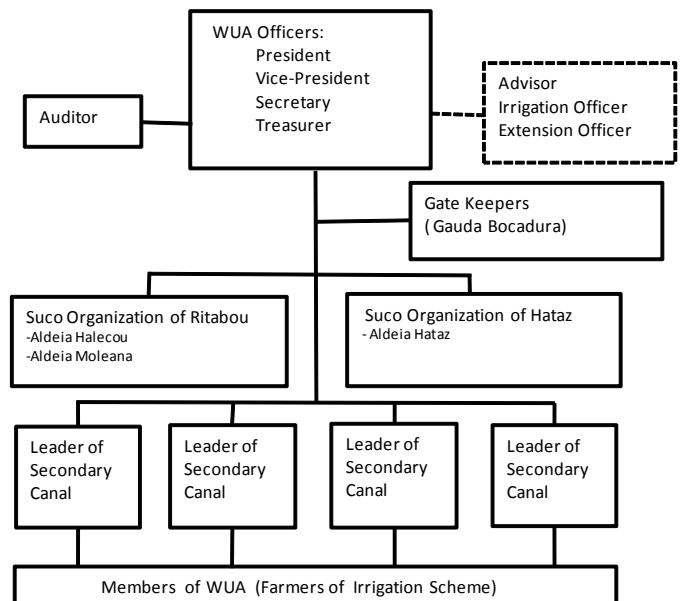


Figure 3-7-3 Organization Structure of WUA

- b) Suco organization---keeps the relation between Suco and WUA. Suco organization mobilizes the farmers to participate when necessary.
- c) Secondary canal organization-----mobilizes farmers for the maintenance of secondary canals.
- d) Member farmers----follow the scheduled cropping and cultivation and irrigation and provide labor and participate repair and maintenance work of irrigation facilities.

3) O/M of Irrigation Facilities

Cropping pattern would be a basis for the adequate water distribution and timely maintenance to keep the irrigation facilities in good condition. The cropping pattern should be planned in consideration of the seasonal water amount to be diverted from the intake. When the crop, variety, cropping area and cropping calendar are decided for the whole irrigation scheme, then the allocation of the cropping area to the command area of the secondary canal will be decided.

The cropping calendar committee will make a plan with participation of president, vice-president, suco-chief, secondary canal leader, gate keeper. The advice of the extension officer is very important.

a. Operation of Facilities

In the first stage of the irrigation period, the gate keeper and secondary canal leader operate the gates of the intake and the secondary canals in accordance with the water requirement based on the cropping pattern.

Afterward, the gates will be operated in accordance with the water quantity of the intake and secondary canals based on the crop growing stage and the amount of rainfall. The gate operation will be modified in consideration of amount of rainfall.

A sand stilling basin with scouring sluice will be provided in the rehabilitation plan. On the completion of the facilities, intensive training of gate operation must be given to the gate keeper to exclude the deposits by flushing gates periodically and to protect the intake from emergency flood by closing the gates immediately. It is expected that the deposits in the main canal is decreased by the operation of the scouring sluice gates.

Table 3-7-4 Committees, Functions and Membership

Committee	Function	Member	Role in Committee
Cropping Calendar Committee	To formulate most suitable cropping pattern in consideration of seasonal water amount	President	Chairman
		Vice-president	Vice-Chairman
	To allocate cropping area to each command area of secondary canal	Suco Chief	Member
	Gate Keeper	Member	
	To adjust cropping area of aldeia within capacity of secondary canal	Leader of Secondary Canal	Member
Operation Committee	To estimate seasonal irrigation water requirement	President	Chairman
		Vice-president	Vice-Chairman
	To deliver and distribute irrigation water properly along main canal and secondary canal	Gate Keeper	Member
		Leader of Secondary Canal	Member
Maintenance Committee	To plan dredging sand and gravel from intake	President	Chairman
	To plan desilting main and secondary canal	Vice-president	Vice-Chairman
	To plan cutting grass in main and secondary canal	Gate Keeper	Member
	To repair broken parts of irrigation facilities	Leader of Secondary Canal	Member
Record and Property Committee	To manage WUA facilities and equipment	Secretary	Chairman
	To keep record f WUA activities and property	Vice-president	Member
	To prepare periodic report activities and property	Leader of Secondary Canal	Member
Finance Committee	To collect water charge/member fee	Treasurer	Chairman
	To maintain records of all finacial matters	Vice-president	Member
		Suco Chief	Member
	To prepare periodic financial report	Leader of Secondary Canal	Member

b. Maintenance of Facilities

The maintenance of the facilities is important in order to keep the irrigation facilities in good condition. The maintenances are consisted of a) daily routine maintenance, b) periodical maintenance, and c) emergency maintenance.

Daily routine maintenance--- In irrigation period, some rubbish stuck on the gates of the intake or turnout must be cleaned immediately. The operation of the scouring sluice to exclude the deposits is daily regular maintenance. These maintenance works are carried out by gate keepers and secondary canal leaders.

Periodical Maintenance-----Before the irrigation season starts, deposits around the intake, the main canal and the secondary canals must be removed and disposed. Greasing to the winch of the gates is also important. These works are done using both O&M equipment and manual labor. At present manual labor requires four days to clean the canals. From the year 2015, wet season paddy cultivation will be introduced. Naturally, the volume of the deposits will be increased in the wet season irrigation. Manual labor works for four days of two times a year might be not sufficient. Canal cleaning may be also required during the irrigation season.

Emergency maintenance----- Emergency maintenance and repair are those works to exclude vast volume of deposit by flood inflow from the intake or partial break of the embankment of the canals in flood disaster.

3-7-4 Construction Works of Irrigation Facility by Participatory of Farmers

The construction works by participatory works of farmers are planned as followings, as well as the periodical participatory works such as cleaning of canal and removal of sedimentation are used to conduct in irrigation scheme.

(1) Branch canal and tertiary

The participatory works of farmers is targeted to arrangement of earth canal, branch canal. According to site survey, the existing canal is constructed by taken into account an actual paddy location, which area are reached irrigation water and canal is activate. This irrigatable area is classified into three area, upstream, middle toward river side and downstream toward river side in beneficiary area. At the downstream area toward river, canal is almost tertiary. While, the other area suffer from leading water due to the unavailable main canal near there. These area lead water from far canal for targeted paddy. Therefore these areas should take into consideration the improvement of branch canal and tertiary along the farmers' practical activity as well as the arrangement of the main canal and secondary canal.

Especially, in the middle area at mountain side where it is around at 2.5 km downstream from the existing intake gates, it is assumed to unsatisfied water. An effective canal networks should be planned as well as the planning of canal slope and alignment

(2) Access road in irrigation scheme

An existing road comes from south-west. The existing road divert into two ways at the junction of south-west, which extend along of mountain and extend to river side. But these roads are limited to pass by car. The road along mountain side is extended up to a half of beneficiary area, almost 2km, as well as the river side road at opposite for mountain road

Currently the farmers are used to pass these roads by motorbike and/or foot. With the expansion of productivity, the proper road should be arranged for the effective transportation. Considering of actual site condition and topography, the road for river side is relatively level, although small bush are observed on the area. Therefore it is easier to extend existing road than mountain side road. So, the expansion road as access road in the scheme is firstly targeted to the river side to reach the downstream of beneficiary area by participatory works of farmers based on the consensus with farmers

3-7-5 Protection Works for River Flood to Secure of Farm Land and Irrigation Facility

On "3-2-1 beneficiary area and households", Halecou irrigation scheme is given frequently flood damage and effect by site interview when the large flood come over the bank at upstream of beneficiary area. According to the satellite picture, it is observed that the scheme had damage after corruption of bank. In other words, the irrigation scheme was run off the surface and/or erosion of a part of beneficiary area. The scheme has not assumed to take large damage since 2004 which make sure of flood damage by satellite pictures. However, considering of past damage by large flood, it should take measure for erosion and prevention of over-flow the bank.

The facility which equip with both roles is applied to river dike, but it need to specified selection for materials and substantial volume of concrete, which cause a costly construction. To achieve the purpose of prevention of fame land, gabions protection by bolder is piled up along the bank as first priority. In addition to protect the over-flow of bank, gabions should be piled up higher one meter than top of bank.

3-7-6 Cost of Irrigation Improvement (Investment plan)

The cost estimation is conducted for improvement of irrigation system. The construction plan for intake facility is planned to three alternatives. An applied case is proposed taking into account combination of these alternatives. A maintenance and establishment of WUA fee should take into account 3~5% for entire project cost which is sourced by other similar situation and project. It will be added in estimation of entire project cost.

Table 3-7-5 Cost of Construction for Irrigation Facility

Case	Contents of construction works				Total construction cost for each plan (US\$)
	Contents of works for intake facility	cost	Contents of related facility	cost	
1	Rehabilitation of intake and construction of flash gates	725,000	Rehabilitation of main canal (L=8.5km)	1,411,000	2,757,000
	Bed protection block for river stream	529,000	Enhancement of bank protection (L=1.0km)	92,000	
2	Rehabilitation of intake and construction of flash gates	706,000	ditto	1,461,000	3,958,000
	Bed protection block for river stream	514,000			
	Collecting drain channel	1,277,000			
3.	Headworks include Rehabilitation of intake	4,196,000	ditto	1,429,000	5,625,000

Note) Indirect cost is proportion to construction cost in plan and eve same works could be difference .

Each plan is conformity with rank of project. Each case should examine to the economic evaluation.

3-8 IMPROVEMENT OF CROP PRODUCTIVITY

3-8-1 Proposed Cropping Pattern and Target Yield

(1) Proposed cropping pattern

In Halecou irrigation scheme, farmers cultivate rice only one time on rainy season. After improving of irrigation facilities, farmers can get enough irrigation water in rainy season. So that, it will be possible to cultivate rice two times per year, and then 252 ha of paddy field is cultivated in dry season. Currently maize is cultivated in dry season on a small scale, however it is recommended to exchange maize cultivation to rice cultivation because rice production of dry season has a commercial value. It is planned to remain cultivated area of rice and maize of rainy season.

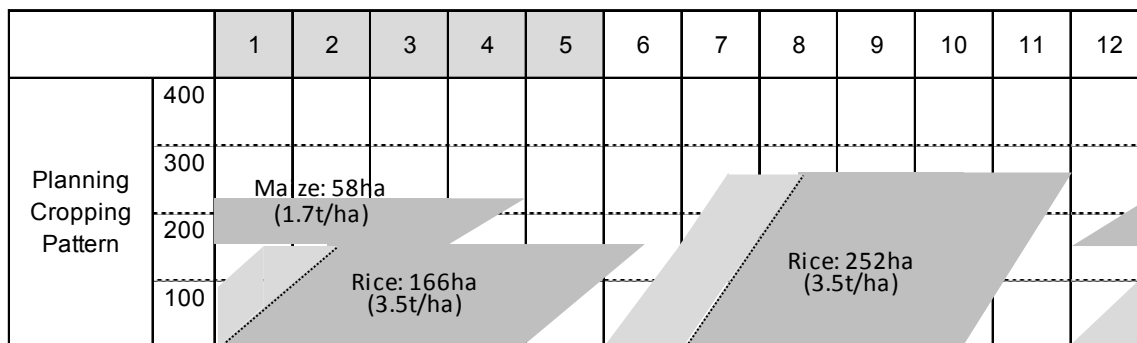


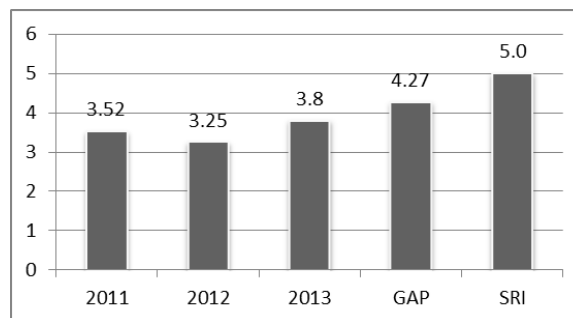
Figure 3-8-1 Planning of Cropping Pattern (Plan of Cultivated Area and Target Yield)

(2) Target yield

1) Rice

a) Past Record of Yield

According to the statistics of NDAH of MAF, the rice production of the Bobonaro district from 2011 through 2013 was 3.25-3.8ton/ha (See Figure 3-8-2). The precision of statistics of MAF is not so high. However it is clear that more than definite amount of rice is produced in Bobonaro district compared with other district.



Source: MAF(NDAH), RDP4, OXFAM Report

Figure 3-8-2 Yield of Rice in Bobonaro District (2011-2013)

The result of GAP practiced in Bobonaro district in 2013/2014 with RDP4 is 4.46ton/ha. The result of RDP4 is more realistic because they measured the water content of paddy after cultivation. On the other hand, SRI is also disseminated in this district. The result of SRI reported by Oxfam and local NGO, MCE-A, is 5.0 ton/ ha.

There are some reasons of the result of high yield. In Bobonaro district, enough amount of irrigation water is used for rice cultivation, dissemination of cultivation techniques by NGO and Extension worker is ahead of other district. And also it is easy to purchase chemical fertilizer, agro-chemicals and agricultural machine in this district.

b) Target Yield

It is planned that improved varieties such as Nakroma is introduced and planted in 80% of paddy field of Halecou irrigation scheme. Nakroma will be utilized for commercial. Meanwhile, traditional

varieties are cultivated in 20% of Halecou irrigation scheme and utilized for self-consumption. It is important to cultivate and preserve the traditional varieties on the point of farmers' preference and Biodiversity.

Table 3-8-1 Percentage of Disseminated Area of Rice Variety and Cultivation Method

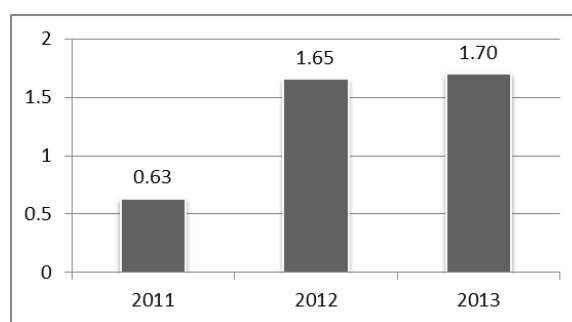
Variety	Percentage of Disseminated Area	Cultivation Method	Percentage of Disseminated Area	Target Yield (ton/ha)
Nakroma	80%	SRI	15%	5.5
		GAP	85%	3.5
Local varieties	20%	Conventional	100%	2.3

Source: JICA Study Team

It is also planned to apply SRI or GAP in the paddy field that Nakroma is introduced. Although SRI is expected to get high yield, it is needed to input labor force for sparse planting of young seedling and thorough weeding and water management more than conventional way. Hence, it is necessary to select the farmers who have a skill about cultivation method and willingness. It will be estimated that SRI is disseminated to 15 % of target area. In the case of GAP, it is necessary to select some techniques to apply to farmer's economic situation and capacity. It is planned that target yield of Halecou irrigation scheme is 3.5 ton/ ha based on the dissemination rate of seed and cultivation method. It is possible to get this target yield according to actual performance.

2) Past record and target yield of maize

The yield of maize in Bobonaro district was increased from 0.63 ton/ ha to 1.70ton/ ha for three years (see Figure 3-8-3. The production of 2011 was decreased in whole country because of bad weather. However it is possible to reach the yield of 2012 or 2013. And then it is planned that target yield of maize is 1.70 ton/ ha based on that of 2013.



Source: MAF(NDAH)

Figure 3-8-3 Yield of Maize in Bobonaro District (2011-2013)

(3) Production cost

The production costs per kilogram of both of rice and maize are 0.31\$/kg. The cost of labor force is highest in all production cost. Next, rental fee of hand tractor and cost for seed (including cost of seed from home seed-raising) is also in high ratio of total cost. It is proposed to keep down the production cost by lowering the cost of input materials and to increase yield by improving cultivation method. It is planned that the production cost of rice and maize are respectively 0.26\$/kg and 0.28\$/kg.

3-8-2 Procurement of Good Quality Seed

(1) Purchase of good quality seed

It is guessed that productivity and quality of seeds collected at home is low because of they are mixed with other varieties. Two CSPs, Commercial Seed Producers, of Suco Ritabou produce Nakroma seed with support of SoL. One of CSP already produced and stocked around five ton of Nakroma seed. The seeds of CSP are tested and certified by Department of Production and Certification for Agriculture Seeds of NDAH, MAF, therefore they have a more 95% of germination rate. It is expected that productivity and quality of rice is improved by using seeds certified.

The seed of CSP is bought by MAF when the priority project is started, and distributed to target farmers. The price of purchasing CSP seed is 1.5 US\$/kg and the seed is sold by same price to farmers. The seed is loaned to farmers who cannot have enough money to purchase the seed, and farmers have to return by paddy when they sell them. The 50kg of seed is distributed to one farmer. The target area is divided to three parts and the seed is provided to one part of target area every year.

It is recommended to renew the seed every three years. After this project, it is planned that a trader supported by MAF purchase the seed of CSP and sell them to farmers. It is supported by MAF that farmers group or water users association connect to CSP to sustainability and priority purchase good quality seed from CSP after project. It is advantage that production cost of rice is suppressed by group purchase.

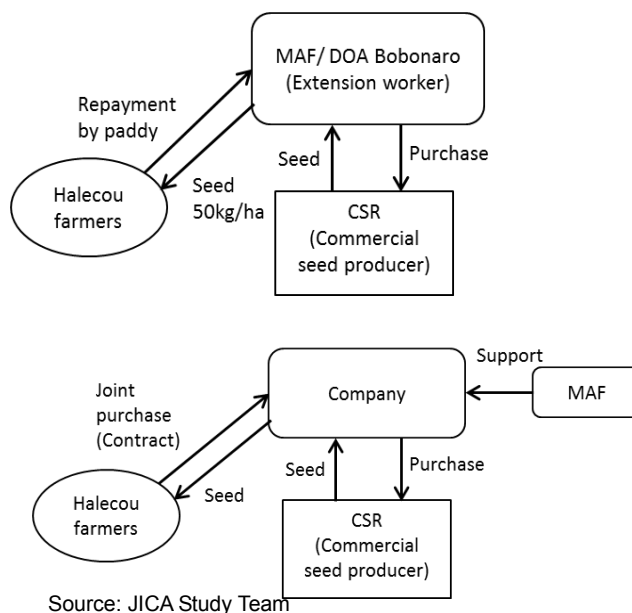


Figure 3-8-4 System of Purchasing Seed (Upper: Project Term Lower: Post- Project)

(2) Selecting of good quality seed

It is necessary to renew the seed ever year. However it is difficult to do it because of economic situation of farmers and actual situation of seed production. Therefore it is recommended to renew the seed every three years. It is also important to train how to collect the seed by themselves. Therefore it is planed that farmers are trained about the way of collecting seed, selecting seed by salt water and treatment of seed with hot water.

Selecting seed with salt water is easy and useful method. It is easy for farmers to prepare materials for this method. It is reported that seed treatment with hot water have an effect for prevention of some disease such as seedling bjight, bacterial brown stripe, blast and white-tip nematode, same as agro-chemicals. It is planned to have training about this method.

3-8-3 Program of Improvement Input Materials (Fertilizer, Agro-chemicals, Agricultural machine and Agricultural Equipment)

(1) Fertilizer and agro-chemicals

Almost of all farmers don't input a chemical fertilizer in Halecou irrigation scheme. Farmers have to go to market of Maliana city for buying chemical fertilizer and agro-chemical because that there are no any shop in the village. Urea or ammonium sulfate is sold in the market however the amount of them is small. Then sustainable purchasing system is planned in priority project. There is an owner who merchandise agricultural materials in Dili such as Sorte trading Lda. They also have a rice mill in Maliana city. So that it is necessary to develop continuous system which include selling paddy and buying agricultural materials with rice traders.

It is also planned to train farmers how to use chemical fertilizer correctly because farmers don't know

Table 3-8-2 Plan for Purchase of Seed

Particular	Unit	Amount
Cultivated area of rainy season	ha	194
Cultivated area of dry season	ha	252
Total cultivated area	ha	446
Applied area of improved seed (80%)	ha	356.8
Seed volume per hectare	kg/ha	50
Seed volume for total area	kg	17,840
Procurement volume of seed per year	kg/year	5,947

Source: JICA Study Team

correct method to use chemical fertilizer. It is important to compare the improved method and conventional method at farmers' model field.

(2) Agricultural machine and equipment

There are around 20 hand tractors in Halceou irrigation scheme according to the result of Farmers' Socio-Economic Survey and field survey. They are owned by farmers group or individual farmers. Around 70% of farmers hire the hand tractor from neighbors. More than half of farmers plow the paddy field by hand with farm equipment and then harrow it with hand tractor. There are few farmers who harrow the paddy field for two times.

The air of the ground is replaced by plowing by hand tractor and then activities of micro-organisms are promoted. Therefore organic materials are disassembled quickly and physical condition of soil is improved with proper water content. Moreover plowing with hand tractor is effective for protection of weed because weed and its seed are ploughed in. Harrowing with hand tractor has a role of a break clod and a role of the land leveling, and then it is effective to equalize a state of the tilled soil. Therefore it is recommended to utilize hand tractor at two times for ploughing and harrowing.

It is important to train farmers about land leveling after puddling with simple type of agricultural equipment. Manual rotary weeder for paddy is also introduced to target farmers because weeding of early growth stage has an effect on growth of paddy and yield. It is recommended that individual farmers or farmers groups purchase the weeder made at the city of Maliana. It is also planned to rent the weeder to farmers who don't have enough money to buy it. In that case farmers have to repay when they sell the paddy.

3-8-4 Program for Promoting Local Resource Circulative Agriculture

(1) Introducing of input materials using local resource

Applying only agro-chemicals lead the soil deterioration or large outbreaks of insect, pest and disease. It is recommended to train how to make and apply the compost or organic fertilizer made by materials which purchased in target area but not limited to train the suitable usage of chemical fertilizer.

Table 3-8-3 Example of Compost or Organic Fertilizer using Local Resources

Local Resource	Utilization
Rice husk + Dung of Buffalo	Compost of charcoal rice husk
Native micro-organism	Compost, Liquid fertilizer
Residue of beans or other crop + Dung of chicken	Green manure, Liquid fertilizer
Rice straw	Puddling to paddy field

Source: JICA Study Team

Gracia farm which is in Ermera district is a biggest chicken farm. They farm around eighty hundred chickens and sell dunk of chicken to neighboring farmers. It is planned to buy dunk of chicken from Gracia farm and make compost at the village or paddy field which is not used for cultivation. It is necessary to compensate nitrogen with urea or ammonium sulfate because dunk of chicken doesn't have enough potash and phosphorous. It is also available for supplying nitrogen to use compost made by cow dunk or residues of plant.

(2) Utilization of local resources (Local NGO)

Habras Moris is a NGO which has done activities at Bobonaro district for a long time. They have participated some project by donor and they know the situation of cultivation of Bobonaro district. It is planned to disseminate compost or organic fertilizer using local materials through the activity of NGO.

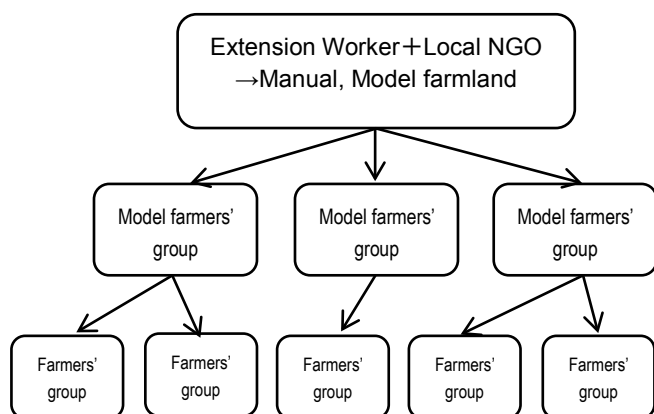
3-8-5 Program for Dissemination of Cultivation Method

(1) Utilization of GAP manual and dissemination through the model farmers group

It is planned to utilize GAP manual made by MAF on dissemination of rice cultivation method. There

are some technics which farmers could not implement due to the situation of farmers and their technical level. It is necessary for extension worker and local NGO to take the farmers opinions and disseminate the technics which farmers implement it easily and sustainability. It is also important to make simple type of manual with easy figure for farmers.

It is also planned that extension worker or local NGO rent a paddy field which is near the village and managed it as a model farm land. Above simple type of manual is noticed on board which is set up near the model farm land. Cultivation method which is applied improved cultivation techniques is presented on the model farm land. Around five model farm lands are selected. Farmers' group who manage a model farm land carry out improved cultivation techniques under the guidance of extension worker or local NGO (as shown) in Figure 3-8-6. They also compare the improved cultivation techniques with conventional method.



Source: JICA Study Team

Figure 3-8-5 System of Dissemination through Model Farm Land

Seed	Using good quality seed, Selecting seed with salt water, Treatment with hot water
Nursery	Preparing of nursery, Sowing density
Land Preparation	Using hand tractor, Land leveling
Transplanting	Transplanting with checkrows: 25-35cm, with row: 25cm x 15cm
Weeding	Weeding with rotary weeder, two to four times, proper timing
Fertilizing	Chemical fertilizer, Compost, Liquied fertilizer (method of applying, time of applying)
Irrigating	Management along the cultivation term, intermittent irrigation
Pest and Disease Control	Prevention method with small amount of agro-chemicals
Other	...

Source: JICA Study Team

Figure 3-8-6 Example of Improved Cultivation Method (source: GAP Manual)

(2) Utilization of local resources (Local NGO)

Movimento Cooperativa Economica-Agricola (MCEA) is a local NGO supported by Oxfam and active in Bobonaro district, Viqueque district and Covalima district. They form a farmers group and disseminate SRI to them.

The MCE-A has a plan to construct an agricultural technical center (tentative name). They also plan to disseminate mainly SRI as a rice cultivation method, horticulture techniques, livestock management and fish cultivation in the center. Farmers should lodge in the accommodation of the center for around two weeks and learn some techniques. It is planned that fund for training in the center is supported from priority project for few farmers selected. It is important to learn more practical techniques from the technicians or farmers who carry out the SRI and produce results.

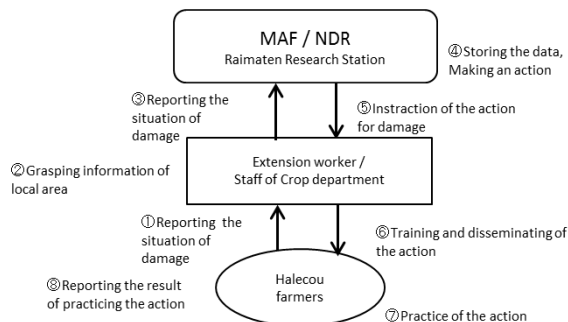
3-8-6 Strengthening Program for Pest and Disease Control

The rice productivity is damaged by disease and harmful insects. Some farmers buy the agro-chemicals and use them against the disease and harmful insects, another farmers use natural homemade pesticide or insecticide with local materials by traditional way. But actual prevent is not so effective. According to the field survey, rice blast or rice tungro disease is emerged in Bobonaro district. There are also damages of bug, grasshopper and rice rootworm.

The damage of rice, maize, beans, root and tubers from disease and insects are researched in National

Directorate of Research, NDR of MAF. Raimaten Research Station which researches the disease of rice is located in Bobonaro district. However it is not enough to collect the data about disease and insect and to make measures to them. It is planned that Halecou irrigation scheme is set as a priority region which is strengthened about measure against disease and insects. It is necessary to carry out grasping situation of damage, designing the measures that are possible with the present situation, carry out that measure, feedback of the result. It is important to make measures which are easy to apply extensively.

The information about the situation of damaged from disease and insect is collected by farmers or extension workers and stocked in the research center. Solution against disease and insects which is possible to implement with current situation are planned in the research center. Extension worker or district officer of crop department implement the solution with farmers, and feedback the result of them. It is also important to improve the measures (see Figure 3-8-7). The information gained from Halecou irrigation scheme are also applied to other area of Timor-Leste.



Source: JICA Study Team

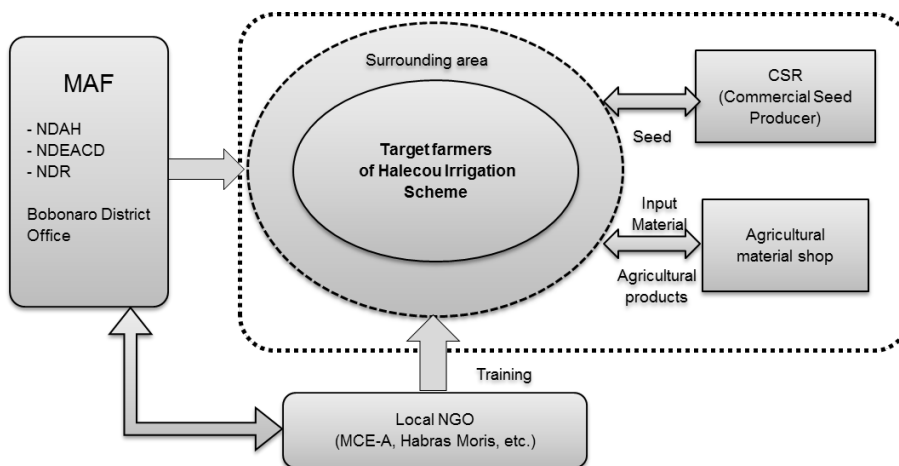
Figure 3-8-7 Flow of Prevention Activity of Pest and Disease

Damages from rats, birds, wild animals and livestock especially in dry season are also important problem. It is also planned to carry out same process against these problems. It is important to manage the livestock in dry season because rice cultivation of dry season is carried out. The priori consultation with farmers who farm livestock is set.

3-8-7 Framework and Cost of Improvement Crop Productivity

(1) Framework of implementation

The priority project as above is carried out with frame work shown in right figure.



(2) Investment plan

The cost for priority project is estimated as Table 3-8-4.

Table 3-8-4 Cost of Improvement of Crop Production

Activities		Cost (US\$)
Activity-1	Program for obtaining and breeding quality seed	40,400
Activity -2	Program of Improvement Input Materials (Fertilizer, Agro-chemicals, Agricultural machine and Agricultural Equipment)	7,500

Activities		Cost (US\$)
Activity -3	Program for Promoting Local Resource Circulative Agriculture	34,780
Activity -4	Program for Dissemination of Cultivation Method	15,000
Activity -5	Strengthening Program for Pest and Disease Control	12,750
Total		110,430

3-9 IMPROVEMENT PLAN FOR POST-HARVEST AND MARKETING

3-9-1 Directions to Improvement of Post-Harvest and Marketing Exploitation

The paddy production shall increase to 1,463 ton/year in the conditions of the cropping areas at 166ha in rain season and 252ha in dry season with the achievement of yield at 3.5 ton/ha-paddy. The surplus is estimated at 942 ton-paddy equivalent to 64% of the whole production as calculated in Table 3-9-1. The surplus 942ton as a commercial paddy shall be distributed to direct sales of milled rice by farmers at 25%, rice millers and traders of paddy at 20%, MCIE purchasing system in paddy at 15%, MAF purchasing to Moleana Technical Agricultural School in paddy at 3% and others at 1%. For exploration of marketing channels, the following factors shall be considered:

- The recovery ratio shall be achieved more than 55% for commercial rice.
- For the direct sales of milled rice, individual farmers shall sell whole and broken grains separately.
- For the sales of paddy to traders and rice millers, the paddy shall be dried until 15% moisture contents in order to store for long terms. The interests of traders and rice millers are less containing of impurities, higher milling ratios due to the unified forms in the shapes of paddy (unity of rice varieties) and well died conditions of paddy.
- Regarding MCIE paddy purchasing system, the farmers have never experienced. As it is possible to supply more than 100 tons-paddy after improving irrigation facilities and farming system, the community-use warehouses shall be required for on-time loading for MCIE contracted traders. As well, MCIE promotes procurement of paddy from agricultural production cooperatives, therefore, the farmers groups shall be trained by MCIE Cooperative Department for organizing of farmers groups and obtaining of social status.
- Regarding MAF paddy purchasing, the farmers group shall contract farming with Moleana Technical Agricultural School for the demands of students and teachers.

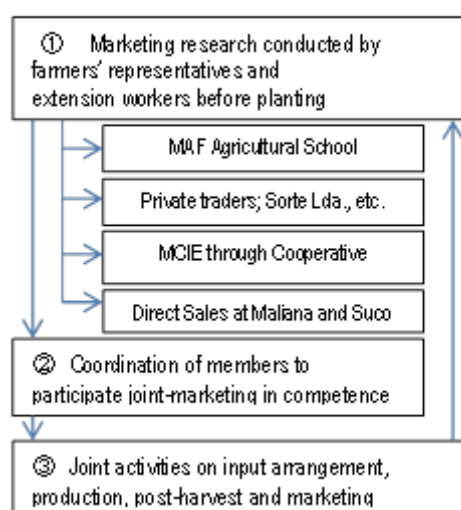
Table 3-9-1 Current Situations and Marketing Exploitation of Paddy

Comparative Items	unit	Halecou				Remarks (Source of Information for w/o project)
		w/o project		w/ project		
Basic Data						
(1) Potential Area	ha	360				Irrigation Inventory Survey
(2) Irrigable Area	ha	252				Irrigation Inventory Survey
(3) No. of Households	HH	103		120		Irrigation Inventory Survey
(4) Numbers per Household	person/HH	6.29		6.50		Farmers Socio-Economic Survey
(5) No. of Inhabitants	person	648		780		(3)×(4)
(6) Wet Season Paddy Cropping Area	ha	166		166		Irrigation Inventory Survey
(7) Dry Season Paddy Cropping Area	ha	0		252		
(8) Yield	ton/ha-paddy	1.49		3.50		Farmers Socio-Economic Survey
(9) Estimated Paddy Production (Dry+Wet Seasons)	ton-paddy	247.3		1,463.0		
(10) Purchase of Milled Rice	ton-rice	20.8		0.0		Farmers Socio-Economic Survey
Distribution in Paddy Basis						
Consumption and Internal Use						
(11) Stock for Home Consumption	ton-paddy, %	221.2	89.43	285.3	19.5	Farmers Socio-Economic Survey
(12) Seed Stock	ton-paddy, %	12.8	5.18	20.5	1.4	Farmers Socio-Economic Survey
Germination Ratio	%	45.3		71.4		35kg-paddyseed/ha=100% germination
(13) Loan Repayment	ton-paddy, %	0.0	0.03	185.8	12.7	Farmers Socio-Economic Survey, US\$190/ha for Input Cost, US\$0.50/kg-paddy
(14) Land Tenant Fee	ton-paddy, %	0.0	0.00	0.0	0.0	Farmers Socio-Economic Survey
(15) Paid as Irrigation Water Fee	ton-paddy, %	0.0	0.00	14.6	1.0	Farmers Socio-Economic Survey
(16) Mutual Help or Christian Society	ton-paddy, %	0.0	0.00	14.6	1.0	Farmers Socio-Economic Survey
Subtotal		234.0	94.64	520.8	35.6	
Sale of Surplus						
(17) Trader/Collector, NGO	ton-paddy, %	0.1	0.05	292.6	20.0	Farmers Socio-Economic Survey
(18) Cooperative Operation	ton-paddy, %	0.2	0.10	14.6	1.0	Farmers Socio-Economic Survey
(19) MCIE through Cooperative	ton-paddy, %	0.0	0.00	219.5	15.0	Farmers Socio-Economic Survey
(20) MAF (Agricultural Technical School)	ton-paddy, %	0.0	0.00	43.9	3.0	Farmers Socio-Economic Survey
(21) Direct Sales at Market	ton-paddy, %	9.5	3.84	365.8	25.0	Farmers Socio-Economic Survey
(22) Community Transaction and Others	ton-paddy, %	3.4	1.37	5.9	0.4	Farmers Socio-Economic Survey
Subtotal	ton-paddy, %	13.3	5.36	942.2	64.4	
Other Indicators						
(18) Post Harvest Losses (not including milling recovery)	ton-paddy, %	35.2	15.0	173.1	12.0	Site Survey, (8)×Loss%
(19) Production without Losses and Seed Stock	ton-paddy	199.3		1,269.4		(8) – (12) – (18)
(20) Milled Rice Basis Consumption, Milling Recovery	ton-rice, %	114.8	50.0	138.1	55.0	(11)×(1 – Loss%)×Recovery% + (10)
(21) Estimated Consumption per Head in Milled Rice (including chicken feeding, extra stock and animals)	kg/head/yr	177		177		(20)÷(5)

3-9-2 Encouraging and Organizing of Local Commercial Rice Farmers' Group

In Bobonaro District, agricultural production cooperatives have not been officially registered to Ministry of Justice. As the first stage in organizing, the spontaneous marketing research by farmers shall be conducted. The distribution of paddy/rice has been limited within villages and the relatives, because the irrigation facilities have not been functioned since 1980's. Therefore, the connection with local traders becomes weakening. After implementing the project, it is expected that the production potentiality will increase. 5 traders more than 100 ton-paddy of trading volume through MCIE purchasing system are existing in Maliana Sub-District. They could not supply continuous 1-2 years due to the bidding results by MCIE.

The largest trader for MCIE purchasing system in Maliana is Sorte Trading Lda., who has installed the milling machines with pre-cleaning, de-husking, milling and grading functions made by Indonesian Agrindo in 2013 and made by Chinese 2015. The company is exploiting marketing channels especially to the inhabitants in the highland areas of Bobonaro and Ermela Districts. The farmers groups of SRI and organic farming supply milled rice to NGO (MCE-A), who are selling in Dili as specialty rice.



The groups formed in Halecau Irrigation Scheme should have the target consuming layers by their decision and determine the required quality such as expecting prices, packages and transporting methods. In the initial stage of sales of milled rice, the group shall manage simple quality control by means of checking the moisture contents of paddy before milling, separating whole and broken grains and removing impurities. The biggest interest of target consumers is a cost factor. The idea and efforts to reduce the production and transport costs exploitation are very important. Effective countermeasures will be formation of groups for joint-purchase of quality seeds, agreement on rotation farming among farmers to recover soil fertilization, contract working groups to conduct plowing/transplanting/harvesting works, transporting arrangement using trailers of hand tractors and operation of community warehouses. Initially, the facilitator shall provide discussing opportunities to form the groups with the clear objective to earn profits, but not to form a legal agricultural cooperative society.

The groups shall conduct the activities, but not limited below:

- (1) Collection of water fee and operation and maintenance of irrigation facilities
- (2) Participation to the bidding on MCIE purchasing system, or paddy supply to MCIE contracted traders
- (3) Contract supply to the organizations under control of MAF
- (4) Joint-purchase of quality seeds, and (according to depending on farmers' requirements) chemical fertilizer, fungicide, pesticide and grain sacks
- (5) Operation of a community warehouse, and (according to depending on farmers' requirements) operation of joint-use rice milling machines or contract supply to rice millers
- (6) Management of hand tractors provided by MAF or procured by the groups
- (7) Re-sales of paddy/rice if the water fees are collected by in-kind
- (8) Arrangement of transportation of paddy/rice and other agricultural products
- (9) Mediation of quarrels among farmers, if required
- (10) Provision of guarantee for credit such as RANAMONA credit cooperative

3-9-3 Value-Chain Approach of Local Commercial Rice

For activation of transaction of local commercial rice, farmers' awareness on market requirements is important at the initial stage. If the project is implemented, the following expecting activities are planned for creation of value-chain on rice business:

- (1) Marketing research by extension workers and farmers representatives of the irrigation scheme
- (2) Discussion with the potential buyers such as traders, rice millers and consuming groups
- (3) Determination of paddy varieties, required quality, timing and minimum selling prices, and the countermeasures of constrains specified by the results of value-chain analysis
- (4) Identification of necessary technologies for post-harvest
- (5) Identification of necessary facilities and machineries for joint-use, their procurement methods and financing
- (6) Introduction of possible farming technologies to improve yields and decrease input/labor costs (quality seeds, irrigation water applying periods, mechanization on tilling and paddling)

and other on-farm works)

- (7) Formation of joint-working in post-harvest such as harvesting, threshing and transporting)
- (8) Shift of the transaction mode from individual sales to joint-sales based on willingness of farmers
- (9) Negotiation for the next year harvest, (return to above (3) article)

In the participatory market research, the selected farmers shall know the commercial rice quality (local and imported), the selling and buying prices of retailers and seasonal price fluctuation. The MAF extension workers shall facilitate the research and arrange the opportunities to negotiate between farmers and buyers such as traders, schools and communities. Then, the farmers’ groups will identify the critical issues in the line of rice supply chain. In order to obtain competitiveness with imported rice, three approaches on input procurement, increase of yield and quality improvement shall be required:

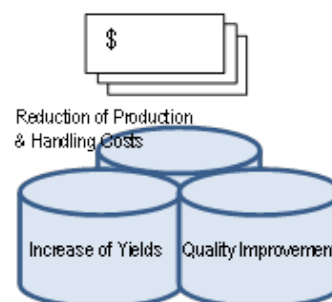


Table 3-9-2 Supply Chain and Weakness to be Improved

Supply Chain	Weakness to be Improved
Input Procurement	Materials for low input rice farming such as high quality seeds produced by SoL seed production group, organic fertilizers and natural pesticides using local resources
Production	Selection of applying farming methods such as direct sowing, ICM or SRI, discussion on use of irrigation water and planting periods by plot, agreement on water use/ crop rotation/ construction of animal fences, formation of working groups in tillage and harvest, introduction of agricultural tools designed by IRCP for weeding and transplanting
Postharvest Handling	Suitable drying of paddy, storage in silo (metal bin) or other effective methods, introduction of paddy pre-cleaner and milled rice separator at least (or manual separation), packaging methods
Marketing (Out of Supply Chain)	Transporting arrangement, supply to buyers in agreed quality, volume and price
Financing	Coordination with credit cooperatives or Local NGOs

The targets of the project are the yield at 3.5ton/ha-paddy and the production cost excluding family labor wages at less than US\$0.40/kg-paddy from the present cost at US\$0.55/kg-paddy. The ratio of broken rice is targeted at less than 25% from the present 25-50%. The facilitator of the project shall coordinate to create idea of farmers groups and to lead their own efforts. The target of farm-gate prices cannot be set at the moment, but the selling prices were fluctuated at US\$0.40-0.55/kg at Maliana.

3-9-4 Improvement Plan on Post-Harvest and Processing Technologies of Local Commercial Rice

In the villages, rice milling machines are operated at 4 places. The existing Chinese-made machines (friction milling type without de-husking) become one of reasons on lower milling recovery ratio and produce more broken rice. After increasing paddy production, the renewal to Agrindo or Yanindo made milling machines would be supported by cost sharing with the groups. Under the prerequisite conditions of quality seeds, irrigation water, soil improvement and pest control, the following appropriate post-harvest technologies will be applied in the project:

- (1) The harvested paddy should be dried until 15% to avoid fungal damages during storage.
- (2) For storing more than 1 month, individual farmers shall use the drums or the steel mini-silos promoted by IFAD and FAO, or the large capacity grain bags (called as the flexible containers) hanging by beams of stores.

- (3) In the case of using the secondhand grain bags or the traditional baskets weaved by palm leaves, the flow of air should be considered especially under the bottoms of bags/baskets. The measures to avoid from damages by rats and rice weevils should be considered.
- (4) Pre-cleaning of the harvested paddy shall be practiced to remove impurities.
- (5) Small rice milling machines shall be replaced, if necessary.
- (6) Separating devices shall be developed using locally available materials.
- (7) If high-end consumers are found, the packages and labels shall be developed with accurate weighing.

The required quality of paddy/ milled rice will be determined by consumers' demands and selling prices, but the cost of inputs shall be minimized by cooperation with large rice millers.

Table 3-9-3 Improvement of Post-Harvest Process by Marketing Channel

<u>Process</u>	Possible Marketing Channels				
	Local Market	MCIE Purchasing	MAF Purchasing Feeding to Tech. Agri. School	Dili Market	As Specialty Product
Required Quality	Low	←—————→			High
Prioritized Factor	Low cost	Unified quality	Safety	No contamination and low broken	Total quality and Brand
(1) Drying	Drying yard or tarpaulin	Drying yard	Drying yard	Drying yard	Drying yard
(2) Storing	Traditional store	Mini-silo or sack/ flexible container in rain water protected store	Mini-silo or flexible container in rain water protected store	Mini-silo or sack/ flexible container in rain water protected store	Mini-silo
(3) Pre-cleaning	By manual	By pre-cleaner	By pre-cleaner	By manual or pre-cleaner	By manual or pre-cleaner
(4) Milling	One-pass type	Mini-plant	Mini-plant	One-pass type or mini- plant	Mini-plant
(5) De-stoning	By manual	By manual	By manual or de-stoner	By manual or de-stoner	By manual or de-stoner
(6) Grading	By sieve	Not necessary	By grader	By sieve or grader	By grader
(7) Polishing	Not necessary	Not necessary	By polisher	By polisher	By polisher
(8) Weighing & Packaging	Packaged by sack, scaled by can (volume)	Packaged by sack, scaled by contact trader	Handled by bulk, scaled by group	Packaged by original sack, scaled by group or trader	Packaged by original sack, scaled by group or trader

3-9-5 Adaption to Government Paddy Purchasing System

(1) Access to government paddy purchasing system

At the step maturing the marketing activities of the agricultural production cooperatives or the farmers group, they will directly access to the government paddy purchasing system. MCIE has the plan to manage the unified operation of imported rice and locally purchasing rice from 2015 and to increase paddy purchasing tonnage. According to the contracted traders, they suggest necessities of prompt payment and quality-based pricing system for fair trading. The agricultural production cooperative or farmers groups shall cope with the following tasks:

- Management of the agricultural production cooperative under supervision of MCIE

Cooperative Directorate and registration to Ministry of Justice

- Agreement among farmer members on paddy collecting points and methods and joint-use of a community warehouse
- Simplified quality control of paddy at the level requested by MCIE and inspection of moisture contents and containing impurities damaged and immature paddy
- Coordination of join-works such as pre-cleaning, weighing and packaging and arrangement of transportation to MCIE specified warehouse
- Banking arrangement and remittance to the members depending on supplied weight

(2) Supply of paddy to technical agricultural school of Moleana²

For the school feeding program to Agricultural Schools, MAF Procurement Directorate conducts bidding. The contracted firms supply food materials to the schools, but most of food materials are imported including milled rice. In the project, the locally produced rice shall be distributed to the School as a leading case of school feeding programs using local materials. The premium farm-gate prices are expected depending on quality and taste. Transaction shall be contracted between the School and the large rice miller, who shall collect quality paddy from the farmers group. The expecting monthly schedule and works by stakeholder is suggested as below:

Table 3-9-4 Paddy Purchasing System for Technical Agricultural School of Moleana

Dry Season Crop	Wet Season Crop	MAF	Rice Miller	Farmers Group	Tech. Agri. School of Moleana
Jan-Feb	Jul-Aug	Holding the seminar of the project, selection of cooperating rice miller	Maintenance of rill milling machines		
Mar-Jun	Sep-Oct	Support on distribution of quality seeds	Selection of farmers groups, paddy purchasing contract with the groups	Farming works of plowing, irrigating, seeding and nursery preparing	
May-Jul	Nov-Jan	Monitoring on contract farmers, arrangement of advance payment to the rice miller	Monitoring on growth of paddy	Farming works of basic fertilizer application and transplanting	
Sep-Nov	Mar-May	Dispatch of trained inspectors on quality evaluation, arrangement of final payment to the rice miller, project evaluation	Integrated works on post-harvest such as collecting, scaling, drying, processing, packaging and payment to contract farmers	Farming works of additional fertilizer application, pest-control and harvesting	Receiving of milled rice, eating quality test of cooked rice

In the MAF purchasing system, MAF Bobonaro District Office will verify the following subjects:

- Farming technology and quality inspection can be implemented by the officers of MAF District Office
- The payment can be promptly done using the existing credit agents from MAF to the contracted rice miller.
- The contract between the rice millers and farmers groups/ individual farmers can be functional.

² MAF/ National Directorate of Education and Agriculture Training/ Technical Agriculture School of Moleana,

- Farmers can secure the gross profits from paddy production.
- The stakeholders of the farmers groups, the rice miller and the School can satisfy the transaction mode in the project.
- The post-harvest losses and the broken rice ratio can be depressed.
- As the results of eating quality test of cooked rice, the dealing rice can be competitive with imported rice (Vietnamese rice, broken >25%) and other local rice.

3-9-6 Input Plan

The costs on the inputs are estimated as below:

Table 3-9-5 Input Costs on the Plan for Post-Harvest and Marketing

Activity		Item	Cost (US\$)	
Act-1	Encouraging and Organizing of Local Commercial Rice Farmers' Group	Manpower mobilization	29,500	65,100
		Materials (training, warehouse, trailer for hand tractor)	35,600	
Act-2	Value-Chain Approach of Local Commercial Rice	Manpower mobilization	33,500	61,300
		Materials (pre-cleaning sieve, scale, tarpaulin, grain bag, etc.)	27,800	
Act-3	Improvement Plan on Post-Harvest and Processing Technologies of Local Commercial Rice	Manpower mobilization	7,500	14,000
		Materials (training, moisture contents meter)	6,500	
				140,400

Remarks: The rice milling machines will not be provided directly to motivate independency of farmers. But the credit through NGO would be considered accordingly in the progress of the project implementation.

3-10 PROJECT EVALUATION IN PRE-FEASIBILITY STUDY LEVEL

The project is evaluated pre-feasibility study level.

3-10-1 Project Cost

The costs on the inputs are estimated as below:

Table 3-10-1 Project Cost

Components	Project Cost (US\$1,000)	Remarks
1. Improvement of irrigation systems		
Level 1 : Intake without division dam *	2,757	Applied
Level 2 : Collecting drain channel	3,958	
Level 3 : Headworks	5,625	
2. Crop production increase	110	
3. Improvement of processing and marketing	140	
Total	3,007	

*Level 1 is applied for economic evaluation.

3-10-2 Economic Validity

(1) Cost

US\$ 2,757 thousand of the construction cost of the irrigation infrastructure improvement plan was allocated equally in the two years of the beginning. After the third year, 3 % of the improvement construction cost is appropriated every year as the operation and maintenance (O&M) cost. The cost of the productivity improvement plan, US\$ 110 thousand and the cost of the processing and distribution improvement plan, US\$ 140 thousand were allocated equally in the three years from the third to the fifth year. All costs were converted to the economic cost across the board, multiplied by 0.95 of the standard conversion factor.

Table 3-10-2 Appropriation of the Project Costs in Halecou

(Unit: US\$ Thousand)

Year	Const. Cost	O&M Cost	Project Cost	Total Cost
1	1,309.58	-	-	1,309.58
2	1,309.58	-	-	1,309.58
3	-	78.57	79.17	157.74
4	-	78.57	79.17	157.74
5	-	78.57	79.17	157.74
6	-	78.57	-	78.57

Source: JICA Study Team

(2) Benefit

The benefit was calculated by deducting the net income before the project from the net income after the project at every crop. US\$ 444 thousand of the project economic benefit was appropriated after the completion of the repair works, from the third year.

Table 3-10-3 Calculation of the Benefit in Halecou

Area (ha)	Planted Area (ha)				Cropping Intensity (%)	Gross Return (US\$ x 1000)	Product. Cost (US\$ x 1000)	Net Return (US\$ x 1000)
	Crop	Rainy Season	Dry Season	Total				
<i>Before Project Condition</i>								
252.0	Paddy	166.0	-	166.0	65.9%	123.18	35.13	88.05
	Maize	58.0	25.0	83.0	32.9%	52.11	14.59	37.52
	Total	224.0	25.0	249.0	98.8%	175.29	49.72	125.57
<i>After Project Condition</i>								
252.0	Paddy	166.0	252.0	418.0	165.9%	728.57	197.85	530.72
	Maize	58.0	-	58.0	23.0%	56.79	17.52	39.27
	Total	224.0	252.0	476.0	188.9%	785.37	215.37	570.00
Benefit in crop production = {(Total Net Income After Project Condition) - (Total Net Income Before Project Condition)}								444.43

Source: JICA Study Team

(3) Economic Internal Rate of Return (EIRR)

The results of the economic analysis of 32 years in Halecou shows that the EIRR is 12 % and the B/C is 1.1. It is confirmed the project can take the benefit which offsets the cost.

Table 3-10-4 Economic Evaluation Indicators in Halecou

Indicator	NPV (US\$ x 1000)	B/C	EIRR
Value	414.79	1.14	11.92%

Discount Rate (i) = 10%

Source: JICA Study Team

The next table shows the result of the sensitivity analysis. In case of no change of the benefit, if the construction cost increases 10 %, the EIRR will be more than 10 %. In case of 10 % decrease of the benefit, if the construction cost does not change, the EIRR will be able to keep in 10 %, whose B/C is 1.0. In case of 20 % decrease of the benefit, if the construction cost increases 10 %, the EIRR will fall in 7 %.

Table 3-10-5 Sensitivity Analysis of EIRR in Halecou

Benefit	Cost condition		
	Base	+5%	+10%
Base	11.92%	11.16%	10.47%
-10%	10.32%	9.62%	8.97%
-20%	8.66%	8.00%	7.38%

Source: JICA Project Team

3-10-3 Social Validity

In addition to the direct economic effect, following indirect effect is expected by implementing the project.

(1) Improvement of rice self sufficiency in beneficiary farmers

Rice cropping period was limited only into wet season so far, since irrigation water was not stably delivered into the paddy fields in dry season, due to soil intrusion into the intake site and deposited soil sedimentation in the canal in wet season. Farmers who could not produce local rice for self consumption were forced to purchase rice from market. By the project, they will surely produce their self consumption rice and achieve 100 % rice self-sufficiency. In addition, related farmers located in the surrounding area will easily purchase their consumption rice from this area. This project can contribute to the improvement of rice self sufficiency in an around area.

(2) Increase of farm household income by expanding market channel of surplus rice

By the project, surplus rice which can be sold as commercial rice is generated. This project provides some market channels including paddy purchasing system for such surplus rice. Selling rice will bring increase of farm household income. Increase of the income will bring positive production incentive to rice farmers. By rising purchasing power, they can purchase necessary input materials such as seed, agricultural machine and fertilizer/ pesticide for expanding rice production.

(3) Ensuring agricultural employment opportunity in rural area.

Through the project implementation, commercial agricultural sense can be created for beneficiary farmers and employment opportunity related with rice production and marketing will be provided. As a rice market is activating, related business with processing/ marketing of rice including market of rice production input materials is also expanded. Considering such effect, it can be said that this project contribute to rural agricultural based economy development in Maliana wide area.

(4) Mitigation of flood damage by irrigation facilities

Intrusion of flooding water into the agricultural fields can be controlled and restricted by rehabilitating intake facility. In parallel with this, if river bank protection adjacent to the irrigation area is provided, land conservation effect can be further increased. In case of the weir, it will be contribute to generating stable river flow and recession of flooding water flow velocity. Rehabilitation of irrigation facilities is generally expected to bring in-direct effect such as mitigation of flood damage and land conservation.

3-10-4 Project Evaluation in Pre-feasibility Study Level

Technical input level for improvement of irrigation, rice farming and processing/ marketing is based on the existing local level. Its level is considered to be applicable in the area. EIRR (Economic Internal Rate of Return) is estimated 11.9 %. It is judged to be feasible from the economic evaluation viewpoint. This project is considered to be the local rice production/ market promotion model in rice market wide range area. This development model can be applied into the similar rice marketing area in the Bobonaro and Baucau districts. In-direct effects as mentioned above can be brought from the project implementation. In term of the environmental and social consideration, no negative impact will be caused. Under such consideration, this project is judged to be feasible as an overall evaluation.

CHAPTER 4 PRIORITY PROJECT FOR LOCAL RICE PRODUCTION IN SAKETO IRRIGATION SCHEME IN VIQUEQUE DISTRICT

4-1 OUTLINE OF IRRIGATION SCHEME

Saketo irrigation scheme is located in Viqueque district which is at near the sea. The irrigation scheme takes water for irrigation from Saketo River which is at east in irrigation scheme. It started in Portuguese era and developed in Indonesian era. In 1996 a headworks and a main canal are rehabilitated, then it is followed by the present day. A beneficiary area is relatively flat land form surrounded by the arecales.

Saketo River with almost 100m width, which is water source of irrigation scheme, is classified into middle size river in Tiomr-Leste. This is the seasonal river which is not flow in December to April. Therefore the paddy is only in rainy season from May to November which is used to be stable river flow.

4-1-1 Location and Topographic Condition

The location and situation in Saketo irrigation scheme are shown as following figure.



Figure 4-1-1 Location and Situation in Scheme

4-1-2 Water Resources

(1) Outline of main water source and its catchment area

Main water source for target beneficiary area is Saketo River and its catchment area at planned intake point is around 57 km² (show Figure 4-1-2). Within the upstream area of Saketo irrigation scheme, Salere Matahoi irrigation scheme is there and its beneficiary area is 252 ha (result of inventory survey). Discharge amount of Saketo River at planned intake point is affected by development activities for this area.

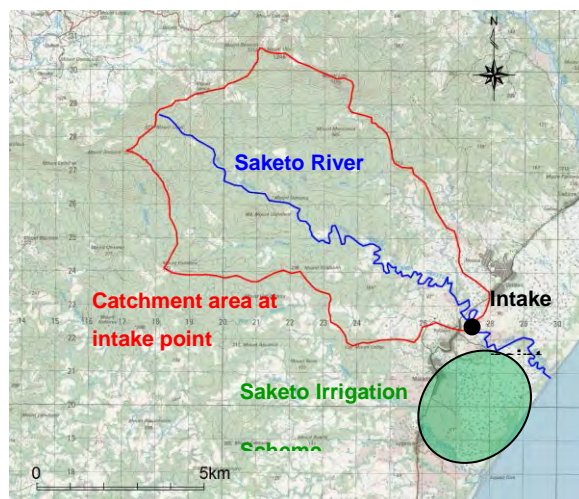


Figure 4-1-2 Catchment Area at Intake Point

(2) Water sources around beneficiary area

Water from Saketo River is controlled by concrete weir with an intake gate. Also there are some temporary streams around beneficiary area which appear after rainfall, but available period and available water amount of those streams vary by rainfall amount. Therefore these streams cannot be a stable water source.

(3) Flood condition

Existing concrete weir was constructed in 1996 by Indonesian government but there are no serious damages on it at present. River bed and stream alignment is stable at the planned intake point. While river bank erosion occurred at the downstream area of the weir but MAF already repaired by gabion wall.

At planned intake point, serious soil sedimentation is not identified. The reasons are supposed that basically total produced soil amount within catchment area is small due to small catchment area and produced soil is trapped at upstream area of weir because river velocity becomes slow due to curving topographic condition.

(4) Water resources amount

Monthly discharge of Saketo River at planned intake point with rainfall amount at beneficiary area is shown in the Figure 4-1-3. River discharge measurement and analysis have not been conducted for Saketo River, discharge amount in the figure is calculated one utilizing an analysis result for Bebui River which natural condition of catchment area is considered as similar as that of Saketo River. Also there are no rainfall observation stations within beneficiary area, rainfall amount in the figure is record of Vato Lari observation station which natural condition is considered as similar as beneficiary area of Saketo irrigation scheme.

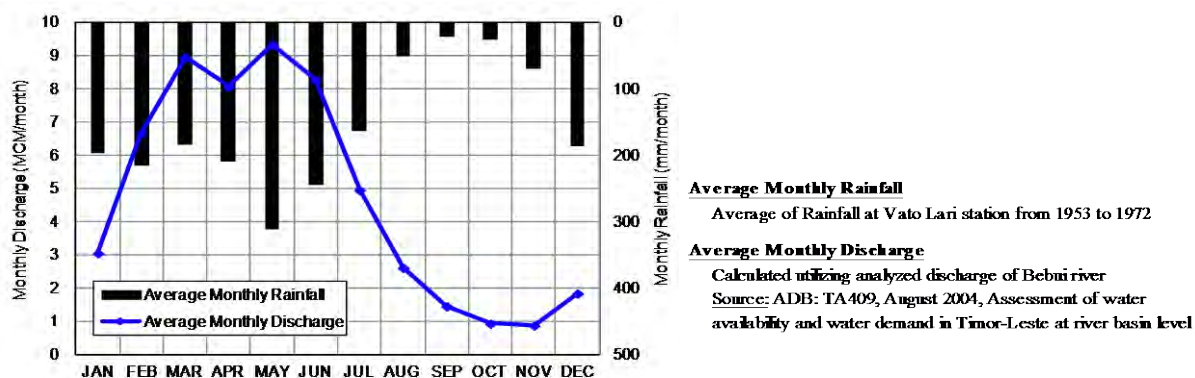


Figure 4-1-3 Monthly Discharge Amount at Planned Intake Point and Rainfall Amount at Beneficiary Area

4-1-3 Land Use

Almost all the beneficiary area is occupied by paddy field and upland is very limited. There are temporary huts for rest within beneficiary area but no residential houses. Beneficiaries are living in the Aldeia nearby beneficiary area.

4-1-4 Agricultural Infrastructure

(1) Access Road

A vehicle can approach to the beneficiary area and roads which a vehicle can pass run from north to south along Saketo River and east to west along existing main canal. Additionally there is another road connects to western edge of beneficiary area. However every road is not extended to inside of beneficiary area.

(2) Electric power supply

No public electric power is supplied to beneficiary area but Aldeias which beneficiaries are living have.

(3) Water supply

No public water is supplied to beneficiary area but Aldeias which beneficiaries are living have common faucets which source is spring. Water is used for domestic use mainly while river water of Saketo River is never used for anything. Face washing and drinking are allowed at a faucet point but cloth washing and bathing are restricted, villagers have to do those at their houses.

4-1-5 Problem about Agricultural Production of Beneficiaries

(1) Problems about agricultural production of beneficiaries based on the Farmers' socio-economic survey

Farmers' socio-economic survey was conducted for 100 farmers of Saketo irrigation scheme. Problems about activities of farm producing are showed in Figure 4-1-4. Shortage of irrigation water is the most important problem in the Saketo irrigation scheme.

According to field survey, there is an opinion that farmers could not effectively utilize hand tractor supported by MAF. However farmers have a willingness to produce more, therefore it is necessary to program which integrate from producing with the irrigation water to selling the production.

(2) Prioritizing the problem at workshop of stakeholder

Workshop was carried out with stakeholders of Saketo irrigation scheme such as extension workers, village representatives and interested persons of rice processing. The order of priority about eight issues is discussed by participants and listed in Table 4-1-1.

It is relatively difficult to purchase the seed, fertilizer and agro-chemicals in the Saketo irrigation

Particular	Problem	Saketo
Irrigation (Water)	Water shortage	99
	Drought damage	85
	Drainage problems	75
Farming/ Cultivation	Damage by pests and diseases	95
	Damage by wild animal	82
	Weed damage	73
	Difficulty in obtaining seeds	60
	Low yield of crops	94
	Difficulty in purchasing fertilizer	81
	Difficulty in purchasing agro-chemicals	79
	Labour shortage	78
	Difficulty in hiring animal/mechanical power	60
	Problems related to loans	10
Marketing	Lack of farm roads	88
	Shortage of selling opportunity	83
	Problems related to processing process	88
	Lack of storage facilities	50

Source: JICA Study Team

Figure 4-1-4 Problem about Agricultural Production of Beneficial Farmers

scheme because of the geographic constraint. It is necessary for target farmers to purchase input materials such as seed and chemical fertilizer with support of MAF. However it is also important to purchase alternative materials in the local area. There are so many areas which is difficult to purchase input materials in the whole country. The way to utilize the local materials is able to be applied to other areas.

4-2 ACTUAL SITUATION OF IRRIGATION SCHEME

4-2-1 Irrigation Area and Households

Area of irrigation scheme is observed approximately 410 ha from interview at site and checked by satellite pictures. This irrigation area includes abandoned area, levees and swamp by spring at south area. About 70% of area, in other words 287ha, is assumed as planed irrigation area from the observation of site survey.

The targeted farmers are 112 households in three villages.

4-2-2 Intake and Diversion of Water in Irrigation Scheme

(1) Current situation of irrigation facility

The irrigation facility in Saketo irrigation scheme is rehabilitated in 1996 which are headworks and main canal (approx. 1.5km), but these facilities has not been rehabilitated since 1996. However, the rehabilitation of bank protection at downstream of headworks is rehabilitated against the erosion of bank.

The headworks rehabilitated in Indonesian era are embedded boulder on surface of weir to protect and enhancement of surface. It is available to keep necessary water level by weir since it is not fatal damage as well as a flash gate and a intake gate. The gate operation is assumed to be activate since the drive parts could work by observation.

The 80cm difference between bed level of intake are relatively low comparing with a general difference of 1 meter, which are concerned that small soils are mixed with in-flow over the capacity of sedimentation.

From the intake of headworks to first diversion gate in the irrigation scheme, the leading canal which is the length of approx. 1km, is the type of concrete lining. It is not observed to fatal damage. Although the sections of canal are observed to wide and narrow section depends on landform, the necessary capacity of flow volume is allowed.

Eventually, there is no fatal damage from headworks to first diversion gate in the irrigation.

Table 4-1-1 Prioritizing of the Problem at Workshop of Stakeholder

Priority	Project
1	Quality seed
2	Cultivation method
3	Local resource
4	Pest and disease control
5	Integrated farming
6	Agricultural fund
7	Manure management
8	Mechanization

Source: JICA Study Team

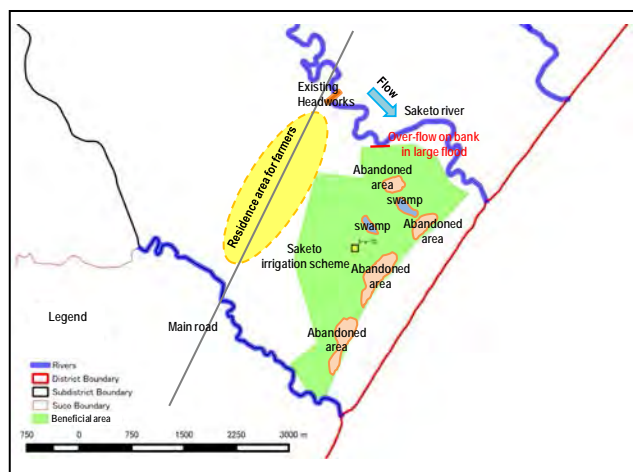


Figure 4-2-1 Situation of Beneficiary Area



Picture :Situation in rainy season



Picture :Situation in dry season

However the facility which is to avoid the soil into flow or remove sedimentation is assumed to need to station at site.

(2) Current situation of irrigation scheme

The leading canal from headworks separate into two canals. One is headed to west area which is main canal (1.9km) and another is headed to south area which is branch canal (1km). Main canal to west is the type of concrete canal which is located at upland area relatively. Four of diversion gates are seen, but it cannot operate due to the broken spindle. The outlet of diversion at paddy is observed to erosion because the diverted water at diversion is discharged from high place, which has high energy. In addition, the followed canal are given low water level and it cause that delivered water is flow at low level than around paddy.

The canal surface is observed deterioration and given the fatal damage by the live-stock (water-buffalo and goats). Eventually, the issues of irrigation scheme are damage of main canal, deterioration of diversion function and difficulty of take water from branch canal.



(gate hoist at intake)

Picture :Situatio of hoist



Picture :Situatio of diversion

4-2-3 Operation and Maintenance of Irrigation Facilities

(1) Water users group

Irrigation facilities, diversion weir, intake and main canal, of this irrigation scheme were constructed in 1983 under the Indonesia regime. The traditional water users group has been working on their operation and maintenance. The traditional water manager called “Kabubee” has kept the responsibility of operating all the gates since.

In 2010, the traditional water group was reorganized to WUA, but it is still categorized as a type of traditional WUAs and not officially registered. It is approximately 112 households that cultivate in this area of the irrigation scheme. Nearly half of households, 60 households have joined in the WUA. Table 4-2-1 shows the board members of the WUA.



Table 4-2-1 Officers of WUA

Officer	Number
President	1
Vice-president	1
Secretary	1
Treasurer	1
Gatekeeper	1

The president, Mr. Ricardo Pinto Soares, owns 40-ha farmland in the irrigation service area. He cultivates some farm land. However, he does not grow crops by himself. Instead, he hires agriculture labor or he rents the farmland to tenant farmers. In the meantime, he runs a small food and general shop and a small rice mill.

The treasurer of WUA has been selected as a WUA board member. However, neither WUA membership fee nor water charge has been ever collected.

(2) Present situation of operation and maintenance

	
<p>No deterioration found on the boulder concrete of the weir. No functional degradation found on the gates of both scouring sluice and intake.</p>	<p>The canal embankment and bottom are damaged by sedimentation and pass of livestock. Repair and cleaning must be carried out before starting irrigation.</p>

Cleaning of the irrigation canals to take away the sedimentation is practiced once a year in February. Three-to-four-day cleaning of canals is implemented, as a general rule, by all farmers who own farmlands in the irrigation service area. As for the head works and also intake works, sediments are removed when the scouring sluice, which is built in the head works, are operated.

(3) Support from the district

In the district agriculture office, a fulltime staff Mr. Christiano is assigned to the section where they support farmers to establish and manage WUAs legally. The Saketo WUA receives support from the district agriculture office for the registration of legal WUA.

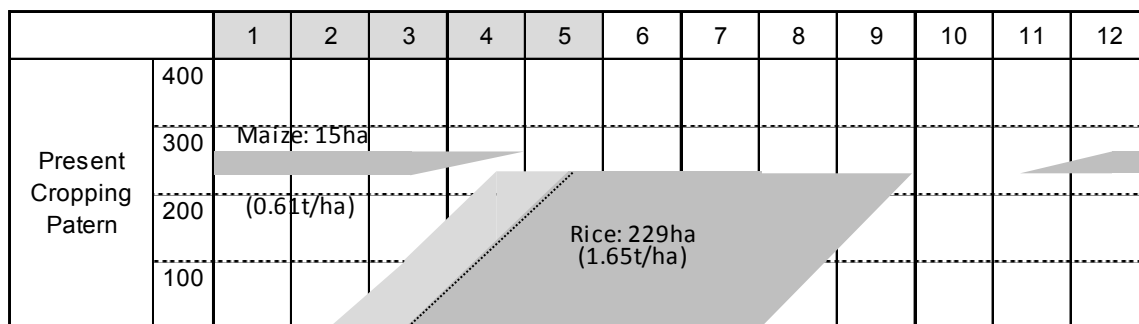
At present, the Saketo WUA is not legally registered WUA, therefore, support of subsidy or machinery dispatch cannot be officially distributed from the district office.

4-3 CURRENT FARMING CONDITION

4-3-1 The Situation of Crop Production

(1) Cropping Pattern of Saketo Irrigation Scheme

Cultivated area and yield of rice and maize in Saketo irrigation scheme is showed in Figure 4-3-1. According to the Farmers’ Socio-Economic Survey, rice is planted in March and harvested in August or September. Maize is cultivated in a part of Saketo irrigation scheme in dry season. The yield of rice and maize are calculated 1.65ton/ha and 0.61ton/ha. The most of maize is cultivated in upland which is outside of irrigated paddy field.



Source: JICA Study Team

Figure 4-3-1 Present Cropping Pattern

(2) Present condition of other Crops' cultivation

1) Cassava

There are 55% of farmers who cultivate cassava. The average cultivated area of cassava is 0.98ha and then the average yield is 0.93ton/ha. The cassava is planted in December before rainy season and harvested in September or October in the next year.

2) Vegetables and Others

Vegetables for home consumption are cultivated in the small home garden same as the other areas. The detail data about vegetable production is not provided from the Farmers' Socio-Economic Survey. There are few farmers selling vegetables according to the field survey.

3) Livestock

The number of household who farm livestock and the average number of livestock per house are showed in Table 4-3-1. There are many farmers who raise pigs or poultry, however the average number of buffalo and cow is more than other priority project area. Farmers who live near the Saketo irrigation scheme have a custom to exchange many livestock for the marriage. Livestock is an important property for farmers. There are more incomes by the sale of the domestic animal than other priority project areas.

Table 4-3-1 Number of Households which Raising Livestock and the Average Number of Livestock

	Number of Households	Average number of livestock (head)
Buffalo	44	17.8
Cow	42	17.3
Goats	24	4.8
Pigs	95	5.8
Chicken	84	7.9
Horse	22	2.5
Ducks	2	1.5
Dog	47	4.0
Others	2	-

(3) Land ownership and tenant system

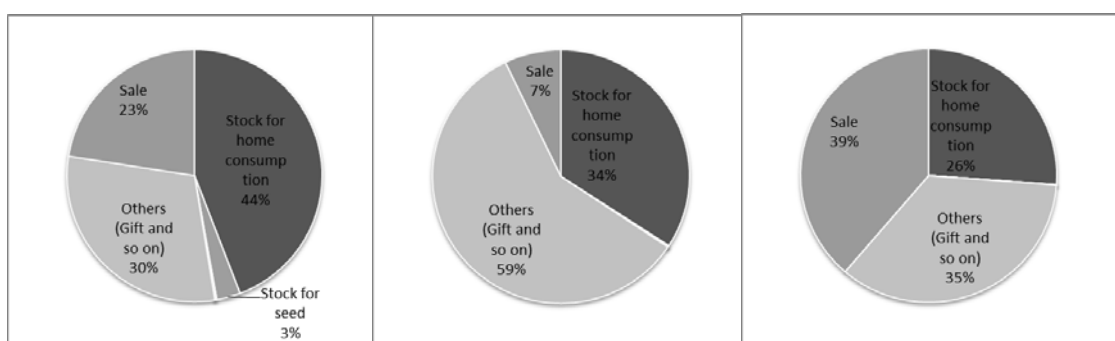
The average area of paddy field which farmers own in Saketo irrigation scheme is 2.04ha. However there is a farmer who has 10ha of paddy field therefore he hires some labor for rice cultivation.

Source: JICA Study Team

(4) Producing and purchasing for food

1) Consumption of main crops

The 44% of rice production per one hectare are utilized for home consumption. And then 30% of them are given to relatives or neighbors and 23% are sold mainly at local market. There are some individual farmers or farmer's groups who sell rice at market of Baucau. The 34% of maize production per one hectare are utilized for home consumption and 59% of them are provided to relatives or neighbors. The percentage of cassava production which is utilized for home consumption, donation to relatives or neighbors and selling at local market are respectively 26%, 35% and 39%.

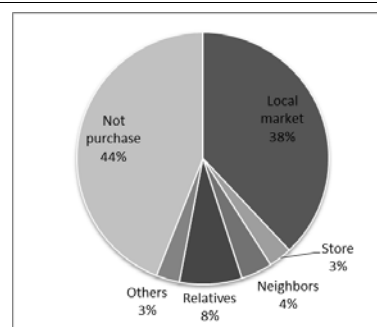


Source: JICA Study Team

Figure 4-3-2 Consumption and Utilization of Main Crops (Left: Rice, Center: Maize, Right: Cassava)

2) Purchasing of rice

It is resulted that the number of household who purchase imported rice when they suffer from food shortages is 56 per 100 households who are surveyed. The average purchase volume per year is around 490kg. Farmers mainly purchase imported rice at local market.



Source: JICA Study Team

Figure 4-3-3 Source of Imported Rice

4-3-2 Production Activities

(1) Rice

ICM is disseminated by extension workers in Viqueque district.

According to the extension worker of Saketo irrigation scheme, ICM is introduced there and then about half of them carry out ICM. However there are no households who practice ICM according to the Farmers' Socio-Economic Survey.

Farming situation of rice cultivation of this irrigation scheme is shown in Table 4-3-2. Land preparation is mainly conducted by men and then activities from seedling to harvesting are carried out men and women jointly. There are many farmers who hire some labors from neighbors when they transplant, weed and harvest. The reasons of low yield of rice are that farmers continue conventional method and utilize seed from home collection for a long time. The amount of input materials such as chemical fertilizer or organic materials is too small. Moreover measure for weed, disease and insect is not enough.

Table 4-3-2 Work Condition of Rice Cultivation of Saketo Irrigation Scheme

Activity	Work Situation	Role
Plowing	By human power using agricultural equipment.	M
Harrowing	95% of farmers use a hand tractor. (90% of farmers rent a hand tractor from neighboring farmers.)	M
Seeding/ Nursery preparation	Farmers seedling directly or make a nursery with conventional method	M/F
Transplanting	Transplant randomly. Farmers hire some labor for transplanting.	M/F
Fertilizing	10% of farmers practice fertilizing. Few farmers use an organic compost made by dung of buffalo. It is difficult to purchase chemical fertilizer.	M
Application of agro-chemicals	5% of farmers apply agro-chemicals. They purchase it at store of Maliana city.	M
Weeding	Farmers weed by hand, they don't use weeder. Some farmers hire labors.	M/F
Irrigating	Farmers clean the canal.	M
Harvesting	Farmers hire some labors.	M/F
Threshing and bagging	95% of farmers rent a threshing machine. It is a custom to repay by cash.	M/F
Transportation / Storing	Some farmers rent track or buffalo for transportation. They store rice production in the vinyl sack or basket.	M/F

Source: JICA Study Team

(2) Maize

Maize is also cultivated with conventional method. Chemical fertilizer, compost and agro-chemicals are not utilized for maize. There are some farmers who hire some labors for weeding and harvesting.

Table 4-3-3 Work Condition of Maize Cultivation of Saketo Irrigation Scheme

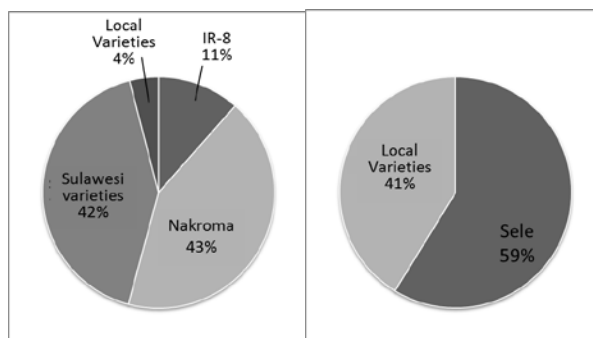
Activity	Work Situation	Role
Plowing	By human power using agricultural equipment.	M
Seeding	Random planting.	M
Fertilizing	Not practiced	—
Application of agro-chemicals	Not practiced	—
Weeding	Some farmers hire labors. They weed by hand or agricultural equipment.	M/F
Irrigating	Rainfed	—
Harvesting	Some farmers hire labors.	M/F
Threshing and bagging	Farmers thresh by hand.	M
Transportation / Storing	Farmers transport by themselves. They store maize in vinyl bag or basket.	M/F

Source: JICA Study Team

4-3-3 Input Materials

(1) Seed

Nakroma which is recommended and distributed from MAF is cultivated in 43% of paddy field of Saketo irrigation scheme (see Figure 4-3-4). On the other hand, about sixty percent of farmers cultivate Sele recommended by MAF. Most of rice seed is produced in farmers house. It is recommended to negotiate about purchase of rice seed with seed producer and then it is also important to renew the seed periodically.



Source: JICA Study Team

Figure 4-3-4 Percentage of Cultivated Area Each Rice or Maize Varieties (Left: Rice, Right: Maize)

(2) Chemical fertilizer, agro-chemical and compost

There are few farmers who apply chemical fertilizer or compost to paddy field. Agro-chemicals are not used by most of farmers. There is no shop selling agricultural materials in Viqueque city, although the small amount of vegetable seeds or agro-chemicals is sold in grocery.

(3) Agricultural machine

There are available 40 hand tractors in Saketo irrigation scheme according to the extension worker. Most of these hand tractors were provided from MAF, although they are owned by individual farmers or farmer's groups. Farmers who don't have hand tractor rent it from neighbors. Rental fee of hand tractor is paid by cash. On the other hand, there are 30 thresher machines which are owned by individual farmers. Farmers rent these thresher machines and pay the rental fee of them by kind.

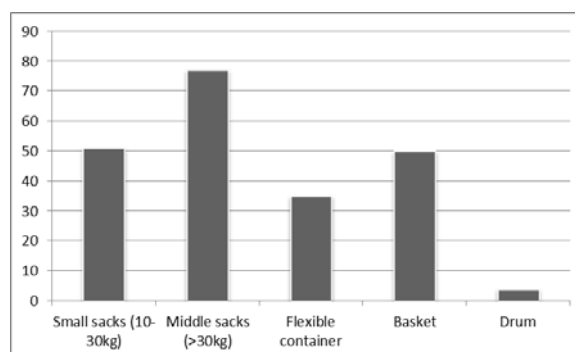
4-4 CURRENT SITUATION OF PROCESSING AND MARKETING

4-4-1 Farmers' Post-Harvest Treatment

(1) Rice

After harvesting, farmer threshes at the paddy field. According to field survey, around 30 threshing machines are used in this area. Based on the Farmers' Socio-Economic Survey, 86% of farmers rent it from neighboring farmers. It is a custom to repay by cash.

After threshing, they transplant paddy to home by manual, motorbike, track or domestic animals such as buffalo or horse. There are various methods to store maize as shown in Figure 4-4-1. Many of farmers store paddy with vinyl sack which size is various. Some farmers store paddy by basket.



Source: JICA Study Team

Figure 4-4-1 Percentage of Households each Method of Maize Storing

(2) Maize

Many farmers dry maize hanging on beam of house and then they thresh them by hand. They store maize by vinyl sack or basket. There are some farmers use drums of IFAD for storing maize in their house.

4-4-2 Post-Harvest and Marketing of Rice

The works of post-harvest of rice produced in Saketo Irrigation Scheme consist of paddy threshing in fields, solar drying in fields, bagging in sacks, transporting, storing in farmers' houses/ traditional warehouses, solar drying on the grounds of farmers' houses and milling depending on consumption in villages and selling at Baucau. In one (1) village, eight (8) rice mills are operated, which recovery ratios are estimated at 55-57% by Satake made machines.

By the results of the Farmers' socio-economic survey, it is estimated 229ha in cropping areas, 1.65 ton/ha-paddy in yields and 337.9 tons in paddy production for Saketo Irrigation Scheme. In the Mashadiki village, where the farmers of Saketo are living, they purchased 28.8tons of milled rice in 2013. The production is insufficient seasonally.

The distributions of paddy are divided into local consumption within the village at 77.5% and sales to outside consumers at 22.5%. Of which local consumption, it accounts at 44.2% for self-consumption and 3.0% for seed use for the next planting. The seed application rate is estimated at 50kg/ha, which is lower than one of Halecou Irrigation Scheme, though the standard rate is 35kg/ha. It would be caused by higher germination ratio using quality seeds such as Nakroma.

The notable thing in distribution of paddy is high supply to the clans at 30.0%. The repayment by in-kind is rare due to low amount of farm inputs. The in-kind water fees are not paid due to deterioration of irrigation facilities.

The direct sale of milled rice accounts for 20.3%. The women of families mill the paddy in local rice millers, carry milled rice by public micro buses and sell milled rice at Baucau or Dili individually. The middlemen are not existed in their transaction modes. If sales activities are coordinated among women, the costs on sales can be reduced.

4-4-3 Processing and Marketing of Other Crops

In Makadiki, the center of Suco Watolari, the weekly market is opened. The foods sold in the market are brought from Dili or Baucau. The most of farmers own the uplands out of irrigation schemes and produce upland rice, maize, banana and cassava. There is no agricultural processing product in this area.

4-5 RURAL SOCIETY AND FARMERS' ECONOMY

4-5-1 Organization of Rural Society

(1) Structure of rural society

Beneficiaries of Saketo irrigation scheme belong to Suco of Makadeki, Matahoi and Uaitame. Most of beneficiaries live in Suco Makadiki. Suco chief or Aldeia chief preside suco or aldeia like Halecou irrigation scheme. There is a council which Suco chief mainly manage. It is one duty for Suco chief to participate ceremony or festival of the Suco.

(2) Traditional ceremony

The cult of split which enshrines a large tree and a large stone as a holy tree and holy stone are practiced by many farmers. There is a custom to offer sacrifice, cigarette or coin and pray.

4-5-2 Gender

There is a tendency that works to be shouldered by men and women are divided in Saketo site, the trend is not very clear, though. For example, women mainly cover land preparation, rice planting, weeding and harvesting, while men do land preparation, nursery preparation and threshing. However, there are some farming activities that both men and women participate in. Men's working hours for rice production is much longer than those of women, around twice, on the other hand, working hours of men and women for cassava and maize production are almost same.

Sale of livestock are mainly done by men, however, incomes from both livestock and crop production are managed by women at homes in many cases. On the other hand, non-farming income is controlled by men mainly. Concerning water fetching and firewood collection, women generally cover the works, and men and children assist women for the works. Roles of men and women in Saketo site is as shown below:

Table 4-5-1 Roles of Men and Women in Saketo Site

Works	Men*	Women*	Children*
Sale			
Sale of Rice and Maize	29	71	12
Sale of Vegetables	10	16	7
Sale of Livestock	66	39	11
Income Control			
Income Control by Sale of Rice and Maize	46	71	-
Income Control by Sale of Vegetables	14	17	-
Income Control by Sale of Livestock	55	73	-
Non-farm Income Control	63	49	-
Housework			
Drinking Water Fetching	70	96	76
Firewood Collection	89	97	48

Remarks 1 (*): The number in the table mentioned above indicate number of respondents.

2: multiple answers.

Source: JICA Study Team (Socio-economic survey), 2015

4-5-3 Farmhouse Economy

(1) Income of the Farmhouse

The average of the household income is arranged in the next table, sorting it into agriculture income and non-agriculture income, based on the family budget data of 100 household in Saketo, collected in the Farmers Socio-Economic Survey. Self-consumption of agriculture produce was converted to money by market price and appropriated for the budget. The average annual income in Saketo is about US\$ 5,800, whose portion of the agriculture income is about 30 %.

Table 4-5-2 Average Household Income in Saketo

Items		Income (US\$/HH)	Ratio (%)
Agriculture income	Rice cultivation	5.0	0.1
	Maize cultivation	133.6	2.3
	Cassava cultivation	245.5	4.2
	Vegetables cultivation	2.1	0.0
	Livestock rearing	1,177.3	20.4
	Leasing for farm machinery and equipment	137.6	2.4
	Wages from working on other farm	23.0	0.4
	Leasing for draft animals	83.2	1.4
	Other agriculture income (Local wine, coconut oil, etc)	846.0	14.6
	Subtotal	2,653.2	45.9
Non-agriculture income	Salary from other occupations (government official, driver, company employee, etc.)	711.9	12.3
	Wages as casual worker	10.4	0.2
	Earnings from business (boutique, restaurant, three wheeler, taxi, etc.)	864.0	14.9
	Receipt of gifts and remittance from relatives and others	596.3	10.3
	Interest earned from money loaned	90.0	1.6
	Other non-agriculture income	856.1	14.8
Subtotal	3,128.7	54.1	
Total		5,781.9	100.0

Source: JICA Project Team

(2) Expenditure of the Farmhouse

Next, the average of household expenditure is arranged in the next table. “Agriculture input of Rice” is US\$ 436, which is the biggest item and occupies 19 % of the total expenditure. The following biggest items are “Expenses for ceremonial occasions”, US\$ 246 (11%) and “Repair and maintenance of house”, US\$ 243 (10%).

Table 4-5-3 Average Household Expenditure in Saketo

Items	Expenditure (US\$/HH)	Ratio (%)	Items	Expenditure (US\$/HH)	Ratio (%)
Agriculture input of Rice	436.0	18.9	Spice & other foods	38.1	1.6
Agriculture input of Maize	15.0	0.6	Tobacco and cigarettes	65.3	2.8
Agriculture input of Cassava	9.6	0.4	Soap, shampoo, etc.	48.7	2.1
Agriculture input of Vegetables	0.0	0.0	Electricity charges	7.8	0.3
Agriculture input of Livestock	3.8	0.2	Expenses for firewood, cooking fuel and LP-gas	6.1	0.3
Agriculture input of Others	0.0	0.0	Expenses for lighting fuel	18.1	0.8
Rice	175.8	7.6	Household furnishing and equipment	102.6	4.4
Maize	23.6	1.0	Repair and maintenance of house	234.4	10.2
Cereals other than rice & maize	3.6	0.2	Clothing	52.4	2.3
Tubers and Roots	16.8	0.7	Medical care	73.8	3.2
Fish	41.7	1.8	Education	190.7	8.3
Meat and eggs	79.1	3.4	Recreation	38.1	1.7
Vegetables	54.7	2.4	Expenses for ceremonial occasions	245.6	10.6
Flour	1.2	0.1	Transportation and communication	67.3	2.9
Bread	39.1	1.7	Remittance to relatives	15.4	0.7
Tea and coffee	39.6	1.7	Land and house rent	13.0	0.6
Milk (powder) & yogurt	7.8	0.3	Taxes	3.1	0.1
Liquor and soft drinks	15.0	0.6	Loan repayment	18.0	0.8
Cooking oil & coconuts	58.6	2.5	Others	10.0	0.4
Sugar and salt	39.2	1.7	Total	2,308.2	100.0

Source: JICA Project Team

4-6 GENERAL DESCRIPTION OF PRIORITY PROJECT IN SAKETO

The proposed priority project in Halecou is composed of three main components, namely, 1) Irrigation system improvement, 2) Crop production increase and 3) Improvement of processing/marketing. Those three components are to be implemented in integrated manners for the project objective achievement. Saketo site is categorized into “rice bowl area”, therefore, the priority project in the site focus on increase of commercial rice production. However, it is on the premise that necessary measures for motivation increase of rice production, e.g. purchasing system promotion, are taken for the priority project implementation. The proposed project objective, expected outputs, activities are as

shown below:

[Project Objective]

Volume of sale of domestically produced rice is increased. (Indicator: 504 tons of domestically produced rice is sold annually.)

[Outputs]

- Harvested area of rice is increased.
- Yield of rice is increased.
- Quality of rice is improved.
- Customers of domestically produced rice are secured.

[Main Activities]

Component 1: Irrigation System Improvement

- Bank protection for farmland /irrigation facility conservation
- Securement of irrigation water

Component 2: Crop Production Increase

- Securement of quality seeds
- Securement of agricultural materials
- Promotion of pest and disease management
- Extension of rice production techniques

Component 3: Improvement of Processing/Marketing System

- Improvement of techniques of post-harvest /processing
- Sale of paddy to MCIE and Technical Agriculture School of Natabora
- Direct sale of rice to consumers
- Sale of rice to rice millers
- Establishment of a group of rice production farmers and training implementation

Overall structure of the priority project in Saketo is illustrated as follows:

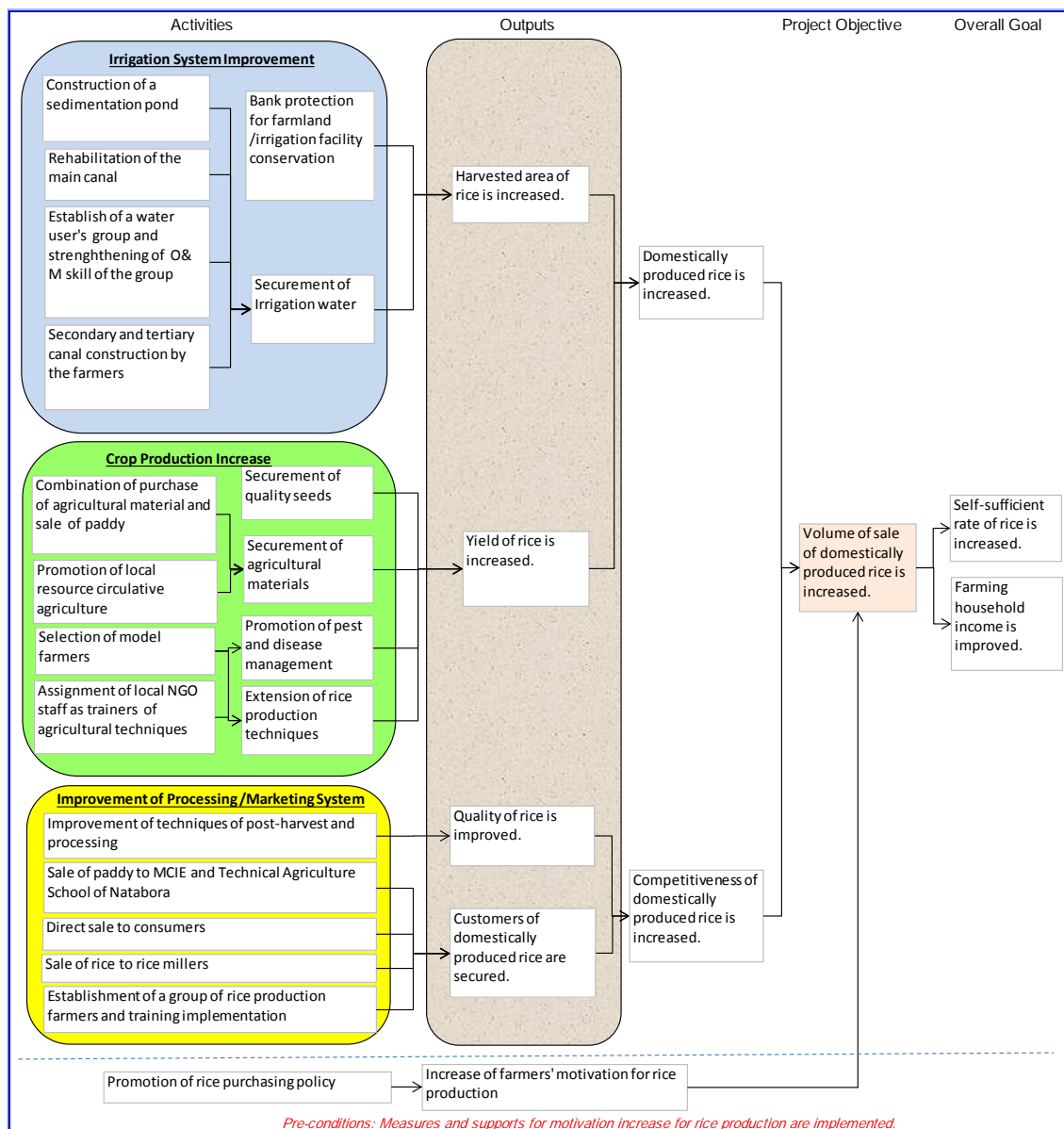


Figure 4-6-1 Overall Structure of the Priority Project in Saketo

4-7 IMPROVEMENT OF IRRIGATION SYSTEM

An actual situation of Saketo irrigation scheme and possible water from river are observed and rehabilitation plan for irrigation system is examined.

4-7-1 Water Resource Development Plan

At present, one time cropping is carried out in the beneficiary area due to small amount discharge of Saketo River during dry season. Therefore even canal structure improvement plan is implemented, paddy cropping will be still limited during rainy season only. Both present and planned cropping pattern are shown in the Figure 4-7-1 and Figure 4-8-1.

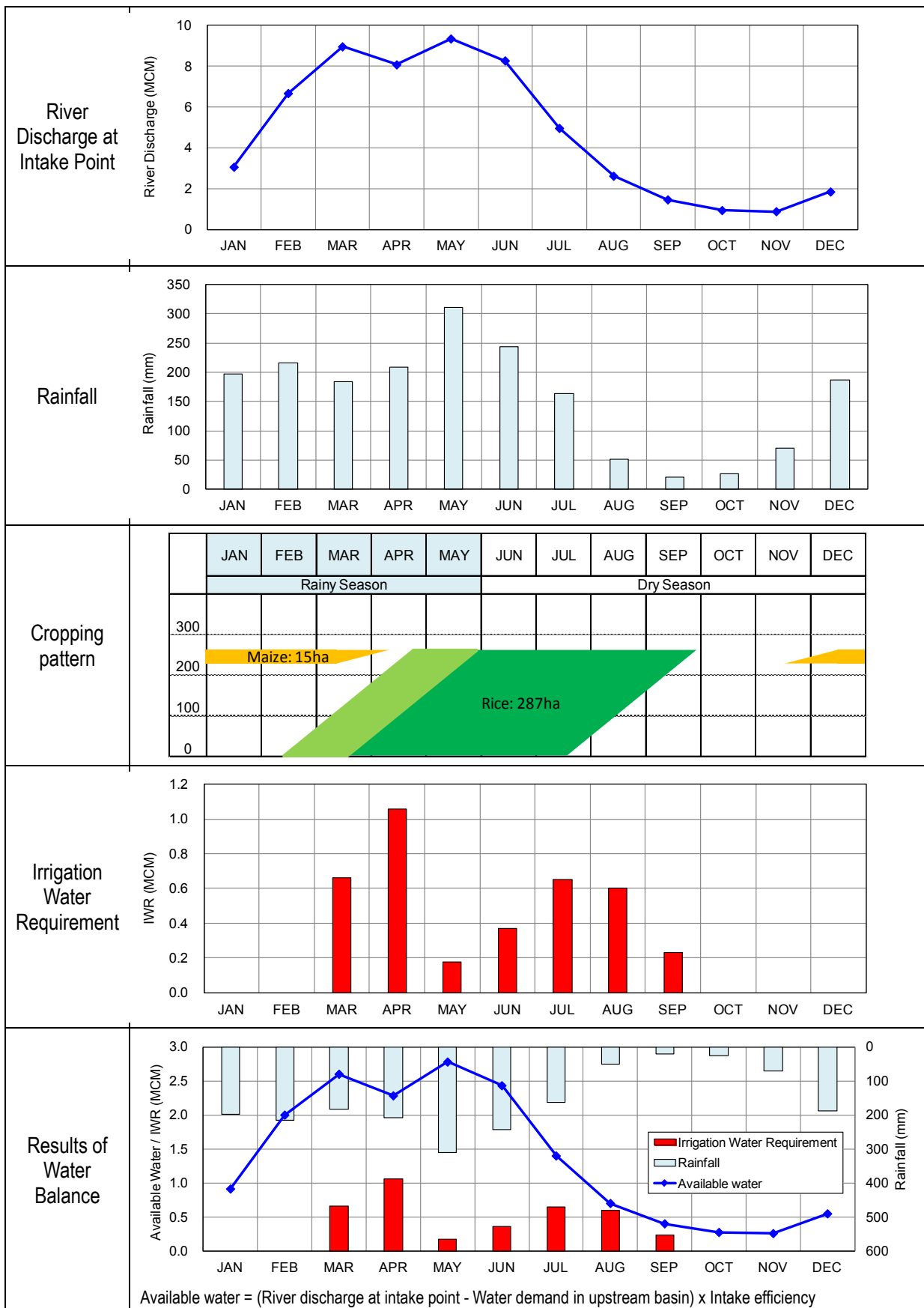


Figure 4-7-2 Results of Water Balance Analysis

4-7-2 Improvement of Intake Facility at River

According to the site survey, the issues of Saketo irrigation scheme focus on followings;

- ① Concerns of soils into in-flow from river at intake
- ② Low flow capacity of canal, due to the deterioration and given the fatal damage by the live-stock (water-buffalo and goats)
- ③ Low function of the diversion facility such as gate
- ④ Difficulty of taking water from branch canal due to low water level in branch canal

A planned intake volume is calculated from "4-6-1 Development of water source" which show 0.41 m³/s as maximum required water in planned cropping pattern. But 0.8m³/s should be the planned intake volume considering of the possible capacity of intake at headworks as following calculation.

$$0.8\text{m (depth of water)} \times 1.3\text{m (width)} \times 0.8\text{m/s (ave. velocity)} = 0.83 \rightarrow 0.8\text{m}^3/\text{s}$$

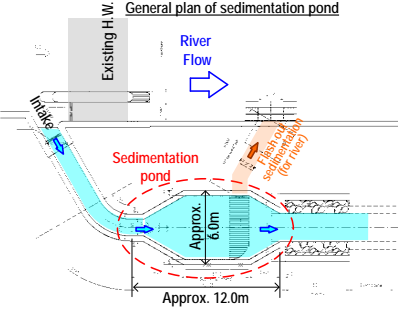
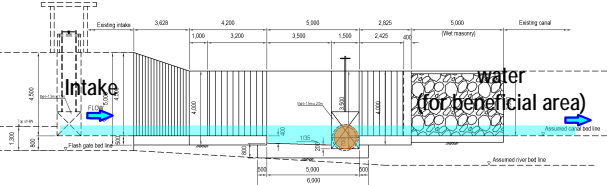
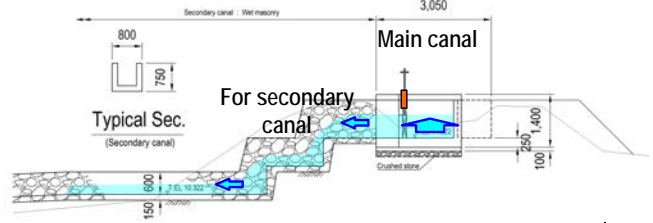
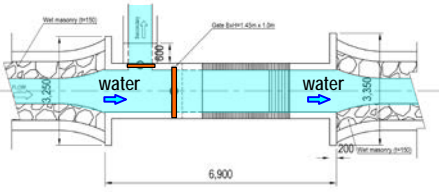
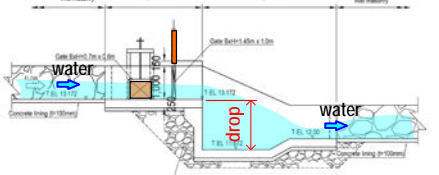
Table 4-7-1 Planned Required Water for Every Month

Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Required Water (m ³ /s)	0.00	0.00	0.25	0.41 →0.8	0.07	0.19	0.29	0.27	0.09	0.00	0.00	0.00

A planned canal alignment should be taken into consideration the leveling of original land-form on planned alignment based on topographic survey. In general, a slope of canal are designed by existing canal slope, however, in rehabilitation plan, the design slope should be almost 1/500 as minimum. The drop works could be designed to keep proper canal slope, if stable slope does not keep it.

A Flood discharge in Saketo River is assumed to about 230 m³/s in 100 yr flood, which is calculated as reference by monthly rain fall from 1952 to 1973 in ADB project. Table 4-7-3 shows the rehabilitation plan of canal.

Table 4-7-2 Alternative Plans of Rehabilitation of Facility

Issue of facility	Rehabilitation plan	Advantage and/or disadvantage
<p>① Concerns of soils into in-flow from river at intake</p>	<p>A sedimentation pond is constructed at right bank of headworks</p>  <p>General plan of sedimentation pond</p>	<p>A sedimentation pond can be construction in official area for facility. A certain effect of sedimentation by pond is expected as well improvement of water quality for irrigation. It expects to alleviate sedimentation in canal. However, the bed level of intake is so low that bed level of pond should be lower than that of level. In other words, It concerns that effect of flash out could be low, due to the difficulty of design for necessary slope. In general, necessary slop for effective flash out is 1/35.</p> <p><u>Longitudinal sec. of pond</u></p>  <p>Longitudinal sec. of pond</p>
<p>② Low flow capacity of canal, due to the deterioration and given the fatal damage by the live-stock (water-buffalo and goats)</p> <p>③ Low function of the diversion facility such as gate</p> <p>④ Difficulty of taking water from branch canal due to low water level in branch canal</p>	<p>An existing canal slope should be revised to proper one. A wet masonry and drop works could be located to keep stable water flow on necessity. In addition, the bridge on canal for live stocks are constructed to avoid a damage on canal.</p> <p>Planned canal slope should be 1/2500 from the view point of existing situation of canal bed.</p> <p>The diversion and control gate should be stationed to proper management.</p> <p>In order to alleviate the water power when a water is discharged or diverted from main canal to branch canal, the drop works are stationed. In addition, the vital branch canal should be masonry to avoid bed erosion.</p> <p><u>Sec. of diversion to secondary canal</u></p>  <p>Sec. of diversion to secondary canal</p>	<p>The materials of canal should be prevailing ones which are available to obtain by farmers so that they can easily obtain. However, at design stage the experts and support by MAF are needed. Especially, the gates are vital portion for the diversion facility which procure from Indonesia or other.</p> <p><u>Plan. of related structure (Diversion and drop)</u></p>  <p>Plan. of related structure (Diversion and drop)</p> <p><u>Sec. of related structure (Diversion and drop)</u></p>  <p>Sec. of related structure (Diversion and drop)</p>

4-7-3 Establishment of WUA and Strengthening O/M Structure

(1) Establishment of WUA

A traditional WUA exists in this irrigation scheme and plays a certain role on O&M of irrigation facilities. The WUA consists of 60 farm households only out of 112 beneficiary farm households in the irrigation service area. At present, the procedure of its registration to be a legally-approved WUA is in progress.

On the occasion when rehabilitation of irrigation facilities is implemented, it will be necessary to register the legally-authorized WUA, in which all farm household in the irrigation service join. Once a WUA is registered as legal entity, it gets easier to have government assistance. In addition, it will be able to make contracts and deals with other entities.

1) Preparation of establishment

The statute of the WUA and the consents of the membership of the eligible farmers in the irrigation service are must be prepared. The standard model statute is provided in the NDIWM of MAF and it will be fully utilized for the targeted WUA statute. Mr. Christiano in charge of WUA in the district agriculture office has initiative to guide the WUA to prepare the statute with amendment to the standard model statute. The draft of statute is completed with assent of the president and representatives of WUA. The internal regulation is also required together with the statute. General assembly, board of directors, officers, eligible member and responsibility and obligation will be clarified, the standard model of internal regulation can be utilized.

2) Application for approval of WUA

When the drafts of statute and internal regulation are completed and consents of eligible farm households are obtained, an application for approval of the establishment of the WUA may be submitted. The application should be submitted from the president, while recognitions are necessary by suco chief, sub-district administrator, district irrigation office, to the district administrator.

3) Examination and announcement

Upon the receipt of the application for the approval, the district administrator examines the application on the basis of the survey report prepared by experts and grants approval. If there is any complaint against the content of public announcement, the district administrator shall make decision by referring to the advice of engineers with technical knowledge within the day of expiry of the examination period.

4) Change after establishment

When the irrigation service area is expanded or decreased, and when the irrigation facilities are drastically changed, the articles of the association must be change in the general assembly of the WUA. These facts together with the change of the membership must be informed to the district office and the registration of the district administration must be renewed.

(2) Strengthening O/M Structure

1) O/M Structure

There are basically four stratum in the WUA structure.

- ① Officers
- ② Suco organization
- ③ Secondary canal organization

④ Member farmers

The Operational structure of the four stratum is shown in Figure 4-7-3. At present, auditor is not elected in the Saketo WUA. It will become an important office and should be included in the article of the WUA when the rehabilitation of the irrigation facilities are completed and members of the WUA increase and water fee is collected.

The irrigation officers and extension officers are merely advisors to the WUA and they don't have any responsibility or power on the decision of the WUA matters.

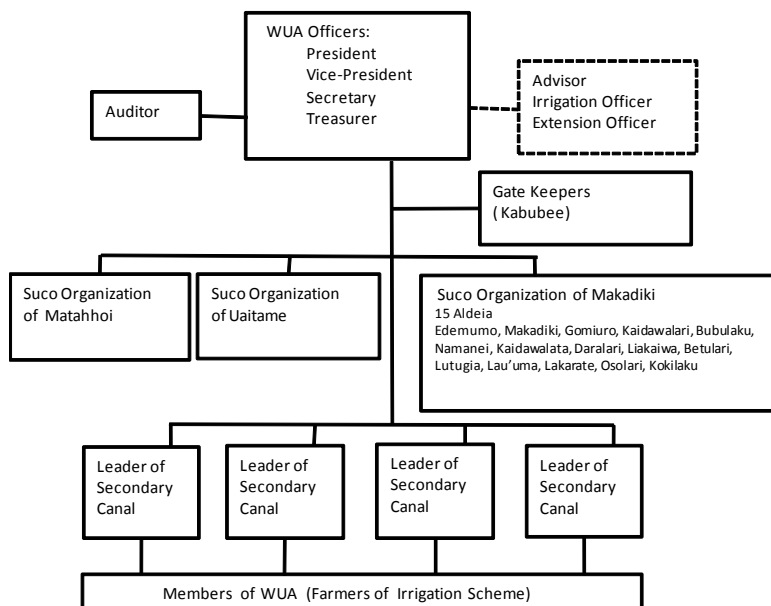


Figure 4-7-3 Organization Structure of WUA

2) Role and responsibility

- ① Officers----- President, Vice president, Secretary, Treasurer. President chairs Cropping Calendar Committee, Operation Committee and Maintenance Committee. Secretary chairs Record and Property Committee. Treasurer chairs Finance Committee. The role and function of the committees are shown in Table 4-7-4.
- ② Suco organization---keeps the relation between Suco and WUA. Suco organization mobilizes the farmers to participate when necessary.
- ③ Secondary canal organization---mobilizes farmers for the maintenance of secondary canals.
- ④ Member farmers---- follow the scheduled cropping and cultivation and irrigation and provide labor and participate repair and maintenance work of irrigation facilities.

3) O/M of irrigation facilities

The annual cropping schedule is the basis of maintenance in order to keep functions of the irrigation facilities, which enable proper water deliveries. The cropping schedule is made by the crop calendar committee, which involves the president, the vice president, suco chiefs, secondary canal leaders, gate keepers. Advices of extension offices are important.

Table 4-7-4 Committees, Functions and Membership

Committee	Function	Member	Role in Committee
Cropping Calendar Committee	To formulate most suitable cropping pattern in consideration of seasonal water amount To allocate cropping area to each command area of secondary canal To adjust cropping area of aldeia within capacity of secondary canal	President	Chairman
		Vice-president	Vice-Chairman
		Suco Chief	Member
		Gate Keeper	Member
		Leader of Secondary Canal	Member
Operation Committee	To estimate seasonal irrigation water requirement To decide control of intake gates and turnouts To deliver and distribute irrigation water properly along main canal and secondary canal	Extension Officer	Advisor
		President	Chairman
		Vice-president	Vice-Chairman
		Gate Keeper	Member
Maintenance Committee	To plan dredging sand and gravel from intake To plan desilting main and secondary canal To plan cutting grass in main and secondary canal To repair broken parts of irrigation facilities	Leader of Secondary Canal	Member
		President	Chairman
		Vice-president	Vice-Chairman
		Gate Keeper	Member
Record and Property Committee	To manage WUA facilities and equipment To keep record of WUA activities and property To prepare periodic report activities and property	Leader of Secondary Canal	Member
		Secretary	Chairman
		Vice-president	Member
Finance Committee	To collect water charge/member fee To maintain records of all financial matters To prepare periodic financial report	Leader of Secondary Canal	Member
		Treasurer	Chairman
		Vice-president	Member
		Suco Chief	Member

a. Operation of Facilities

The irrigation is mainly for wet-season paddy cultivation. The water delivery schedule (i.e. water volume taken at the intake, the flow rate, duration and interval of irrigation and water volume to respective canals at diversion works) are determined based on the cropping schedule, which is made at the start of irrigation, and then gate keepers operates gates so as to realize the scheduled water deliveries.

b. Maintenance of Facilities

The maintenance of the facilities is important in order to keep the irrigation facilities in good condition. The maintenances are consist of ① daily routine maintenance, ② periodical maintenance, ③ emergency maintenance.

Daily routine maintenance---In irrigation period, some rubbish stuck on the gates of the intake or turnout must be cleaned immediately. The operation of the scouring sluice to exclude the deposits is daily regular maintenance. These maintenance works are carried out by gate keepers and secondary canal leaders.

Periodical Maintenance--- Shortly before the irrigation season starts, the following maintenance works are implemented: desilting around the intake, cleaning of the main canal and the secondary canals, greasing the winch of the gate gates, etc. These works are one a year and it takes 3 to 4 days.

Emergency maintenance--- Emergency maintenance and repair are those works to exclude vast volume of deposit by flood inflow from the intake or partial break of the embankment of the canals in flood disaster.

c. Funds for O&M

It is supposed to be most appropriate that the maintenance costs are covered by the water charge collected form WUA members. All beneficiary farm households have to join in the WUA because the water charge must be collected fairly.

The above plans of WUA establishment and maintenance presume earnings from rice sales. Activities for these plans should be implemented in a holistic manner with facilitation of production, processing and distribution expansion of rice.

4-7-4 Construction Works of Irrigation Facility by Participatory of Farmers

The construction works by participatory works of farmers are planned as followings, as well as the periodical participatory works such as cleaning of canal and removal of sedimentation are used to conduct in irrigation scheme.

(1) Branch Canal and Tertiary

The participatory works of farmers is targeted to arrangement of earth canal, branch canal. According to site survey, the canal networks on Saketo irrigation scheme is stationed to deliver inclusively, which canal is almost head from north to south directly, which are seemed to observe the good flow function.

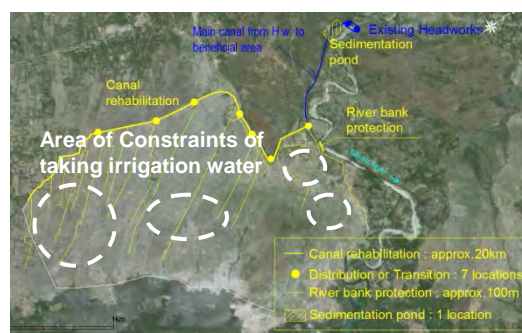


Fig 4-7-4 Situation of Branch Canal

However, the constraint area are scattered in the irrigation scheme because branch canals are given low water level than around paddy. These area of canal should improve access to the main canal and construct the wet masonry on necessary in order to keep proper water level in delivery.

(2) Access road in irrigation scheme

An existing road come from north and the available to pass by car or truck is limited. The vehicle can pass up to 1.5km along main canal to west from 1st diversion gate. The other road can pass up to a half at east and west around the scheme. In other words, there is no road to round scheme.

Currently the farmers are used to pass these roads by motorbike and/or foot. In harvest season, some paddy is forced to cross by truck to load and transport it. With the expansion of productivity, the proper road should be arranged for the effective transportation and easy to access for road. Considering of actual site condition and topography, the non-cultivated area is observed surround of irrigation scheme. So, the expansion road as access road in the scheme should be firstly extended along surround of irrigation scheme.

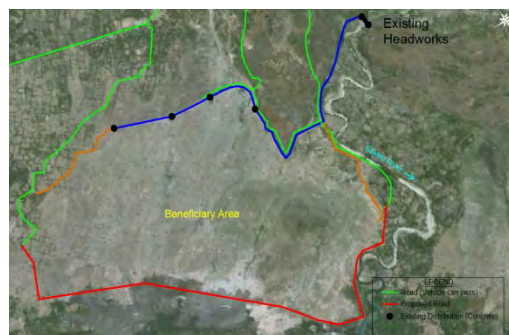


Fig 4-7-5 Planned Access Road in Irrigation Scheme

4-7-5 Protection Works for River Flood to Secure of Farm Land and Irrigation Facility

According to the interview at site, irrigation scheme at east side is given sometime flood damage and effect when the large flood comes to near the top of bank.

It should take measure for erosion and prevention of over-flow the bank, and use gabion protection which is prevailing materials in Timor-Leste..

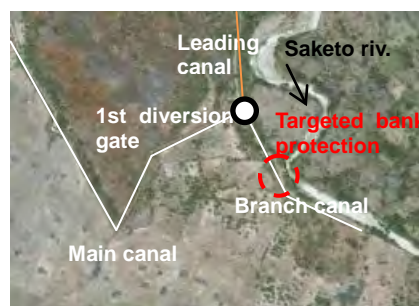


Fig 4-7-6 Targeted Bank Protection

4-7-6 Cost of Irrigation Improvement (Investment plan)

The cost estimation is conducted for improvement of irrigation system. A maintenance and establishment of WUA fee should take into account 3~5% for entire project cost which is sourced by other similar situation and project. It will be added in estimation of entire project cost.

Table 4-7-3 Cost of Construction for Irrigation Facility

Contents of construction works	Cost	Total construction cost (US\$)
Sedimentation pond	195,000	1,140,000
Rehabilitation of main canal (L=3.8km)	780,000	
Rehabilitation of branch canal (L=15.2km)	132,000	
Enhancement of bank protection (L=1.0km)	33,000	

4-8 PLANNING OF IMPROVEMENT OF CROP PRODUCTIVITY

4-8-1 Planning of Cropping Pattern and Target Yield

(1) Planning of cropping pattern

One times cultivation of rainy season is planned based on current cropping pattern because resource of

water is limited. The cultivated area is expanded because irrigation water is lead to the end with improvement of irrigation scheme. It is also planned that cultivated area of maize is remained current area. However yield of maize is increased because of utilizing good quality seed, improvement of cultivation method and input of compost with local resource.

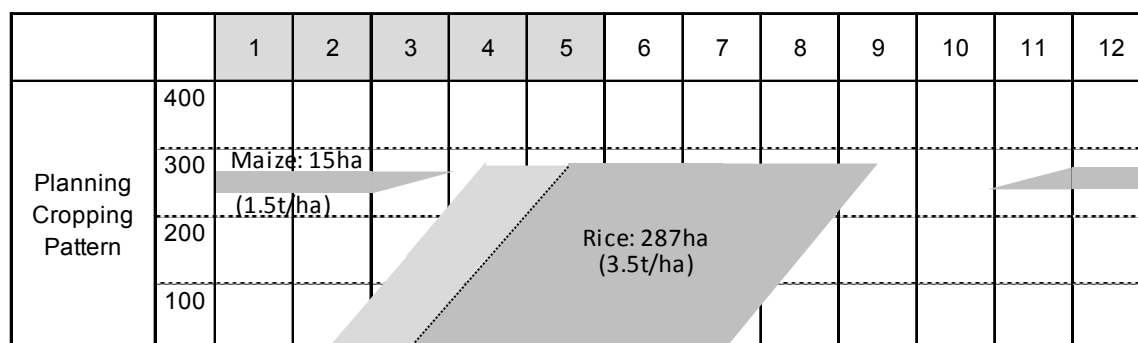


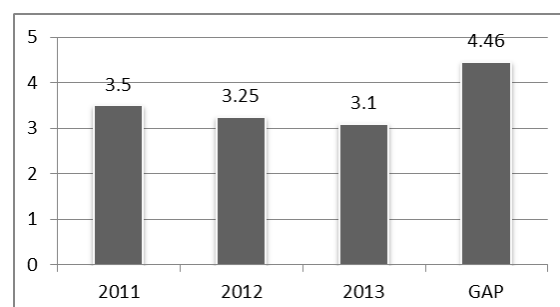
Figure 4-8-1 Proposed Cropping Pattern and Target Yield in Saketo Site

(2) Target yield

1) Rice

a) Past record of yield

According to the statistics of NDAH of MAF, the rice production of the Viqueque district from 2011 through 2013 was 3.1-3.5ton/ha (See Figure 4-8-2). The result of dissemination of GAP practiced in Viqueque in 2013/2014 district with RDP4 is 4.46ton/ha.



Source: MAF (NDAH), RDP4

Figure 4-8-2 Yield of Rice in Viqueque District (2011-2013)

b) Setting of target yield

There is an obvious difference of yield between the above current yield and the yield of Saketo irrigation scheme estimated from Farmers' socio-economic survey. It is guessed that the reason of the difference is continuing conventional method, shortage of input materials such as good quality seed or fertilizer. It is possible to increase rice production by supplying irrigation water continuously, applying seed and fertilizer sustainably and improving cultivation method. In the project, improved varieties such as Nakroma are introduced to 80% of the beneficiary area. Nakroma is mainly utilized for commercial selling. On the other hand, traditional varieties are cultivated in 20% of beneficiary area for home consumption.

Table 4-8-1 Percentage of Disseminated Area of Rice Variety and Cultivation Method

Variety	%	Cultivation method	%
Nakroma	80%	ICM	20%
		GAP	80%
Local varieties	20%	Conventional	100%

Source: JICA Study Team

It is also planned to practice of ICM in the paddy field which Nakroma is applied. There are some techniques of ICM such as utilizing high yield varieties and healthy seedlings which is grown in the mat nursery, row transplanting, periodical weeding, adequate fertilizing and water management in the paddy field. ICM is known in the whole country because it was disseminated from 2003. However it is necessary to input agricultural materials and work force. Therefore rate of dissemination of ICM is planned around 20% of target area with farmers which have capacity and strongly motivation to carry out some techniques. It is planned that target yield of Saketo irrigation scheme is 3.5 ton/ha based on the dissemination rate of seed and cultivation method. It is possible to get this target yield according to actual performance.

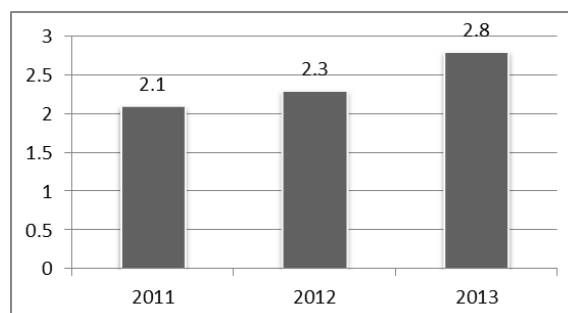
2) Maize

a) Past record of yield

The yield of maize is recorded with 2ton/ha in the recent years. It is evaluated that maize productivity is increased in the whole district.

b) Setting of target yield

Currently maize is cultivated in the small part of the beneficiary area of Saketo irrigation scheme. Most of maize is produced in upland field. It is planned that cultivated area of maize are remained current area. It I also planned to set the target yield of maize is 1.5 ton/ha because it is applied simple method such as introducing good quality of seed or applying compost or green manual made by local resources. That target yield could be reached with conventional method.



Source: NDAH-MAF

Figure 4-8-1 Yield of Maize in Viqueque District (2011-2013)

(3) Production cost

The production costs per kilogram of rice and maize are 0.48\$/kg and 0.74\$/kg respectively. The cost of labor force such as transportation, weeding and harvesting is highest in all production cost. Next, rental fee of hand tractor and is also in high ratio of total cost. It is proposed to keep down the production cost by lowering the cost of input materials and to increase yield by improving cultivation method. It is planned that the production cost of rice and maize are respectively 0.26\$/kg and 0.36\$/kg. It is possible to lower 0.22\$/kg of cost about rice production.

4-8-2 Program for Obtaining and Breeding Quality Seed

(1) Purchase of good quality seed

It is planned that seed from Commercial Seed Producers is introduced beneficiaries in the same way of Halecou irrigation scheme. In the beginning of priority project, MAF purchase the seed with 1.5 US\$/kg from CSR and sell to beneficiaries with same price. If farmers don't have enough money to purchase the seed, it is loaned to them. And then they have to return by paddy when they sell paddy. The 50kg of seed is distributed to one farmer. The target area is divided to three parts and the seed is provided to one part of target area every year.

In the priority project, it is supported that farmers take a commitment with CSR through traders to purchase the good quality of seed.

(2) Selecting of good quality seed

It is difficult to purchase the seed every year as Halecou irrigation scheme. It is recommended to renew the seed every three years. Therefore it is planed that farmers are trained about the way of collecting seed, selecting seed by salt water and treatment of seed with hot water.

Table 4-8-1 Seed Procurement Plan

Particular	Unit	Amount
Cultivated area of rainy season	ha	287
Cultivated area of dry season	ha	0
Total cultivated area	ha	287
Applied area of improved seed (80%)	ha	229.6
Seed volume per hectare	kg/ha	50
Seed volume for total area	kg	11,480
Procurement volume of seed per year	kg/year	3,827

Source: JICA Study Team

4-8-3 Program of Improvement Input Materials (Fertilizer, Agro-chemicals, Agricultural Machine and Agricultural Equipment)

(1) Fertilizer and agro-chemicals

It is needed for beneficiaries to visit shops selling chemical fertilizer in Viqueque city. They have to go to the Baucau district in some cases. It is planned to establish sustainable purchasing system in priority project. For example, the system of group purchase through the trader is established for purchasing agricultural input materials.

It is necessary to train how to manure with proper amount in proper time because farmers have not learned appropriate method of manure. It is also planned to compare the improved cultivation method in the model plot with conventional method.

(2) Agricultural machine and equipment

Around 40 hand tractors are utilized in Saketo irrigation scheme according to the result of Farmers' economic survey and field survey. Around 90% of farmers hire the hand tractor from neighbors or farmer's group. There are few farmers who harrow the paddy field for two times.

The air of the ground is replaced by plowing by hand tractor and then activities of micro-organisms are promoted. Therefore organic materials are disassembled quickly and physical condition of soil is improved with proper water content. Moreover plowing with hand tractor is effective for protection of weed because weed and its seed are ploughed in. Therefore it is recommended to utilize hand tractor at two times for ploughing and harrowing.

It is planned to introduce the simple type of agricultural equipment in the priority project. It is recommended that the agricultural equipment for land leveling is easy for farmers to make. It is also introduced to purchase the rotary weeder from the NGO of Baucau district. If there is a farmer who cannot purchase the rotary weeder, it is rent to them from the project. And then they have to repay by paddy when they sell paddy.

4-8-4 Program for Promoting Local Resource Circulative Agriculture

The acquisition of the chemical fertilizer is limited for beneficiaries. It is planned to train farmers to make or apply the compost or organic fertilizer which are made by local resources. Many buffalos or cows are raised in Saketo irrigation scheme. It is recommend raising them at the enclosing method and utilizing the dung of them for the compost. Currently a large quantity of rice husk produced at the place of rice-cleaning mill is left as is. It is planned to train how to make the charcoal of rice husk.

4-8-5 Program for Dissemination of Cultivation Method

(1) Utilization of GAP manual and dissemination through the model farmers group

It is planned to utilize GAP manual made by MAF on dissemination of rice cultivation method like the project of Halecou irrigation scheme. Especially in this project area, ICM is mainly trained for farmers. It is necessary to improve the techniques for the situation of farmers so that farmers carry it out depending on progress of the project continuously.

It is also planned to train farmers at the model farm land which is managed by extension worker or local NGO and model farmer's group selected from beneficiaries (see Chapter 3, 3-7-5). Model farmer's group practice improved cultivation method at the model farm land under the instruction of expert or extension worker and compare it with conventional method.

(2) Utilization of local resources (Local NGO)

MCEA also have activities in Viqueque district like Bobonaro District and then they know well about agricultural situation. CSR is one of local NGO which act at Viqueque district to introduce good quality of seed, train improved cultivation method and improve soil condition. It is important to utilize these local NGOs which understood the local situation well and disseminate sustainable techniques.

4-8-6 Strengthening Program for Pest and Disease Control

The traditional ways (natural medicine) made by local resources and agro-chemicals purchased by famers are utilized in this area. However the efficiency of them is no so good. According to the survey, rice blast, rice tungro disease and leaf bright are emerged in Viqueque district. There are also damages of bug, grasshopper and stem borer.

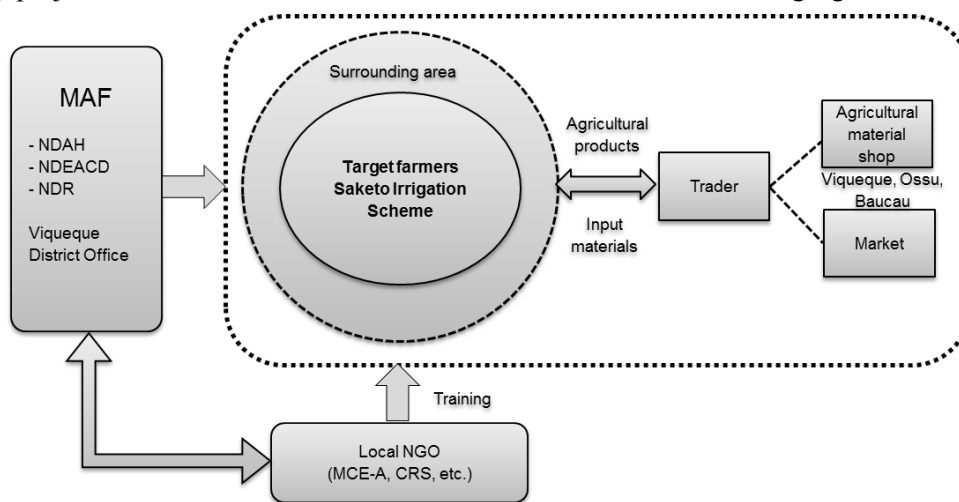
It is planned to establish the system of prevention activity of pest and disease coontrol same as Priority Project of Halecou irrigation scheme. In this system, it is important to collect current information, plan the action against pest or disease, implement the action, feedback the result of action. However, exclusive acknowledgment about pest and disease are necessary, it is also planned to invite the expert from neighboring country such as Indonesia if NDR could not solve these problem.

It is also planned to carry out same process against damages from rats, birds, wild animals and livestock.

4-8-7 Framework and Cost of Improvement Crop Productivity

(1) Framework of implementation

The priority project as above is carried out with frame work shown in following figure:



(2) Investment plan

The cost for priority project is estimated as Table 4-8-3.

Table 4-8-3 Cost of Improvement of Crop Production

	Activities	Cost (US\$)
Activity-1	Program for obtaining and breeding quality seed	30,500
Activity -2	Program of Improvement Input Materials (Fertilizer, Agro-chemicals, Agricultural machine and Agricultural Equipment)	7,500
Activity -3	Program for Promoting Local Resource	18,500

Activities		Cost (US\$)
	Circulative Agriculture	
Activity -4	Program for Dissemination of Cultivation Method	3,000
Activity -5	Strengthening Program for Pest and Disease Control	10,500
Total		70,000

4-9 IMPROVEMENT PLAN FOR POST-HARVEST AND MARKETING

4-9-1 Directions to Improvement of Post-Harvest and Marketing Exploitation

The wet season planting paddy will be the major crop with expansion of irrigation areas from 229ha to 287ha. The total production will be predicted at 1,004.5 ton-paddy. It is expected that the deficits on supply and demand in the village will be resolved after the project. The villagers buy imported milled rice in January to February at 28.8 tons (2013). The villagers buy rice during the period of shortage of grains, and the deficit of carbon-hydrate substances could not be replaced by maize.

As the unique distributing channel of rice, the farmers in Saketo Irrigation Scheme supply 30% of producing volume to their clans who do not live in paddy producing areas. Another channel is direct-sales in Baucau and Dili by women farmers. The farmers in the scheme has never experienced MCIE paddy purchasing, therefore the system as a production incentive impacts on improvement of livelihoods.

According to the farmers socio-economical survey, the constrains in marketing exploitation are low selling prices, scarce transporting methods to the marketplaces and difficulty on procurement of packaging materials. The individual transaction can be denied, but the contract with large rice millers are advantaged on cost effectiveness and efficiency.

After the project, the surplus of paddy will increase to 504.3 tons-paddy equivalent to 50.2% of whole production at 1,004.5 tons-paddy referred to Table 4-9-1. Considering the current marketing channels, the surplus paddy are planned to distribute to 28% for direct-sales of milled rice, 10% for paddy trader, 10% for MCIE purchasing system, 1% for MAF agricultural schools and 1% for others. For the purchasing system, the farmers groups shall contract with the large rice miller, ACELDA¹, in order to create efficient logistics of paddy. ACELDA has actual performance in agribusiness and management of individual farmers, and the company group has own retail shops.

¹ ACELDA Unipessol Lda. has the business purposes in rice milling, plant oil extraction and food distribution. The company possesses the factory of rice milling plant and oil extracting plant in Baucau and retail shops in Baucau and Dili. Procurement of the milling plant was supported in 2014 by the former AudAid under Market Facility Project.

Table 4-9-1 Current Situations and Marketing Exploitation of Paddy

Comparative Items	unit	Saketo		Remarks (Source of Information for w/o project)		
		w/o project	w/ project			
Basic Data						
(1) Potential Area	ha	410		Irrigation Inventory Survey		
(2) Irrigable Area	ha	287		Irrigation Inventory Survey		
(3) No. of Households	HH	112	130	Irrigation Inventory Survey		
(4) Numbers per Household	person/HH	7.61	7.80	Farmers Socio-Economic Survey		
(5) No. of Inhabitants	person	852	1,014	(3)×(4)		
(6) Wet Season Paddy Cropping Area	ha	229	287	Irrigation Inventory Survey		
(7) Dry Season Paddy Cropping Area	ha	0	0			
(8) Yield	ton/ha-paddy	1.65	3.50	Farmers Socio-Economic Survey		
(9) Estimated Paddy Production (Dry+Wet Seasons)	ton-paddy	377.9	1,004.5	((6)+(7))×(8)		
(10) Purchase of Milled Rice	ton-rice	28.8	0.0	Farmers Socio-Economic Survey		
Distribution in Paddy Basis						
Consumption and Internal Use						
(11) Stock for Home Consumption	ton-paddy, %	167.0	44.19	254.1	25.3	Farmers Socio-Economic Survey
(12) Seed Stock	ton-paddy, %	11.4	3.02	13.1	1.3	Farmers Socio-Economic Survey
(Germination Ratio)	%	70.2		76.9		35kg-paddy seed/ha =100% germination
(13) Loan Repayment	ton-paddy, %	0.8	0.21	102.5	10.2	Farmers Socio-Economic Survey, US\$150/ha for Input Cost, US\$0.42/kg-paddy
(14) Land Tenant Fee	ton-paddy, %	0.0	0.00	0.0	0.0	Farmers Socio-Economic Survey
(15) Paid as Irrigation Water Fee	ton-paddy, %	0.2	0.04	10.0	1.0	Farmers Socio-Economic Survey
(16) Mutual Help or Christian Society	ton-paddy, %	113.4	30.02	120.5	12.0	Farmers Socio-Economic Survey
Subtotal		292.8	77.48	577.2	49.8	
Sale of Surplus						
(17) Trader/Collector, NGO	ton-paddy, %	8.5	2.24	100.5	10.0	Farmers Socio-Economic Survey
(18) Cooperative Operation	ton-paddy, %	0.0	0.00	10.0	1.0	Farmers Socio-Economic Survey
(19) MCIE through Cooperative	ton-paddy, %	0.0	0.00	100.5	10.0	Farmers Socio-Economic Survey
(20) MAF (Sale at Comoro HQ or Natarbora Agricultural Technical School)	ton-paddy, %	0.0	0.00	10.0	1.0	Farmers Socio-Economic Survey
(21) Direct Sales at Market	ton-paddy, %	76.5	20.25	281.3	28.0	Farmers Socio-Economic Survey
(22) Community Transaction and Others	ton-paddy, %	0.1	0.03	2.0	0.2	Farmers Socio-Economic Survey
Subtotal	ton-paddy, %	85.1	22.52	504.3	50.2	
Other Indicators						
(18) Post Harvest Losses (not including milling loss)	ton-paddy, %	55.0	15.0	119.0	12.0	Site Survey, (8)×Loss%
(19) Production without Losses and Seed Stock	ton-paddy	311.5		872.5		(8)−(12)−(18)
(20) Milled Rice Basis Consumption, Milling Recovery	ton-rice, %	103.3	52.5	123.0	55.0	(11)×(1−Loss%)×Recovery%+(10)
(21) Estimated Consumption per Head in Milled Rice (including chicken feeding, extra stock and animals)	kg/head/yr	121		121		(20)÷(5)

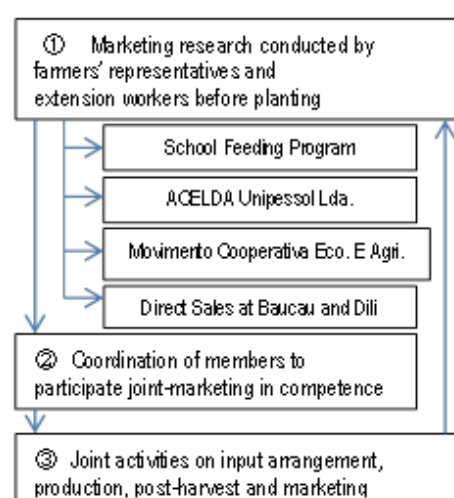
4-9-2 Encouraging and Organizing of Local Commercial Rice Farmers' Group

In the beneficiary villagers in Makadiki of Saketo Irrigation Scheme, the agricultural cooperative has not been established officially, but the group with 20 members supported by MCE-E (NGO) is applying to register to Ministry of Justice. Another group for quality seed production under SoL has tried SRI, but the activities have not been expanding due to cost effectiveness or lack of marketing channels of milled rice.

The group of MCE-A had sold 1-2 ton/year (2014) in Dili consumers through MCE-A as organic rice. Among members, the mutual cooperation is relatively high, if the profit making is surely achieved.

As the results of the participatory workshop, it is assumed that the arrangement of matching between individual farmers and buyers is more easily realized than organizing the groups in the initial stage. The formation of groups will be accordingly strengthened through technical and marketing supports.

In the village, two elementary schools in total 1,400 pupils exist, but local materials are not used for



the school feeding program in despite of long distance (12 hours by trucks) from Dili. The demands are estimated at 8 ton/year-rice. It is desirable to use locally-produced rice for economic and environmental education in school feeding program in future. The farmers will be facilitated to organize for the following activities for marketing:

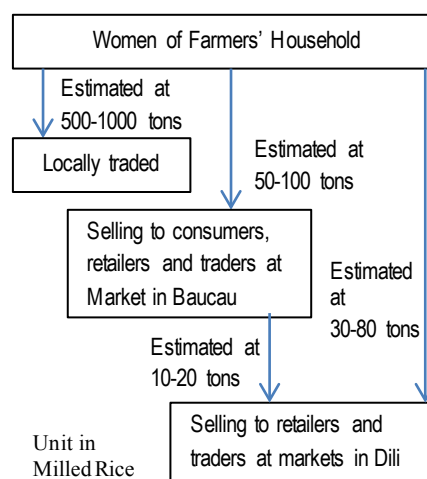
- Negotiation with Ministry of Education to supply local food materials for school feeding program in Suco Makadiki
- Registration of membership to ACELDA before cropping and transaction of paddy
- Supply high quality milled rice in specified variety, non-chemicals used, broken ratio <10%, impurities <0.1% and no contamination of rice weevils
- Improvement of selling methods for direct sales at Baucau and Dili by women and exchange of information
- Promotion to MCIE in order to participate MCIE Purchasing System
- Exploitation of marketing channels of black and red rice as a specialty product
- Negotiation with local traders in Viqueque , Ossu or other towns

The purpose of joint-marketing should be simplified and clearly, and the activities depending on the requirements by buyers will be agreed among group members. It is suggested that the purpose to express to the farmers is ‘profit-making.’ Historically, the people of Uatolari Sub-District have own dialect and culture. The facilitators and extension workers should not enforce the farmers, but respect their decisions and assist creating self-initiative performance of farmers.

4-9-3 Value-Chain Approach of Local Commercial Rice

The women in farmers’ households are spending for 5-10 days to sell their milled rice. At the marketplaces in Baucau and Dili, they decide the selling prices taking into account for the reactions of buyers by variety and quality. Sometime, they clean the milled rice removing small stones, straws, husks, and weed seeds by hands.

The present transactions are costly in handling and taking time. The women’s groups for sales of milled rice may help to decrease the costs. Small stores near the marketplaces can depress quality losses and working force, if women’s group can hire. The facilitator of the project shall lead to analyze the weakening factors in supply chain of milled rice with the women marketers to reduce the marketing costs and upgrade rice quality depending on consumers.



For marketing to MCIE and ACELDA, the farmers should know the membership system showing below, which ACELDA has developed through collection of Candlenuts:

Table 4-9-2 Process on Acquisition of Memberships for ACELDA

Process	ACELDA Side	Farmers Side	Extension Workers
1. Identification of farmers	Conducting survey on farmers and farms	Providing personal information to ACELDA authorized by Suco Chief	Supporting survey by ACELDA
2. Training	Dispatching of trainers on required paddy/rice quality, varieties and	Learning marketable quality, postharvest handling and loading methods	Supporting technical matters on production

Process	ACELDA Side	Farmers Side	Extension Workers
	postharvest handling		
3. Holding meeting	-	Discussing on quality seed procurement, tractor use, joint-work (<i>Hanesan</i>), sacks and organic fertilizer production among farmers' groups	Facilitating farmers in manner of internally-motivated participation
4. Agreement on procurement	Agreed on varieties, moisture contents, contamination removal of contamination, collecting point and date, weighing method, minimum amount, minimum guarantee unit price, membership ID, sharing of personal data, witnessed by MAP		Witnessing
5. Issuance of Membership ID Card	Constructing data base of personal data of members	Receiving ID card	-
6. Purchase of Paddy	Collecting paddy at agreed places and date, weighing, conducting quality inspection and immediate bank transfer	Loading paddy by agreed packaging at agreed place and date showing ID card	Supporting technical matters on postharvest and pre-inspection
7. Milling, Packaging and Retailing	Milling at Acelda's warehouse in Baucau and selling in their retailing shop in Baucau and Dili	—	—
8. Sales Planning in the Next Season	Evaluating buy/sell situations and each farmer's performance	Preparing planting in the next season	Supporting production planning in the next year

4-9-4 Post-Harvest and Processing Technologies of Local Commercial Rice

In general, the usual farmers do not feel any necessity to improve rice quality, because farmers think there is no market for high quality rice. According to directly-selling experiences of women, they have an awareness in unification of rice sizes, moisture contents, low contains of broken rice, low contamination of impurities and, in addition, non-chemicals used. Regarding rice sizes and broken rice, farmers can easily separate by simple sieves, but the seed variety and quality are also important.

The threshed paddy is better to be immediately dried in the paddy fields, but the paddy cannot be remained in the fields for more than one day due to the damages by wild birds and rats. Construction of concrete yards near the village and use of tarpaulins (water-proofed vinyl sheets) will improve the paddy drying works. Impurities can be removed by winnower or sieves in manual operation, not by engine-driven pre-cleaner.

If transaction with ACLDA is expanding, introduction of dry-type rice polisher o ACELDA shall be considered. Since the local milled rice is most commonly remained powder of brans on the surface of grains, removal of brans is important for competitiveness with imported rice in physical appearance and longer preserving periods to delay oxidization. The packaging materials will not be assisted to farmers' groups, but provide to ACELDA or MCE-A, who have their marketing channels to high-end consumers.

The quantitative post-harvest losses can be occurred by traditional paddy storage methods and insufficient drying before storage. The storage by piling second-hand grain sacks is convenient, but it is easy to be damaged by fungi, rice weevils and rats. FAO designed tin tanks (called as a mini-silo) are suitable for local conditions. IFAD promoting drums are not suitable to handle for paddy, thus some improvement may be required. The traditional baskets weaved by palm leaves are easily procured in a lower cost, but not suitable in high humidity conditions. The farmers groups will decide by their decision showing alternative storage methods depending economic conditions and paddy sales forecast. The milling machines of Satake and Agrindo one-pass type are prevailed. Supports on procurement of spare parts such as rubber rolls in a de-husking part and screens in a milling part will be considered to increase milling recovery at 55% or more.

There are market demands of black and red rice in Timor-Leste. The packages will be considered to

improve.

4-9-5 Adaption to Government Paddy Purchasing System

(1) Access to government paddy purchasing system

At the step maturing the marketing activities of the agricultural production cooperatives or the farmers group, they will directly access to the government paddy purchasing system. MCIE has the plan to manage the unified operation of imported rice and locally purchasing rice from 2015 and to increase paddy purchasing tonnage. The agricultural production cooperative or farmers groups shall cope with the following tasks:

- Management of the agricultural production cooperative under supervision of MCIE Cooperative Directorate and registration to Ministry of Justice
- Agreement among farmer members on paddy collecting points and methods and joint-use of a community warehouse or the existing MAF warehouse (built under the Bebuy Irrigation Project)
- Simplified quality control of paddy at the level requested by MCIE and inspection of moisture contents and containing impurities damaged and immature paddy
- Coordination of join-works such as pre-cleaning, weighing and packaging and arrangement of transportation to MCIE specified warehouse
- Banking arrangement and remittance to the members depending on supplied weight
- Coordination with ACELDA under the Government Paddy Purchasing System

(2) Supply of paddy to technical agricultural school of Natarbora²

For the school feeding program to Agricultural Schools, MAF Procurement Directorate conducts bidding. The contracted firms supply food materials to the schools, but most of food materials are imported including milled rice. In the project, the locally produced rice shall be distributed to the School as a leading case of school feeding programs using local materials. The premium farm-gate prices are expected depending on quality and taste. Transaction shall be contracted between the School and the large rice miller, who shall collect quality paddy from the farmers group. The expecting monthly schedule and works by stakeholder is suggested as below:

Table 4-9-3 Paddy Purchasing System for Technical Agricultural School of Natarbora

Dry Season Crop	MAF	Rice Miller	Farmers Group	Tech. Agri. School of Moleana
Nov-Dec	Holding the seminar of the project, selection of cooperating rice miller	Maintenance of rill milling machines		
Jan-Feb	Support on distribution of quality seeds	Selection of farmers groups, paddy purchasing contract with the groups	Farming works of plowing, irrigating, seeding and nursery preparing	
Mar-Jun	Monitoring on contract farmers, arrangement of advance payment to the	Monitoring on growth of paddy	Farming works of basic fertilizer application and transplanting	

² MAF/ National Directorate of Education and Agriculture Training/ Technical Agriculture School of Natarbora located at the southern part of Manatsuto District

Dry Season Crop	MAF	Rice Miller	Farmers Group	Tech. Agri. School of Moleana
	rice miller			
Jul-Sep	Dispatch of trained inspectors on quality evaluation, arrangement of final payment to the rice miller, project evaluation	Integrated works on post-harvest such as collecting, scaling, drying, processing, packaging and payment to contract farmers	Farming works of additional fertilizer application, pest-control and harvesting	Receiving of milled rice, eating quality test of cooked rice

In the MAF purchasing system, MAF Viqueque District Office will verify the following subjects:

- Farming technology and quality inspection can be implemented by the officers of MAF District Office
- The payment can be promptly done using the existing credit agents from MAF to the contracted rice miller.
- The contract between the rice millers and farmers groups/ individual farmers can be functional.
- Farmers can secure the gross profits from paddy production.
- The stakeholders of the farmers groups, the rice miller and the School can satisfy the transaction mode in the project.
- The post-harvest losses and the broken rice ratio can be depressed.
- As the results of eating quality test of cooked rice, the dealing rice can be competitive with imported rice (Vietnamese rice, broken >25%) and other local rice.

4-9-6 Input Plan

The costs on the inputs are estimated as below:

Table 4-9-4 Input Costs on the Plan for Post-Harvest and Marketing

Activity		Item	Cost (US\$)	
Act-1	Encouraging and Organizing of Local Commercial Rice Farmers' Group	Manpower mobilization	15,000	35,800
		Materials (training, mini-silo, trailer for 4-wheel tractor)	20,800	
Act-2	Value-Chain Approach of Local Commercial Rice	Manpower mobilization	30,000	66,300
		Materials (pre-cleaning sieve, scale, tarpaulin, grain bag, vacuum packaging machine, etc.)	36,300	
Act-3	Improvement Plan on Post-Harvest and Processing Technologies of Local Commercial Rice	Manpower mobilization	3,000	8,000
		Materials (training, moisture contents meter)	5,000	
				110,100

4-10 PROJECT EVALUATION IN PR-FEASIBILITY STUDY LEVEL

The project is evaluated pre-feasibility study level.

4-10-1 Project Cost

The costs on the inputs are estimated as below:

Table 4-10-1 Project Cost

Project	Project Cost (US\$1,000)	Remark
1. Improvement of irrigation systems	1,140	
2. Crop production increase	70	
3. Improvement of processing and marketing	110	
Total	1,320	

4-10-2 Economic Validity

(1) Cost

US\$ 1,140 thousand of the construction cost of the irrigation infrastructure improvement plan was allocated equally in the two years of the beginning. After the third year, 3 % of the improvement construction cost is appropriated every year as the operation and maintenance (O&M) cost. The cost of the productivity improvement plan, US\$ 70 thousand and the cost of the processing and distribution improvement plan, US\$ 110 thousand were allocated equally in the three years from the third to the fifth year. All costs were converted to the economic cost across the board, multiplied by 0.95 of the standard conversion factor.

Table 4-10-2 Appropriation of the Project Costs in Saketo

(Unit: US\$ Thousand)

Year	Const. Cost	O&M Cost	Project Cost	Total Cost
1	541.50			541.50
2	541.50			541.50
3		32.49	57.00	89.49
4		32.49	57.00	89.49
5		32.49	57.00	89.49
6		32.49		32.49

Source: JICA Study Team

(2) Benefit

The benefit was calculated by deducting the net income before the project from the net income after the project at every crop. US\$ 187 thousand of the project economic benefit was appropriated after the completion of the repair works, from the third year.

Table 4-10-3 Calculation of the Benefit in Saketo

Area (ha)	Planted Area (ha)				Cropping Intensity (%)	Gross Return (US\$ x 1000)	Product. Cost (US\$ x 1000)	Net Return (US\$ x 1000)
	Crop	Rainy Season	Dry Season	Total				
<i>Before Project Condition</i>								
287	Paddy	229.0	-	229.0	79.8%	153.58	79.76	73.82
	Maize	15.0	-	15.0	5.2%	3.95	1.72	2.23
	Total	244.0	-	244.0	85.0%	157.53	81.48	76.05
<i>After Project Condition</i>								
287	Paddy	287.0	-	287.0	100.0%	405.82	149.46	256.36
	Maize	15.0	-	15.0	5.2%	9.72	2.90	6.82
	Total	302.0	-	302.0	105.2%	415.54	152.35	263.18
Benefit in crop production = {(Total Net Income After Project Condition) - (Total Net Income Before Project Condition)}								187.13

Source: JICA Study Team

(3) Economic Internal Rate of Return (EIRR)

The results of the economic analysis in Saketo shows that the EIRR is 12 % and the B/C is 1.1. It is confirmed the project can take the benefit which offsets the cost.

Table 4-10-4 Economic Evaluation Indicators in Saketo

Indicator	NPV (US\$ x 1000)	B/C	EIRR
Value	147.84	1.11	11.60%

Discount Rate (i) = 10%

Source : JICA Study Team

4-10-3 Social Validity

In addition to the direct economic effect, following indirect effect is expected by implementing the

project.

(1) Improvement of rice self-sufficiency in beneficiaries

Rice cropping was unstable because of deficit of irrigation water, lack of paddy cropping skill and crop damage caused due to disease. As the results, self-consumption rice cannot be produced. Beneficiaries are forced to purchase deficit rice from rice market in Baucau and Viqueque. By the project implementation, related farmers can produce self-consumption rice and achieve 100 % rice self-sufficiency. They can also sell surplus rice after ensuring self-consumption rice as the commercial rice to the rice market. This project can contribute to the improvement of rice self-sufficiency in an around area.

(2) Increase of farm household income by expanding market channel of surplus rice

MCIE paddy purchasing system was not worked in the area, By implementing this project, surplus rice or commercial rice will be able to sell in which the project will provide some market channels including governmental purchasing system. Expansion of selling opportunity surely brings to generate farm household income. By activating selling business of rice, farmers' production incentive will become high.

(3) Ensuring agricultural employment opportunity in rural area.

Through the project implementation, agricultural employment opportunity related with rice production and marketing will be provided. As commercial sense is created, rice market is activating and related business with processing and marketing is expanded. Market dealing with input material such as seed, agricultural machine and fertilizer/ pesticide is also developed. Considering such effect, it is considered that this project contributes to rural agricultural based economy development in Viqueque wide area.

(4) Mitigation of flood damage by irrigation facilities

Intrusion of flooding water into the agricultural fields can be controlled and restricted by rehabilitating intake facility. In the area, intake weir has been constructed. By this weir, flooding damage will be mitigated on the downstream area, and river bank protection is useful for land conservation effect. It also contributes to recession effect of flooding water flow velocity

4-10-4 Project Evaluation in Pre-feasibility Study Level

Technical input level for improvement of irrigation, rice farming and processing/ marketing is based on the existing local level. Its level is considered to be applicable in the area. EIRR (Economic Internal Rate of Return) is estimated 11.6 %. It is judged to be feasible from the economic evaluation viewpoint. This project is considered to be the local rice production/ market promotion model in remote area from Dili rice market. This development model can be applied into the similar rice marketing area in the districts, Viqueque, Covalima and Ainaro in the south region. In-direct effects as mentioned above can be brought from the project implementation. In term of the environmental and social consideration, no negative impact will be caused. Under such consideration, this project is judged to be feasible as an overall evaluation.

CHAPTER 5 REGIONAL DOMESTIC RICE DISTRIBUTION IMPROVEMENT PROJECT IN MALIANA, BOBONARO DISTRICT

5-1 CURRENT STATUS OF RICE PROCESSING AND DISTRIBUTION IN MALIANA REGION

5-1-1 Amount of Paddy Production

The lowland area between the Nunura River and Burobo River has a high potential of irrigation in Maliana and Kaikori Sub-districts in Bobonaro District. A bunch of irrigation schemes are relatively large-scale and consolidated. Catchment areas of those rivers are extensive and surrounded by mountains. Moreover, the area has abundant precipitation because damp air from the sea collides against the mountains and turns to rainfall

There are 15 irrigation schemes whose irrigated areas amount to 4,123ha. However, only two schemes, Maliana I and Beacou, take water from perennial rivers so that it makes possible to take water at any time all through the year. The other schemes rely on seasonal rivers, which depend on rainfall. The inventory survey has revealed that the double cropping is practiced in approximately 10% of the irrigated area. Although the yield per hectare greatly depends on the farming methods or water-intake conditions, the statistical data of MAF/ NDAH say that the average yield of the district is 3.25 tons/ha in 2012, which means that 14,740 tons of paddy has been produced in the district¹.

The number of farm households (HHs) is 2,911 for the 15 schemes, and that results in 1.42 ha/HH in average.

The most-grown cultivar of rice is IR-64, followed by IR-72, Nakroma (IR-116), Sigoga, local crossbreeds, Membramo, and F1 imported from China. The reasons that IR-64 dominates are the strength against diseases and relatively-high yields per hectare. However, Membramo, which used to be issued by the Indonesian government, is more popular from the viewpoints of flavor and textures. Membramo seeds are available from Oecusse District at present, but the flavor has been deteriorated because of farmers' self-extraction of seeds.

Table 5-1-1 Irrigation Schemes in Maliana

Region				
Ref.No.	Scheme Name	Area (ha)	HH	ha/HH
1-e-1TC	MALIANA I	900.0	1,467	0.61
1-e-5S	HALECOU	364.0	103	3.53
1-e-6S	MALIANA II	1,700.0	388	4.38
1-e-7S	MAUTALO	91.0	54	1.69
1-e-8S	MARCO	208.0	203	1.02
1-e-12TR	BEACOU	75.0	30	2.50
1-e-13TR	HOLIHUT	118.0	162	0.73
1-e-17TR	KORLULI	39.0	37	1.05
1-e-18TR	DARE	31.0	175	0.18
1-e-20TR	PAILELO	60.0	44	1.36
1-e-21TR	BEASU OABEIN	2.0	21	0.10
1-e-23TR	NUNURA	227.0	78	2.91
1-e-24TR	BEAMAREN	14.0	52	0.27
1-e-25TR	LEOLIMA	10.0	72	0.14
1-e-Add-1	MULA'U	284.0	25	11.36
Total		4,123.0	2,911	1.42

Source: Inventory Survey (Irrigation)

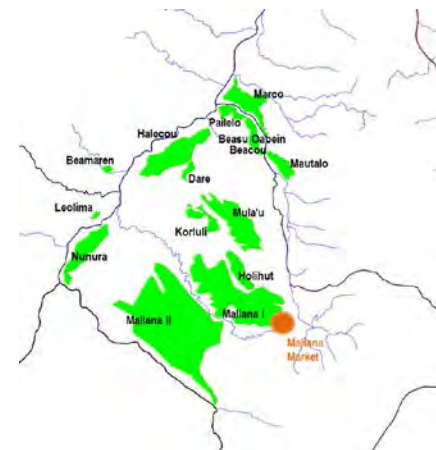


Figure 5-1-1 Regional Scheme in Maliana

¹In this regard, the preciseness of yield survey methods is controversial. The 1.49 tons /ha derived from Farm Socio-economic Survey of the Study imply that it is approximately 3.0 tons/ha if irrigation is in good conditions and 1.5 to 2.0 tons /ha at most if irrigation is NOT furnished.

5-1-2 Current Status of Processing and Distribution of Domestic Commercial Rice

(1) Processing and distribution of domestic commercial rice in the Maliana region

The paddy harvest scale, which takes into account after-harvest losses except for threshing and polishing, is estimated 13,700 tons in Maliana and Cailaco sub-districts where intensive rice cultivation is practiced. There is no data on paddy distribution. The rough estimation of rice distribution from the Study is 4,000 tons for self-consumption by growers' families and their relatives, 1,200 tons for sales at the Maliana market, 1,500 tons (Year 2004) purchased by MCIE, and the remaining 7,000 tons distributed to mountainous areas in Bobonaro and adjacent districts. In general, it is relatively easy to sell domestic rice in mountainous areas because its unit price gets closer to that of the imported rice in such areas.

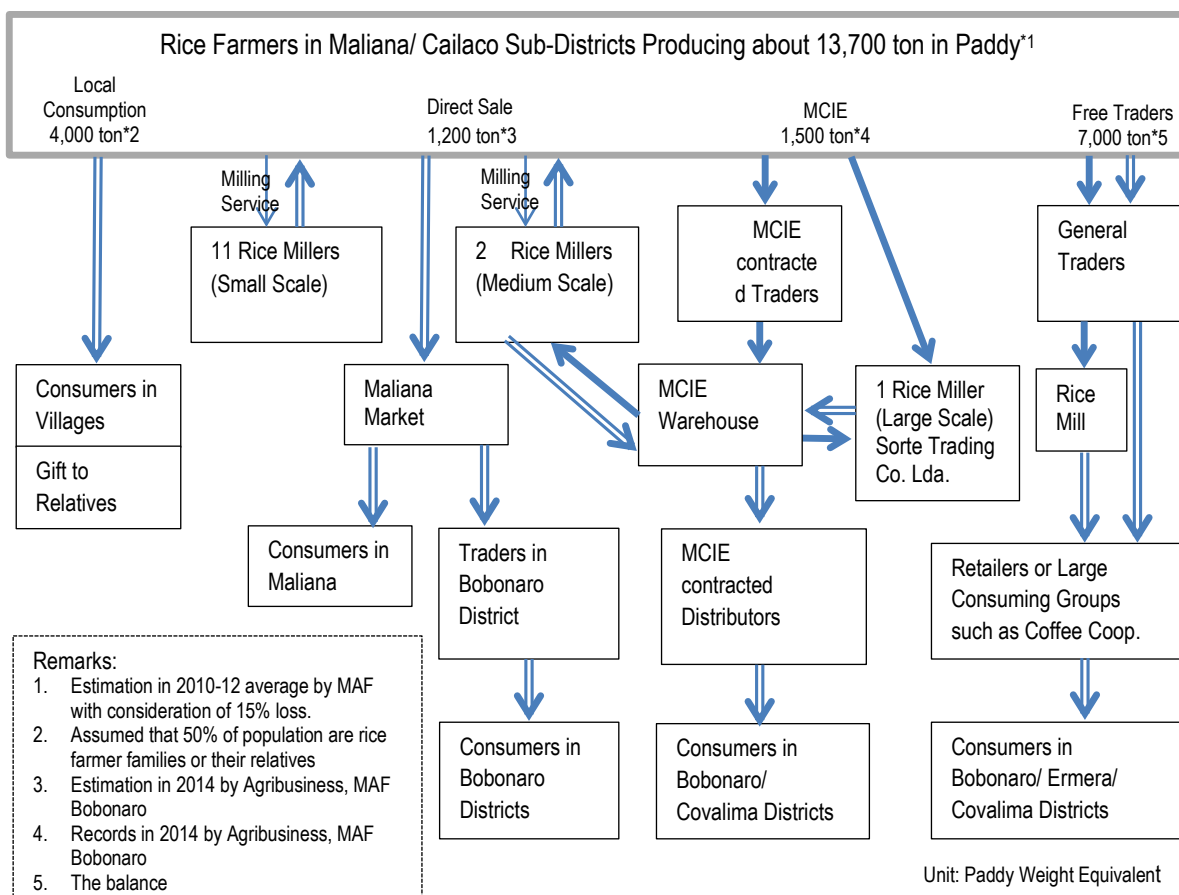


Figure 5-1-2 Routs of Processing/Marketing of Commercial Rice

(2) Inefficiency of the MCIE's paddy purchase system

The nationwide paddy purchase by MCIE is varies depending on years and fluctuated, such as 1,265 tons in 2009, 857 tons in 2010, 796 tons in 2011, 240 tons in 2012, none (cancelled) in 2013, and 1,524 tons in 2014. In 2014, 1,868 US\$/ton or more was spent for paddy purchasing at the designated destinations for sales (Table 5-1-2). The polished-rice price at the Maliana warehouses is 1,717 US\$/ton. The mutual comparisons amongst the price at the Maliana market (2014), 750 to 850 US\$/ton for the imported polished rice, and 900 to 1,000 US\$/ton for the domestic rice imply that big economic losses have been occurring.

Most of the losses have resulted from excess moisture content of paddy when putting into warehouses, damages by rats and birds during storage, two-time hauling into and out of warehouses/economic losses due to workers and hauling costs and low yield rates.

Table 5-1-2 Direct Costs of MCIE's Purchase System

Item		Actual Cost and Loss	Amount (Milled Rice 1-ton Equivalent)
Fixed Cost	Purchase from farmers	0.50 US\$/kg	980.39 US\$
	Loading arrangement, sacks, scaling, transport to MCIE warehouse	0.25 US\$/kg	490.20 US\$
Losses	Impurity in collected paddy	1% above total	14.71 US\$
	Paddy moisture contents at 20%	6% above total	88.24 US\$
	Damages by birds and rats in warehouse during storage	3% above total	44.12 US\$
Milling	Milling and transport to/from MCIE warehouse	0.05 US\$/kg	50.00 US\$
	Milling recovery	51%	
	MCIE sacks	0.05 US\$/kg	50.00 US\$
Distribution	Distribution	0.15 US\$/kg	150.00 US\$
	Mis-handling	unknown	unknown
Total			1,867.65 US\$

Source: JICA Study Team, hearing from contract rice millers in 2015

(3) Current Situation of Farmhouse Economy

In the wide area of Maliana, five major irrigation scheme of Maliana I, Maliana II, Marco, Nunura, and Murau were selected for the target of the Farmers Socio-Economic Survey. Within the area, the interview survey was conducted with 100 households. The average of the household income is arranged in the next table, sorting it into agriculture income and non-agriculture income, based on the family budget data of the 100 households. Self-consumption of agriculture produce was converted to money by market price and appropriated for the budget.

1) Income of the Farmhouse

The average annual income in Maliana wide area, consists of five major irrigation schemes, is about US\$ 4,760, whose portion of the agriculture income is about 34 %. The other non-agriculture income includes rental fee of machine and vehicle, making and sales of furniture, etc.

Table 5-1-3 Average Household Income in Maliana Wide Area (Major Five Irrigation Schemes)

Items		Income (US\$/HH)	Ratio (%)
Agriculture income	Rice cultivation	941.6	19.6
	Maize cultivation	(14.3)	(0.3)
	Cassava cultivation	6.9	0.1
	Vegetable cultivation	154.4	3.2
	Livestock rearing	371.0	7.7
	Leasing for farm machinery and equipment	105.6	2.2
	Wages from working on other farm	47.5	1.0
	Leasing for draft animals	10.7	0.2
Subtotal		1623.3	33.8
Non-Agriculture income	Salary from other occupations (government official, driver, company, employee, etc.)	248.0	5.2
	Wages as casual worker	28.6	0.6
	Earnings from business (boutique, restaurant, three wheeler, taxi, etc.)	624.5	13.0
	Receipt of gifts and remittance from relatives and others	17.3	0.4
	Interest earned from money loaned	38.5	0.8
	Other non-agriculture income	603.9	12.6
Subtotal		3184.1	66.2
Total		4807.4	100.0

Source: JICA Project Team Note: Agriculture Income is excluding cost other than family labor

2) Expenditure of the Farmhouse

The average of household expenditure in Maliana wide area is arranged in the next table. “Expenses for ceremonial occasions” is US\$ 520, which is the biggest item and occupies 20 % of the total expenditure. The following biggest items are “Agriculture input of Rice”, US\$ 433 (17%), “Education”, US\$ 176 (7%), and “Agriculture input of Maize”, US\$ 116 (4%).

Table 5-1-4 Average Household Expenditure in Maliana Wide Area (Major Five Irrigation Schemes)

Items	Expenditure (US\$/HH)	Ratio (%)	Items	Expenditure (US\$/HH)	Ratio (%)
Agriculture input of Rice	433.3	16.5	Spice & other foods	21.7	0.8
Agriculture input of Maize	115.5	4.4	Tobacco and cigarettes	95.9	3.7
Agriculture input of Cassava	17.9	0.7	Soap, shampoo, etc.	75.5	2.9
Agriculture input of Vegetables	3.63	0.1	Electricity charges	52.9	2.0
Agriculture input of Livestock	0.25	0.0	Expenses for firewood, cooking fuel and LP-gas	6.7	0.3
Agriculture input of Others	1.5	0.1	Expenses for lighting fuel	10.4	0.4
Rice	35.9	1.4	Household furnishing and equipment	38.9	1.5
Maize	5.0	0.2	Repair and maintenance of house	95.8	3.6
Cereals other than rice & maize	0.4	0.0	Clothing	114.2	4.3
Tubers and Roots	14.2	0.5	Medical care	36.4	1.4
Fish	36.6	1.4	Education	176.1	6.7
Meat and eggs	48.1	1.8	Recreation	11.5	0.4
Vegetables	82.5	3.1	Expenses for ceremonial occasions	520.0	19.8
Flour	19.6	0.7	Transportation and communication	70.3	2.7
Bread	72.1	2.7	Remittance to relatives	69.5	2.6
Tea and coffee	57.6	2.2	Land and house rent	0.5	0.0
Milk (powder) & yogurt	18.9	0.7	Taxes	1.2	0.0
Liquor and soft drinks	14.2	0.5	Loan repayment	21.8	0.8
Cooking oil & coconuts	64.2	2.4	Others	108.1	4.1
Sugar and salt	57.7	2.2	Total	2626.5	100.0

Source: JICA Study Team

5-1-3 Problems and Development Potential on Processing and Distribution

(1) Instability and non-continuity of rice distribution

There are 3 problems pointed out in the workshop held in Bobonaro district, which NDAH staff, brokers and farmer representatives took part in:

- No domestic rice market,
- Insufficient irrigation water, and
- No stable and continual provision of rice polishing.

Also, the farm socio-economic survey has pointed out that rice farmers' problems are irrigation water shortage at water sources, low yields and disease (Table 5-1-5). Those problems cause the sale benefit generation of paddy and polished rice to hold down. No markets for domestic rice mean that imported rice is inexpensive but domestic one is expensive and that brokers handle domestic rice less than imported one.

Further, the workshop pointed out the deficiency of transparency, feasibility and reliability of the purchase system by MCIE. Both non-reliability of the MCIE's paddy purchase policy and pricing regardless of product quality are supposed to damp the incentive for producing activities. Meanwhile government-aid rice, which should be issued to the socially vulnerable and disaster victims, are distributed in the same routes as commercial rice are generally distributed. Then, this fact distorts the rice market to a certain extent. In addition to the abovementioned causes, instable production status makes the continuous supply of rice difficult.

(2) Possibility to expand the rice distribution in Bobonaro District.

In accordance with SDP, the grain-growing region centering on Maliana and Cailaco sub-districts in Bobonaro District is located in international border zones. It is difficult to get precise data of rice distribution in such zones, but data acquisition is more active than in other districts.

It is inferred that nearly 3,500 tons of polished rice was traded in a single year, presuming that the distribution amount of paddy is 7,000 tons as mentioned above, because the irrigation inventory survey shows that 66 % of farm HHs sell rice externally. Also, the double cropping is practiced by 61% of farm HHs and per-capita agriculture income is 1,125US\$ in Bobonaro District. They are highest among districts. Rice-selling farm HHs account for 66% out of those surveyed, which is larger than rice-purchasing farm HHs as well as Oecusse District. This is the evidence that there are surplus rice. Some brokers in Bobonaro District shipped rice to the West Timor when a certain price difference occurred, according to the interview survey.

Farmers sell the abovementioned surplus rice individually to markets, relatives and/or neighbors and such a distribution manner is not efficient. Moreover, rice is measured and sold traditionally by can; canful rice is 550 to 750 grams and priced roughly 0.1 or 0.25US\$. Such a sales style can distinguish white rice from colored one, but does not make any incentive for quality-basis pricing.

Many farmers have expressed to grow paddy willingly if sufficient irrigation water is available, according to the interview survey. Increased population and a change of diet habits have made increased rice consumption per capita and expanded the potential demand of rice to a certain extent. It is expected that changes of external conditions (imported rice price) make farmers more aspiring on

Table 5-1-5 Problems Pointed out by Rice Farmers in Maliana District

Particular	Problem	Point
Irrigation (Water)	Water shortage	90
	Drought damage	82
	Drainage problems	62
Farming/ Cultivation	Damage by pests and diseases	79
	Damage by wild animal	62
	Weed damage	72
	Difficulty in obtaining seeds	22
	Low yield of crops	82
	Difficulty in purchasing fertilizer	58
	Difficulty in purchasing agro-chemicals	63
	Labor shortage	36
	Difficulty in hiring animal/mechanical power	40
Marketing	Problems related to loans	30
	Lack of farm roads	56
	Shortage of selling opportunity	59
	Marketing problems for products to find traders	66
	Lack of storage facilities	52

Source: JICA Study Team (Farm household Socio-economic survey, N=100)

rice production. Some rice millers are anticipating the expansion of rice business and have purchased new rice milling machines.

5-2 PROBLEMS FOR EXPANDING DOMESTIC COMMERCIAL RICE DISTRIBUTION

The following are 3 problems pointed out by domestic rice brokers in accordance with the farm socio-economic survey and the interviews.

- The quality of polished is low. Here, the word “quality” means (a) the yield rate of polishing is high², (b) the rate of rice breakage is low (less than 25%), (c) trash, immature rice and damaged rice are less, and (d) paddy is not deteriorated due to storage conditions by farmers.
- Polishing and sales of domestic rice is less beneficial. The profit rate of retailing imported rice is better than domestic rice by 15 to 30%
- Farmers have no motivations for producing commercial rice.

Table 5-2-1 Problems from Viewpoints of Brokers/ Rice Millers

Standpoints	Constrains pointed out by Traders/ Millers	Potentiality in Actions
Local rice is low quality .	Impurities (stone/husk), immature and damaged rice are highly contained. Broken rice ratio is high. Degradation of paddy during storage by farmers is commonly occurred.	Improvement of paddy quality. Separation of head rice and broken rice with selling methods. Improvement of storage methods.
Rice business is not profitable .	Rice recovery is low. Collection is not efficient. High pricing is not acceptable local consumers. No incentive to improve milling facilities and invest on rice business. MCIE purchasing is inefficient and high cost mechanism, no inspection introduced and not affect pricing on quality.	Operation of the business model on rice trade, which is profitable for both of rice millers and farmers. Development of value-added products of broken rice such as rice noodles. Efficient and low cost model in MCIE Purchasing.
Farmers are not conscious of better quality production.	Drying and pre-cleaning are not sufficient. The sizes of rice are not unified. Farmers do not desire better quality paddy and feel risks to grow qualified seed varieties.	Clear and simple incentives on farmers' profits by means of lowering production costs, high yielding and efficient collection.

Source: JICA Study Team

5-3 THE NECESSITY OF IMPROVEMENT IN POLISHING AND DISTRIBUTING PADDY

The following activities and/or efforts will be necessary in order to solve the above problems.

(1) Quality improvement

There is anxiety that pricing will not reflect the quality improvement. In reality, however, the lower the rice-breakage rate the easier the rice sale. Pricing the polished rice does not depend on its quality at present at the Atambua market in the West Timor, but rice prices are set reflecting classification of flavored rice, white rice, degree of blending specific cultivar, breakage rate and grain size. This fact implies a high possibility that the same manner of pricing is practiced in Timor-Leste in future.

² In accordance with IRCP II, the moisture content of paddy is 13 to 14 %, and the yield rate of rice polishing is 60 to 62 % for the mini-plant made by Agrindo.

The farm socio-economic survey (2015) has pointed out a lot of rice damages by disease and insects³. Many farmers use insecticide and bactericide in the Maliana region, but how to use agrichemicals and low-cost biological prevention will be challenges from now on. Though paddy/rice often has weevils during storage, the weevil damage can be prevented by storing paddy/rice properly.

The degradation of paddy quality is caused by improper storage methods under the eaves or in warehouses and/or by deficient dry in the sun. Even if the drum-can silo of IFAD or the steel-plate silo of FAO is employed, paddy must be dried sufficiently in the early times. Otherwise, ferment or breeding of filamentous bacterium may occur. It is recommended that paddy be dried in well-ventilated places for several weeks after being harvested. For instance, there is a method to make moisture contained in paddy grain come down to the bag bottom and evaporate by hanging a 1-ton bag filled with paddy from a beam of the existent warehouse. Also, it is effective to spraying cayenne pepper as a countermeasure against weevils. In case that farmers sell paddy to rice millers, it is effective to ship paddy to rice mills immediately after harvesting and dry it at the concrete yard for sun drying from viewpoints of quality preservation and efficiency.

(2) Business model formulation

No rice millers in Timor-Leste handle paddy more than 1,000 tons in a year. There are rice millers that continuously ship polished rice in Baucau District, which are Salguiros Agriculture Production Association in Laga Sub-district and ACELDA Company in Baucau Sub-district. The former handles paddy by 300 tons a year, and the latter 100 tons. Not a few rice millers in the Maliana region are pay-per-polish, and complete a series of works from paddy-collecting through polishing to shipping. It will be a key to foster rice millers who are able to handle more-than-1000 tons of paddy a year for promoting the domestic rice distribution.

The following operations are necessary to formulate the rice business: production and efficient collection by contract culture with farmer groups, batch solar drying on concrete yards, proper paddy preservation in controlled warehouses, processing with a good yield rate by good rice mill machines, trash elimination, separation of breakage rice from perfect one, precise weighing and packaging, slip control for smooth payment to farmers, fixing shipping routes, analyses and application of response from consumers such as variety, weight unit for sale, quality, price and package, and so forth. Streamlining the above operations can make reduce costs from paddy-collection to polished rice sales. Subsequently, the cost reduction will enable domestic rice sales in the mountainous areas far from Dili under competition against imported rice.

In the meantime, it is important to bring making and selling rice-processed products into view for a wide range of rice business. Breakage rice, which is separated from perfect rice, can be useful for making rice porridge, feed for chicken farming and material for processed products. At this moment, there is no rice-processed product. Since the Timor-Leste people prefer noodles, for example, it is possible to provide them with the opportunity to demonstrate cooking and direct-selling the noodles made of breakage rice so that breakage rice gets added value. In so doing, cooperation of local NGOs and female groups make it more feasible.

Though the MCIE's purchase system is improved year by year, one of major challenges is reduction of costs and losses.

It is expected that the abovementioned business model becomes a model of rice and paddy distribution and is incorporated in the paddy purchase system in future.

³ The JICA Study Team has confirmed the following in the field: rice blast, sheath blight disease and rice tungro disease. Also, it has confirmed the following insect pests: leptocorisa chinensis, green rice leafhopper and Donacia provostii. In this regard, other disease and pests are possible, too.

(3) Motivating farmers

The reason why the Timor-Leste farmers keep practicing extensive farming (growing a variety of crops in small amounts) is to avoid risks during growing crops due to climate change and so forth. Dissemination of cultivation techniques is not easy because of such a psychological element of farmers. In order to attain increased rice production, it is necessary to give farmers opportunity to learn that improved cultivation techniques result in more benefit through increased yield and processing and distributing harvested rice. It is necessary to make opportunities that farmers study and demonstrate the above with rice millers and brokers so as to improve farmers' incentive for production.

Rice millers and brokers supply necessary materials to farmer groups or Agriculture Production Association and assist them for increased rice production. In the meantime, the distribution costs will be reduced if the producers' side makes a system that enables to operate in a unified manner, e.g. shipping only a necessary amount of rice in accordance with a plan prepared beforehand.

5-4 NECESSITY OF A COOPERATION PROJECT

Owing to input of inexpensive imported rice and change of socio-economic state, farmers in the countryside become more and more reluctant to grow paddy. In order to reduce farmers' reluctance on paddy growing and get rice production more activated, it is indispensable to improve the farmers' incentive for rice production. To do that, firstly, activation of rice distribution is a must.

The government system of purchasing paddy is essential to improve farmers' incentive from the viewpoint of keep or expand the rice-production capacity. However, the current system has a lot of problems regarding rice quality and economic efficiency. The following are important in future: (a) Agricultural cooperatives ship paddy to MCIE, and (b) brokers that can be trusted a series of operations from paddy collection to shipping polished rice are fostered. It is necessary to streamline the distribution of goods by making a network of hubs to complete the abovementioned series of operation in major rice production areas. Thereby, the distribution costs will be reduced and the domestic rice can be sold as well as the imported one.

MAF is in charge of processing and distributing agricultural products, but its capacity of planning and implementation is extraordinarily-low. Capacity building of MAF is indispensable to improve the above rice polishing and distribution. In this regard, external technical aids are desired.

As mentioned above, the Maliana area is the best area for the rice distribution hub in Timor-Leste. MAF builds "Rice Distribution Centre" there so as to foster rice millers and brokers. The center is to be built in a private land and equipped rice millers whose capacity is more than 1 ton per hour, large warehouses. Also, labor force is employed to a maximum extent there.

The project promotes activation of rice production, processing and distribution in cooperation with not only the above rice distribution center but also existent farmer groups in irrigation areas such as Maliana I and Aldeia Halecou. Major activities are as follows,

(a) Quality improvement and value-adding (Input cost: 350,000 US\$)

- Improvement of rice-polishing technologies; introduction of grinding/friction polishing machine in the polishing process, Stone-removing rice polishing machine, gravity-basis separators,
- Improvement of paddy quality (seeds, disease and pest prevention, fertilizer application) by farmers and contract cultivation, and
- Development of rice-processed products (probably noodles) made of breakage rice, and cooking and selling them by female groups.

(b) Cost-cutting in distribution and sales (Input cost: 150,000 US\$)

- Formulation of an unified model of the middle trader, which is “Collection by farmer groups → batch solar drying → storage in 1-ton bags → polishing → Weighing and packaging,
- Introduction of payment management method by respective farmers, which is used by ACELDA, and
- Promotion of sales methods in farming villages in mountainous areas.

(c) Motivation to farmers (Input cost: 100,000US\$)

- Demonstration of model farmer selection, production process and post-harvest process,
- Support to farmer groups such as cooperative shipping,
- Quick and efficient payment using credit associations and NGOs, and
- One-stop service for agricultural materials at distribution hubs.

These activities are implemented by the private sector, and MAF supports them. Roles of MAF are as follows,

- Coordination of purchasing methods between MCIE and the private sector,
- Training for farmer groups, which are also WUAs,
- Assistance for liquid seed distribution and fertilizer manufacturing for increased yield per hectare and quality improvement,
- Introduction of Integrated Pest Management (IPM) for quality preservation by reducing sterile rice or damaged rice⁴,
- Irregular inspections by paddy/rice examining staff,
- Support for contract cultivation (dissemination of a standard contract form for paddy procurement), and
- Commencement of School Feeding Program at Technical Agriculture School of of Moleana.

Figure 5-4-1 shows the image of the rice distribution center run by rice millers and brokers in cooperation with MAF.

⁴Beauveria bassinana and Trichoderma are effective against insects and disease, respectively.

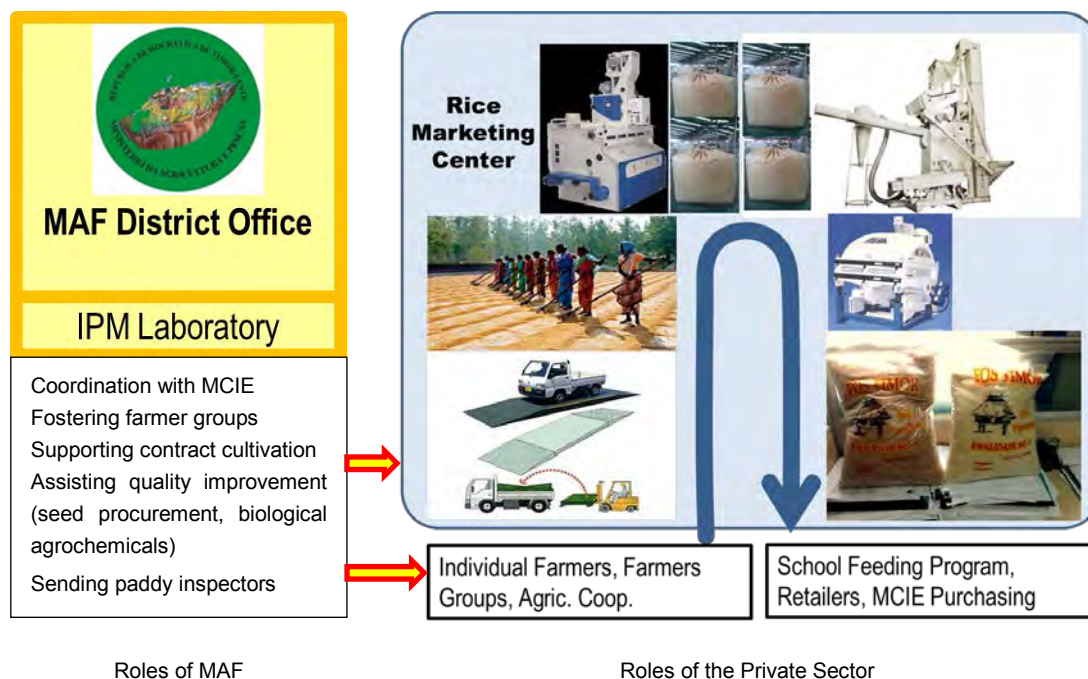


Figure 5-4-1 Image of “Rice Distribution Hub” Run by MAF in Partnership with Brokers/ Rice Millers

5-5 SUMMARY OF EX-ANTE EVALUATION

1. Name of the Project

Country: Timor-Leste

Project: The Project on Rice Postharvest and Marketing Capacity Development in Maliana Wide Area in Bobonaro District (Draft)

2. Project Description

(1) Project outline: objectives and outputs

The Project intends to strengthen rice post-harvest processing and marketing capacities of rice farmers, small-scale business owners and district agriculture staff. The target rice farmers are those who grow paddy in irrigation schemes in Maliana and Cailaco Sub-districts, Bobonaro District. The Project will contribute to quality improvement and strengthening of production, processing and distribution of the domestic rice. The Project includes activities of (a) establishment of rice distribution hubs run by agricultural cooperatives and rice millers under the government purchasing system, (b) promotion of the distribution of quality domestic rice, (c) standardization of quality of domestic paddy and rice, (d) strengthening of district agriculture staff’s implementation capacity of training regarding post-harvest processing and marketing, and (e) capacity strengthening on post-harvest processing and management for rice brokers, rice processing female groups and rice farmers.

(2) Schedule (period of cooperation)

Planned from January 2016 to January 2020 (48 months in total)

(3) Estimated Project Cost from the Japanese Side

250 million yen

(4) Counterpart organization

Ministry of Agriculture and Fisheries (MAF), National Council on Food Security, Sovereignty and Nutrition in Timor-Leste (KONSSANTIL)

(5) Domestic cooperation organization

Ministry of Agriculture, Forestry and Fisheries (MAFF)

(6) Project beneficiaries and scale

Beneficiaries:

MAF staff, district agriculture staff, rice farmers in Maliana and Cailaco Sub-districts, rice processing female groups, small-scale business owners (rice millers and brokers)

Scale: Five irrigation schemes, which cover 3,600 ha in total.

3. Background and Necessity of the Project**(1) Current state and problems**

The GDP of Timor-Leste is 5,579 million US\$ in 2012, of which 77.2% was earned by crude oil and the other 22.8% was earned by non-oil sectors. The revenue in the oil sector decreased from 3,800 million US\$ in 2008 to 2,950 million US\$ in 2012. The growth rate of non-oil sectors was 7.8% from 2011 to 2012, and relatively stable. The trade balance has been in deficit since the independence of the nation. The deficit was maximum in 2008 and then it decreased. However, the deficit skyrocketed to 1,100 million US\$ in 2012. Meanwhile, the general consumption increased from 500 million US\$ in 2000 to 700 million US\$ in 2012, and its growth rate was 13.1% from 2011 to 2012.

Under these circumstances, one of important agendas of Timor-Leste is industrial development to break away from the oil-dependent economy. The GDP earned by the agriculture sector only shares approximately 20% of the non-oil-sector GDP, but 66% of working population are hired in the agriculture sector. In other words, agriculture gives employed-working opportunities to local people.

The staple food of Timor-Leste is shifting from root vegetables, maize and pulse to rice. After the independence, rice consumption keeps increasing year by year, while rice production has tended to decrease since 2008, when it was 50,000 tons (paddy) and maximum, and it came down to 45,000 tons (paddy) in 2012, when the self-sufficiency rate of rice was estimated at 35%.

The potential needs of rice is estimated at 118,554 tons (polished rice), presuming that the rice consumption rate is 106 kg/capita/year. The surplus demand is compensated by inexpensive imported rice under the circumstances the domestic rice production is unstable. It is estimated that 76,562 tons of rice was imported in 2012. Increased inexpensive imported rice is one of causes of decreased domestic production of rice. If such a state last a certain long period, farmers may lose their willingness to grow rice causing dilapidated irrigation facilities and decreased rice crop acreage.

Though the goal of SDP is 100% of the self-sufficiency rate, it is difficult to attain it at present. In the other hand, the concrete goal of post-harvest processing is to reduce the post-harvest loss of staple foods (rice and maize) from 20% to 5%. Subsequently, concrete action plans does not necessary result in increased rice production.

Malfunctioning irrigation facilities and problems regarding rice distribution are biggest challenges of farmers. Improvement of domestic rice distribution needs a variety of activities for quality improvement. In order to activate the rice distribution, it is necessary for rice brokers, farmers and farmer groups to improve the rice quality and to establish shipping system that live up to brokers'

needs.

As for quality improvement, rice growers and rice processing manufacturers are lack in technologies and expertise on post-harvest processing. Improper drying and polishing raise the breakage rate, and they are not able to remove small stones which have got mixed in with rice during harvest and drying. For this reason, processing manufacturers and brokers keep price down when they purchase domestic rice. Subsequently, such low price makes farmers reluctant to grow rice. There is a countermeasure feasible at present, which is to make rice pricing transparent by sorting expensive quality rice from inexpensive one. Pricing motivates farmers to grow paddy.

It is pro-poor activities to strengthen the competing power against imported rice through improvements of post-harvest technologies, development of rice products suiting consumers' taste and brand-name rice, because the strengthening increases rice production, improves the self-sufficiency rate, improves the food security, ensures employment opportunity in agriculture, and livelihood improvement of rice farmers.

One of the goals of SDP is reduction of the post-harvest loss. In turn, MAF has listed the improvement of post-harvest processing as one of the goals for increased rice production. MAF has requested Japan's technical cooperation on human resources development for post-harvest processing and marketing by strengthening capacities of MAF and district staff involved in paddy purchase policy, rice farmers involved in rice distribution.

(2) Position on the national policy of the partner country

The government of Timor-Leste mentions the basic strategy of nation-building till 2030 in SDP adopted in 2011. As for the agriculture sector, the strategy mentions improvement of farming techniques, food production and rice self-sufficiency rate. The development goals of the rice self-sufficiency rate are i) food production more than demand in 2020, ii) expansion of irrigated paddy acreage from 50,000ha to 70,000ha till 2020, iii) reduction of post-harvest loss of rice from 20% to 5% in 2030.

In response to the abovementioned, MAF has drawn up the MAF Strategic Plan (MAFSP) in 2012. The plan is composed of 5 areas (a) agricultural production and productivity, (b) market and added value, (c) policy, institution and infrastructure, (d) organization strengthening, (e) natural resources conservation and management. The Project focuses on production and post-harvest processing technologies and improves domestic rice quality and secondarily price and sales amount. As a result, farmers are motivated to grow paddy and increased rice distribution is attained due to reduction of post-harvest loss.

4. Framework of the Project

[Major Items]

(1) Outputs

(a) Project Goals and Indicators

The quality of domestic rice distributed is improved and post-harvest loss is reduced in the Project target area.

【Indicators】

- 1) One hundred tons of quality domestic rice (paddy) is dealt in a single year in the Project target area,
- 2) The rice unit price goes up from US\$0.40/kg to US\$X/kg, and

3) The rate of post-harvest loss decrease from 20% to X%.

※The target value of indicators, X is set in a year after the Project begins.

(b) Overall Goal and Indicators

Two distribution hubs are built for the government paddy purchase system in the Project-target districts.

【Indicators】

- 1) Quality domestic rice is dealt in the Project-target districts by more than 100 tons or more in paddy in a year.
- 2) The unit price of rice goes up by X% compared to that at the end of the Project, and
- 3) The post-harvest loss rate reduces by X% compared to that at the end of the Project.

※The target value of indicators, X is set during a management and guidance survey or at the midterm review.

(2) Outputs and Activities

(a) Output 1

Methods to distribute both high and low quality domestic rice are identified.

【Activities】

- 1-1 District agriculture staff analyzes the potential demand of domestic rice, both high quality high price one and low quality and low price one, after they survey distribution routes, amounts and price tendencies,
- 1-2 District agriculture staff identifies problems regarding small-scale rice millers and rice farmers. In particular, also, they reveal why production and collection costs are relatively high,
- 1-3 problems are identified regarding the promotion of rice processing by female groups,
- 1-4 Methods of collection, processing and marketing for distribution and reducing the post-harvest loss rate are created for both high and low quality domestic rice, and
- 1-5 Cultivation techniques, post-harvest processing equipment and facilities, and their installation places are selected for quality improvement.

【Indicators】

- 1-1) Reports that show problems on distribution of quality domestic rice and countermeasures against them are made, and
- 1-2) District agriculture staff makes presentation at the MAF head office.

(b) Output 2

A business model is established so that it becomes a distribution hub for domestic rice.

【Activities】

- 2-1 The amount handled by the government purchase system and the private sector is increased,

- 2-2 Quality standards of paddy and polished rice necessary for the government purchase system is examined and verified, and
- 2-3 Economically-sustainable business models are established.

【Indicators】

- 2-1) Amount of paddy and rice dealt at distribution hubs are recorded for respective brokers,
- 2-2) Rating standards for paddy and polished rice are made so that they are used in the purchase system, and
- 2-3) Balance is recorded at every distribution hub.

(c) Output 3

MAF staff's implementation capabilities of training on rice marketing and post-harvest processing technology are strengthened.

【Activities】

- 3-1 A training plan for district agriculture staff is made,
- 3-2 Training curricula and materials are prepared for district agriculture staff,
- 3-3 Trainings on rice value chain, marketing, post-harvest processing technology and agriculture cooperative are implemented for district agriculture staff,
- 3-4 District agriculture staff implements trainings for rice farmers, and reviews contents of those trainings,
- 3-5 The above activities 3-1 to 3-4 are implemented for staff of the MAF head office,
- 3-6 Training plans for MAF staff in other districts, where paddy is grown, are made,
- 3-7 Training curricula and materials for MAF staff in other districts, where paddy is grown, are prepared, and
- 3-8 Trainings for MAF staff in other districts, where paddy is grown, are implemented.

NOTE) The words "other districts" include Baucau, Viqueque, Oecusse, Covalima, etc., where domestic commercial rice is grown.

【Indicators】

- 3-1) More-than-80% trainees pass the exam at the end of trainings.

(d) Output 4

Post-harvest technologies and management capability of rice brokers, rice-grower groups, processing groups are strengthened.

【Activities】

- 4-1 Training programs are made for brokers and rice-grower groups in the target area,
- 4-2 Training curricula and materials of the above 4-1 are made,
- 4-3 Training equipment is introduced,
- 4-4 Trainings are implemented for brokers and rice-grower groups in the target area,

-
- 4-5 The above activities 4-1 to 4-4 are implemented for brokers and rice-grower groups, and
- 4-6 Training outcomes are disseminated to brokers and rice-grower groups other than target groups.

【Indicators】

- 4-1) More-than-80% trainees, who are brokers and rice-grower group representatives, pass examinations at the end of the trainings,
- 4-2) Brokers deal rice by qualities: high and low,
- 4-3) The gross profit on production goes up by X% in average,
- 4-4) The post-harvest loss rate of paddy reduces by X%, and
- 4-5) processing groups sell rice-processed products

(3) Inputs

1) Japan side

[1] Experts

- a) Chief Advisor/ Rice Marketing
- b) Post-harvest Processing Technology of Rice
- c) Farming/ Seed Multiplication
- d) Farmer Organization/ Rural Finance
- e) Training Plan
- f) Short-term Experts: IPM (bacterium culture), Pulse and Vegetables Cultivation, Irrigation Facility Renovation
- g) Local Operational Coordinator

[2] Reception of Trainees

Reception of Trainees in the third countries

[3] Materials and Equipment

- a) Equipment necessary to run rice distribution hubs (Small combine, rougher, paddy dryer with paddy husks inflammation, small silo or 1-ton bag, stone remover, sorter, weigh machine, sewing machine, packaging material, grinding machine, transporter, testing equipment, etc.),
- b) IPM laboratory equipment (optical microscope, thermos-hygrostat, sterilizer, clean bench, glass instrument, bacteria culture material, etc.),
- c) Equipment necessary for technical dissemination (materials for dissemination and training, maintenance costs of model farmers' farms), and
- d) Office equipment

[4] Activity Costs

- a) Local assistants of projects,
- b) Project vehicle leasing,
- c) Costs of post-harvest processing trainings for MAF staff, and
- d) Office equipment and public relations costs, etc.

2) Timor-Leste Side

[1] Staffing

- a) Project Director (Chief of Food Security Division, Policy Department, MAF)
- b) Project Manager (Director of Agriculture Department, Bobonaro District, MAF)
- c) District Coordinator (Programme Manager, open recruitment)
- d) Counterpart (C/P)
 - Staff of District Agriculture Department (Agri-business, Agri. Extension, Rice Inspection (New Position))
 - District MCIA Staff (Supervising Staff of Agri. Cooperatives, Staff of MCIA Purchasing System)
- e) KONSSANTIL Rice Committee as Superior Supervisory Organization
- f) Rice cooperative promotion NGOs, credit cooperative NGOs, rural development NGOs, etc. as cooperative organizations

[2] Facilities, etc.

- a) Prefabricated warehouse, which is 24m wide, 43m long and 6m high, to be used for storage of paddy and paddy husks, combustion-drying place of paddy and office space
- b) Solar-drying place
- c) Office space for C/P and experts
- d) Two IPM laboratories, which is 8m wide and 12m long
- e) Training place (rented)

[3] Service Charge

- a) Costs for staff related to the project
- b) Basic running costs of the project, e.g. utility costs

[4] Activity Costs

- a) Training-travel costs of MAF staff, inclusive of trainings in third countries
- b) Activity costs for agricultural extension staff
- c) Costs on casual workers

(4) External Factors (External Factors to be fulfilled)

MCIE works in partnership with MAF in the government rice purchase system.

[1] Presumption

- No political unrest, which is serious and affects economic activities and public security, takes place, and
- The international price of rice does not skyrocket as in year 2008.

[2] External Conditions to Attain Outputs

- MAF staff, who are well trained, are continuously involved in project activities,
- Natural disasters (droughts, floods, etc.) disease, and damages due to insects, birds and animals do not take place in the project target area; rice production does not affected such disasters, and
- MAF is able to prepare sites to install equipment.

[3] External Conditions to Attain Project Goals

- Imported rice does not increase any more,
- MCIE makes a partnership with MAF in the paddy purchase system,
- Neither natural disasters nor serious economic incidents affect rice distribution, takes place in and around the project target area, and
- The ministry of education (MOE) introduces a school lunch service using domestic agriculture products.

[4] External Conditions to Attain Project Overall Goals

- Low-interest loans are generalized among farmers so as to save labor or purchase inputs,
- The following projects keep implemented: GAP promotion by MAF, farmer-participatory seed multiplication, capacity development of extension workers, etc, and
- Urban consumers deeply understand the importance of domestic rice promotion through Diet deliberations or politicians' statements.

5. Evaluation Result through the Evaluation Five Items**(1) Relevance**

It is concluded that the Study is valid because of the following,

- In Timor-Leste, the quality (appearance) of domestic rice is commonly low and rice-pricing does not depend on quality. This fact constrains income-increase of farmers, who are involved in rice production and processing, and increased willingness of domestic growers in rice production. In the meanwhile, consumers consume inexpensive imported rice in large amounts, and the rice demand is large. By realizing distribution responding to demands of both high and low quality rice through proper post-harvest processing and marketing, the necessity to take incentive packages becomes large for farmers to grow rice.
- Quality rice is distributed in larger amounts and it becomes popular, if pricing depends on quality and productivity and quality of small rice millers improve. The resultant popularization musters willingness of farmers to grow rice and quality-based rice production and distribution are facilitated.
- There is no rice-processed product in markets of Timor-Leste. Consequently, it is necessary to expand the consumption of domestic rice by-products such as broken rice. The Project strengthens the capacity of female agriculture-product processing groups in order to add value to broken rice so that rice consumption becomes extended in rural areas. The capacity strengthening includes introduction of appropriate technologies.

- There are 5 irrigation schemes and secondarily a number of small rice millers in Maliana Sub-district in the Project target area. Thus, it will be a pioneering case to begin quality improvement at Maliana Sub-district.
- The Project includes activities regarding motivation towards increased rice production by rice growers. They are one of concrete activities contributing to attaining the goal on increased food production mentioned in SDP.

(2) Effectiveness

As a conclusion, the Study has effectiveness owing to the following reasons,

- The Project firstly makes a policy to facilitate distributions of both high and low quality rice after marketing analyses and problem analyses of respective actors (Output 1). Then, secondly a rating standard of rice quality is determined in order to disseminate quality-based pricing (Output 2). Thirdly, farmer groups for income increase by fulfilling the standards set in Outcome 2 are trained on post-harvest processing technologies and marketing (Outcome 4). Lastly, capacity strengthening is implemented for rice brokers, rice-grower groups and agricultural cooperatives (Output 5). Through these 5 outputs, quality improvement and reduction of post-harvest loss rate of rice are attained under a holistic approach by rice millers and brokers.
- Setting a rating standard that depends on rice quality clarifies the domestic rice standard, which is ill-defined at present, and makes a common concept of values for trading rice among growers, brokers and consumers. The common concept becomes motivation to extend domestic rice consumption.
- Rice quality improvement, inclusive of equipment input, is a plan with flexibility in selecting a variety of approaches, and it is also standardized on a level that farmers understand and concretely implement.

(3) Efficiency

As a conclusion, the Study has efficiency owing to the following reasons,

- The current government rice purchase system spends approximately 1.80 US\$/kg for polished rice. However, the domestic rice will be competitive against imported rice, if distribution-streamlining enables to set the rice price cheaper than or equal to 1.00 US\$/kg.
- The international price of rice has skyrocketed in the past due to global climate change or change of the international socio-economic state. It is important to keep national food production capacity under prediction of price escalation. It becomes possible to hold production capacity that is able to compete against imported rice, if the government paddy purchase system takes in the quality-based rating.
- As for improvements of rice cultivation techniques, seed output and extension workers' capacity, it is possible to collaborate with MAF's projects (incl. prioritized projects) and efficient project management is anticipated.
- It is presumed that indicators and target values of outputs are appropriate. However, the target values may change depending on external circumstances of agriculture. They are revised when Output-1 activities ends and during the second half of the Project so that project management is efficient.
- Capacities of relevant parties are strengthened as the Project proceeds. Then, Bobonaro district agriculture staff plays a central role in activities.

(4) Impact

The following are prospective impacts of the Project.

- The quality-based paddy purchase system makes farmers' willingness strengthen so that rice farmers' income increases.
- In the Project target area, domestic rice quality produced by small rice millers improves and post-harvest loss rate reduces within 3 to 5 years after the end of the Project.
- It is expected that relevant parties with strengthened capacity make technical dissemination after the Project so that quality and post-harvest loss rate of rice produced by small rice millers are improved in other areas.
- Quality improvement and streamlining in collection of rice make competing power against imported rice, and further they strengthen the willingness of rice farmers and increase income of people involved in rice production or processing. In addition, activated agriculture activities will cause development of commercial farming and ensure the food security.

(5) Sustainability

The following sustainability is assumed in this Project.

- Rice distribution hubs built in the Project enable the private sector to sell domestic rice in a sustainable manner.
- The above strengthens rice farmers' willingness and increases the amount of domestic rice production.
- It becomes possible to build distribution networks to stably supply domestic rice to inhabitants in densely-populated mountainous areas.

CHAPTER 6 PRIORITY PROJECT FOR STRENGTHENING FOOD PRODUCTION IN BIKALIU IRRIGATION SCHEME IN VIQUEQUE DISTRICT

6-1 OUTLINE OF IRRIGATION SCHEME

Bikalieu irrigation scheme is located at mountainous area near Ossu in Viqueque district which is located on hill between Cuha River at north and Bikalieu River at south. The scheme had been started to development in Portuguese era and the paddy cultivation was carried out up to 1980s in Indonesia era. The farmers cultivated the skirts of hill. However, rice has not been cultivated since 1980s.

The reason of expired paddy in the scheme is that the interview shows the difficulty of take water due to the changed river bed and shortage of labor such as social effect. Considering of site survey, possible reason of expired paddy is assumed to the difficulty of take water.

In 2011, a weir as headworks was constructed in order to restart the paddy cultivation at abandon area which was cultivated up to 1980s. However, in same year, the constructed weir was flashed out in rainy season and farmers could not restart the paddy. Bikalieu River is width of 20-50 m which is classified to mountainous river. Although it has never dry up through the year, the dry season is extremely low water

The scheme is selected to targeted area for "Community policing program" by DFAT. They lecture the public rule and mandate of the nation through the regional police. In order to secure the stable society and drinking water, the tank for water supply as life line. The indicator of selection degree of cooperation, generous and social environment is taken into account.

6-1-1 Location and Topographic Condition

The location and situation in Bikalieu irrigation scheme are shown as following figure.



Figure 6-1-1 Location and Situation of Scheme

6-1-2 Water Resources

(1) Outline of main water source and its catchment area

Main water source for targeted beneficiary area is Bikaliu River and its catchment area at planned intake point is around 15 km² (show Figure 6-1-2). Within the upstream area of Bikaliu irrigation scheme, Raumata irrigation scheme is there and its beneficiary area is 76 ha (result of inventory survey). Discharge amount of Bikaliu River at planned intake point is affected by development activities for this area.

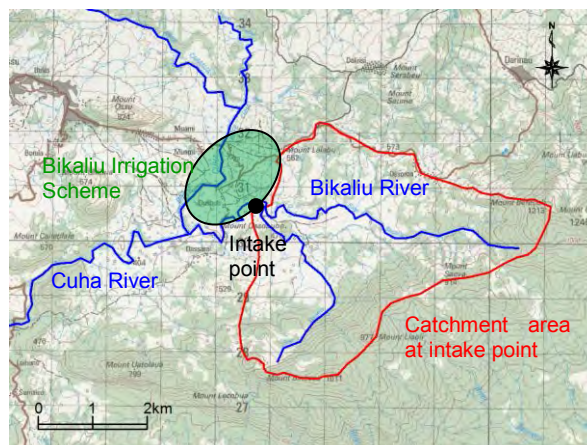


Figure 6-1-2 Catchment Area at Intake Point

(2) Water sources around beneficiary area

There is a Cuha River running just beside beneficiary area but it is difficult to take water from this river because river surface is much lower than the elevation of beneficiary area. Therefore water source for beneficiary area is limited to Bikaliu River only.

(3) Flood condition

A concrete weir is constructed at Bikaliu River in 2011 but that was washed away by the first flood in the same year. Since river flow condition changed drastically by this accident, it is difficult to identify the long term stability of river.

(4) Water resources amount

Monthly discharge of Bikaliu River at planned intake point with rainfall amount at beneficiary area is shown in the Figure 6-1-3. River discharge measurement and analysis have not been conducted for Bikaliu River, discharge amount in the figure is calculated one utilizing an analysis result for Cuha River which natural condition of catchment area is considered as similar as that of Bikaliu River. Also there are no rainfall observation stations within beneficiary area, rainfall amount in the figure is record of Ossu observation station which natural condition is considered as similar as beneficiary area of Bikaliu irrigation scheme.

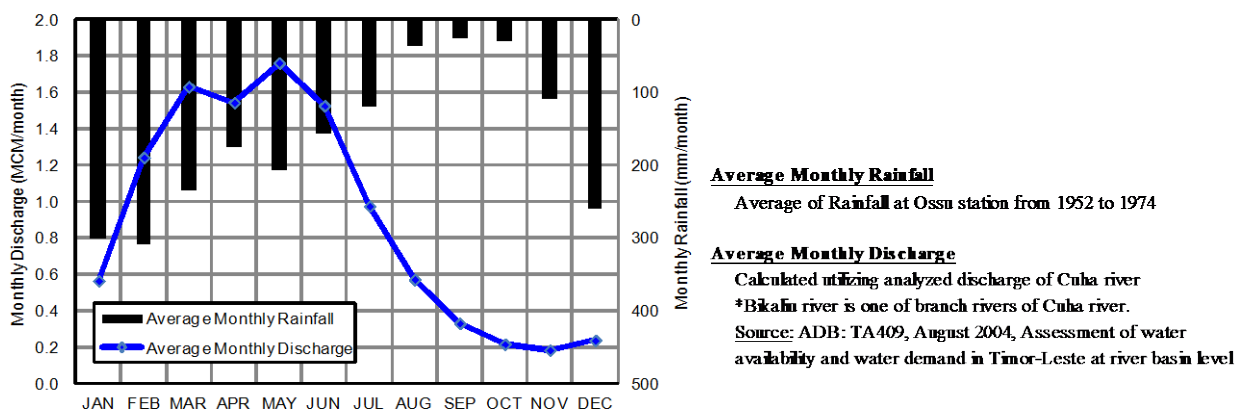


Figure 6-1-3 Monthly Discharge Amount at Planned Intake Point and Rainfall Amount at Beneficiary Area

6-1-3 Land Use

At present, beneficiary area is abandoned and no agricultural activities are being conducted. However there is vestige of terrace paddy fields of past time. Beneficiaries are living in the Aldeia nearby

beneficiary area.

6-1-4 Agricultural Infrastructure

(1) Access Road

A vehicle can approach to the beneficiary area and a road which vehicle can pass runs from north to south along the edge of beneficiary area. However this road is not extended to inside of beneficiary area.

(2) Electric power supply

Neither beneficiary area nor Aldeias which beneficiaries are living has no public electric power supply. However solar power generators were provided for many households and they keep generated electric power utilizing a car battery and use it during the night.

(3) Water supply

There is a pipe line which guides water from the spring located at the hillside area of the opposite bank of Bikaliu River from beneficiary area to the tank settled near Aldeia where beneficiaries are living. Guided water is stored in this tank and used for domestic use while river water of Bikaliu River is almost never used for anything.

6-2 ACTUAL SITUATION OF IRRIGATION SCHEME

6-2-1 Irrigation Area and Households

Targeted area is shown in Figure 6-2-1 which is abandon area cultivated in Indonesian era and expanded at skirts at hill of village.

According to the interview and satellite pictures, the beneficiary area is almost 50ha. Considering of situation that slope of landform and irrigable area by site survey, it is 30 ha which account for 65 % of area.

Currently, the area is used as the grass land for livestock. In addition, the trace of levee in Indonesia era is observed in the field. In rainy season, a small pond is appeared at the low level area which is used as watering place for livestock. The famers of the beneficiary area expand to six village and households is 30.

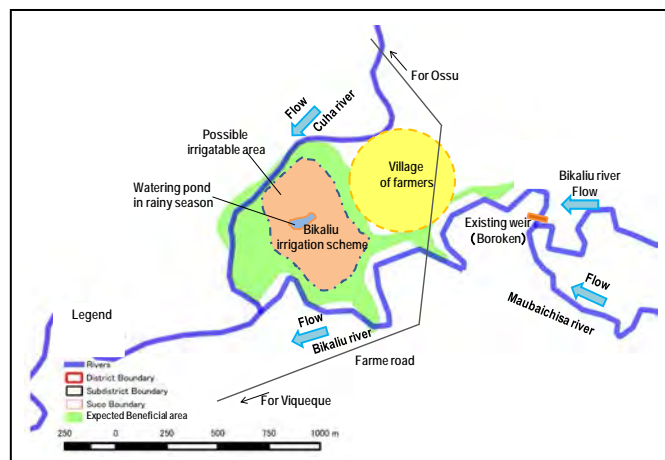
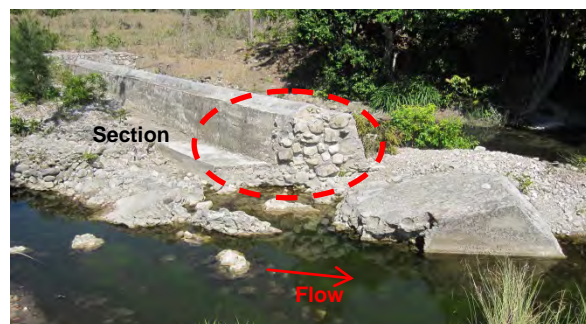
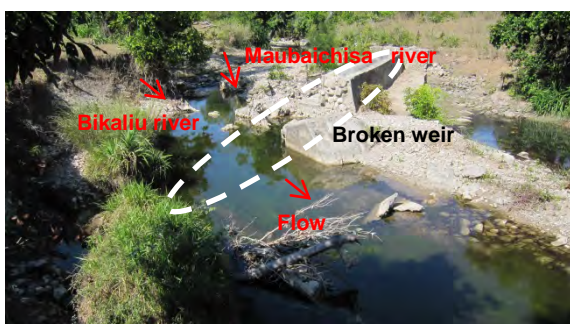


Figure 6-2-1 Situation of Beneficiary Area

6-2-2 Intake and Diversion of Water in Irrigation Scheme

(1) Current situation of irrigation facility



Pictures Section of broken weir

The constructed weir in 2011 by regional contractor was broken in same year by flood. Furthermore, the constructed canal could not reach to beneficiary area which was checked the flow of water before the broken. It is assumed to mis-design on bed level of canal alignment.

The constructed weir is fixed type which is located at junction between Bikaliu River and Maubaichisa River. The broken parts is at Bikaliu side. The weir consists of boulder concrete and the crest is higher 1 meter than bed. It is planned to take water at canal on right bank. An intake is equipped with a gate, but it is broken same as weir.



Pictures Existing canal

The cause of broken is that unexpected burden affect to weir, in addition, the structural scale is not weir but almost retain wall, and the boulder concrete does not has proper quality, in which the boulder is more than concrete and it caused to the shortage of strength, due to the much void among boulders. As for the alignment of canal, mis-design of bed level cause the prevention of flow.

(2) Current situation of irrigation scheme

Although there is currently not canal in beneficiary area, the trace of levee is observed in the area and can be assumed to irrigation situation at that time. The water from intake at Bikaliu River is passed at high place at east of beneficiary area and used to irrigate by topographic slope in land form. The trace of branch canal is not observed in the field, but appropriate assessments on bed level make realize to irrigation in targeted area.



Picture Situation of beneficiary area

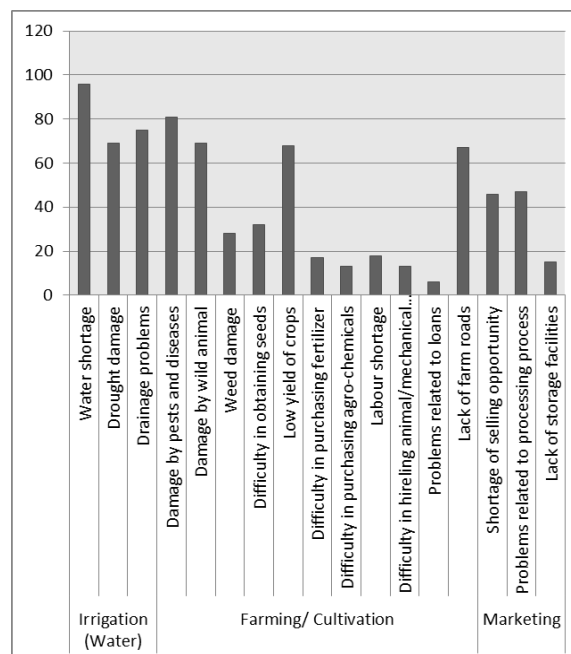
6-2-3 Operation and Maintenance of Irrigation Facilities

The irrigation facilities were constructed in 2011. Two months later, a flood broke them down completely. Thereby, they were abandoned. No operation and maintenance work was implemented due to the nothing of activate irrigation facility.

6-2-4 Problem about Agricultural Production of Beneficiary Farmers

(1) Problems about agricultural production of beneficiary farmers based on the Farmers' socio-economic survey

In the result of Farmers' socio-economic survey, the targets are one hundred of Bikaliu beneficiary farmers. According this survey, shortage of irrigation water is the most important problem for the farmers. Irrigation schemes are constructed in 2008, although it is difficult to cultivate in dry season because of sedimentation of canal. Rice cultivation is not carried out in this beneficiary area. However there are some farmers who cultivate rice with irrigation water in other area near the Bikaliu irrigation scheme.



Source: JICA Project Team
Figure 6-2-2 Problem about Agricultural Producing of Beneficiaries

Farmers have recognized that it is possible to cultivate rice if irrigation water is enough.

Low yield and damage of pest, disease, insect and wild animals are also important problem in this area. There are some reasons for low yield like other targeted area. It is guessed that utilizing of seed from home seed-raising for a long time, low input materials and continuing traditional cultivation method are the reason for low yield. There are many farmers who produce vegetables in small home garden. Vegetables are also damaged by pest, disease and insect, moreover it is difficult to purchase agro-chemicals. Farmers suffer from this problem about vegetables cultivation.

(2) Prioritizing the problem at workshop of stakeholder

Workshop was carried out with stakeholders of Bikaliu irrigation scheme such as extension workers, village representatives and interested persons of rice processing. The eight issues about rice production of Timor-Leste were extracted in Master Plan. The order of priority about eight issues based on discussion of participants is listed in Table 6-2-1.

Prevention of disease and insect is put the highest priority problem for them because it is occurred in vegetable cultivation. Next it is put high priority to strengthening integrate farming and obtaining good quality of seed. There is no shop near the targeted area to purchase good quality seed for rice or vegetables.

Table 6-2-1 Prioritizing of the Problem at Workshop of Stakeholder

Priority	Project
1	Pest and disease control
2	Integrated farming
3	Quality seed
4	Manure management
5	Agricultural fund
6	Cultivation method
7	Local resource
8	Mechanization

Source: JICA Project Team

6-3 CURRENT SITUATION OF PRODUCING, PROCESSING AND MARKETING OF AGRICULTURAL PRODUCTS

6-3-1 Current Farming Condition

(1) Current farming condition of surrounding area of Bikaliu irrigation scheme

1) Cropping Pattern of Main Crops (Rice, Maize and Cassava)

Farmers' socio-economic survey was conducted to 100 farmers living near Bikaliu irrigation scheme including 23 farmers who have paddy field there. Four farmers of 23 farmers have some paddy fields outside of Bikaliu irrigation scheme, according to the survey. Farmers who don't have other paddy field work as a labor of agricultural work of relatives or neighboring farmers. When they work as a labor, they share the production with employer.

Table 6-3-1 Farming Condition of Surrounding Area of Bikaliu Irrigation Scheme

	Percentage of Household (%)	Average of cultivated area (ha)	Average of yield (ton/ha)
Rice	26	1.2	0.99
Maize	86	0.68	0.59
Cassava	100	0.65	0.92

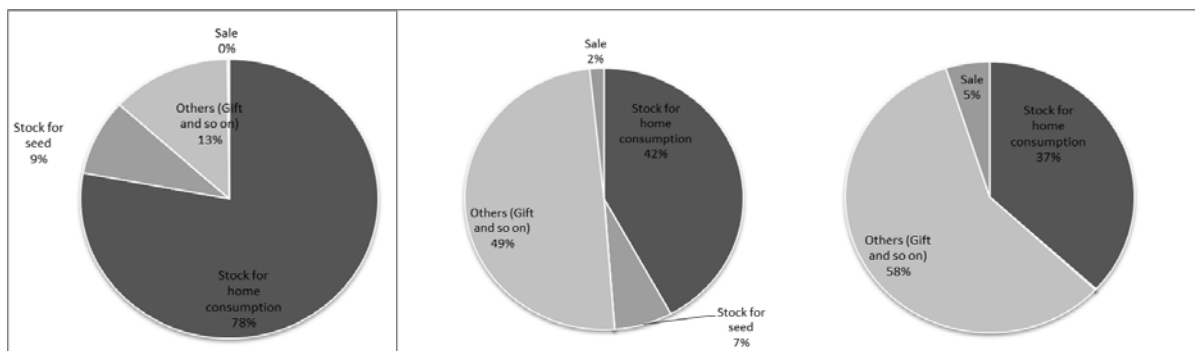
Source: JICA Study Team

First cropping of rice is conducted in the paddy field near the Bikaliu irrigation scheme. Rice is planted in February, March or April and harvested in October or September. 86% of farmers cultivate maize on the other hand all of farmers produce cassava. However yield of all crops are low.

2) Cropping Pattern of Other Crops and Vegetables

Beans are cultivated by mixed cropping with maize or cassava in small area. Some kind of vegetables such as mustard and chili are cultivated in home garden. However it is difficult to understand the detail situation of horticulture because cultivated area of vegetables and the production is too small. According to hiring from Aldeia chief or farmers, vegetables are planted in April as the late of rainy season and harvested and sold in July or August.

(2) Purchasing of food and measures of food shortage



Source: JICA Study Team

Figure 6-3-1 Situation of Consumption or Utilization of Main Crops (Left: Rice, Center: Maize and Right: Cassava)

The situation of utilizing and marketing about main crops is shown in Figure 6-3-1. Farmers who produce rice consume 80% of rice production. It is considered that farmers give half of maize or cassava production to relatives or neighboring farmers who are not able to cultivate main crops. It is possible that farmers exchange the crops to other agricultural production, however the detail data was not acquired from Farmers’ socio-economic survey.

Four farmers of 23 beneficiary farmers cultivate rice. The amount of self-consumption of rice per person is estimated and showed in Table 6-3-2. Households who produce rice have to cover shortage of self-consumption with purchasing imported rice. On the other hand, households who don’t produce rice have to purchase imported rice for all self-consumption.

Table 6-3-2 Volume of Purchasing and Consumption of Rice

Number of household	Self consumption (Rice)	Purchase (Rice)	Family member	Total consumption
	kg/HH	kg/HH	person/HH	kg/person
4	705.4	225.0	8.8	106.3
19	0.0	857.9	7.3	117.5

Source: JICA Study Team

Most of farmers purchase imported rice from traders who come to village by vehicle. Some farmers also purchase imported rice at the market or the store of Ossu. If farmers produce rice in Bikaliu irrigation scheme, the cost for purchasing imported rice is decreased.

6-3-2 Actual Situation of Livestock

Pig, chicken and buffalo are mainly raised as domestic animals as shown Table 6-3-3. Suco Uaguia including Bikaliu irrigation scheme are set as targeted area of Community policing program. And then it is not allowed to raise freely large domestic animals except dog and chicken in this Suco. So that buffalos and goats are tied by rope and pigs are raised in an enclosure.

There are few farmers who started to raise fish in the pond using the water from water stand which is lead from water spring. They purchase young fishes from the nursery of Suco Loi-Huno which is located along the main load. It is expected that fish rising is also one of source of farmer’s income.

Table 6-3-3 Percentage of Households who Raise Livestock and Number of Livestock per Household

	Percentage of household (%)	Average number of livestock (head)
Buffalo	29	7.10
Cow	19	4.47
Goats	27	3.26
Pigs	85	2.86
Chicken	80	8.24
Horse	35	2.94
Dog	74	2.80
Others	8	-

Source: JICA Study Team

6-3-3 Selling and Marketing of Agricultural Product

Agricultural production including livestock production is sold to traders who come to village. There is no any market near the Bikaliu irrigation scheme, so that farmers sell agricultural production at the market of Ossu or the place near the main road. Although there are no regular traders, the number of traders depends on the situation of agricultural production.

There is no store selling agricultural material so that farmers have to go to Viqueque city or Baucau city to purchase them. It is considered that farmers purchase them through traders who come to village to buy agricultural production.

6-4 RURAL SOCIETY AND FARMERS' ECONOMY

6-4-1 Organization of Rural Society

(1) Structure of rural society

Suco chief or Aldeia chief preside suco or aldeia same like other targeted area. There is a council which Suco chief mainly manage. Participants of this council are Suco chief, secretary, accountant, every Aldeia chief, representative of youth, traditional farmer's leader, representative of veteran, and representative of religion and community police.

Suco Uaguia is a targeted area of Community policing program as above therefore community police is assigned. If some problems are happened in this village, residents have a meeting and solve the problem with advice of Suco chief, Aldeia chief or community police. Community police instruct farmers to observe the laws and public rules. And also they have a role to regulate residents who don't observe the rule such as regulation about raising domestic animals.

(2) Traditional ceremony

The cult of split which enshrines a large tree and a large stone as a holy tree and holy stone are practiced by many farmers. Farmers believed that it is needed to carry out a ceremony when they have to perform some activities against holy tree or holy stone. It is also believed that collapse of previous irrigation scheme was happened because ceremony was not carried out when the construction had started.

6-4-2 Gender

There is a tendency that works to be shouldered by men and women are divided in Bikaliu site, the trend is not very clear, though. For example, women mainly cover rice planting, weeding, post-harvest activities, while men do land preparation, management of canals and threshing. However, there are some farming activities that both men and women participate in. Men's working hours for rice production is much longer than those of women, more than twice, on the other hand, working hours of men and women for cassava and maize production are almost same.

Sale of produced crops are shouldered by women, however, sale of livestock is done by both men and women. however, incomes from such sale, especially, cash obtained through sale of crop production is mostly controlled by women at homes. Concerning water fetching and firewood collection, not only women but also men and children cover the works. Roles of men and women in Bikaliu site based on the Socio-economic survey are as shown below:

Table 6-4-1 Roles of Men and Women in Bikaliu Site

Works	Men*	Women*	Children*
Sale			
Sale of Rice and Maize	16	34	5
Sale of Vegetables	14	31	6
Sale of Livestock	33	41	3
Income Control			
Income Control by Sale of Rice and Maize	4	44	-
Income Control by Sale of Vegetables	5	44	-
Income Control by Sale of Livestock	14	70	-
Non-farm Income Control	14	80	-
Housework			

Works	Men*	Women*	Children*
Drinking Water Fetching	56	84	64
Firewood Collection	67	80	57

Remarks 1 (*): The number in the table mentioned above indicate number of respondents.

2: multiple answers.

Source: JICA Study Team (Socio-economic survey), 2015

6-4-3 Farmhouse Economy

(1) Income of the farmhouse

The average of the household income is arranged in the following table, sorting it into agriculture income and non-agriculture income, based on the family budget data of 100 household in Bikaliu, collected in the Farmers Socio-Economic Survey. Within the 100 households, rice farmers are 23 households. Self-consumption of agriculture produce was converted to money by market price and appropriated for the budget. The average annual income in Bikaliu including the self-consumption of agriculture produce is about US\$ 2,300, whose portion of the agriculture income is about 30 %.

Table 6-4-2 Average Household Income in Bikaliu

Items		Income (US\$/HH)	Ratio (%)
Agriculture income	Rice cultivation	135.7	5.7
	Maize cultivation	116.5	4.9
	Cassava cultivation	4.7	0.2
	Vegetables cultivation	11.4	0.5
	Livestock rearing	337.1	14.2
	Betel nut cultivation	87.6	3.7
	Other agriculture produce (Candle nut, Fish, etc.)	58.7	2.5
	Wages from working on other farm	21.0	0.9
	Leasing for farm machinery and equipment	0.5	0.0
Subtotal		773.1	32.7
Non-agriculture income	Salary from other occupations (government official, driver, company employee, etc.)	297.0	12.6
	Wages as casual worker	263.3	11.1
	Earnings from business (boutique, restaurant, three wheeler, taxi, etc.)	451.6	19.1
	Receipt of gifts and remittance from relatives and others	295.9	12.5
	Interest earned from money loaned	26.9	1.1
	Pension benefit	131.0	5.5
	Other non-agriculture income	127.1	5.4
Subtotal		1,592.8	67.3
Total		2,366.0	100.0

Source: JICA Study Team

In the agriculture income, the biggest item is “Livestock rearing” of US\$ 337, which occupies 14 % of the total income. The following biggest items are “Rice cultivation” of US\$ 136 (6%), “Maize cultivation” of US\$ 117 (5%) and “Betel nut cultivation” of US\$ 88 (4%).

In the non-agriculture income, the biggest item is “Earnings from business” of US\$ 452, which occupies 19 % of the total income. “Salary from other occupations”, “Receipt of gifts and remittance” and “Wages as casual worker” are also more than 10 %. “Pension benefit” of US\$ 131, which is considered as a major cause of the recent trend away from farm-work, also occupies 6 %. It shows the pension system becomes an income source as same level as “rice cultivation”.

(2) Expenditure of the farmhouse

The average of household expenditure in Bikaliu is arranged in the following table. Purchasing of “Rice” is US\$ 415, which is the biggest item and occupies 18 % of the total expenditure. The following biggest items are “Repair and maintenance of house”, US\$ 198 (9%), “Expenses for ceremonial occasions”, US\$ 176 (8%), “Education”, US\$ 133 (6%), “Medical care”, US\$ 104 (4%) and purchasing of “Bread”, US\$ 98 (4%). The custom of eating bread in breakfast causes the big expenditure. Amount of money for the purchasing of rice is four times as that of bread though it is said the consumption of bread is increasing.

Table 6-4-3 Average Household Expenditure in Bikaliu

Items	Expenditure (US\$/HH)	Ratio (%)	Items	Expenditure (US\$/HH)	Ratio (%)
Agriculture input of Rice	62.8	2.7	Spice & other foods	64.5	2.8
Agriculture input of Maize	77.6	3.3	Tobacco and cigarettes	69.1	3.0
Agriculture input of Cassava	29.8	1.3	Soap, shampoo, etc.	44.5	1.9
Agriculture input of Vegetables	0.7	0.0	Electricity charges	10.8	0.5
Agriculture input of Livestock	2.1	0.1	Expenses for firewood, cooking fuel and LP-gas	29.2	1.3
Agriculture input of Others	1.0	0.0	Expenses for lighting fuel	24.9	1.1
Rice	415.3	17.8	Household furnishing and equipment	39.9	1.7
Maize	5.3	0.2	Repair and maintenance of house	197.9	8.5
Cereals other than rice & maize	2.8	0.1	Clothing	65.1	2.8
Tubers and Roots	6.8	0.3	Medical care	103.5	4.4
Fish	24.2	1.0	Education	132.5	5.7
Meat and eggs	85.6	3.7	Recreation	25.0	1.1
Vegetables	81.8	3.5	Expenses for ceremonial occasions	176.4	7.6
Flour	34.1	1.5	Transportation and communication	72.2	3.1
Bread	97.6	4.2	Remittance to relatives	52.3	2.2
Tea and coffee	50.5	2.2	Land and house rent	14.8	0.6
Milk (powder) & yogurt	30.0	1.3	Taxes	8.7	0.4
Liquor and soft drinks	20.9	0.9	Loan repayment	17.6	0.8
Cooking oil & coconuts	73.6	3.2	Others	21.9	0.9
Sugar and salt	54.3	2.3			
			Total	2,327.6	100.0

Source: Socio-economic survey, JICA Study Team

6-5 GENERAL DESCRIPTION OF PRIORITY PROJECT IN BIKALIU SITE

The proposed priority project in Bikaliu site is composed of two main components, namely, 1) Irrigation system improvement and 2) Crop production increase. Bikaliu site is categorized into “subsistent farming area”, therefore, the priority project in the site does not focus on commercial rice production. Instead, the project has intention to reduce expenditure for rice purchasing through rice production for house consumption, and to promote horticulture crop production, and finally the project aims at increase of faming household income. The proposed project objective, expected outputs, activities are as shown below:

[Project Objective]

Faming household income is increased (Indicator: Faming household income is increased by US\$ 2,592 per year.)

[Outputs]

- Rice production is restated.
- Yield of horticulture crop is improved.

[Main Activities]

Component 1: Irrigation System Improvement

- Securement of irrigation water

Component 2: Crop Production Increase

- Securement of quality seeds
- Extension of rice production techniques
- Promotion of soil improvement and manure production
- Extension of horticulture crop production techniques

Overall structure of the priority project in Bikaliu site is illustrated as follows:

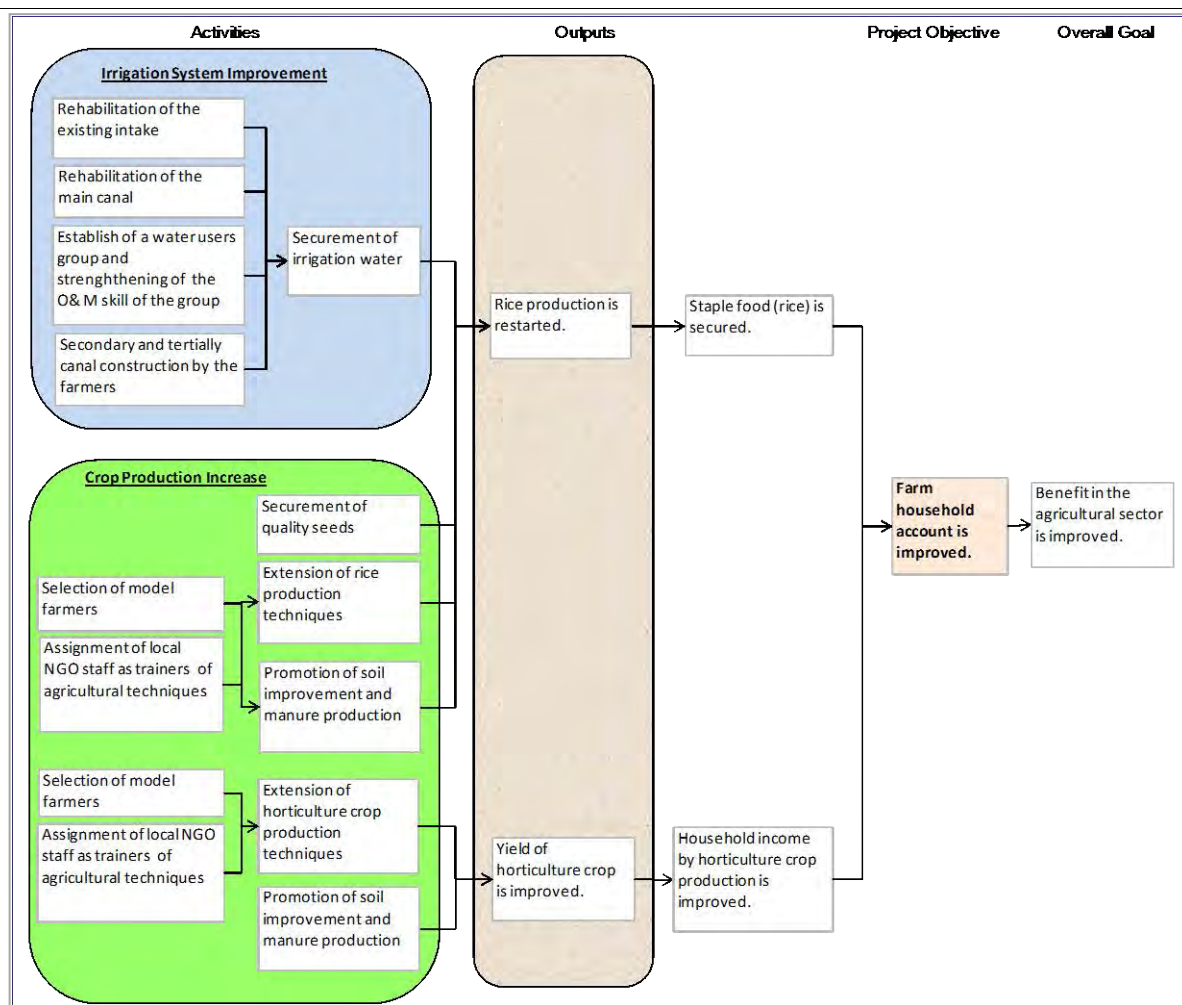


Figure 6-5-1 Overall Structure of the Priority Project in Bikaliu

6-6 IMPROVEMENT OF IRRIGATION SCHEME

6-6-1 Water Resource Development Plan

At present, no agricultural activities are carried out at beneficiary area. It is planned to construct weir at Bikaliu River and paddy cropping at beneficiary area will be available. Both present and planned cropping pattern are shown in the Figure 6-6-1. Even a weir is constructed, paddy cropping will be still limited during rainy season only due to small amount discharge of Bikaliu River during dry season.

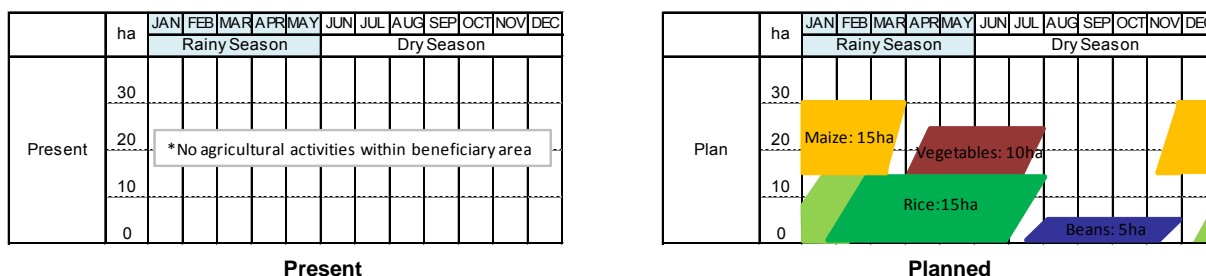


Figure 6-6-1 Cropping Pattern

The condition and results of water balance analysis based on the planned cropping pattern are shown in the Table 6-6-1 and Figure 6-6-2. As a result, available water amount from river is more than the amount of irrigation water requirement every month. This means the water amount at the intake point

is enough to irrigate all the planned beneficiary area.

Table 6-6-1 Condition of Water Balance Analysis

Items		Specification	Remarks	
River discharge	River name	Bikalieu River		
	Data source	Cuha river (Average of 1952-1974)	Data from ADB report ^{*2}	
	Catchment area at intake point	15 km ²		
Rainfall	Data source	Vato Lari (Average of 1953-1972)	Data from RSPAS ANU	
	Efficient rainfall	80% of rainfall (maximum 250mm)		
Bikalieu Irrigation Scheme	Rice	Rainy Season	15 ha	
		Dry Season	0 ha	
		Percolation	3 mm/day	
		Standing and puddling water	300 mm	
		Interim water requirement	50 mm	
	Maize	Rainy Season	15 ha	
		Dry Season	0 ha	
	Vegetables	Rainy Season	10 ha	
		Dry Season	0 ha	
	Beans	Rainy Season	0 ha	
Dry Season		5 ha		
Irrigation schemes in the upstream basin ^{*1}	Name and Area of beneficiary area	Raumata	76 ha	
	Irrigation area	Rainy Season	38 ha	50% of Total Area
		Dry Season	0 ha	
	Cropping pattern	Same as Bikalieu Irrigation Scheme		
Other water demand	Drinking water and water for live stock			
Intake efficiency		0.3		
Irrigation Efficiency		0.55		

*1: Upstream irrigation scheme; Raumata (5-a-32TR)

*2: ADB: TA409, August 2004, Assessment of water availability and water demand in Timor-Leste at river basin level

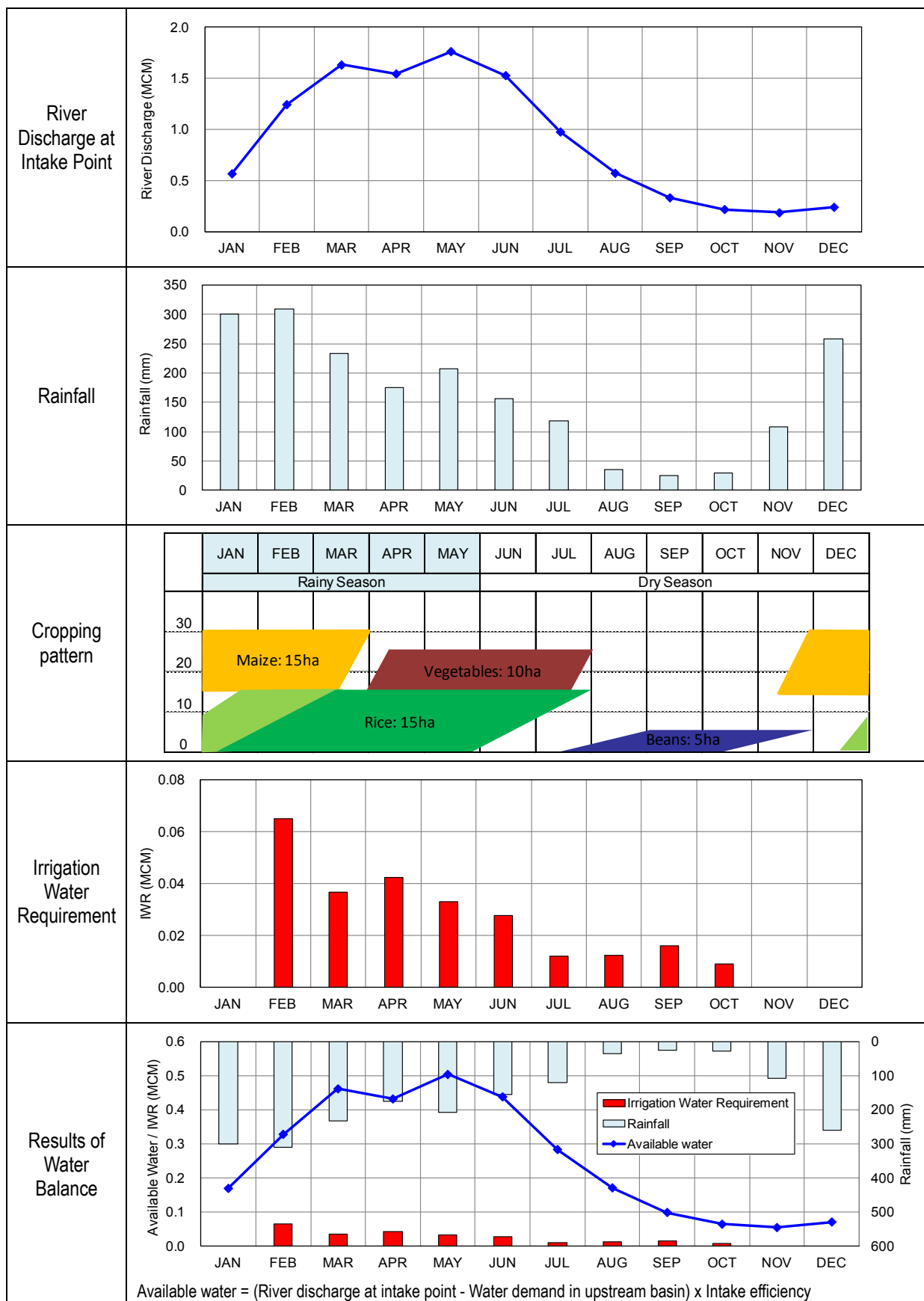


Figure 6-2-2 Results of Water Balance Analysis

6-6-2 Improvement of Irrigation System

An actual situation of Bikaliu irrigation scheme has trouble of as followings;

- ① Unable to take water due to the broken headworks (weir)
- ② Unable to pass the water by leading canal from intake to beneficiaryly area and nothing of main canal in beneficiary area

The planned intake volume is $0.02\text{m}^3/\text{s}$ from required water in the scheme

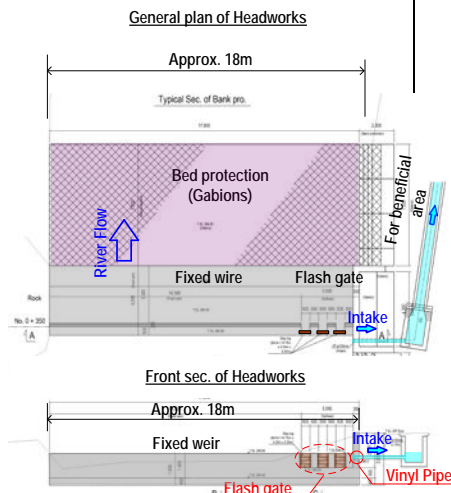
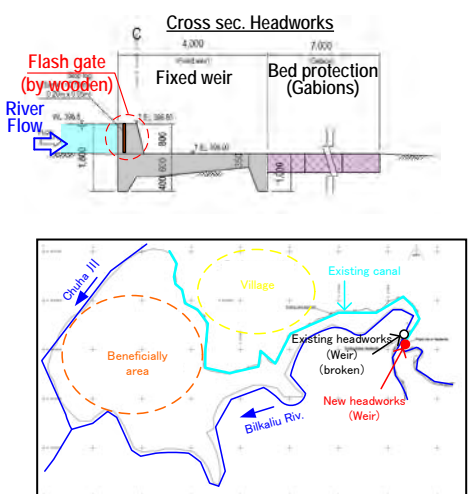
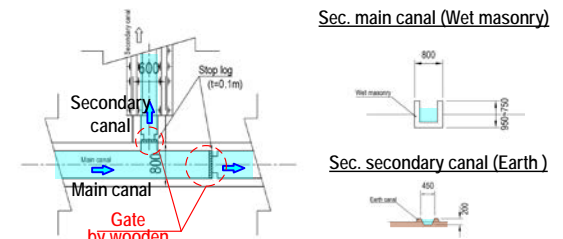
Table 6-6-2 Planned Required Water for Every Month

Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Required Water (m^3/s)	0.00	0.02	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.00	0.00

A planned canal alignment should be taken into consideration the leveling of original land-form on planned alignment based on topographic survey. In general, a slope of canal are designed by existing canal slope in moderate land form, however, in rehabilitation plan in case of steep slope in mountainous area, the design slope should be prioritized to actual land form. Therefore the design could be steeper than typical plan and the drop works could be designed to keep proper canal slope on necessity.

A flood discharge in Bikaliu River is assumed to about $120\text{ m}^3/\text{s}$ in 100 years flood, which is calculated as reference by monthly rain fall from 1952 to 1973 in ADB project. Table 6-6-3 shows the rehabilitation plan of canal.

Table 6-6-3 Plans of Rehabilitation of Facility

Issue of facility	Rehabilitation plan	Advantage and/or disadvantage
<p>① Unable to take water due to the broken headworks (weir)</p>	<p>The weir is construction. The new weir is planned at upstream on Bikaliu River than the broken weir. An another rivier of Maubaichisa is used to dry up in dry season, while Bikaliu River never dry up. In addition, given that the required water is calculated, Bikaliu River is enough to supply the required water. furthermore, the above plan expectedly give a cost saving.</p> <p style="text-align: center;"><u>General plan of Headworks</u></p>  <p style="text-align: center;"><u>Front sec. of Headworks</u></p>	<p>The delivery of water to beneficiary area is stable. The weir equipped with stop log gate by wooden could be broken and flashed out in a certain large flood in order to discharge excess flow. However, the flashed out stop log need to set again after flood.</p>  <p style="text-align: center;"><u>Cross sec. Headworks</u></p> <p style="text-align: center;"><u>General plan of layout</u></p>
<p>② Unable to pass the water by leading canal from intake to beneficiary area and nothing of main canal in beneficiary area</p>	<p>An existing canal slope should be revised to proper one. A wet masonry and drop works could be located to keep stable water flow on necessity. In addition, the bridge on canal for live stocks are constructed to avoid a damage on canal.</p> <p>Planned canal slope should be 1/400 from the view point of existing situation of canal bed.</p> <p>The diversion and control gate should be stationed to proper management.</p>	<p>The materials of canal should be prevailing ones which are available to obtain by farmers so that they can easily obtain. However, at design stage the experts and support by MAF are needed. Especially, the gates are vital portion for the diversion facility which procure from Indonesia or other.</p> <p style="text-align: center;"><u>Typical Diversion</u></p>  <p style="text-align: center;"><u>Sec. main canal (Wet masonry)</u></p> <p style="text-align: center;"><u>Sec. secondary canal (Earth)</u></p>

6-6-3 Establishment of WUA and Strengthening O/M Structure

(1) Establishment of WUA

The irrigation facilities of this scheme were constructed in 2011. However, they were broken down by a flood and abandoned 2 months later when was in rainy season of the same year. No crops have been grown in the service of the irrigation scheme since then. Therefore, it is necessary to establish a new organization for O&M.

In this regard, the targeted area is featured by facilitation of subsistence farming by a small number of beneficiary farm households, which are scattered about in the mountainous area. Consequently, it is difficult to introduce an organization type, which has sharing-roles divided into a lot of small tasks and periodical payment of membership fee, like WUA of large- and medium-scale irrigation schemes. The Project shall formulate an organization, which presumes mutual assistance in the village, in this scheme.

1) Preparation of establishment

When construction works of irrigation facilities are implemented, the Project shall prepare regulations that cover basic O&M activities as well as an agreement forms for farmers in the service area who are main users of the facilities. Also, also it selects the representative and vice-representative as facilitators of the organization.

It will be essential to clearly write down easy repair of facilities, maintenance activities such as canal cleaning of several times a year, and when meetings are held. Also, the Project shall examine contents that are inappropriate as regulations and new articles to be added together with district agriculture department officers in charge of irrigation, so as to add how to handle maintenance activities which is difficult for farmers alone to implement when necessary.

2) Reporting of establishment

Basically application is not necessary because the organization presumes mutual assistance among villagers. In this regard, an organization is established under observation of the officer in charge of irrigation in the district agriculture office, and then the officer shall report the establishment of an organization of this scheme to the district governor and MAF.

3) Change of Activities after Establishment

The organization members discuss the necessity of changes of activities at the meeting place located in the centre of the village and make changes if necessary as a conclusion.

(2) System plan for O&M of irrigation facilities

1) Organizational structure

The minimum requirement of the organizational form is the representative and the vice representative as facilitators. For a small-scale scheme, it is supposed that the village chief usually represents the organization. It is all right to select some board members when necessary. However, segmentation of roles in such a small organization may disturb communication and/or smooth activities. Hence, it is presumed that the organization is exclusively operated by the representative.

2) Activities

Activities of the organization are mainly maintenance and cleaning of irrigation facilities. The proposed facility plan shows small-scale facilities that handle small amounts of water, and such small-scale ones do not need complicated gate-operations for water intake or flood control. The

following are activities supposed.

a. Operation

A small spillway for usual water intake is built in the fixed weir. The spillway must be closed by wooden gate or stop-logs. These obstructing objects are designed to be destroyed depending on the extent of floods so that they do not block flood flows by extending the flow section of the weir. Therefore, the organization must close the spillway again once floods wash away those obstructing objects.

b. Maintenance

Maintenance is classified into 3 types as follows.

Routine Maintenance : Checking water flow condition and facility malfunction between the head works and the service area

Periodic Maintenance : farmer-participatory canal cleaning, condition-checking of the head works and small and easy repairs of canals, etc.

Emergency Maintenance : repair of gabions washed away from the immediate downstream of the head works, re-setting stop-logs for closing the spillway of the head works, and cleaning of canals closed by sediment flow.

c. Funds Necessary for Maintenance

The organization purchases cement, wires to make gabions and stop-log for spillway closure if facility maintenance activities need funds. These are general materials and available to farmers, and further specific skills are not necessary for farmers to work. Funds shall be collected from members through meetings whenever necessary, so as to purchase such materials.

6-6-4 Construction Works of Irrigation Facility by Participatory of Farmers

The construction works by participatory works of farmers are planned as followings, as well as the periodical participatory works such as cleaning of canal and removal of sedimentation are used to conduct in irrigation scheme.

(1) Branch canal and tertiary

The targeted irrigation scheme has been abandoned for 30 years, therefore it should be constructed branch canal in the scheme. An effective canal networks should be planned as well as the planning of canal slope and alignment depend on farmers activity. So the participatory works of farmers is vital works. According to site land form, the canal alignment should be stationed at up land relatively showed on Figure 6-6-3.

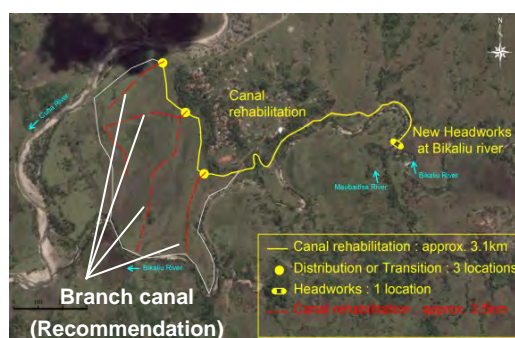


Figure 6-6-3 Recommended Branch Canal in the Scheme

(2) Access road in irrigation scheme

An existing road extends from south to north through the village. One is for Viqueque city to south west and other is for Ossu city to north.

To enter the village visitor need to head to top of hill at once then, they enter to beneficiary area on foot.

When the agricultural activity is started in the field, the proper road should be arranged to directly access for road. Furthermore, the maintenance road should be stationed along the main canal with proper width. Accordingly, Figure 6-6-4 shows on recommendation plan for road in the beneficiary area

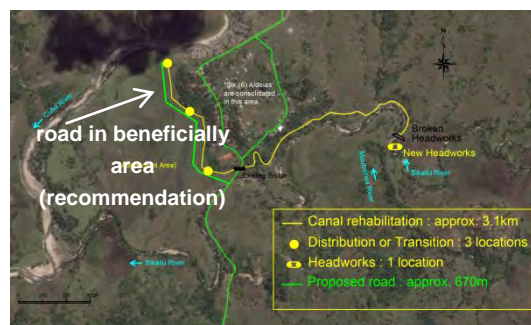


Figure 6-6-4 Road Plan for Recommendation in the Beneficiary Area

6-6-5 Cost of Irrigation Improvement (Investment Plan)

The cost estimation is conducted for improvement of irrigation system. A maintenance and establishment of WUA fee should take into account 3~5% for entire project cost which is sourced by other similar situation and project. It will be added in estimation of entire project cost.

Table 6-6-4 Cost of Construction for Irrigation Facility

Contents of construction works	Cost	Total construction cost (US\$)
Headworks (Weir)	180,000	350,000
Rehabilitation of main canal (L=1.6km)	147,000	
Rehabilitation of branch canal (L=1.5km)	23,000	

6-7 IMPROVEMENT OF CROP PRODUCTIVITY

6-7-1 Program of Producing Food for Self-Supporting

(1) Proposed cropping pattern

It is planned that rice is cultivated in flat area and maize or vegetables are cultivated in the area of hill. Rice is planned to cultivate in rainy season. Moreover cropping pattern including other crops and vegetables are decided depending on the condition of irrigation water and cropping pattern of surrounding area.

It is introduced to produce beans such as mung bean, cowpea and green bean and so on, as second crop. It is necessary to cultivate beans which are available for improving soil and supplying nutrition because it is difficult for farmers to purchase chemical fertilizer in this village. It is recommended to cultivate many kinds of vegetables in small quantities because there is a risk of damaged from disease or insect if one kind of vegetable is cultivated in big quantities. Onion, chili and mustard are utilized for planning because they are cultivated in Viqueque district and selling well in market.

Table 6-7-1 Proposed Cropping Pattern (Plan of Cultivated Area and Target Yield)

	ha	1	2	3	4	5	6	7	8	9	10	11	12
Plan	40												
	30	Maize: 15ha (1.0t/ha)			Vegetables: 10ha (3.0-6.0t/ha)								
	20	Rice: 15ha (2.5t/ha)						Beans: 5ha (1.5t/ha)					
	10												

(2) Target yield

1) Rice

Most of paddy fields surrounding area of Bikaliu irrigation scheme are small size and along the slope. And then almost of all production are utilized for home consumption. It is planned to obtain the yield with the local resources because it is difficult to purchase agricultural materials such as chemical fertilizer, agro-chemicals and agricultural machine.

Although the average yield of rice is 3.0 to 3.5 ton/ha (2010-2012) in the whole Viqueque district, it is 1.5 to 2.0 ton/ha with conventional method before 2008 when ICM had not been introduced. It is planned to convert ICM to conventional method at priority project. Therefore the target yield is set as 2.5 ton, along the past record and the introduction planning of cultivation method.

2) Maize

The average yield of maize at surrounding area is 0.59 ton/ha according of Farmers' socio-economic survey. On the other hand, according to the statistics of NDAH of MAF, the average yield of maize in Viqueque district is 2.3 ton/ha. Target yield is set as 1.5 ton, along the plan to use good quality seed and to input compost made by local resources.

3) Beans

According to the statistics of NDAH of MAF, the yield of beans (pea, green bean and mung bean) is 0.85 to 3.0 ton/ha (from 2011 to 2013). It is planned to set 1.5 ton/ha of target yield based on these past result. When beans are cultivated, nitrogen of air is fixed by activities of root nodule bacterium combining with the root of beans. Input of materials such as fertilizer or compost cause that soil nutrition will be improved at Bikaliu irrigation scheme. Soil physical condition is improved and activities of useful micro-organisms are promoted by plowing residual materials such as straw.

4) Vegetables

It is planned to cultivate onion, chili and mustard as the basic patter of vegetables. These vegetables are widely cultivated in Viqueque district. According to the statistics of NDAH of MAF, the yield of vegetable is 3.0 to 5.8 ton/ha. It is planned that the target yield of onion, chili and mustard is 3.0, 3.0 and 6.0 ton/ha respectively, they are based on these past record

6-7-2 Program for Dissemination of Cultivation Method

There are some farmers who cultivate rice at surrounding area of Bikaliu irrigation scheme. However there are no farmers who received seed from MAF, and then they use the seed from home seed-raising. Therefore degradation of quality and yield is happened due to mixing of varieties. It is planned that seed of rice and maize produced by seed producers are provided to beneficiary farmers of the priority project. It is also proposed to purchase seed of beans and vegetables at the local area. After the project, it is necessary for farmers to purchase seed by themselves. It is important to train how to purchase seed.

This area is difficult to purchase and input the agricultural materials such as fertilizer, agro-chemicals and labor force intensively. Therefore it is necessary to instruct simple technique about cultivation methods such as low transplanting, weeding, and land leveling based on conventional method or IRCS, Improved Rice Cropping System. For example, it is planned to instruct making and using simple type of agricultural equipment such as T-shaped land leverer and weeder with nail.

6-7-3 Program for Promoting Local Resource Circulative Agriculture

In Suco Uagua including Bikaliu irrigation scheme, it is not allowed to raise freely large domestic

animals except dog and chicken. So that buffalos and goats are tied by rope and pigs are raised in an enclosure. It is planned to organize the training for raising domestic animals with enclosure and utilize the dung of them for compost. It is not prohibited to raise chicken freely, it can be also instructed to make simple type of hen house and compost with their dung. Compost made by dung of domestic animals can be useful for improving soil condition and supplying nutrition, when it is applied to the field.



Simple type of weeder

It is planned to have trainings about utilizing method of local resources such as residuals of crops, plant of beans, rice bran and rice husk. Although organic materials of compost are slow-release, applying of compost to the field has an effect on improvement of soil and productivity of crops.

6-7-4 Strengthening Program of Integrated Farming with Livestock Breeding

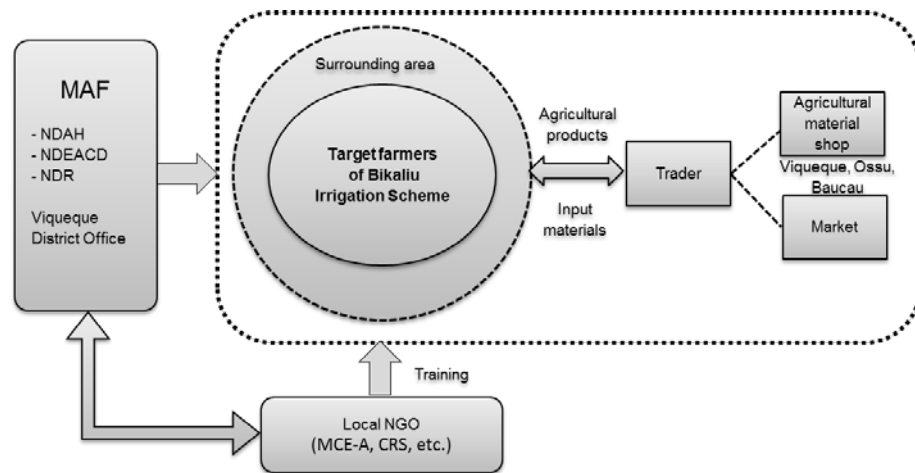
Beneficiary farmers of Bikaliu irrigation scheme and neighboring farmers produce vegetables such as chili, lettuce and mustard in small home garden. Some traders of Ossu, Viqueque or Baucau city visit Suco Uagua and buy vegetables form farmers. However it is not regular trade because the amount of vegetable production is too small and instable due to damage of disease or pest.

It is planned to have training about cultivation techniques of vegetables, manure management of compost or green manure, prevention

6-7-5 Framework and Cost of Improvement Crop Productivity

(1) Framework of implementation

The priority project as above is carried out with frame work shown in this figure. It is planned to develop the integrated agricultural productivity including rice, vegetables and livestock in this Planning of Improvement of Crop Productivity. Therefore in the program for Dissemination of Cultivation Method, it is also planned to have training not only beneficiary farmers of Bikaliu irrigation scheme but also other farmers of surrounding area.



(2) Investment plan

Table 6-7-2 Project Cost for Crop Production Increase

Activities		Cost(US\$)
Activity-1	Program for Dissemination of Cultivation Method	30,570
Activity -2	Program for Promoting Local Resource Circulative Agriculture	6,000
Activity -3	Strengthening program of integrated farming with livestock breeding	6,500
Total		43,070

6-8 PROJECT EVALUATION IN PRE-FEASIBILITY STUDY LEVEL

The project evaluation is implemented at pre-feasibility study level.

6-8-1 Project Cost Estimation

The costs on the inputs are estimated as below:

Table 6-8-1 Project Cost

Project Components	Project Cost (US\$1,000)
Irrigation	350
Crop production improvement	43
Total	393

6-8-2 Economic Validity

(1) Cost

US\$ 350 thousand of the construction cost of the irrigation infrastructure improvement plan was allocated equally in the two years of the beginning. After the third year, 3 % of the improvement construction cost is appropriated every year as the operation and maintenance (O&M) cost. The project cost of the farming improvement plan, US\$ 43 thousand was allocated equally in the three years from the third to the fifth year. All costs were converted to the economic cost across the board, multiplied by 0.95 of the standard conversion factor.

Table 6-8-2 Appropriation of the Project Costs in Bikaliu

(Unit: US\$ Thousand)

Year	Const. Cost	O&M Cost	Project Cost	Total Cost
1	166.25			166.25
2	166.25			166.25
3		9.98	13.62	23.59
4		9.98	13.62	23.59
5		9.98	13.62	23.59
6		9.98		9.98

Source: JICA Study Team

(2) Benefit

The benefit was calculated by deducting the net income before the project from the net income after the project at every crop. The benefit of vegetables and beans were calculated, applying mustard and mungbean for represent crops of them, respectively. US\$ 72 thousand of the project economic benefit was appropriated after the completion of the repair works, from the third year.

Table 6-8-3 Calculation of the Benefit in Bikaliu

Area (ha)	Planted Area (ha)				Cropping Intensity (%)	Gross Return (US\$ x 1000)	Product. Cost (US\$ x 1000)	Net Return (US\$ x 1000)
	Crop	Rainy Season	Dry Season	Total				
<i>Before Project Condition</i>								
30	-	-	-	-	-	-	-	-
	Total	-	-	-	-	-	-	-
<i>After Project Condition</i>								
30	Paddy	15.0	-	15.0	50.0%	24.64	4.03	20.61
	Maize	15.0	-	15.0	50.0%	14.40	3.71	10.69
	Vegetables	10.0	-	10.0	33.3%	40.03	3.09	36.94
	Beans	-	5.0	5.0	16.7%	4.28	0.73	3.55
	Total	40.0	5.0	45.0	150.0%	83.34	11.56	71.78
Benefit in crop production = {(Total Net Income After Project Condition) - (Total Net Income Before Project Condition)}								71.78

Source: JICA Study Team

Also, the project financial benefit excluding the family labor is about US\$ 78 thousand. Dividing the financial benefit by 30 households of the target farmers, a household income is expected to increase US\$ 2,592 annually thanks to the implementation of the project. The average household income above mentioned will increase to 2.1 times.

(3) Economic Internal Rate of Return (EIRR)

The results of the economic analysis of 32 years in Bikaliu shows that the EIRR is 16 % and the B/C is 1.4. It is confirmed the project can take enough benefit which offsets the cost.

Table 6-8-4 Economic Evaluation Indicators in Bikaliu

Indicator	NPV (US\$ x 1000)	B/C	EIRR
Value	165.00	1.42	15.67%

Discount Rate (i) = 10%

Source : JICA Study Team

The following table shows the result of the sensitivity analysis. In case of no change of the benefit, if the construction cost increases 10 %, the EIRR will be more than 14 %. In case of 10 % decrease of the benefit, if the construction cost increases at 10 %, the EIRR will be more 12 %. In case of 20 % decrease of the benefit, if the construction cost increases 10 %, the EIRR will be able to keep in 10 %, whose B/C is 1.0.

Table 6-8-5 Sensitivity Analysis of EIRR in Bikaliu

Benefit	Cost condition		
	Base	+5%	+10%
Base	15.67%	14.80%	13.99%
-10%	13.82%	13.01%	12.25%
-20%	11.90%	11.15%	10.45%

Source : JICA Project Team

6-8-3 Social Validity

In addition to the direct economic effect, following indirect effect is expected by implementing the project.

(1) Production of home consumption rice

No rice production could be conducted since irrigation system since constructed irrigation facilities has been collapsed. Farm households in the project area are forced to purchase home consumption rice. By leading the project, rice production becomes possible, as the results, they can reduce purchasing amount.

(2) Increase of farm household income by introducing integrated farming

By implementing the project, integrated farming with breeding livestock and diversified cropping can be introduced into the area. Farmers can sell the crops like vegetable through merchant. This can bring to generate farm household income. Strengthening integrated farming surely contributes to self-reliance of related farmers.

(3) Alleviation of adverse effect of flood

The Headworks (weir) is expected to not only stable intake water but also alleviation of flood power and effect of sabo, which could contribute to stable river bed. These interaction effects are expected to an alleviation of flood damage and a disaster prevention, indirectly.

(4) Mitigation of flood damage by irrigation facilities

By constructing the weir, flood damage can be mitigated on the down stream area. It is also expected to reduce flooding water flow velocity and contribute to make river course stable.

6-8-4 Project Evaluation at pre-F/S Level

Technical input level for improvement of irrigation and rice farming is based on the existing local level. Its level is considered to be applicable in the area. EIRR (Economic Internal Rate of Return) is estimated 15.7 %. It is judged to be feasible from the economic evaluation viewpoint. This project is considered to be the strengthening model for self sufficient agriculture. This development model can be applied into the similar irrigation area in sloped and mountainous area. According to the irrigation inventory survey, 79% of the total 425 irrigation schemes are classified into small scale traditional scheme with average irrigable area 55 ha. Irrigation schemes where farm household can not produce enough amount of rice for home consumption purpose are located in the country. This development model can be applicable in such similar areas. In-direct effects as mentioned above can be brought from the project implementation. In term of the environmental and social consideration, no negative impact will be caused. Under such consideration, this project is judged to be feasible as an overall evaluation.

CHAPTER 7 ACTION PLAN FOR IMPLEMENTATION OF PRIORITY PROJECTS

7-1 PREPARATION WORK FOR PRIORITY PROJECTS

7-1-1 Making Governmental Consensus

Super goal of the rice policy, “Local rice production is increased for contributing to the national food security” can be achieved by applying the both policies nationwide in the irrigation area. However, prior to launching nationwide project implementation for the policies, it is crucial to find and solve possible problems for providing project implementation and to reflect it to the nationwide project implementation method. Priority projects are regarded as a pilot and urgent project to lead nationwide project implementation.

Under such consideration, it is proposed that MAF recognizes the importance of priority projects and take action to make governmental consensus to implement of them (referred to the section 6-2-7 in “Master Plan”)

7-1-2 Establishment of MAF Implementation Organization

Action taken by MAF so far was independent activity by national directorate like the MTOP and AAP, in case of donor’s supporting project, related national directorate has participated in it led by the donors. As the results, outcomes and lessons learned from the past activities and donor projects were unshared as the cross cutting subjects among related national directorates. In the priority projects proposed, integrated approach is required to increase local rice production. Project activities are designed so as to link with related national directorates with rice production systematically. In order to implement the priority project effectively, it is required to establish new implementation organization in MAF, separately from the existing organization.

New organization for promoting rice productivity supporting policy should be organized by three development sections; irrigation, rice production and processing and marketing. Each section is consisted by the well versed staff recruited from related national directorates. Draft of organization structure is proposed as shown in Figure 7-1-1.

Related for production incentive stimulating policy, KONSSANTIL is designed as a key organization to communicate with related organizations in the MAF for aiming to national food security. However, it was not fully functioned to activate rice production and marketing in cooperation with related directorates. Considering this situation, section dealing with paddy purchasing system should be established in the new MAF organization structure. This section staff should be recruited from the SFSSNC (Secretariat of Foods Security and Sovereignty, Nutrition and Cooperation), who is responsible for paddy purchasing system in the nationwide rice policy implementation in cooperation with KONSSANTIL. SFSSNC is charged with situation analysis related with rice policy and discussion with MCIE on paddy purchasing system.

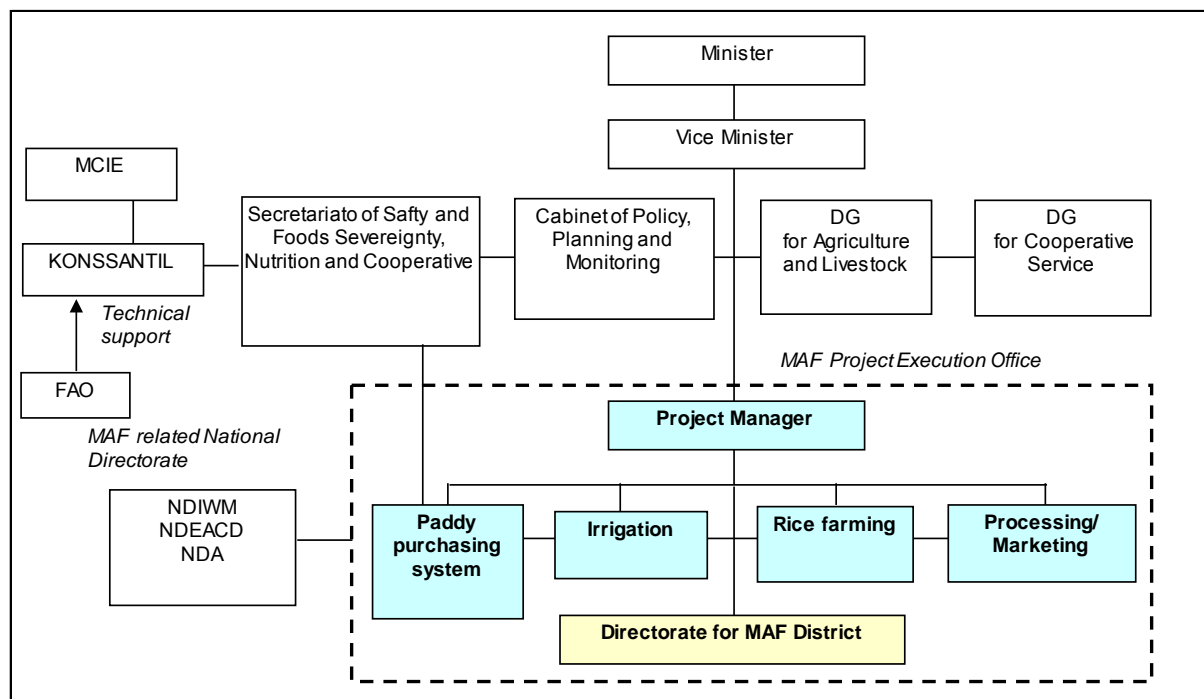


Figure 7-1-1 Draft of MAF Implementation Organization for Priority Projects

7-2 PRIORITY PROJECTS WITH CAPACITY DEVELOPMENT

MAF is the implementation body for the priority projects. It is strongly proposed that MAF provides development stages of planning, designing and operation/ management as an implementation body. However, present capacity of MAF is considered to be weak, judging from the implemented projects and activities conducted so far. Capacity development is needed for MAF implementation organization to promote the proposed priority projects.

For promoting the productivity improvement supporting policy, capacity in planning, designing and implementing the proposed programs/ projects is required. It is also important to provide communication and cooperation capacity among each section of irrigation, rice farming and processing and marketing. As for paddy purchasing system, it is needed in the fields of analysis capacity on outcomes and lessons learned from the past MCIE paddy purchasing system, basic knowledge related to current rice marketing including import rice, setting purchase price of paddy. Communication/ arrangement capacity with MCIE is also important to promote the paddy purchasing system.

Capacity development is the crucial subject for established MAF implementation organization to promote nationwide master plan, rice policy implementation. Capacity development should be done in the priority project implementation process. Considering the present MAF capacity, priority project should be implemented under the technical support by donor agencies. Priority project should be operated by the OJT (On-the-Job Training) manner. Necessary capacity could be obtained through this OJT. After the priority projects, capacity of related staff could be developed so as to promote nationwide master plan implementation.

7-3 ACTION PLAN FOR PRIORITY PROJECTS

7-3-1 Approach to Implementation of the Priority Projects

Basic concept for implementing the priority projects is as follows.

Preparation work

-
- (1) Preparation/ arrangement with related ministries and budgeting;
 - (2) Formulation of MAF capacity development project implementation plan with related ministries approval (implementation plan as at technical cooperation project by donor)
 - (3) Setting of the project implementation organization in MAF (see Figure 7-1-1)

Implementation of the priority project with capacity development

- (4) On the Job Training through the priority projects.
 - 1) Learning from past related projects and on-going projects.

It is recommended that MAF recognizes significance and necessity of the rice policy in the master plan. Moreover, MAF is requested to find and analyze the development constraints in each field of irrigation, rice farming and processing/ marketing for promoting rice policy through learning from the on-going and completed projects/ activities. These should be reflected on the overall planning and designing stages of the priority projects.

- 2) Preparation of action plan for improving paddy purchasing system

Paddy purchasing system should be settled as a sustainable policy to provide production incentive for rice farmers. Related to future paddy purchasing system, it was discussed with MCIE that both MCIE and it is essential that MAF collaborates to improve it for functional and useful system for rice farmers/ cooperative and traders. MAF is strongly requested to incorporate rice production viewpoint into the purchasing system. This priority project should be launched urgently in parallel with making consensus among related ministries related to the master plan implementation. This project would be supported by related donors and experts versed in governmental purchase of agricultural products.

- 3) Promotion project for local rice production in Halecou irrigation scheme in Bobonaro district

This project is to increase local rice production through improvement of irrigation system, rice farming and rice marketing in Bobonaro district where rice production is active. For market improvement, as a market channel of paddy, paddy purchasing system is applied. Project area is the learning place for related staff of the implementation organization to develop capacity in the technical fields of irrigation, rice productivity and post-harvest processing/ marketing. In the learning, as a first approach to developing the irrigation system improvement, its planning and design should be updated from pre-feasibility study level to the implementation study level. This is the first action for realizing the project. This project should be launched together with the above 2) Preparation of action plan for improving paddy purchasing system, since paddy purchasing system would be adopted. Project implementation period is planned to be five years to improve rice farming and market channel development including purchase of paddy by government.

- 4) Promotion project for local rice production in Saketo irrigation scheme in Viqueque district

Objective of this project is the same as the above mentioned 3) project in Halecou area. Different condition is the availability of water resource. This project is considered to be the development model for the similar areas in the south region in the Timor-Leste. Trial of paddy purchasing would be adopted as well as in the Halecou area. Implementation plan including launch and implementation period is the same as the 3) project.

- 5) Local rice market improvement project in Maliana wide area in Bobonaro district

Maliana wide area is considered to be the higher development potential of rice market. In this project, it is expected to establish business model of local rice aiming to increase local rice production. It is planned to make distribution or marketing flow of paddy (or rice) from collection to shipping more

effective. This project is expected to cooperate with Mariana I irrigation area and Halecou irrigation area in market development. It is originally scheduled to launch in the following two year after the commencement of the 3) project; Halecou area. However, launching this project may be rescheduled depending on the actual implementation progress of that 3) project.

- 6) Promotion project for strengthening food production in Bikaliu irrigation scheme in Viqueque district.

This project aims to ensure food security for rural household in the sloped and mountainous area. The objective is different from the other priority projects aiming to promote local rice production. Area scale is small, compared with other priority projects. Accordingly, although planning and designing stages are expected to be led by central MAF organization, implementation stage might be operated and managed by district organization. Considering such conditions, implementation period is planned to be four years. It is desirable to implement together with the 4) project, Saketo area, from the viewpoint of MAF's capacity development. If any implementation limitation arisen, its implementation priority is considered to be relatively low than the other priority projects.

7-3-2 Overall Implementation Plan of the Priority Projects

Overall implementation plan of the priority project is scheduled on the time table for nationwide master plan implementation, as shown in Figure 7-3-1.

Figure 7-3-1 Action Plan of Project for Increasing Local Rice Production

Rice Policy; Project for increasing local rice production	Overall target;	Local rice production is increased thereby contributing to national food security																
	Project component;	Production Incentive Stimulating Policy (paddy purchasing system) and Productivity Improvement Supporting Policy																
	Project target area;	425 irrigation scheme (total area 34,360 ha)																
	Execution organization;	MAF																
		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Preparation of Rice Policy		[Gantt bar: 2015-2016]																
Rice Policy Promotion Plan		[Gantt bar: 2015-2030]																
1 Formulation of Overall Promotion Plan of the Rice Policy																		
1-1 Making consensus of overall promotion plan of the rice policy in MAF		[Gantt bar: 2015-2016]																
1-2 Formulation of the overall promotion plan with Cabinet approval		[Gantt bar: 2015-2016]																
1-3 Establishment of implementation organization in MAF		[Gantt bar: 2015-2016]																
1-4 Formulation of MAF capacity development project for leading the rice policy with Cabinet approval		[Gantt bar: 2015-2016]																
2 MAF capacity development project for leading the rice policy		[Gantt bar: 2015-2030] <i>Capacity development for MAF to materialize the rice policy with paddy purchasing system</i>																
2-1 Preparation, Arrangeent with related ministries and Budgeting		[Gantt bar: 2015-2016]																
2-2 Formuon of MAF capacity development project implementaton plan with related ministries approval		[Gantt bar: 2015-2016]																
2-3 Setting of the project implementation organization in MAF		[Gantt bar: 2015-2016]																
2-4 Capacity development through OJT		[Gantt bar: 2015-2030] <i>Establishment of cross sectional organization in central and related district level</i>																
1) Learning from past related projects and on-going projects		[Gantt bar: 2016-2018]																
2) Priority project No.1; Preparation of action plan for improving paddy purchasing system		[Gantt bar: 2016-2022] <i>Establishment of paddy purchasing system</i>																
3) Priority project No.2; Promotion project for local rice production in Halecou irrigation scheme in Bobonaro district		[Gantt bar: 2017-2022] <i><Fund source; Infrastructure fund, MAF budget> Irrigation, farm improvement and processing/ market development with paddy purchasing system</i>																
4) Priority project No.3; Promotion project for local rice production in Saketo irrigation scheme in Viqueque district		[Gantt bar: 2017-2022] <i>Irrigation, farm improvement and processing/ market development with paddy purchasing system</i>																
5) Priority project No.4; Local rice market improvement project in Maliana wide area in Bononaro district		[Gantt bar: 2019-2022] <i>Strengthening local rice market</i>																
6) Priority project No.5; Promotion project for strengthening food production in Bikaliu irrigation scheme in Viqueque district		[Gantt bar: 2017-2022] <i>Irrigation, farm improvement</i>																
3 Nationwide Project Implementation by MAF																		
3-1 Preparation (making consensus, overall budgeting)		[Gantt bar: 2015-2016]																
3-2 Preparation of naionwide project implementation plan		[Gantt bar: 2017-2022]																
3-3 Establishment of project implementation organization in central and district level		[Gantt bar: 2017-2022]																
3-4 Recurrent project implementation on the batch basis of selected irrigation schemes		[Gantt bar: 2015-2030] <i>Priority projects in OJT</i>																
	Target fields	No. of scheme	Area (ha)															
	Irrigation	Urgent rehabilitation	74	7,590	[Gantt bar: 2015-2030]													
		Detail survey	156	15,010	[Gantt bar: 2015-2030]													
		Examination survey	195	11,760	[Gantt bar: 2015-2030]													
	Farming/ processing/marketing	425	34,360	[Gantt bar: 2015-2030]														
Monitoring/ evaluation of the project implementation		[Gantt bar: 2015-2030]																

7-4 SHORT TERM ACTION PLAN (2015-16) FOR PRIORITY PROJECTS

Priority project should be prioritized prior to the nationwide master plan implementation. To realize this situation, it is necessary that MAF takes actions immediately for making governmental consensus as national policy. In addition, political consensus on paddy purchasing system with MCIE and budgeting approval should be made. On the other hand, for promotion of rice policy, ministerial consensus and establishment of MAF implementation organization should be made within the MAF.

Action taken by MAF to realize the above situation is itemized in the Table 7-4-1. Main implementation division and national directorate are also listed.

Table 7-4-1 Short Term Action Taken by MAF for Realizing the Priority Projects

Items	2015				2016				Main Implementing Division
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	
1) Finalizing Agriculture Master Plan									
a) Productivity improvement supporting policy		■							Cabinet of Policy, Planning and Monitoring
b) Production incentive stimulating policy		■							Secretariat of Food Security and Sovereignty, Nutritional and Cooperation ND for Agriculture and Horticulture ND for Irrigation and Water Management
2) Realizing the productivity improvement supporting policy									
a) Making consensus on the policy in MAF		■							Cabinet of Policy, Planning and Monitoring
b) Explanation of the policy to related Ministries			■						DG for Agriculture and Livestock
c) Establishment of the implementing organization in MAF				■	■				Secretariat of Food Security and Sovereignty, Nutritional and Cooperation
d) Preparation of overall project execution plan for increasing rice production				■	■				ND for Agriculture and Horticulture
e) Making capacity building plan for related MAF staff					■				ND for Irrigation and Water Management
f) Finalizing the priority projects with approval of Cabinet					■	■			ND for Extension and Agriculture Community Development
g) Budgeting for the implementation of the priority projects							■		
3) Realizing the production incentive stimulating policy									
a) Making consensus on the policy including tariff policy in MAF and Cabinet		■							Secretariat of Food Security and Sovereignty, Nutritional and Cooperation
b) Review of the existing purchasing system with MCIE		■							DG for Cooperative Services
c) Improvement of the paddy purchasing system through KONSSANTIL								▶	DG for Agriculture and Livestock
d) Making the 2016 paddy purchasing plan with MCIE			■	■					ND for Agribusiness
e) Discussion on improvement plan (introduction of quality standard and training for inspectors)				■	■				ND for Agriculture and Horticulture
f) Making the 2017 paddy purchasing plan with MCIE							■		

CHAPTER 8 CONCLUSION AND RECOMMENDATION

8-1 CONCLUSION

8-1-1 Selection of Priority Project

In order to materialize the master plan in the nationwide irrigation scheme, it is crucial to identify and fix some problems through the pilot project implementation. The proposed priority projects are regarded as pilots and urgent project to lead nationwide master plan implementation.

As one of the priority projects, “preparation of action plan for improving paddy purchasing system” to embody the rice production incentive supporting policy is selected. In addition, as for productivity improvement supporting policy, three (3) local rice production promotion projects in the rice bowl areas and one project for food production enhancement in subsistence farming area are selected. Target areas of the priority project are selected from the existing 425 irrigation schemes. As the first step of site selection, candidate areas are listed from the viewpoints of necessity of irrigation rehabilitation, in next step, the areas are narrowed down by in viewpoints of development potential of rice farming and processing/ marketing. As the results, following five projects are selected as the priority projects.

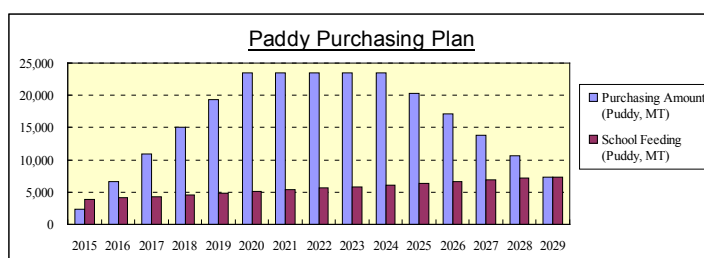
Development plan of each priority project is described in following sub-chapters.

Priority Project	Development model	Development direction	Production Incentive Stimulating Policy		Productivity Improvement Supporting Policy		
			Tariff Policy	Paddy purchasing system	Irrigation	Paddy productivity	Processing & Marketing
1 Preparation of action plan for improving paddy purchasing system	Improvement model of paddy purchasing system	Improve the paddy purchasing system so that rice farmers can expand paddy production.		*			
2 Promotion project for local rice production in Halecou irrigation scheme in Bobonaro district	Local rice production/ market promotion model in rice market wide range area	Provide production and market conditions so that rice farmers can move into commercial rice production.		*	*	*	*
3 Promotion project for local rice production in Saketo irrigation scheme in Viqueque district	Local rice production/ market promotion model in remote area from large rice market	Provide production and market conditions so that rice farmers can move into commercial rice production.		*	*	*	*
4 Local rice market improvement project in Maliana wide area in Bobonaro district	Local rice market improvement model	Strengthen local rice market channel through improving rice quality, realizing low cost supply chain and motivating rice farmers.		*		*	*
5 Promotion project for strengthening food production in Bikaliu irrigation scheme in Viqueque district	Strengthening model for self sufficient agriculture	Ensure food security in household level through strengthening food production and integrated farming.			*	*	

* : Applied in the Priority Project

8-1-2 Preparation of Action Plan for Improving the Paddy Purchasing System

The proposed paddy purchasing system is to secure a market channel of produced paddy, which surely stimulates rice farmers for expanding paddy production. It is planned to increase quantity of the rice purchase gradually considering rice farmers' sales intention. Peak amount is originally designed at 24,000 ton, namely, 21 % of the forecasted total production, from 2020 to 2024. The amount will be decreased due to the free market mechanism gradually by shifting buyers from the government to the private sector. Future outlook of purchasing system should be discussed with MCIE. Therefore, it is necessary to make a consensus for setting of rice purchasing volume among MCIE and other related ministries through KONSSANTIL.



The short term action plan for improvement of the paddy purchasing system is proposed as shown in

8-1-4 Promotion Project for Local Rice Production in Saketo Irrigation Scheme in Viqueque District

This project is to ensure increase of local rice production as well as in the case of Halecou irrigation scheme mentioned above. By improvement of irrigation system, techniques of rice production and processing/ marketing system, local rice production for both home consumption and commercial purposes is increased. This is achieved through taking actions to provide available market channels of produced paddy or rice. Such market channel securement gives production incentive to the rice production farmers.

Basic area information				
Irrigation potential area (irrigation planning area)		410 ha (287 ha)		
No. of beneficiary / farm household (av. HH size)		852/ 112 HH (7.61/HH)		
Irrigation system rehabilitation plan				
Intake	Fix weir	Intake gate, Scouring sluice	1 set	
Canal	Deliver canal/ Main canal/ sedimentation basin	3.75 km		
	Secondary canal	Earth/ stone lining canal		
Input cost (US\$1,000)		2,757		
Productivity improvement plan				
Cropping plan		Area (ha)	Yield (ton/ha)	Production (ton)
Wet	Paddy	287	3.5	1,004.5
	Maize	15	1.5	22.5
Dry	Paddy			
	Maize			
Input cost (US\$1,000)		70		
Processing/ marketing improvement plan				
Paddy production (ton)			1,004.5	100%
Home internal use (consumption/ seed/ Loan repayment, etc)			500.2	50%
Sale of surplus (Trader/ Collector/ Rice miller/ MCIE, Direct sale, etc)			504.3	50%
Purchase of rice (ton)			0.0	
Maize production (ton)			22.5	100%
Internal use (consumption/ stock/ seed/ feed)			20.9	93%
Sale of surplus			1.6	7%
Input cost (US\$1,000)			110	
Project cost/ Economic analysis				
Project cost (US\$1,000)			1,320	
EIRR; Economic Internal Rate of Return (%)			11.6	

Technical support level for improvement of irrigation, rice farming and processing/ marketing in the project is appropriate for the situations in the area. EIRR is estimated at 11.6 %, therefore, the project is judged to be feasible from the economic evaluation viewpoint. The project can be a model of local rice production/ market promotion in the remote area far from Dili's rice market. The model can be applied in the similar rice bowl areas located in the south region, districts; Viqueque, Covalima and Ainaro. Moreover, in term of the environmental and social consideration, no significant negative impact is expected. Under such conditions, this project is judged to be feasible on the whole.

8-1-5 Local Rice Market Improvement Project in Maliana Wide Area in Bobonaro District

Agricultural production area located in Maliana and Calico sub-districts has a high potential for rice production and marketing in the country. This project is to formulate rice a market development model, which can be applied to other rice production area such as irrigation areas in the Baucau district.

Current paddy production in the area is roughly assumed at 13,700 ton. The amount of rice for the commercial purpose is roughly estimated at 9,700 ton, however, it is fluctuated depending on the production. Since cheaper rice is imported, the local rice market is unstable. It is difficult for traders/ rice millers to obtain a profit at the local rice market.

To cope with this situation, it is important to take integrated approach from production to marketing. Therefore, it is necessary to provide business incentive for the rice production farmers, collectors/ traders/ rice millers and so on. The project proposes to establish a "Rice market center", in which they can work together to enhance rice market business.

The project plans to take actions; i) improvement of rice quality and adding value (improvement of rice milling technique, improvement of quality of paddy, paddy production based on the advance agreement, making rice processing products by using broken rice), ii) reduction of marketing and

selling cost (efficient works from rice collection to packaging, efficient payment to the rice production farmers, and promotion of rice selling to neighboring mountainous area), iii) motivation increase of the rice production farmers (selection of model farmers, demonstration and display of working process from production to post harvesting/ processing, support of cooperative shipping, and payment to rice farmers by making use of cooperative and NGOs).

It is proposed that MAF supports such activities. However, it is sometimes difficult for MAF to prepare action plans and operate/ manage them. Provision of technical support from related donors which are versed with such actions is needed. Therefore, it is proposed to implement this priority project under the JICA technical cooperation project.

8-1-6 Promotion Project for Strengthening Food Production in Bikaliu Irrigation Scheme in Viqueque District

This project aims at food securement for home consumption. By the project implementation, not only paddy but also maize and vegetables are to be cultivated further. Consequently, the proposed project can contribute to not only production increase for home consumption but also improvement of the farm household income through sale of the vegetables.

The proposed technical support level for improving the irrigation system and rice farming in the project is determined based on the available local resource in and around the area. Since the EIRR is estimated at 15.7 %, the project is valid

in term of economic view. As for environmental and social consideration, no big-scale negative and long-term impact can be caused. Under such conditions, this project is judged to be feasible as a whole. This project can be the development model for strengthening self-reliance agriculture. By the project implementation, annual farm household income is expected to be increased from US\$2,300 to US\$4,900. This development model can be applied into the similar irrigation areas in sloped and mountainous area. According to the irrigation inventory survey, 79% of the total 425 irrigation schemes are classified into the small scale traditional scheme and the average irrigable area of those schemes is 55 ha. In the most of such irrigation schemes, farmers can't produce enough rice for home consumption at this moment. This development model can be applicable in such areas.

8-2 RECOMMENDATION

The proposed priority projects are considered to be feasible. These projects should be implemented as

Basic Information				
Irrigation potential area (irrigation planning area)		50 ha (30 ha)		
No. of beneficiary / farm household (av. HH size)		203人/30戸 (6.78人/戸)		
Irrigation system rehabilitation plan				
Intake	Fix wier	Fix weir	18 m	
Canal	Deliver canal/ main canal	Stone/ concrete canal	1.6 km	
	Secondary canal	Earth canal	1.5 km	
Input cost (US\$1,000)		350		
Productivity improvement plan				
Cropping plan		Area (ha)	Yield (ton/ha)	Production (kg)
In the area				
	Paddy	15	2.5	37,500
	Maize	15	1.0	15,000
Wet	Onion	3	3.0	9,000
	Peppar	3	3.0	9,000
	Mustard	4	6.0	24,000
Dry	Beans	10	1.5	15,000
Out of the area				
	Wet Maize	8.5	0.4	3,400
Input cost (US\$1,000)		43		
Food security plan (Home consumption food production)				
Paddy production (kg)		25,000		
Home internal use (consumption/ seed, etc)		25,000		
Sale of surplus		0		
Purchase of rice (kg)		12,324		
Corn production (kg)		18,400		
Vegetables production (kg)		42,000		
Project cost/ Economic analysis				
Project cost (US\$1,000)		393		
EIRR; Economic Internal Rate of Return (%)		15.7		

a series of pilots, prior to the nationwide master plan implementation. In order to execute the priority projects, it is recommended that MAF takes action to make political consensus among related ministries, budgeting and establish a new implementation organization within MAF.

On the other hand, seemingly, it will be difficult for MAF to plan, operate and manage those priority projects. Therefore, it is proposed to strengthen capacities of MAF further and it is needed to conduct such capacity development through on-the-job style in the implementation process of the priority projects. Through this, MAF can obtain more knowledge and skills to manage the implementation of the nationwide master plan. Thus, it is recommended that the priority projects are to be implemented under the technical support from the donors concerned, which are well versed in such technical fields.

III. Environmental and Social Consideration

CHAPTER 1 STRATEGIC ENVIRONMENTAL ASSESSMENT

1-1 POLICIES, PLANS AND PROPOSED GOALS

The SDP (2011-2030) regards the agricultural sector as one of key sectors for development of Timor-Leste and it specifies some targets for food self-sufficiency improvement by 2030, e.g. increase of irrigated area in the country. At the same time, the SDP mentions that the National Planning Framework to promote sustainable economic growth and equitable development, from national level to Sucos level, will be prepared until 2015, with protecting Timor-Leste’s biodiversity and natural environment in the conservation zones. It means that fair economic development taking consideration into environmental conservation is very important for the country.

Based on the SDP mentioned above, MAF also has developed the MAF-Strategic Plan, MTOP and MTIP. The proposed Agriculture Master Plan through the Project is to supplement the existing plans mentioned above and focuses on domestic food production increase for food security. Considering achievement of goals set so far, the goal of the proposed Agriculture Master Plan is set as “Local food production is increased through enhancing farmers' production incentive by improving enabling production environment”. The Master Plan presents issues to be solved and countermeasures, and proposes programs and projects for increase of domestic food supply.

1-2 STRATEGIES TO ACHIEVE THE PROPOSED GOAL

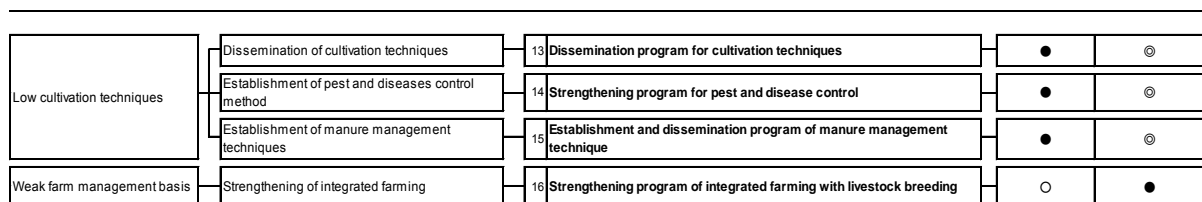
For the purpose of the achievement of the proposed goal, five strategies are proposed. They are: 1) Irrigation system is improved, 2) Crop productivity is improved, 3) Processing and marketing process of local rice is improved, 4) Rice farmers have high incentive to expand rice production, and 5) MAF’s capacity is improved. Several programs/projects are proposed for each strategy. Setting priority of proposed programs/projects, namely, high priority, moderate priority and low priority are put for the proposed Rice bowl Areas and Subsistent Farming Areas, respectively, considering natural, social and technical conditions as follows:

Strategy 1: Irrigation system is improved.

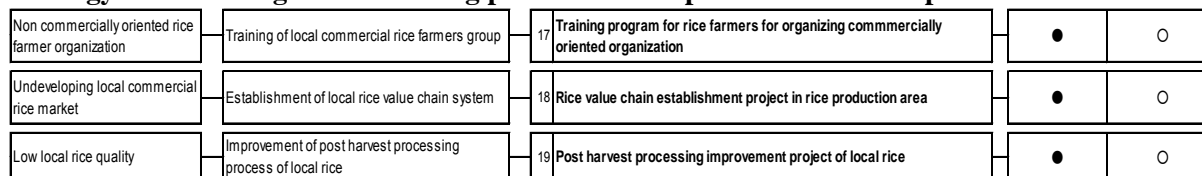
Subjects	Countermeasures	Program/ Project/ Policy/ Institution	Approach to applying program/ project/ policy/ institution	
			Rice bowl area	Subsistent farming area
<Productivity Improvement Supporting Policy>				
Lack of irrigation water	Making sure of water source	1 Intake weir construction project	●	◎
		2 Tube well construction project	○	●
		3 Regulating pond construction project	●	○
		4 Small irrigation water storage pond/ tank construction project for smallholders	○	●
Removal of deposited sediments	Establishment of WUA and strengthening of operation and management	5 Strengthening program for operation and management system of irrigation system	●	◎
	Creating of farmers' ownership sense	6 Farmers participation irrigation related facilities construction project	●	●
Protection of irrigation system and farmland	Provision of river control works	7 River control facility construction project for protection of irrigation system and farmland	●	◎
	Establishment of management system from facility design to supervision works	8 Capacity development program of NDIWM for leading irrigation development project	●	●

Strategy 2: Crop productivity is improved.

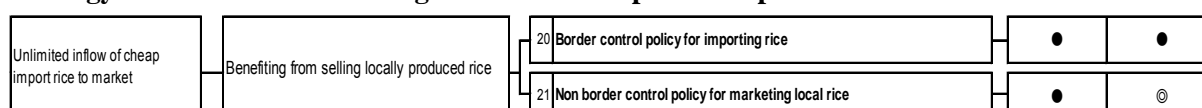
Lack of input materials	Obtaining of quality seeds	9 Program for obtaining and breeding quality seed	●	●
	Promotion of farm mechanization	10 Promotion program for private mechanization	●	○
	Provision for credit to obtain input materials	11 Establishment of agricultural fund system	●	○
	Making use of local resource	12 Local resource circulative agriculture promotion project	●	◎



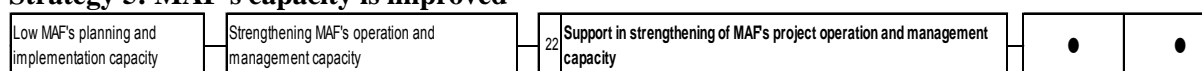
Strategy 3: Processing and marketing process of local produced rice is improved.



Strategy 4: Rice farmers have high incentive to expand rice production.



Strategy 5: MAF’s capacity is improved



● : High priority ◎ : Medium priority ○ : Low priority

Figure 1-2-1 Framework for Accomplishment of Goal

Note: Prior to target area selection, categorization of farmland in Timor-Leste into 1) Rice bowl area and 2) Subsistent farming area was done as mentioned in next sub-chapter, priorities of the proposed program/project are put depending on the situations in the two zones.

Concerning the strategy 4 “Rice farmers have high incentive to expand rice production”, it is a policy matter regarding the rice market, e.g., increase of tariff rate on rice. Followings are four proposed development scenarios to enhance incentive of rice production in the Strategy 4. The details of the proposed development scenarios are discussed in Chapter 7 of the Master Plan.

Development scenario	Contents
Development scenario-1	Inflow of cheap import rice under tariff 2.5% and sales tax 2.5% to the market is continued. MAF struggles to increase rice production under the present policy.
Development scenarios-2	Inflow of cheap import rice under tariff 2.5% and sales tax 2.5% to the market is continued, same as the development scenario-1. As for production incentive stimulating policy, MAF will choose suitable policies from proposed policy. Together with this, MAF will introduce proposed productivity improvement supporting policy. By applying both policies, MAF aims to expand rice production.
Development scenario-3	Government will choose the border control policy as production incentive stimulating policy. For example, tariff barrier will be erected and tariff rate will be set in the competitive price range between import rice and locally produced rice. Together with this policy, MAF will introduce proposed productivity improvement supporting policy. By applying both policies, MAF aims to expand rice production.
Development scenario-4*	Government will choose the border control policy as production incentive stimulating policy, same as the development scenario-3. As for tariff policy, however, tariff rate will be set to be high enough to restrict rice import practically. Together with this, MAF will introduce proposed productivity improvement supporting policy. MAF aims to reach the target of rice self-sufficiency by local rice.

*The development scenario-4 is excluded for further consideration on making development scenarios. It is concluded that it is hard to apply scenario-4, judging from a) the present social/ political situation in this country, b) discussions with the parties concerned so far, c) border control policies applied in the ASEAN countries, and d) Timor-Leste’s policy for affiliation to the ASEAN. Therefore, only scoping of the scenario-4 is discussed in this sub-chapter.

Proposed program/projects to achieve the strategies will not be implemented separately. Only irrigation project or improvement of farming technique improvement project is not effective to achieve the goal of the Agriculture Master Plan, since there are plural constraints to achieve the target. Those

programs will be integrated for implementation in each target area to maximize the effectiveness. Combination of programs/projects will be determined taking considering into natural/social conditions, needs and priority of each area.

1-3 EXAMINATION OF THE POLICIES AND PLANS

Prior to determination of target areas, zoning of agricultural areas of the country was done considering geological/hydrological conditions, current farming system, marketing /distribution conditions and so on. Two agricultural zones, namely, 1) Rice Bowl Area and 2) subsistent farming area, were identified. Five districts, which present the highest rice production and rice surplus, and which are advanced in terms of commercial rice production, were selected as the Rice Bowl Areas. Still, subsistent farming is also operated in the Rice Bowl Areas partly, which means that the five districts can be regarded as diversified area in view of rice production. The Rice Bowl Areas are Maliana area, Baucau area, Viqueque area, Ainaro & Covalima area and Oecusse area. Locations of the proposed rice bowl are illustrated in following figure:

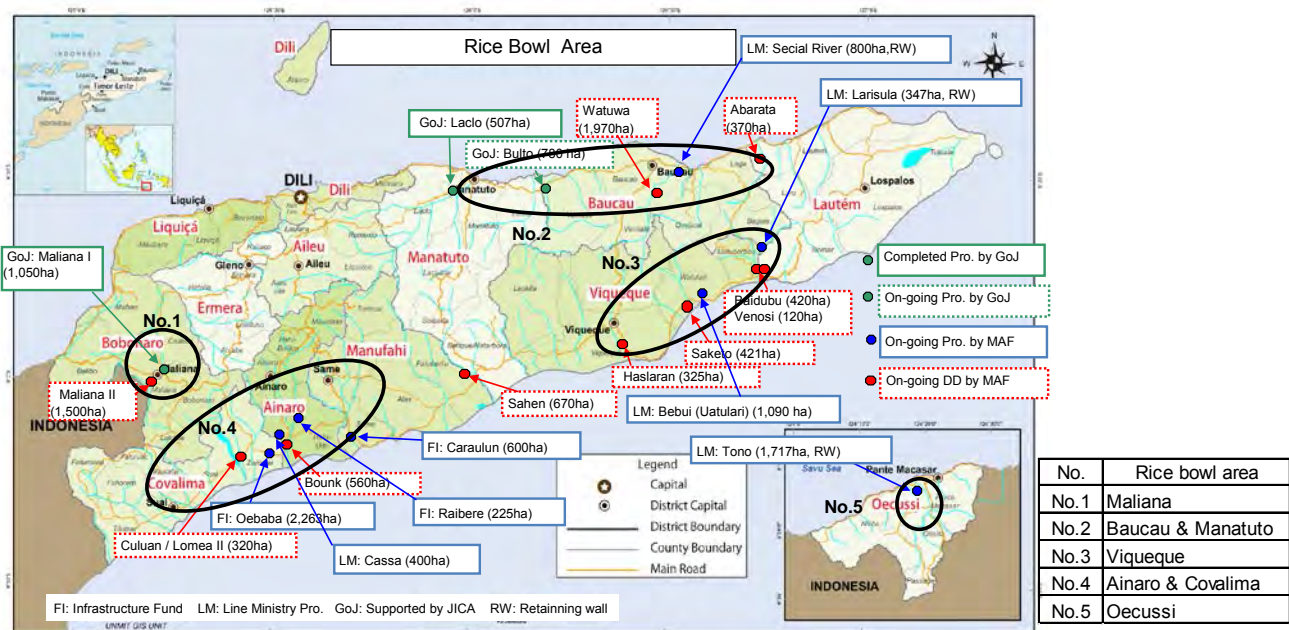


Figure 1-3-1 Location of the Rice Bowl Areas

Rice production is yet to be commercialized in the subsistent farming areas, and the farmers implement diversified crop cultivation, together with livestock breeding and other income generation activities. They mainly focus on ensuring food and nutrition for house consumption instead of commercial farming. Those areas also can be target areas of the project, however, priority of project implementation in the areas can be lower than that in the Rice Bowl Area.

1-4 SCOPING OF THE PROPOSED STRATEGIES

Expected impacts by the proposed strategies are examined as shown in following table. Out of those strategies, “Strategy 1: Irrigation system is improved” will take structural measures, therefore, issues, e.g., air pollution can be caused during the construction. However, it is not planned to construct big-scale irrigation facilities, therefore, scale of expected environmental impacts will be relatively small, and the duration will be limited to the construction period. There is a possibility that temporary land acquisition for stock yard is necessary, however, it could be limited to only construction period. At strategy level, locations of the proposed projects area yet to be identified, and impacts on conservation/protected areas are unknown.

Regarding “Strategy 4: Rice farmers have high incentive to expand rice production”, it has advantages and disadvantages for all policies. For instance, when the tariff of imported rice is increased, local rice will have competitive power with imported one, which leads to enhance motivation of domestic rice production farmers. On the other hand, general rice consumers will have to purchase rice at higher price than current one, which can give damages to the people’s livelihood.

Other strategies, namely, Strategy 2, 3 and 5 could not give environmental adverse impacts since their main components are technical improvement and capacity development.

Scoping of the proposed strategies are as shown below:

Table 1-4-1 Expected Environmental Impacts by the Proposed Strategies

Strategy 1: Irrigation system is improved. Strategy 2: Crop productivity is improved. Strategy 3: Processing and marketing process of local produced rice is improved. Strategy 4: Rice farmers have high incentive to expand rice production Strategy 5: MAF’s capacity is improved.					
Environmental Parameters	Strategy 1	Strategy 2	Strategy 3	Strategy 4	Strategy 5
1. Air Pollution	B ⁻ (construction period)	D	D	D	D
2. Water Pollution	B ⁻ (construction period)	D	D	D	D
3. Waste	B ⁻ (construction period)	D	D	D	D
4. Soil Contamination	B ⁻ (construction period)	D	D	D	D
5. Noise and Vibration	B ⁻ (construction period)	D	D	D	D
6. Ground Subsidence	D	D	D	D	D
7. Offensive Odor	D	D	D	D	D
8. Bottom sediment	D	D	D	D	D
9. Protected area	C	D	D	D	D
10. Ground water	C	D	D	D	D
11. Hydrological Situation	B ⁻ (construction period)	D	D	D	D
12. Topography and Geographical features	D	D	D	D	D
13. Involuntary Resettlement	D	D	D	D	D
14. Land Acquisition	B ⁻ (construction period)	D	D	D	D
15. Cultural heritage	D	D	D	D	D
16. Landscape	D	D	D	D	D
17. Indigenous and ethnic people	C	D	D	D	D
18. Livelihood/local economy	B ⁺	B ⁺	B ⁺	A/A ⁺	D
19. Existing social infrastructures and services	B ⁻ (construction period)	D	D	D	D
20. Misdistribution of benefit and damage	D	D	D	B ⁻	D
21. Social institutions	D	D	D	D	D

Strategy 1: Irrigation system is improved. Strategy 2: Crop productivity is improved. Strategy 3: Processing and marketing process of local produced rice is improved. Strategy 4: Rice farmers have high incentive to expand rice production Strategy 5: MAF's capacity is improved.					
Environmental Parameters	Strategy 1	Strategy 2	Strategy 3	Strategy 4	Strategy 5
22. Water Usage or Water Rights and Rights of Common	C	D	D	D	D
23. Gender	D	D	D	D	D
24. Children rights	D	D	D	D	D
25. Hazards (Risk), Infectious diseases such as HIV/AIDS	D	D	D	D	D
26. Accidents	B ⁻ (construction period)	D	D	D	D
27. Global Warming	D	D	D	D	D

A⁺: large scale positive impact, B⁺: small-medium scale positive impact, C: unknown, D: no impact of negligible,
A⁻: large scale negative impact, B⁻: small-medium scale negative impact

1-5 CURRENT ENVIRONMENTAL CONDITIONS

(1) Geological Conditions

Land area of Timor-Leste is around 15,000km² and it has steep cliffs in northern part in general and relatively gentle slope with plains and swamps in southern part. The highest mountain, namely, Mt. Tata Mailau (elevation: 2,963m), is located on the center of the country. Most of the plains along the seacoast are affected by flood of rivers and sea water intrusion due to sea level fluctuation, which gives impact on agricultural development. Oil and natural gas are produced in the sea area of southern part, those products contribute to the national finance.

(2) Meteorological Conditions

The country's meteorology condition is categorized into monsoon climate which has rainy and dry seasons. The rainy season is from December to April, while dry season is from May to November in general. However, it has certain amount of rainfall in the mountainous areas during the dry season, which means that trend of precipitation varies depending on the geological conditions and elevation. The country land is categorized into six zones in terms of agricultural metrology as illustrated figure right. It is possible to cultivate paddy twice per year in the South Coast Lowland, although it is easily affected by flood and high tide.



Figure 1-5-1 Agricultural Metrology Zone

Zone	Location	Area (ha)	Elevation (EL.m)	Annual rainfall (mm)
North Coast Lowlands	Lowland in the northern coast	147,000 (10%)	<100 m	<1000 mm
Northern Slope	North low land, hills, high land	337,000 (23%)	100-500 m	1000-1500 mm
Northern Uplands	Highest/ middle land in the north	290,000 (20%)	>500 m	>1500 mm
Southern Uplands	Hills/ mountainous land in the south	215,000 (15%)	>500 m	>2000 mm
Southern Slopes	Hills land in the south	305,000 (21%)	100-500 m	1500- 2000 mm
South Coast Lowland	Low land in the southern coast	167,000 (11%)	<100 m	<1500 mm
Total		1,461,000 (100%)		

Source ; National Directorate for Research & Specialist Services, MAF.

Compiled by the Study Team referring the State of Nation Report, Agriculture and Fisheries (April, 2008)

(3) Water Resources

1) Rivers in Timor-Leste

Timor-Leste has 29 main rivers and 12 hydrologic units as shown in Figure 1-5-2 and Table 1-5-1 (ADB, 2004, “Assessment of Water Availability and Water Demand in Timor-Leste at River Basin Level”), respectively. The average monthly river discharge of representative rivers in some hydrologic units is shown in the Figure 1-5-3 (ADB, 2004). The data of each river shows very clear tendency of flood season and dry season. In general, since water retention capacity of the watershed is low and the slope of rivers is steep, rain water in the mountainous area is flushed into the downstream immediately. Furthermore, as most of the land is originated from fragile geological formation such as limestone, in many cases, rain causes sediment discharge into the downstream.



Figure 1-5-2 Hydrologic Units and Main Rivers¹

Table 1-5-1 Specification of Main Rivers¹

Hydrologic Unit	Main Rivers		Catchment Area (km ²)	Length (km)	Average Annual Discharge (MC M)	Area
	No.	Name				
(1) Loes	1	Loes	2,417.0	116	1,741	North
(2) Lacio	2	Comoro	248.0	33	93	North
	3	Lacio	1,297.0	98	913	North
(3) Laleia	4	Laleia	533.0	55	304	North
	5	Vernasse	210.0	48	73	North
(4) Seical	6	Seical	489.0	45	269	North
	7	Uaimuhi	137.0	31	137	North
	8	Laivai	170.0	31	102	North
	9	Raumoco	191.0	30	96	North
(5) Vero	10	Malalada	170.0	36	91	North
	11	Irakaloro	423.0	25	299	North South
(6) Irabere	12	Namarulo	153.0	24	83	South
	13	Irabere	341.0	29	293	South
	14	Bebui	193.0	33	207	South
	15	Cuha	268.0	37	198	South
(7) Tukan & Sahen	16	Tuco (Weluai)	266.0	36	198	South
	17	Luca	238.0	40	173	South
	18	Dilor	225.0	43	154	South
	19	Sahen	294.0	54	230	South
(8) Clere & Belulic	20	Clere	288.0	51	213	South
	21	Lacio do Sul	216.0	49	149	South
	22	Caraulun	554.0	52	385	South
	23	Belulic	379.0	46	371	South
(9) Mola & Tafara	24	Mola	277.0	39	164	South
	25	Lourmea	348.0	36	260	South
	26	Raiquita	111.0	27	99	South
	27	Tafara	360.0	45	304	South
(10) Lilaui & Tono	28	Tono	499.0	50	311	Oecusse
	29	Bessi	338.0	45	217	Oecusse
(11) Jaco	-	-	11.0	-	-	Island
(12) Alauo	-	-	141.0	-	-	Island

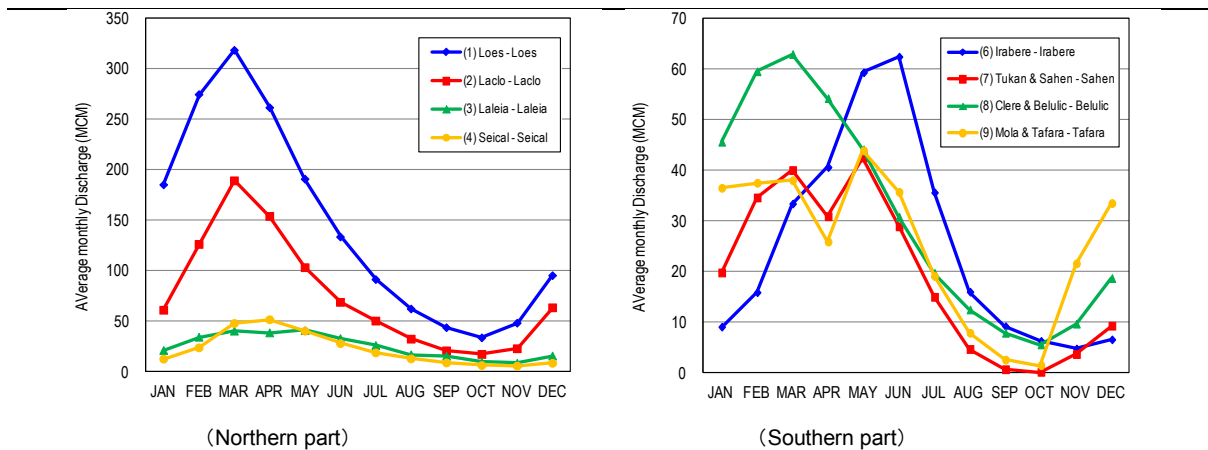


Figure 1-5-3 Average Monthly River Discharge

2) Trans-boundary Rivers

The watersheds of Loes River, Tafara River, Tono River and Bessi River are partly located in Indonesia, and they are important water sources for Indonesia as well as for Timor-Leste. Therefore, development activities within these watersheds such as agricultural development can reduce the volume of available water for Indonesia, which can cause a conflict. There is no agreement concerning development activities in these watershed between Timor-Leste and Indonesia at this moment. As of November 2014, MAF called on the Government of Indonesian to discuss the issue.

3) Ground Water

Hydrogeological conditions in Timor-Leste are classified into 3 groups, namely, 1) Intergranular Porosity, 2) Fissured Porosity (Karst) and 3) Localized Porosity in terms of rock texture, fracturing, lithology, age, extent and thickness¹. Since intergranular porosity and fissured porosity have relatively big pores, they have high potential of ground water. On the other hand, localized porosity consists of fractured, metamorphosed and crystalline igneous rocks, and it has little porosity and limited water flow. Considering the ground water potential, potential aquifer yield map is illustrated as shown below.



Figure 1-5-4 Potential Aquifer Yield Map

Remarks: The part colored in white shows low potential area in terms of aquifer yield.

¹ Vulnerability assessment of climate change impacts on groundwater resources in Timor-Leste, July 2012, Australian Government Department of Climate Change and Energy Efficiency

The areas which show high potential of aquifer range in southern and eastern coastal areas and a part of inland where young limestone is distributed. Northern coastal area has salty aquifer, therefore, amount of available ground water is not very big. Moreover, inland areas along rivers show low aquifer yield.

(4) Population

The total population of the country is 1.06 million (census survey, 2010), average number per household is 5.8. Annual population increase rate is 2.41%, which shows higher percentage compared with ones in other East-South Asian countries. Population, population density and population increase rate by district are presented in following table:

Table 1-5-2 Population by District

District	Area (km ²)	Population		Popu. Density 2010	Annual Growth Rate (%) (2004-2010)	Average HH size 2010
		2010	2004			
Aileu	663.02	44,325	37,926	66.9	3.02	6.3
Ainaro	817.26	59,175	52,476	72.4	2.06	6.1
Baucau	1,478.80	111,694	100,326	75.5	1.69	5.2
Bobonaro	1,252.49	92,049	83,034	73.5	1.19	5.4
Covalima	1,139.32	59,455	52,818	52.2	2.07	5.4
Dili	303.99	234,026	173,541	769.8	4.80	6.7
Ermera	759.73	117,064	103,199	154.1	1.73	6.1
Lautém	1,708.34	59,787	55,921	35.0	1.12	5.3
Liquiçá	525.65	63,403	54,834	120.6	2.36	6.1
Manatuto	1,629.09	42,742	36,719	26.2	2.65	6
Manufahi	1,250.81	48,628	44,950	38.9	1.35	6.5
Oecussi	731.97	64,025	57,469	87.5	2.14	4.7
Viqueque	1,797.01	70,036	65,245	39.0	1.16	5.2
Total	14,057.48	1,066,409	918,458	75.9	2.41	5.8

Source : Population and Housing Census 2010, National Statistics Directorates

(5) Industrial and Economic Structure

Total GDP of the country in 2010 is US\$4,130 million including oil industry, while GDP excluding oil industry is US\$875 million, which means that the oil industry accounts for high percentage of the industries in the country. GDP per sector is described in following table:

Table 1-5-3 GDP by Sector

Items	2008	2009	2010
GDP (million US\$)	4,414.7	3,283.4	4,130.5
Oil sector	3,749.7	2,495.3	3,255.3
Non-oil sector	665.0	788.1	875.1
Gross national income (GNI) (million US\$)	3,288.7	2,598.1	3,167.4
GDP per capita (US\$)	4,096	2,958	3,615
Oil sector	3,479	2,248	2,849
Non-oil sector	617	710	766

Source: Timor-Leste's National Accounts 2004-2010 Volume I National Directorate of Statistics, MoF

When it comes to percentage of industries in GDP excluding oil industry, "Wholesale and retail trade, transportation and storage, accommodation and food service" accounts for 24.1%, which is the highest, while "agriculture, forestry and fishery" accounts for 21.4%. Regarding population by industry, "agriculture, forestry and fishery" accounts for 65%, which is the largest in the country.

(6) Land Ownership

According to the Constitution of Timor-Leste, all national citizens have rights to ownership of land. However, legislation of the proposed law related to land ownership in Timor-Leste has not been done yet, which makes it difficult to identify land ownership. Ministry of Justice has implemented a survey for confirming land ownership in nationwide by contracting with a Portuguese consultant company from 2014 to 2020 (JICA Team, 2013). However, they put priority of the survey on the residential areas, which leads to delay of survey in rural areas. There are many lands where ownerships are not identified during the Portuguese Era, Indonesia Era and independence, there are many land disputes under examination at the courts.

(7) Land Cover

Land cover of the country is diversified very much, for example, forest, grass land and so on depending on district. In general, forest occupies large percentage of the land, around 60% and it is followed by area of grass land. Paddy cultivation is actively done in Covalima, Baucau, Viqueque and Bobonaro. Land cover of Timor-Leste by district is shown as follows:

Table 1-5-4 Land Use of Timor-Leste

Unit: ha

District	Grass land	Bare land	Paddy field	Dry farm	Settlements	Water body	Very sparse forest	Dense forest	Sparse forest	Cloud covered area	Total
Lautem	37,982.78	2,376.39	611.68	8,947.64	0.00	269.64	4,090.58	59,284.55	66,467.80	1,234.01	181,265.07
Viqueque	55,299.91	2,810.27	6,889.12	878.51	22.23	1,580.59	46.89	45,637.80	72,808.33	1,769.54	187,743.19
Baucau	45,484.35	4,779.57	7,764.04	798.43	53.18	1,016.74	5,749.75	25,715.02	58,149.23	1,079.59	150,589.90
Manatuto	18,948.30	2,177.01	4,711.21	474.26	0.00	4,339.93	23,290.33	47,528.89	74,181.35	2,532.37	178,183.65
Manufahi	45,684.75	299.44	3,049.97	2,546.53	0.00	2,665.50	1,706.15	32,397.43	41,362.00	2,603.55	132,315.32
Ainaro	34,748.65	214.03	450.33	2,097.09	0.00	1,244.52	2,183.76	13,160.20	24,620.31	1,679.24	80,398.13
Aileu	19,981.26	1,100.06	147.44	0.02	0.00	314.67	18,032.77	9,255.37	24,425.68	473.83	73,731.10
Dili	8,482.38	2,065.31	242.34	0.00	2,154.14	147.15	2,517.84	6,011.52	13,889.75	1,194.73	36,705.16
Liquica	15,117.36	2,812.79	265.80	1,056.10	10.94	1,113.43	2,425.67	16,958.83	14,601.96	546.05	54,908.93
Ermera	32,670.30	5,098.20	1,177.76	44.05	0.00	1,597.08	1,466.03	16,061.58	18,625.98	91.76	76,832.74
Bobonaro	40,470.46	8,088.47	5,416.26	2,692.70	432.31	3,590.54	1,642.73	15,543.09	58,732.74	987.93	137,597.23
Covalima	33,869.41	4,934.77	8,133.26	2,286.02	315.77	2,689.46	20.95	19,353.68	47,593.15	1,058.00	120,254.47
Oecusse	14,507.31	11,960.70	2,528.15	331.22	0.00	2,308.06	0.00	6,022.71	40,741.46	2,962.73	81,362.34
Total	403,247.22	48,717.01	41,387.36	22,152.57	2,988.57	22,877.31	63,173.45	312,930.67	556,199.74	18,213.33	1,491,887.23
(percentage)	27%	3%	3%	1%	0%	2%	4%	21%	37%	1%	100%

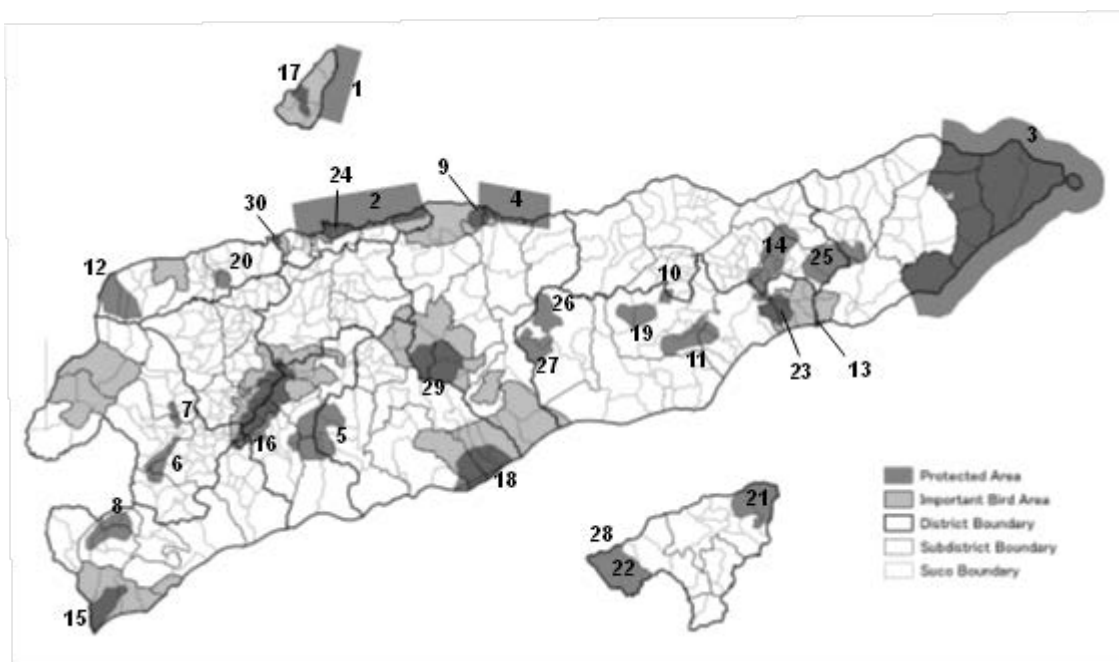
Source: NDFWM, "Land Cover, Land Use and Forest Status in Timor-Leste in 2010"

(8) Protected Areas

"Regulation No. 2000/19 on Protected Places" (UNTAET, 2000) stipulates 15 areas constituting islands, beaches, mountains, sanctuaries, reserves and so on as protected wild areas. Those areas shall be managed to maintain and enhance their wild and natural characteristics. Construction of structures and roads, hunting, taking/disturbing of plants, use of land for agricultural purpose and pollution of those protected areas are prohibited within the area. In 2007, additional 17 protected areas were identified by the Department of Protected Areas and National Parks. In 2011, some of those sites were combined and the total number of the sites was set at 30. After that, the number of protected wild areas has been increased gradually, at present, 52 sites have been identified (NDFWM, 2014).

In addition to those protected wild areas, Important Bird Areas (IBA) are identified as protected areas, with limitation for new development as well as in the protected wild areas. IBA is also regarded as the area to be protected according to the NDFWM. The locations of protected wild areas and IBA are

illustrated as follows²:



List of the Protected Areas

1. Mount of Ataruo	16. Mount Tatamailau and Talobu/Laumeta
2. Behau Mangrove/forestry	17. Manucoco Protected Area
3. Nino Konia Santana Ntional Park	18. Ribeira de Clere and lake of Modomahut
4. Lake of Lamsanak	19. Mount of Mundo Perdido
5. Mout of Cabiague and Lake of Welenas	20. Mount of Fatumasin
6. Mount of Tapo/Saburai	21. Mount Cutete
7. Mount of Loelako	22. Mount Manoleu
8. Mount of Taroman	23. Mount of Burabo
9. Mount of Kuri	24. Cristo Rei Protected Area
10. Mount of Laretame	25. Mount Legumau
11. Mount of Builo	26. Mount of Aitana
12. Mount of Guguleur	27. Mount of Bibileo
13. Lake of Maurei	28. Are Mangal Citrana
14. Mount of Matebian	29. Mount New Diatuto
15. Area Protegida Reserva de Tilomar	30. Tasitolu Lake

Figure 1-5-5 Location Map of Protected Areas and IBAs

According to the Department of Biodiversity, MCIE, it is prohibited to start any activities such as agriculture or construction works within the protected wild areas and IBAs. However, it is allowed for the residents to continue farming or doing other activities for their livelihood in the area, if they have operated those activities before declaration of the Protected Areas. Furthermore, it is possible to rehabilitate existing facilities and to occupy some areas temporarily for such rehabilitation works, however, it is not allowed to expand scale of existing facilities.

In addition to the protected areas mentioned above, 24 wetlands and water bodies are identified as “Wetland of national significance in Timor-Leste” according to “The National Biodiversity Strategy and Action Plan of Timor-Leste (2011-2020)” (2011), which are also regarded to be protected from

² The number of total protected areas is 52, however, the latest location map of protected areas is under revision and only 30 sites are illustrated on the map. Therefore, 30 sites of protected areas and IBA are shown in the figure.

new development, however, the location map is still under preparation. There is no wetland which is registered as the Ramsar site in Timor-Leste at this moment.

1-6 LEGAL AND INSTITUTIONAL SYSTEM

(1) Institutional Framework

In Timor-Leste, plural governmental organizations are involved in environmental and social consideration. Department of EIA under the National Directorate of Environment (NDE), MCIE is responsible for EIA process. Following figure illustrates the organization chart of General Directorate of Environment.

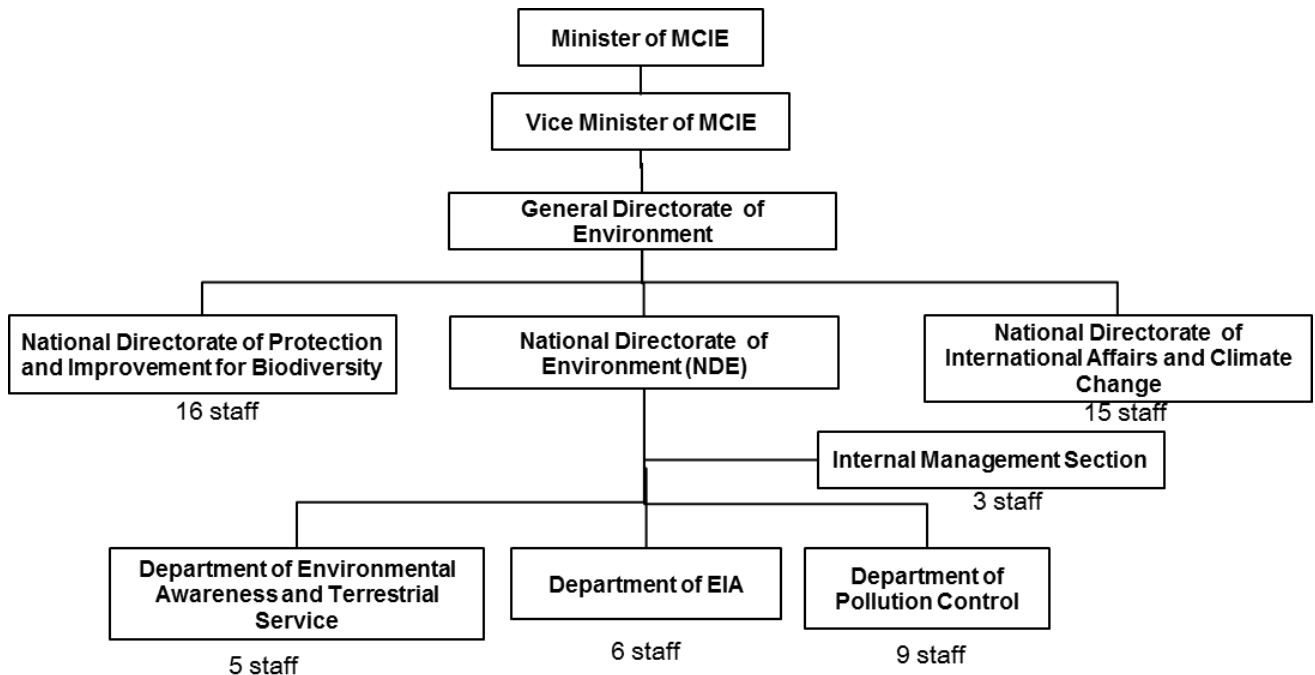


Figure 1-6-1 Organization Chart of Secretary State for Environmental Matters, MCIE³

Apart from the MCIE, NDFWM under the MAF is in charge of management of the Protected Area. On the other hand, Department of Land Dispute, Ministry of Justice, is the main organization concerned to resettlement and land acquisition.

(2) Legal System

(a) Procedure of Environmental Impact Assessment

Procedure of Environmental Impact Assessment (EIA) in Timor-Leste is based on “Decree Law No.5/2011 Environmental License”. In terms of scale of environmental impacts, proposed projects are classified into three categories, namely, 1) Category A, 2) Category B and 3) Category C. The classification is based on Annex I and Annex II of the Decree Law No.5 mentioned above. Any projects, which are classified as Category A and Category B, require implementation of EIA and Initial Environmental Examination (IEE), respectively. For instance, new irrigation development which command more than 100ha is sorted to Category A, while projects which commands less than 100ha is classified into Category B. There is no mention of categorization for rehabilitation projects in the

³ The figure of institutional structure is formulated based on the interview to the NDE staff.

Decree Law No.5, however, rehabilitation projects of existing irrigation system can be sorted into Category B according to the EIA department staff. Project lists which are classified into Category A and Category B are shown in the following tables:

Table 1-6-1 List of Category A Projects

No	SECTOR	SCALE
I	MINING SECTOR	
1	Mining and minerals (toxic) exploration	All
2	Operation/exploration for non-metallic minerals, sand and gravel	$\geq 30,000$ CBM / year
3	Processing and refinement of minerals / quarrying (nontoxic)	$\geq 30,000$ CBM / year
4	Quarries, open pit mining and peat extraction in isolated areas	$\geq 30,000$ CBM / year
5	Deep drilling Geothermal	All
II	OIL INDUSTRY SECTOR	
1	Extraction of Oil and Gas (for commercial purposes) Extraction phase for the oil sector and the classification in accordance with this award represents all activities of physical preparation of the project area to beginning drilling for oil and gas ("Drilling") to the deactivation phase.	All
2	Pipelines to Transport Oil and Gas (offshore and onshore)	exceeding 500 mm diameter and > 10 km length
3	Storage sites for Oil / Natural Gas / Petrochemicals or Chemicals	$\geq 1,000,000$ L
4	Oil and Gas Refineries	All
III	ENERGY SECTOR	
1	Stations producing electricity and heat, fuel, steam and combined cycle	≥ 20 MW or > 5 Ha
2	Construction or expansion of hydroelectric power stations (except mini hydro and DC)	≥ 15 MW or > 10 Ha
3	Other types of power stations, including renewable energy (excluding hydro) (see note 1)	> 15 MW or > 10 Ha
4	Suspended Electrical Transmission Lines, including substations	≥ 110 Kv and ≥ 20 km
IV	INDUSTRY SECTOR	
1	Industrial Parks	All
2	Shipyards	≥ 5 Ha site area and installation area of $\geq 15,000$ m ²
3	Treatment of hazardous materials (large-scale, determined by the environmental Authority)	All
4	Production of weapons, ammunition and explosives	All
V	TRANSPORT SECTOR	
1	Construction of a large road in a metropolitan or large city	≥ 5 km
2	Construction of national and regional roads	≥ 10 km
3	Construction of rural roads	Length ≥ 30 km
4	Construction of bridges	≥ 300 m
5	Ports and port facilities	≥ 500 gross tons
6	Construction and expansion of airports and airfields	All
7	Construction and expansion of Heliports	≥ 5 Ha
8	Construction of railway lines and associated facilities	All
VI	CIVIL CONSTRUCTION	
1	Urban Development (including cleaning of land for housing)	≥ 5 Ha
2	Commercial units of a size for a commercial center	≥ 2 Ha
3	Construction of multi-story buildings and apartments	≥ 2 Ha
VII	SANITATION SECTOR	
1	Elimination of hazardous waste	All
2	Landfills and municipal solid waste deposits	≥ 100 tons / day, ≥ 100 CBM / day, ≥ 10 Ha
3	Wastewater Treatment Stations	$\geq 10,000$ families / eq.
4	Facilities for recycling hazardous materials	All
5	Facilities for recycling non-hazardous materials	≥ 2 Ha

No	SECTOR	SCALE
6	Hospitals	≥ 100 rooms
VIII	WATER SECTOR	
1	Expropriation of land (landfill)	≥ 20 Ha
2	Sea coast recovery projects	≥ 25 Ha
3	Construction of a dam	≥ 15m in height or altered area ≥ 200 Ha
4	Marine dredging / Coastal protection works or river (to combat maritime erosion, to modify the coast, such as dams, culverts, jetties and other works of defense against the action of the sea)	≥ 20 Ha
5	Systems for collecting water from lakes, rivers, springs or other water sources (excluding the soil or groundwater)	Annual volume captured > 1 million CBM / year
6	Ingestion of groundwater by drilling	≥ 10 L / Sec.
7	Works for transfer of water by tunnel	≥ 1 km
8	Construction of aqueducts and water mains	≥ 3km
IX	AGRICULTURAL, LIVESTOCK AND FORESTRY SECTORS	
1	Irrigation systems (including irrigation and drainage infrastructure)	≥ 100 Ha
2	Clear the soil for conversion to agriculture (including intensive)	≥ 100 Ha
3	Plantations	≥ 20 Ha
4	Forests for logging	≥ 25 Ha
5	Development of rice fields in forest areas	≥ 3 Ha
X	TOURISM SECTOR	
1	Large scale properties, areas or tourist offices	≥ 20 Ha
2	Construction and expansion of hotels	≥ 100 rooms, or ≥ 10 Ha
3	Construction and expansion of apartments and tourist apartments along the sea coast	≥ 100 locations
4	Golf courses	≥ 10 Ha
5	Construction of safari parks or zoos	≥ 10 Ha
XI	DEFENCE AND SECURITY SECTOR	
1	Construction of Ammunition Storage Facilities	All
2	Construction of Military Bases and Naval and Air	All
3	Construction of combat training centers / firing ranges	≥ 100 Ha
XII	LOCATION FACTORS	
1	Sensitive or valuable ecosystems (beaches, mangroves, coral reefs, protected areas, marine areas)	All
2	unique and valuable landscape	All
3	Archaeological and / or historic site	All
4	Densely populated areas	Resettlement ≥ 300 persons
5	Occupied by cultural communities or tribes	All
6	Geographically sensitive area	All

Table 1-6-2 Lists of Category B Projects

No	SECTOR	SCALE
I	MINING SECTOR	
1	Exploitation of non-metallic minerals (sand and gravel)	<30,000 CBM / year and ≥ 5,000 CBM / year
2	Processing and refinement of minerals / quarrying (nontoxic)	<30,000 CBM / year and ≥ 5,000 CBM / year
3	Quarries, open pit mining and peat extraction in isolated areas	<30,000 CBM / year and ≥ 5,000 CBM / year
II	PETROLEUM INDUSTRY SECTOR	
1	Oil and Gas exploration: Phase of oil exploration and classification under this award represents all data collection activities including seismic to support the planning of physical interventions in the extraction process.	All
2	Pipelines to Transport Oil and Gas (offshore and onshore) (see note 2)	All outdoor facilities (not

No	SECTOR	SCALE
		classified as A)
3	Storage sites for Oil / Natural Gas / Petrochemicals or Chemicals	< 1,000,000 L or \geq 200,000 L
III	ENERGY SECTOR	
1	Stations producing electricity and heat, fuel, steam and combined cycle	< 20 MW or 2 to 5 Ha
2	Construction or expansion of hydroelectric power stations (except mini hydro and DC)	< 15 MW or 20 to 10 Ha
3	Renewable energy (excluding hydro) (see note 3)	2-15 MW or 20 to 10 Ha
4	Suspended Electrical Transmission Lines, including substations	25-110 kV
IV	INDUSTRY SECTOR	
1	Any type of plant: a) Manufacture of coke (dry coal distillation), including gasification and liquefaction; b) Steel industry; c) Casting of Metals; d) Non-ferrous foundry industry; e) production of timber, including kiln drying, planning and sawing workshop, chemical treatment of wood and wood chips in the process; f) Machinery industry; g) Plant electricity supply; h) Petrochemical industry: production of petroleum; i) Pottery and / or soil and stone product manufacturing industry; j) Production of cement and lime; k) Food processing industry; l) Industrial production of starch; m) Workshop handling of flammable and/or hazardous materials (car repair shop, gas stations, etc. ; n) Pharmaceuticals industry; o) Products: Pressed / molded wood (e.g., fiber board and particle and plywood); p) Other: Plants releasing environmental pollutant, noise, vibration, dust and/or smells, or plants handling flammable and/or hazardous materials (small scale, determined by the environmental authority) ;	Site \geq 1 Ha and installation area \geq 3,000 m ²
2	Shipyards	site area <5 Ha and \geq 1 Ha and installation area <15,000 m ² and \geq 3,000 m ²
V	TRANSPORT SECTOR	
1	Rehabilitation of an existing road, excluding community road (including toll roads, bridge crossing, each with two lanes)	All
2	Construction of bridges	< 300 m
3	Rehabilitation of ports and port facilities	< 500 gross tons
4	Rehabilitation of airports and airfields, or building a smaller facility at the airport	All
5	Rehabilitation of heliports, or building a smaller facility at the heliport	All
VI	CIVIL CONSTRUCTION	
1	Urban Development (including clearing of land for housing)	1-5 Ha
2	Commercial Units of size for a commercial center	< 2 Ha and \geq 0.5 Ha
3	Parking	\geq 1 Ha
4	Construction of multi-story buildings and apartments	< 2 Ha
5	Campsite of refugees and slums	\geq 1 Ha
VII	SANITATION SECTOR	
1	Landfill and municipal solid waste deposits	< 100 ton / day, 1-100 CBM / day, 0.5 to 10 Ha
2	Wastewater Treatment Stations	< 10,000 families / eq.
3	Facilities for recycling non-hazardous materials	< 2 Ha
4	Hospitals	< 100 rooms
VIII	WATER SECTOR	
1	Expropriation of land (landfill)	< 20 ha

No	SECTOR	SCALE
2	Sea coast recovery projects	area from 10 to 25 Ha
3	Construction of a dam	< 15m height
4	Marine dredging / Coastal protection works or river (to combat maritime erosion, to modify the coast, such as dams, culverts, jetties and other works of defense against the action of the sea)	< 20 Ha
5	Ingestion of groundwater by drilling	<10 L / sec.
6	Works for transfer of water by tunnel	<1 km
7	Construction of aqueducts and water mains	< 3 km
IX	AGRICULTURAL, LIVESTOCK AND FORESTRY SECTORS	
1	Irrigation systems (including irrigation and drainage infrastructure)	< 100 Ha
2	Clear the soil for conversion to agriculture (including intensive)	< 100 Ha
3	Pigs (Production and Care)	≥ 2,500 m ²
4	Birds (Production and Care)	≥ 2,500 m ²
5	Operation of animals (cattle and sheep)	≥ 2,500 m ²
6	Plantations	< 20 Ha
7	Forests for logging	< 25 Ha
8	Development of rice fields in forest areas	< 3 Ha
X	TOURISM SECTOR	
1	Large scale properties, areas or tourist offices	< 20 Ha
2	Construction and expansion of hotels	50-100 rooms, or <10 Ha
3	Golf Courses	< 10 Ha
4	Marinas, ports and docks for recreation on lakes and reservoirs	≥ 50 berths for vessels with a length of 6m
5	Marinas, ports and docks for recreation on the seacoast	≥ 50 berths for vessels of 12m length
6	Construction of safari parks or zoos	< 10 Ha
XI	DEFENSE AND SECURITY SECTOR	
	Construction of combat training centers / firing ranges	Area < 100 Ha

Project proponents shall obtain an Environmental License for project implementation. Any proponent of Category A project shall prepare a Project Document (PD), an Environmental Impact Statement (EIS) and an Environmental Management Plan (EMP), while proponents of Category B projects shall prepare a PD, an IEE result and an EMP. PD shall cover following contents:

1. Name, address and contact details of the proponent;
2. Location and scale of the project;
3. District and villages where the proposed project will be located and the project may have any impact;
4. Plans and technical drawing of the proposed project;
5. Summary of the technical studies on the feasibility of the proposed project;
6. Land ownership and right of water use;
7. Environmental impacts;
8. Public consultation;
9. Consultation with other authorities;
10. Proposal for classification of the proposed project: and
11. Executive summary.

In terms of public involvement and information disclosure, organization of a public consultation and exchange of Impacts and Benefits Agreement are stipulated in the Decree Law No.5. It is a must to organize public consultations for Category A projects (Article 11 of the Decree Law No.5), while it is

organized if the Environmental Authority require a public consultation (Article 18 of the Decree Law No.5). Impacts and Benefits Agreement are exchanged between the proponents and representatives of the surrounding communities to protect their traditional land use other rights (Article 16 of the Decree Law No.5).

The procedures for screening of proposed projects, submission of necessary documents, organization of public consultation, issuance of environmental license and so on for Category A, and Category B and C projects are presented in Figure 1-6-2 and Figure 1-6-3⁴, respectively.

⁴ Those chart of procedures are presented in “EIA Expert Version 1.01” (Expert System for EIA Customized for EIA process in Timor-Leste, 2011), which was assembled by JICA and supervised by Ministry of Commerce, Industry and Environment, State Secretariat for Environment and National Directorate for Environment.

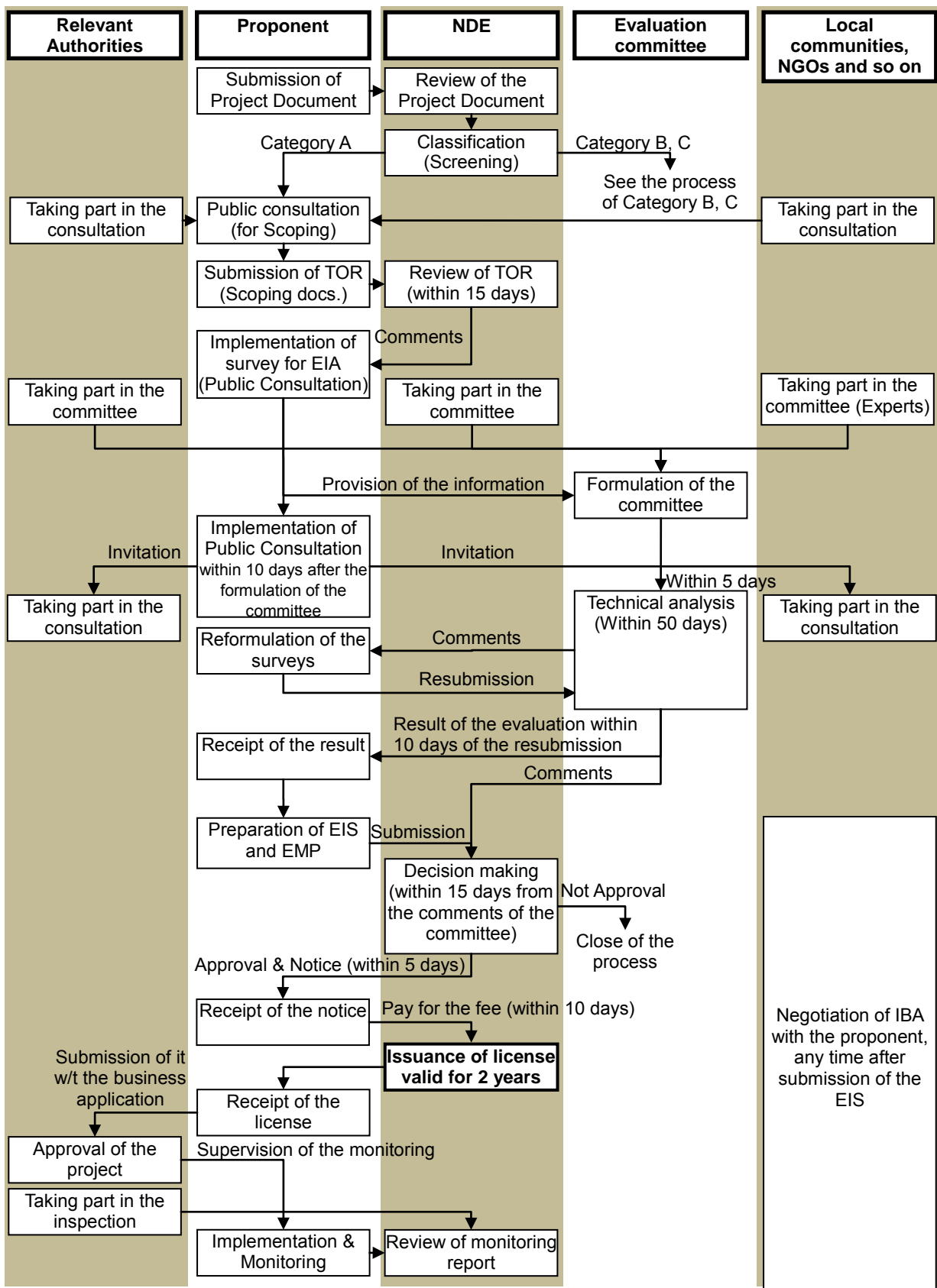


Figure 1-6-2 EIA Process for Category A Projects

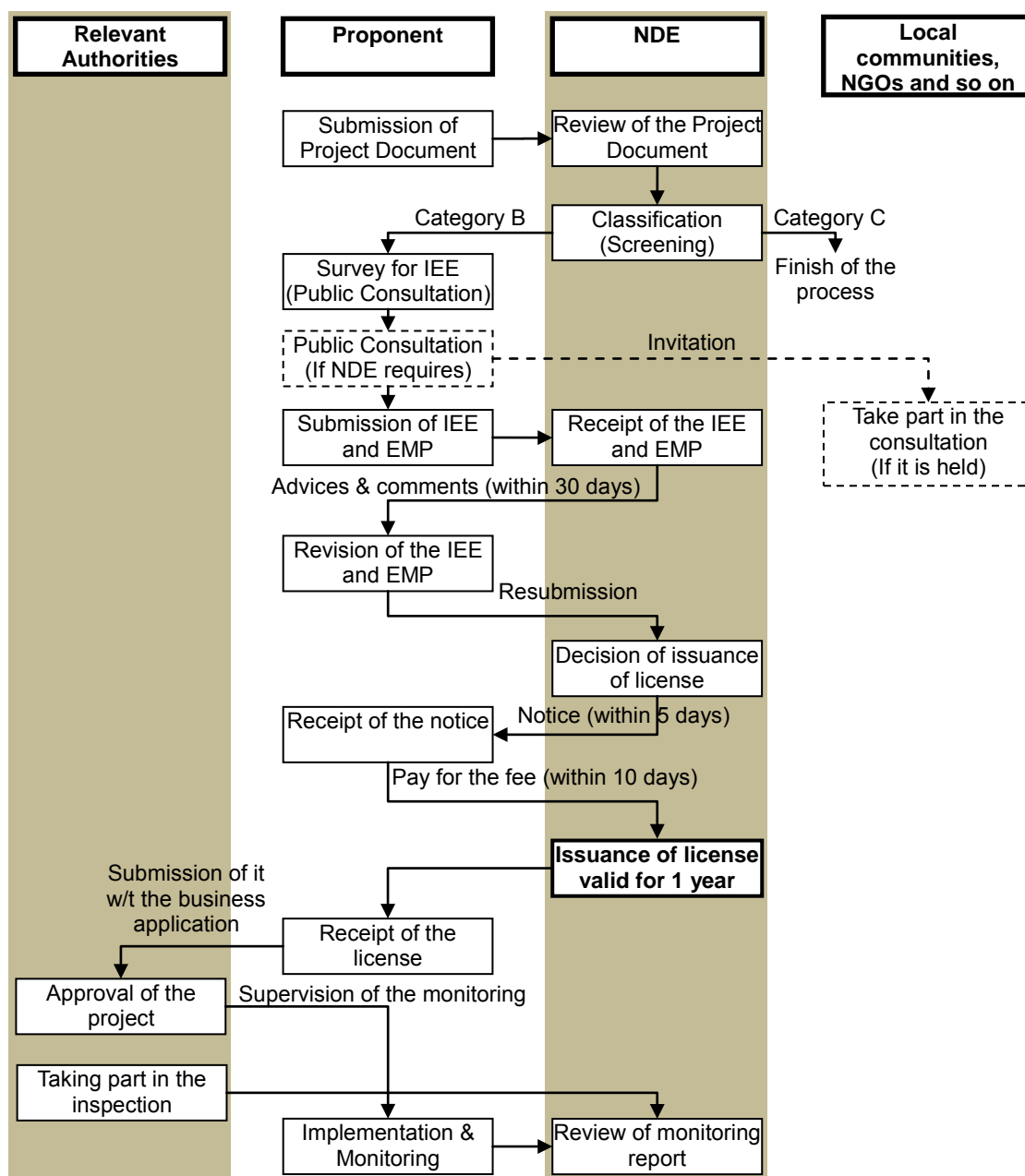


Figure 1-6-3 EIA Process for Category B and C Projects

(b) Environmental Regulation

Environmental regulations such as Ambient Environmental Quality Standards are under development in Timor-Leste at present. When any construction works are implemented, no regulation is applied for pollution control. According to the International Environmental Expert under the Ministry of Public Works in Timor-Leste, the approach for some projects funded by WB is to use international best practice such as Environmental, Health, and Safety guidelines of the International Finance Cooperation. However, since there is no laboratory or measurement equipment regarding environment, quantitative measurement is very difficult at this moment, and qualitative monitoring and mitigation measures are taken for minimization of negative impacts.

(c) Laws regarding Involuntary Resettlement and Land Acquisition

A law regarding land ownership is still under preparation in Timor-Leste. "Law on land property" (tentatively called) has been already drafted and it was submitted to the parliament, however, it has yet

to be approved. Therefore, there is no regulation or standards how to compensate for the affected persons if any project requires resettlement and land acquisition.

According to the Directorate of Land Property for Government, Ministry of Justice, there are some customary procedures for compensation resulting from resettlement and land acquisition. Department of Land Dispute, Department of Land Custody, Department of Land Distribution and Department of Management of Special Land Development, which are under the Ministry of Justice, are mainly involved in resettlement and land acquisition. Compensation rates are determined based on negotiation with affected persons taking consideration into similar cases in the past, in collaboration with district or sub-district level staff. NDE staff cover monitoring activities and they receive complaints from project affected people about the impacts, if any.

In the Road Network Upgrading Project under the Ministry of Public Works, if land acquisition and involuntary resettlement are caused by any projects, they shall prepare a Resettlement Action Plan. Since official compensation rate for lands or houses are still under the discussion, compensation unit prices are determined based on a market price survey in these projects. Moreover, it is necessary to exchange an agreement regarding compensation between the project affected persons and the proponent.

As mentioned before, some of laws regarding environmental and social considerations in Timor-Leste are under discussion. On the other hand, JICA has established “Guideline for Environmental and Social Considerations (2010 April)” (mentioned as the JICA Guideline hereinafter). The JICA Guideline pays attention to procedure and compensation measures in case of involuntary resettlement and land expropriation by any projects. Therefore, the most important thing is to avoid or minimize resettlement and land acquisition as much as possible. Followings are gap between the JICA Guideline and laws in Timor-Leste.

Table 1-6-3 Gap between JICA Guideline and Laws in Timor-Leste

No.	JICA Guidelines (2010)	Laws in Timor-Leste	Gap	Measures to fill in the gaps
1.	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	No laws concerned	There is no law to avoid involuntary resettlement and land expropriation as much as possible.	It is needed to select priority project which will not require resettlement and land acquisition.
2.	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	Requisitioning and expropriation of property for public purposes shall only take place following fair compensation in accordance with the law. (Constitution Article 54)	There is no big gap, however, detail information of “fair compensation” (e.g. compensation rates) are not stipulated.	It is very difficult to set official compensation rates at this moment, however, it is possible to propose set appropriate compensation rates considering other cases and land market price if resettlement and land acquisition are required.
3.	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	No laws concerned	Compensation rates are decided based on negotiation or experiences.	Based on experiences, land market prices, negotiation with the affected people, proper compensation rates shall be proposed in case of resettlement and land acquisition. According to necessity, livelihood recovery plans are to be proposed.
4.	Compensation must be based on the full replacement cost as much as possible.	No laws concerned	Compensation rates are decided based on	Based on experiences, land market prices, negotiation

No.	JICA Guidelines (2010)	Laws in Timor-Leste	Gap	Measures to fill in the gaps
	(JICA GL)		negotiation or experiences.	with the affected people, proper compensation rates shall be proposed in case of resettlement and land acquisition.
5.	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	No laws concerned	Timing of payment or assistance is not clear.	Prior to project implementation, it is needed to prepare a plan of compensation and to provide monetary or land based compensation before resettlement and land acquisition.
6.	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	No laws concerned	It is not a must to prepare resettlement action plans.	A resettlement action plan shall be prepared in case resettlement and land acquisition are required. It is necessary to avoid such situation as much as possible.
7.	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	Inform and provide clarifications on the project to the public, including the potential environmental impacts and their mitigation (Decree Law No.5 Article 11).	There is no big gap.	-
8.	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	No laws concerned	Even though there is no regulation for this matter, in general, local authorities use local and understandable languages for the people.	-
9.	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	The Environmental Inspection Service has the duty to inspect projects with environmental licenses during the construction, development and decommissioning phases (Decree Law No.5 Article 31).	There is no mention of participatory monitoring.	In case of resettlement and land acquisition, establish of a participatory monitoring system by representatives of the affected people can be proposed.
10.	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	No laws concerned	No grievance mechanism has been established.	In case of resettlement and land acquisition, establish of a grievance handling system can be proposed.
11.	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off	No laws concerned	Socio-economic survey of the affected people is not a must.	In case of resettlement and land acquisition, a socio-economic survey shall be implemented.

No.	JICA Guidelines (2010)	Laws in Timor-Leste	Gap	Measures to fill in the gaps
	date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP4.12 Para.6)			
12.	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)	No laws concerned	Land ownership is not clear in some areas due to insufficient land survey.	Considering there are many land disputes, it is difficult to identify land ownership in some cases. It is needed to pay special consideration to such areas to avoid resettlement and land acquisition.
13.	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	No laws concerned	Land-based compensation is under development.	In case of land acquisition, land based compensation can be proposed. If there are no lands to be provided, monetary compensation would be provided.
14.	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	No laws concerned	No transitional support is developed.	It is needed to propose projects which do not require resettlement.
15.	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8)	No laws concerned	No special attention is paid.	If there are some vulnerable groups in the affected persons, it is necessary to propose to provide some support to them with high priority.
16.	For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25)	No laws concerned	It is not a must to prepare abbreviated resettlement action plans.	According to necessity, an abbreviated resettlement plan shall be prepared. It is noted to avoid resettlement and land acquisition as much as possible.

1-7 ANTICIPATED ENVIRONMENTAL IMPACTS BY THE PROPOSED STRATEGIES

Out of the proposed strategies, “Strategy 1: Improvement of irrigation system” may require construction works. It is not planned to construct large-scale and new irrigation facilities at this moment, instead, rehabilitation of existing irrigation facilities and small scale irrigation facility construction are proposed. In such cases, some environmental impacts e.g., air pollution, water pollution, noise & vibration are anticipated during only construction period, and unrecoverable significant environmental impacts are not expected. At this moment, locations of proposed programs/projects have been yet to be fixed, however, it is possible to select project sites outside of areas to be protected or residential area to avoid damages to them. There is a possibility that the implementation of the strategy will cause damage to ground water and rights of water, however, the degree and extent would be limited. Regarding positive impacts, production increase and institutional strengthening, e.g., capacity development of MAF staff and WUA are expected.

Concerning “Strategy 4 Rice farmers have high incentive to expand rice production”, the extent and type of anticipated impacts are depending on the positions, namely, consumers or farmers. If price of

rice is increased, negative impact on livelihood of consumers including vulnerable people is expected, while motivation of rice production farmers can be enhanced. When tariff of rice is set at low level, rice price can be steadily low, which leads to food security in the country, however, motivation of rice farmers will be decreased. Moreover, there is an option which to provide subsidy by MAF to rice production farmers. However, there is a possibility to cause inequitable distribution due to financial limitation, while this measure may result in production increase and cost reduction for farmers. It is needed to implement fair subsidization, especially, for vulnerable people.

Regarding other strategies, namely, “Strategy 2: Crop production is improved”, “Strategy 3: Processing and marketing process of local rice is improved”, and “Strategy 5: MAF’s capacity is strengthened to operated and manage proposed programs/projects” focus on capacity building in general and will not require construction works. In addition, it will not cause drastic change price of rice, which can give impacts on livelihood. Therefore, it can be judged that negative impacts by those programs are negligible while positive impacts by the strategies are anticipated.

1-8 COMPARISON OF THE PROPOSED STRATEGIES IN TERMS OF ENVIRONMENTAL IMPACTS

Based on the examination mentioned above, key environmental issues of all the strategies are picked up and they are examined. At this stage, environmental impacts by zero option are also discussed. Not only negative impacts but also positive impacts by each strategy and those degrees of impacts are discussed.

Option 0 will not implement any activities, therefore, no positive and negative impact is expected, and no project cost is necessary.

As mentioned before, Strategy 1 can contribute to production increase, which leads to improvement of livelihood economy, while it can cause air pollution, water pollution, noise/vibration and so on during the construction stage. Those adverse effects are limited to the construction period only and degree of the impacts is relatively small. Impacts on the protected areas and possibility of land acquisition are unknown at present, however, it is possible to avoid such situation by appropriate project site selection. Moreover, project cost of the Strategy 1 is relatively high compared with other strategies.

Regarding Strategy 4, impacts will vary according to policies to be taken. The extent of impacts will be large scale since many farmers and consumers can be affected.

As for Strategy 2, 3 and 5, they mainly focuses on capacity development and implementation of those strategies can contributed to improvement of livelihood and local economy, and any negative impacts are not expected. Project under the strategies will be mainly technical cooperation and the cost could be relatively low.

Scoping result of the proposed strategies is as follows:

Table 1-8-1 Main Environmental Impacts by Option

Environmental Parameters	Option 0	Strategy 1	Strategy 2	Strategy 3	Strategy 4	Strategy 5
1. Air Pollution	D	B ⁻ (construction stage)	D	D	D	D
2. Water Pollution	D	B ⁻ (construction stage)	D	D	D	D
3. Waste	D	B ⁻ (construction stage)	D	D	D	D
4. Soil Contamination	D	B ⁻	D	D	D	D

Environmental Parameters	Option 0	Strategy 1 (construction stage)	Strategy 2	Strategy 3	Strategy 4	Strategy 5
5. Noise and Vibration	D	B ⁻ (construction stage)	D	D	D	D
6. Ground Subsidence	D	D	D	D	D	D
7. Offensive Odor	D	D	D	D	D	D
8. Bottom sediment	D	D	D	D	D	D
9. Protected area	D	C	D	D	D	D
10. Ground water	D	C	D	D	D	D
11. Hydrological Situation	D	B ⁻ (construction stage)	D	D	D	D
12. Topography and Geographical features	D	D	D	D	D	D
13. Involuntary Resettlement	D	D	D	D	D	D
14. Land Acquisition	D	B ⁻ (construction stage)	D	D	D	D
15. Cultural heritage	D	D	D	D	D	D
16. Landscape	D	D	D	D	D	D
17. Indigenous and ethnic people	D	D	D	D	D	D
18. Livelihood/local economy	D	B ⁺	B ⁺	B ⁺	A/A ⁺	B ⁺
19. Existing social infrastructures and services	D	B ⁻ (construction stage)	D	D	D	D
20. Misdistribution of benefit and damage	D	D	D	D	B ⁻	D
21. Social institutions	D	D	D	D	D	D
22. Water Usage or Water Rights and Rights of Common	D	C	D	D	D	D
23. Gender	D	D	D	D	D	D
24. Children rights	D	D	D	D	D	D
25. Hazards (Risk), Infectious diseases such as HIV/AIDS	D	D	D	D	D	D
26. Accidents	D	B ⁻ (construction stage)	D	D	D	D
27. Global Warming	D	D	D	D	D	D
Project cost (scale)	Zero	Middle	Low	Low	High	Low-Middle

A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.

C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)

D: No impact is expected.

1-9 MITIGATION MEASURES

(1) Strategy 1: Irrigation system is improved

When construction works are planned, social and natural conditions of the sites shall be examined for project identification. If proposed sites are located on areas to be protected areas, it is needed to shift

the planned sites to others. Furthermore, it is very important to examine locations for construction works to minimize temporary land acquisition. During construction stage, environmental pollution such as air pollution or noise is expected, however, it is possible to reduce such impacts by some mitigation measures. Following mitigation measures against the Strategy 1 can be proposed:

Table 1-9-1 Mitigation Measures against Strategy 1

Environmental parameters	Anticipated impacts	Mitigation measure against negative impacts
Air pollution	<ul style="list-style-type: none"> • Generation of dust 	<ul style="list-style-type: none"> • Water spray • Setting of fence surrounding construction sites
Water pollution	<ul style="list-style-type: none"> • Discharge of mud water 	<ul style="list-style-type: none"> • Setting of sedimentation ponds • Shifting of river water course from inside to outside of construction sites
Waste	<ul style="list-style-type: none"> • Construction waste is produced 	<ul style="list-style-type: none"> • Proper disposal of the waste
Noise and vibration	<ul style="list-style-type: none"> • Noise and vibration 	<ul style="list-style-type: none"> • Usage of sound-proof vehicles • Operation during only day-time
Soil contamination	<ul style="list-style-type: none"> • Oil leakage 	<ul style="list-style-type: none"> • Regular check and maintenance of construction vehicles
Impacts on hydrology	<ul style="list-style-type: none"> • Impact on intake from river water during construction 	<ul style="list-style-type: none"> • Setting of temporary water ways
Land expropriation	<ul style="list-style-type: none"> • Temporary occupation of lands for stock yard 	<ul style="list-style-type: none"> • Use of governmental land for stock yard • To avoid private land for stock yard selection
Impacts on Indigenous people	<ul style="list-style-type: none"> • Land acquisition 	<ul style="list-style-type: none"> • Proper project site selection to avoid residential area of indigenous people
Impacts on ground water	<ul style="list-style-type: none"> • Impact on ground water 	<ul style="list-style-type: none"> • Preliminary analysis of ground water dynamics to examine possibility of impacts on ground water • If necessary, intermittent intake from ground water instead of continuous intake
Impacts on protected areas	<ul style="list-style-type: none"> • Impacts on protected areas 	<ul style="list-style-type: none"> • Confirmation of protected areas and site selection of the construction site outside of the protected areas
Impacts on social infrastructure	<ul style="list-style-type: none"> • Impacts on river water use • Traffic jam 	<ul style="list-style-type: none"> • Temporary water course setting • Water supply by water tank trucks • Decentralization of construction vehicles to minimize traffic jam • Traffic control
Accident	<ul style="list-style-type: none"> • Accident in and around the construction sites 	<ul style="list-style-type: none"> • Decentralization of construction vehicles to minimize traffic jam • Proper operation management • Traffic control

(2) Strategy 2: Crop production is improved, Strategy 3: Processing and marketing process of local produced rice is improved, and Strategy 5: MAF's capacity is improved.

Concerning Strategy 2, 3 and 5, capacity development of farmers and official personnel of MAF is more focused and no construction works are planned. As mentioned in previous sub-chapter, no significant adverse impact by those strategies is anticipated. Therefore, there is no matter to be considered to minimize or mitigate the expected adverse environmental impacts for those strategies.

(3) Strategy 4: Rice farmers have high incentive to expand rice production.

Some policies are proposed in the Strategy 4 and implementation of the strategy may give some adverse impacts on the people in the country. When rice price is increased, livelihood of vulnerable people can be affected significantly. It is needed to provide some support e.g. rice provision to the people by the government. On the other hand, if tariff of imported rice is set at low level, rice production farmers will lose their motivation. In such case, governmental local rice purchasing system

shall be promoted to encourage the rice production farmers.

Table 1-9-2 Mitigation Measures against Strategy 4

(1) Development Scenario 1 (almost same as the current attempts)

Environmental parameter	Anticipated Adverse Effects	Countermeasures
Impacts on livelihood /local economy	<ul style="list-style-type: none"> • Increase of trade expenditure by rice import • When rice price at the international market is increased, as well as rice price is increased in Timor Leste, which leads to rice deficit. • Motivation of rice production farmers is decreased and abandoned farmland can be expanded. 	<ul style="list-style-type: none"> • Strengthening of export industries • Stock of local rice • Protection of uncompetitive farmers and shifting from rice to other crops or from farming to other industries
Misdistribution of benefit and damage	<ul style="list-style-type: none"> • Motivation of rice production farmers is decreased and farm income will be decreased, while general consumers can purchase cheap rice as in the past 	<ul style="list-style-type: none"> • Strengthening of export industries • Protection of uncompetitive farmers and shifting from rice to other crops or from farming to other industries

(2) Development Scenario 2 (current attempts+ measures for motivation increase)

Environmental parameter	Anticipated Adverse Effects	Countermeasures
Impacts on livelihood /local economy	<ul style="list-style-type: none"> • When rice price at the international market is increased, as well as rice price is increased in Timor Leste, which leads to rice deficit. • Uncompetitive farmers are weeded out. 	<ul style="list-style-type: none"> • Strengthening of export industries • Stock of local rice • Protection of uncompetitive farmers and shifting from rice to other crops or from farming to other industries

(3) Development Scenario 3 (price setting of local rice and imported one at the competitive level)

Environmental parameter	Anticipated Adverse Effects	Countermeasures
Impacts on livelihood /local economy	<ul style="list-style-type: none"> • Due to rice price increase, consumers have to shoulder higher cost • When rice crop fails in Timor Leste, rice deficit can be caused. 	<ul style="list-style-type: none"> • Further support for vulnerable people • Reservation of rice from other importing countries in case of rice shortage
Misdistribution of benefit and damage	<ul style="list-style-type: none"> • Increase of rice price is an opportunity for rice production farmers, while it can give damage to general consumers. 	<ul style="list-style-type: none"> • Further support for vulnerable people

1-10 MONITORING

It is important to implement monitoring to examine whether anticipated impacts and effectiveness of countermeasures by strategy will be implemented. Proposed monitoring indicators are shown as below:

Table 1-10-1 Proposed Monitoring Plan

Strategy	Anticipated negative impact	Mitigation measure against negative impacts	Monitoring indicator	Responsible organization
Strategy 1	<ul style="list-style-type: none"> • Land acquisition /involuntary resettlement • Damage to flora and fauna to be protected • Temporally pollution during construction stage 	<ul style="list-style-type: none"> • Site selection to avoid/minimize land acquisition/ involuntary resettlement • Project site selection outside of areas to be protected • Proper construction works such as air pollution control or sufficient explanation to the affected people 	<ul style="list-style-type: none"> • Whether proper construction sites to avoid/minimize land acquisition/ involuntary resettlement and protected areas • Whether proper management of construction works is done (parameters: air pollution, water pollution, noise/vibration and so on) 	MAF, Ministry of Justice
Strategy 2	None	None	None	-

Strategy	Anticipated negative impact	Mitigation measure against negative impacts	Monitoring indicator	Responsible organization
Strategy 3	None	None	None	-
Strategy 4 Scenario (1)	<ul style="list-style-type: none"> • Increase of cost for rice import • Fluctuation of rice price due to unstable international rice price • Motivation of rice production is decreased • Increase of abandoned paddy field area 	<ul style="list-style-type: none"> • Promotion of export industries • Establishment of rice stock system • Promotion of rice purchase system by the government • Enhancement of rice cultivation contract system • Shift to other crop cultivation and promotion of other industries 	<ul style="list-style-type: none"> • Price of rice • Quantity of food reservation • Whether governmental purchase system functions • Area of abandoned paddy field 	MAF
Strategy 4 Scenario (2)	<ul style="list-style-type: none"> • Increase of cost for rice import • Fluctuation of rice price due to unstable international rice price • Uncompetitive rice farmers are damaged 	<ul style="list-style-type: none"> • Promotion of export industry • Establishment of rice stock system • Shift to other crop cultivation and promotion of other industries 	<ul style="list-style-type: none"> • Price of rice • Quantity of food reservation • Area of abandoned paddy field • Whether the purchase system by MAF functions 	MAF
Strategy 4 Scenario (3)	<ul style="list-style-type: none"> • Cost of food for general consumers can be increased. • Insufficient amount of rice in case of bad harvest within the country 	<ul style="list-style-type: none"> • Provision of food to vulnerable people • To secure rice importing country in case of emergency 	<ul style="list-style-type: none"> • Price of rice • Whether appropriate support for the vulnerable people is done 	MAF
Strategy 5	None	None	None	-

1-11 SCOPING OF PRIORITY PROJECTS

Priority projects are determined based on the framework of the proposed Agriculture Master Plan. Out of the proposed five strategies, Strategy 4, which enhance motivation of rice production farmers, need to acquire consensus among the MAF official personnel and other governmental officers concerned for the implementation. As discussed in Chapter 1 of “II. Priority Projects”, action plan formulation for rice purchase system by MAF is proposed to embody Strategy 4 and 5, and the target area of the action plan is whole Rice Bowl areas.

Sites of the priority projects were determined in terms of three points of view, namely, irrigation, farming and processing/distribution, which are consistent with the development strategies of the proposed Agriculture Master Plan. Furthermore, not only the Rice Bowl Areas but also subsistent farming areas are the targets of the priority projects. The selected sites are Viqueque District (one in the Rice Bowl Area and subsistent farming area, each) and Bobonaro District (two sites in the Rice Bowl Area), four sites in total. Proposed components of the priority projects are as follows:

Table 1-11-1 Components of Proposed Priority Projects

Site	Project Name	Components	Irrigation area
1. Rice bowl areas	Action plan formulation of rice purchase system by MAF	<ul style="list-style-type: none"> • Action plan formulation for rice purchase system by MAF and establish of a rice stock center 	-
2. Bobonaro District HALECOU area	Production increase project of domestically produced commercial rice	<ul style="list-style-type: none"> • Construction of a collecting channel type intake under the river bed • Training for facility operation • Promotion of sustainable and environmental friendly agriculture using local materials and resources • Extension of farming techniques • Training of rice production farmers 	360ha

		<ul style="list-style-type: none"> • Establishment of a value chain system of domestic commercial rice • Improvement of processing and distribution of domestically produced rice 	
3. Viqueque District SAKETO area	Production increase project of domestically produced commercial rice	<ul style="list-style-type: none"> • Participatory secondary and tertiary canal rehabilitation, and canal extension • Training of maintenance techniques through participatory construction works • Foundation of a farmers' organization • Extension of farming techniques • Training of rice production farmers • Establishment of a value chain system of domestic commercial rice 	410ha
4. Bobonaro District (irrigation schemes)	Distribution enhancement project of domestically produced commercial rice	<ul style="list-style-type: none"> • Promotion of sustainable and environmental friendly agriculture using local materials and resources • Extension of farming techniques • Training of rice production farmers • Establishment of a value chain system of domestic commercial rice • Improvement of processing and distribution of domestically produced rice 	-
5. Viqueque District BIKALIU area	Substantially agricultural strengthening project	<ul style="list-style-type: none"> • Construction of a diversion weir in the river • Training for facility operation • Foundation and strengthening of a water users association • Promotion of integrated agriculture 	50ha

Alternatives of the proposed priority projects are examined in terms of technical matter, cost, functionality and environmental aspects. They are summarized as follows:

Table 1-11-2 Alternatives of Proposed Priority Projects

Site/Project Name	Option (1) Main technical characteristics of proposed priority projects	Option (2) Alternatives	Remarks
Rice bowl areas Action plan formulation of rice purchase system by MAF	-	-	-
Bobonaro District HALECOU area Production increase project of domestically produced commercial rice	<u>Construction of a collecting channel type intake under the river bed</u> <ul style="list-style-type: none"> • Due to low flow velocity, effective diversion is possible. 	<u>Construction of a fixed type weir with gates in the river</u> <ul style="list-style-type: none"> • It can be relatively large scale and costly, since it is a cross sectional facility. Moreover, environmental impact is anticipated. 	In terms of cost, efficient water intake and environmental impact, option (1) is proposed.
Viqueque District SAKETO area Production increase project of domestically produced commercial rice	<u>Participatory construction works</u> <ul style="list-style-type: none"> • Simple and basic techniques applicable for the farmers are applied. • Ownership of the structures for the farmers can be established, 	<u>Construction works by the government</u> <ul style="list-style-type: none"> • Construction cost can be costly compared with one in participatory way. • Ownership of the structures for the farmers cannot be established 	Option (1) can grow ownership of the facilities. In terms of environmental aspect, there is no difference between two options. Therefore, option (1) is recommended.
Bobonaro District Distribution enhancement project of domestically	-	-	-

<p>produced commercial rice</p> <p>Viqueque District BIKALIU area</p> <p>Substantially agricultural strengthening project</p>	<p><u>Construction of a mountain stream intake type weir in the river</u></p> <ul style="list-style-type: none"> Given that the river is very steep and the river width is small, the proposed weir can intake natural overflow without gates, which makes it possible to alleviate the adverse influence of water flow and rolling stones in case of flood. Maintenance is relatively easy. 	<p><u>Construction of a fixed type weir with gates</u></p> <ul style="list-style-type: none"> It can be relatively large scale and costly, since it is a cross sectional facility. Moreover, environmental impact is anticipated. Since it is needed to open the gates whenever flood is occurred, maintenance can be difficult. 	<p>In terms of efficiency, option (1) is selected. Considering environmental aspect, given that there was a facility before and the same scale structure will be constructed, significant negative impacts by the proposed construction works are not anticipated.</p>
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Following figure illustrates locations of the proposed priority project sites (three sites where structural measures are proposed) and the Protected Areas (mentioned in Figure 1-5-5). Judging from the figure presented below, the proposed priority project sites are outside of the Protected Areas (30 sites). However, it is necessary to confirm whether the proposed project sites are outside of all of the Protected Areas in collaboration with the NDFWM, since there are new Protected Areas which are not shown in the map.

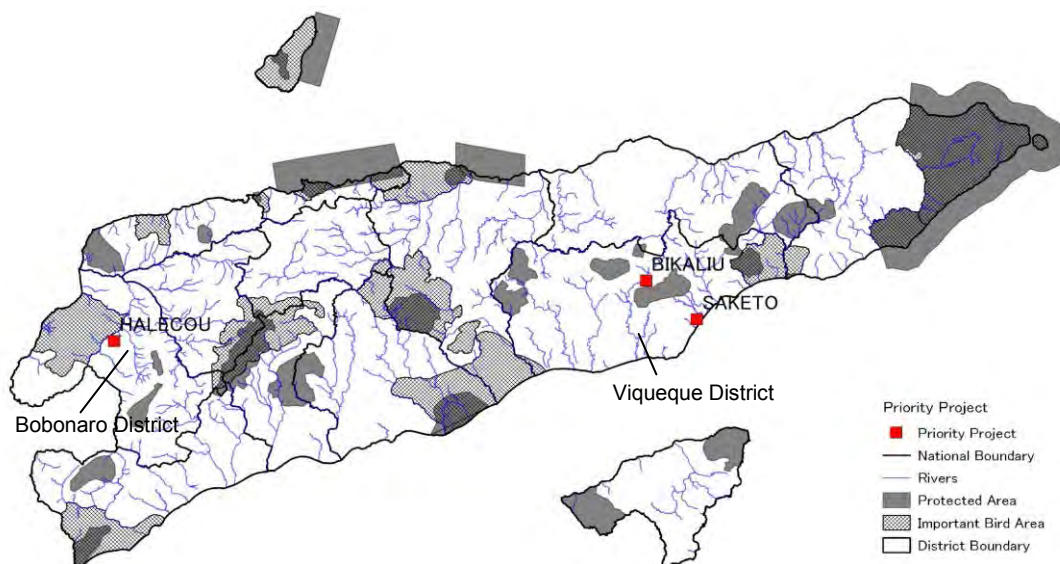


Figure 1-11-1 Protected Areas and Sites of Proposed Priority Projects

Scoping of the proposed priority projects by using an environmental checklist was implemented. Given that main components of the priority project 1 to 3 are rehabilitation of existing irrigation facilities, improvement of farming techniques, establishment of value chain system and so on, these projects would bring about positive impacts on livelihood/local economy. Non-structural measures such as capacity development and organization of water users association could not cause any negative impacts in surrounding environment. Some negative environmental impacts can be caused by the structural measures.

Concerning the Priority Project 1, it will formulate an action plan to embody the policy to purchase of rice by MAF and it will not implement any activities. Therefore, the Priority Project 1 is not targeted of scoping in following table.

Regarding the Priority Project 2 at Halecou area, it is planned to construct a water collection facility under the river bed, which will hardly change surrounding environment after the construction works completion. Priority project 3 at Saketo area mainly focuses on rehabilitation of existing irrigation

facilities which can be done by the farmers. Some adverse effects are anticipated during the construction period, however, the scale is very limited. At Bikalu area, where implementation of the Priority Project 5 is proposed, a weir was constructed by the Government of Indonesia before, however, it was broken very soon after the construction completion. It is planned to construct the same scale facility as the Priority Project 3, therefore, negative environmental impacts are not expected after the construction works completion. For all of the priority projects mentioned above, it is needed to secure stock yard and it is very important to utilize public lands for that to avoid land acquisition. As a whole, adverse impacts are expected during only construction period and the scale is limited.

Priority Project 4 focuses on mainly capacity development in terms of farming and processing/distribution in the irrigation schemes in Bobonaro District, therefore, positive impacts on livelihood /local economy are anticipated, and negative impacts are very negligible considering structural measures or change of policies will not be taken.

The scoping result is as shown below:

Table 1-11-3 Scoping Result of Proposed Priority Projects

Priority project 2: Bobonaro District HALECOU area Production increase project of domestically produced commercial rice				
Priority project 3: Viqueque District SAKETO area Production increase project of domestically produced commercial rice				
Priority project 4: Bobonaro District Distribution enhancement project of domestically produced commercial rice				
Priority project 5: Viqueque District BIKALIU area Substantially agricultural strengthening project				
Environmental Parameters	Priority project 2	Priority project 3	Priority project 4	Priority project 5
1. Air Pollution	B ⁻ (during construction)	B ⁻ (during construction)	D	B ⁻ (during construction)
2. Water Pollution	B ⁻ (during construction)	B ⁻ (during construction)	D	B ⁻ (during construction)
3. Waste	B ⁻ (during construction)	B ⁻ (during construction)	D	B ⁻ (during construction)
4. Soil Contamination	B ⁻ (during construction)	B ⁻ (during construction)	D	B ⁻ (during construction)
5. Noise and Vibration	B ⁻ (during construction)	B ⁻ (during construction)	D	B ⁻ (during construction)
6. Ground Subsidence	D	D	D	D
7. Offensive Odor	D	D	D	D
8. Bottom sediment	D	D	D	D
9. Protected area	C	C	D	C
10. Ground water	D	D	D	D
11. Hydrological Situation	B ⁻ (during construction)	B ⁻ (during construction)	D	B ⁻ (during construction)
12. Topography and Geographical features	D	D	D	D
13. Involuntary Resettlement	D	D	D	D
14. Land Acquisition	B ⁻ (temporary acquisition)	B ⁻ (temporary acquisition)	D	B ⁻ (temporary acquisition)
15. Cultural heritage	D	D	D	D

Priority project 2: Bobonaro District HALECOU area Production increase project of domestically produced commercial rice Priority project 3: Viqueque District SAKETO area Production increase project of domestically produced commercial rice Priority project 4: Bobonaro District Distribution enhancement project of domestically produced commercial rice Priority project 5: Viqueque District BIKALIU area Substantially agricultural strengthening project				
Environmental Parameters	Priority project 2	Priority project 3	Priority project 4	Priority project 5
16. Landscape	D	D	D	D
17. Indigenous and ethnic people	D	D	D	D
18. Livelihood	B ⁺	B ⁺	B ⁺	B ⁺
19. Existing social infrastructures and services	B ⁻ (during construction)	B ⁻ (during construction)	D	B ⁻ (during construction)
20. Misdistribution of benefit and damage	D	D	D	D
21. Social institutions	D	D	D	D
22. Water Usage or Water Rights and Rights of Common	D	D	D	D
23. Gender	D	D	D	D
24. Children rights	D	D	D	D
25. Hazards (Risk), Infectious diseases such as HIV/AIDS	D	D	D	D
26. Accidents	B ⁻ (during construction)	B ⁻ (during construction)	D	B ⁻ (during construction)
27. Global Warming	D	D	D	D

A⁺: large scale positive impact, B⁺ small-medium scale positive impact, C: unknown, D: no impact of negligible,
 A⁻: large scale negative impact, B⁻: small-medium I scale negative impact,

Draft Terms of Reference (TOR) to examine environmental impacts by the proposed projects is described as follows:

Table 1-11-4 TOR for Environmental Examination (Draft)

Environmental Parameters	Study Contents	Study Method
Air Pollution	<ul style="list-style-type: none"> General situations in the adjacent area of construction sites 	<ul style="list-style-type: none"> Confirmation of construction period, construction sites
Water Pollution	<ul style="list-style-type: none"> Information collection of other similar cases 	<ul style="list-style-type: none"> Data collection in other similar projects
Waste	<ul style="list-style-type: none"> Waste disposal method 	<ul style="list-style-type: none"> Data collection in other similar projects
Soil Contamination	<ul style="list-style-type: none"> Oil leakage from construction vehicles 	<ul style="list-style-type: none"> Confirmation of situations in other similar projects
Noise and Vibration	<ul style="list-style-type: none"> General situations in the adjacent area of construction sites 	<ul style="list-style-type: none"> Confirmation of location of hospital, school, residential areas and so on
Protected area/Rare species	<ul style="list-style-type: none"> Identification of protected area around the proposed priority projects 	<ul style="list-style-type: none"> Interview to NDFWM staff Site survey
Hydrological situation	<ul style="list-style-type: none"> Examination of hydrological situations during construction works 	<ul style="list-style-type: none"> Data collection in other similar projects
Land acquisition (tentatively)	<ul style="list-style-type: none"> Identification of tentative land acquisition 	<ul style="list-style-type: none"> Interview to local people and official personnel
Existing social infrastructures services	<ul style="list-style-type: none"> Traffic jam due to the project 	<ul style="list-style-type: none"> Confirmation of road conditions Confirmation of situations in other similar projects
Accidents	<ul style="list-style-type: none"> Possibility of accident 	<ul style="list-style-type: none"> Confirmation of situations in other similar plans

1-12 STAKEHOLDER MEETING

The Proposed Agriculture Master Plan including the development framework was presented to the MAF official personnel and other persons concerned for examination. In addition to that, a series of problem analysis workshops to identify issues for rice production and sale was organized at the district level in the Rice Bowl Areas. Contents of the discussion and workshop results are described in this sub-chapter.

1-12-1 Meeting on the Proposed Agriculture Master Plan

The meeting to discuss and examine the proposed Agriculture Master Plan including the framework was organized on 26th May among the Japanese advisers, JICA office staff, MAF personnel (central level) and the Study Team members. The Team leader presented the study progress and findings to the participants at the beginning of the meeting. All the participants shared some issues related to crop production, and they agreed to continue such meetings from now on. The participants are as shown below:

Name	Position
Mr. Mariano Assanami Sabino	Minister
Mr. Lourenço B. Fontes	Director General for Agriculture and Livestock
Mr. Octavio da C. M. de Almeida	Director, DNPP (as of the meeting), Cabinet of Political Planning and Monitoring (at present)
Mr. Gil Rangel	Executive Secretary, Food Security & Cooperation (as of the meeting), Secretariat of Safety and Food Sovereignty, Nutrition and Cooperative (at present)
Mr. Fernando Egidio Amaral	Director, NDPIAC
Mr. Augusto Fernando	Director, NDPA
Mr. Adolfo R. Ferreira	Director, NDPSE
Mr. Martinho Lopes Soares	Director, NDIGUA (as of the meeting), Director, NDIWM (at present)
Mr. Oscar M. Goncalves	Director, NDAH
Mr. Carlos M. Amaral	Chief Dep., NDPV
Mr. Arcanjo dos Reis	Chief Dep., NDPIAC
Mr. Alberto Gomes Lopes	Chief Dep., NDPIAC
Mr. Rofino S. Gusmao	Senior Officer, DNPP
Mr. Hikoyuki Ukai	JICA Chief Representative
Mr. Hideto Daiko	JICA Project Formulation Advisor
Mr. Kenji Kamikura	Agriculture Policy Advisor, JICA Expert
Mr. Hiroshi Tanaka	Agriculture and Irrigation Advisor, JICA Expert

Comments and contents of discussion at the meeting are as follows:

- Crop diversification and effective river water use are important.
- It is needed to go the field to understand farmers' mind-set for agriculture promotion.
- Supportive data for the proposed the Agriculture Master Plan is necessary.
- A road map to achieve the SDP goals has to be prepared. It is needed to know what kinds of impacts by the proposed policy options are expected, especially on the rice consumers.
- Inter-ministry discussion is important to achieve the goal of the SDP, since some issues are out of MAF's obligation.
- Other donors have plans to support rice producing area, by providing rice mills and equipment.

1-12-2 Meeting on the Proposed Development Scenario

On 7th July, the meeting to discuss the proposed four development scenario in the Strategy 4 mentioned above was organized between the team members and the official personnel of Timor-Leste concerned (MAF central level). At the beginning, the development scenarios were presented to the

MAF key persons. The team leader emphasized the importance to consider farmers' motivation for rice production increase. As a whole, the participants from MAF agreed on that it is difficult to set tariff barrier and necessity of rice purchasing by MAF. Finally, the development Scenario 2, which introduces the rice purchase system by MAF, was identified as the most effective measure against the current issues at the meeting. The persons who exchanged opinions with the Study Team are as shown below:

Name	Position
Mr. Lourenço B. Fontes	Director General for Agriculture and Livestock
Mr. Gil Rangel	Secretariat of Safety and Food Sovereignty, Nutrition and Cooperative
Mr. Martinho Lopes Soares	Director, NDIWM

1-12-3 Problem Analysis Workshop at Rice Bowl Areas

For the purpose of identification of characteristics and needs in the Rice Bowl Area, namely, five sites, a series of problem analysis workshop (W/S) was conducted and problem trees were formulated. The results of W/S are to be referred for formulation of priority projects. Schedule and the participants of W/S are as shown below:

Table 1-12-1 Schedule of W/S and Participants

Date	District	Participants			
		Farmers	Official personnel of MAF (District)	Official personnel of MAF (central)	NGO staff
23 May 2014	Baucau	26	6	3	0
27 May 2014	Viqueque	22	10	2	2
30 May 2014	Covalima	21	4	2	2
3 June 2014	Bobonaro	20	10	3	8
10 June 2014	Oecusse	23	6	3	1

Given that the one of SDP goals is increase of rice sufficiency, "Local rice cannot be sold" was set as the core problem at the problem analysis W/S. Participants of the W/S were rice production farmers, village chief/sub-chief, rice traders, MAF district staff and so on, and they were requested to analyze causes of the core problem. Major listed issues by district are as shown below:

(1) Baucau

- Due to insufficient irrigation water, rice can be cultivated only once per year;
- Taste of local rice is good, which leads to increase of high price;
- Modern farming technology such as ICM is not implemented since farmers are busy for other activities e.g. fishery and livestock;
- Markets are located far from the production areas and road condition is bad, which leads to bad market access;
- Labor force is insufficient, since only women harvest crop in general; and
- Motivation of rice production is low, since vegetable cultivation and fishery are more profitable than rice cultivation.

(2) Viqueque

- WUA have yet to be established in some areas and existing irrigation facilities are damaged by floods, consequently, farmers cannot access to enough irrigation water;
- Rice purchasing system does not function;

- There are few companies to purchase rice or to invest fertilizers for rice cultivation;
- Low quantity and quality makes price of local rice high;
- Due to budget shortage, agricultural training is not implemented sufficiently, which can lead to low quality of rice; and
- Farmers are very busy for other activities such as fishery and construction, and they do not enough time for implementation of new agricultural techniques.

(3) Covalima

- Existing irrigation facilities are not maintained sufficiently;
- Rice purchasing system by the government does not functioned;
- Even if farmers have knowledge of new agricultural techniques such as ICM, they do not practice such techniques due to labor shortage;
- There is distance from production areas to markets; and
- Farmers do not understand advantage of participation in farmer's groups, which are authorized by MAF. Training by MAF extension workers are implemented targeting farmers groups, and individual farmers cannot access to information by MAF.

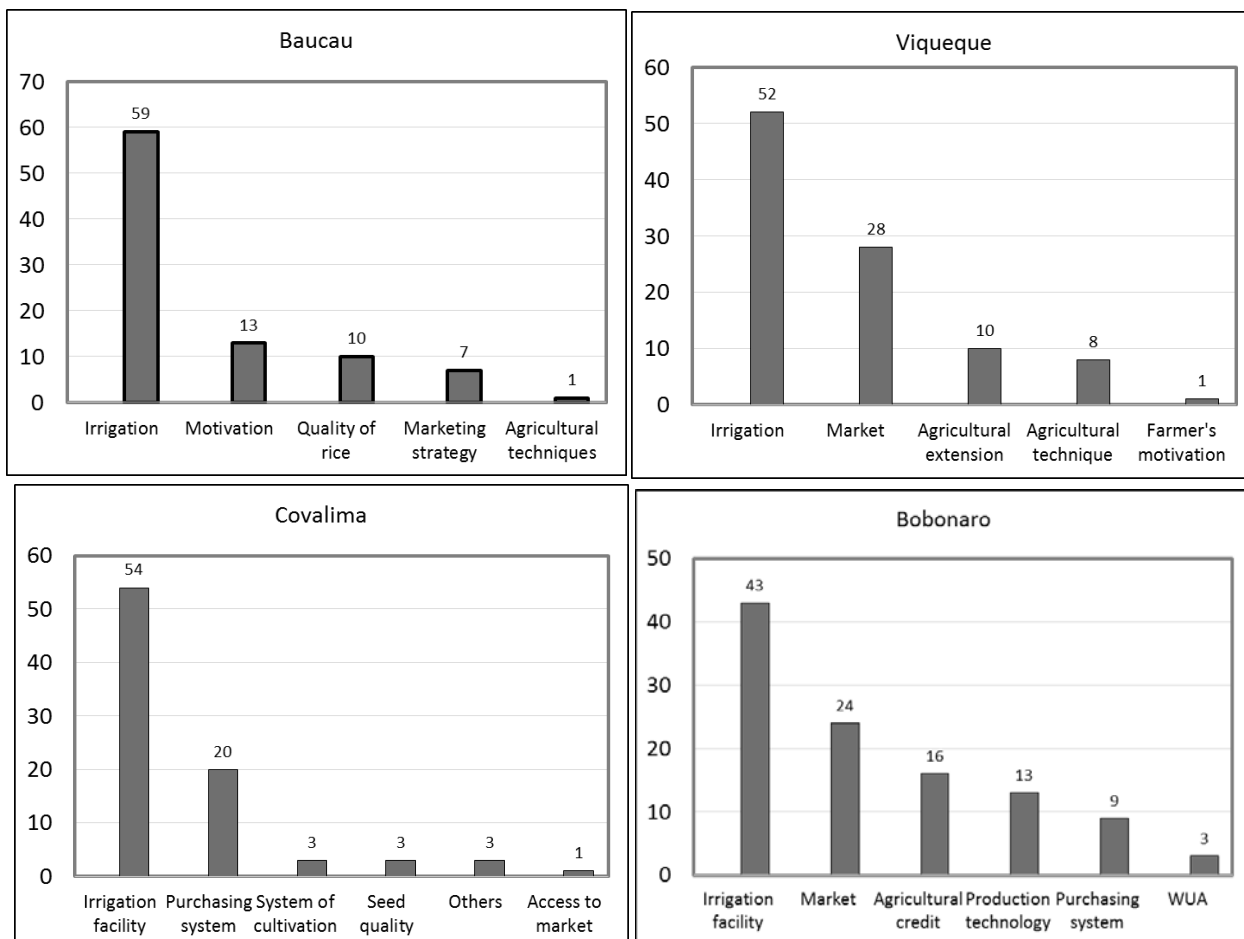
(4) Bobonaro

- Number of rice buyers is limited;
- Agricultural training or provision of fertilizer by MAF targets farmer groups, however, advantage of participation in such groups is not understood by farmers;
- There are cases that credit cooperative faded out, since rice could not be sold and the cooperatives could not refund;
- Rice is provided to WUA board members, however, they cannot encash the rice, which leads to low motivation of the members; and
- Production cost such as labor and fertilizer is high.

(5) Oecusse

- There are many issues regarding irrigation, e.g., degraded irrigation structure, damages to by flood, soil sedimentation which break canal and intake;
- It is difficult to get quality seeds, since available seeds are home-grown;
- Damage by pests and diseases are big concern;
- Available water from rivers is insufficient around international boundary, since much water is taken in Indonesia, which is located on upstream;
- Farmers do not know proper amount of fertilizer nor suitable timing for fertilizer application;
- Irrigation water during dry season is insufficient (farmers do not cultivate rice during rainy season due to flood); and
- Before independence, there was a rice purchase system through agricultural cooperatives, however, it was dissolved.

Problems, which were listed up at the W/S, were classified into 5 to 6 categories (9 categories for only Oecusse District), and priority ranking was done by the participants (each person had three scores for voting). As illustrated in following figures, needs of irrigation water was ranked at the highest in all the districts. Market strategy and access to markets were identified as high priority needs next to irrigation. Agricultural technical issues were actively discussed, however, its priority was not very high. Concerning Oecusse, it shows unique tendency compared with other districts, for instance, quality seed and disease & pest control were ranked up at second and third highest priorities, respectively. The raking results are illustrated in following figures:



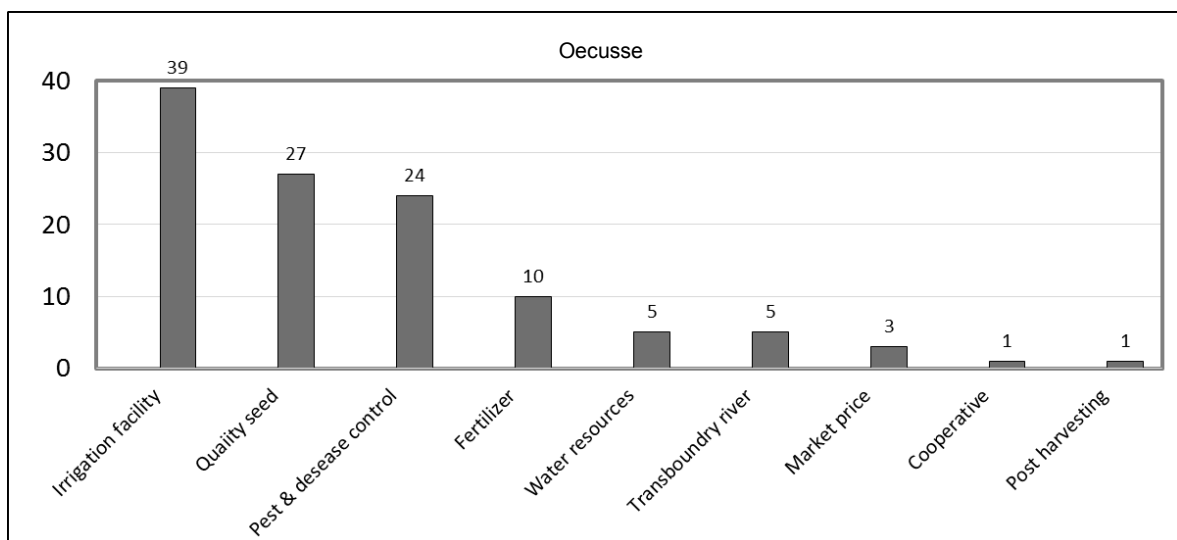


Figure 1-12-1 Ranking Results for Priority by District

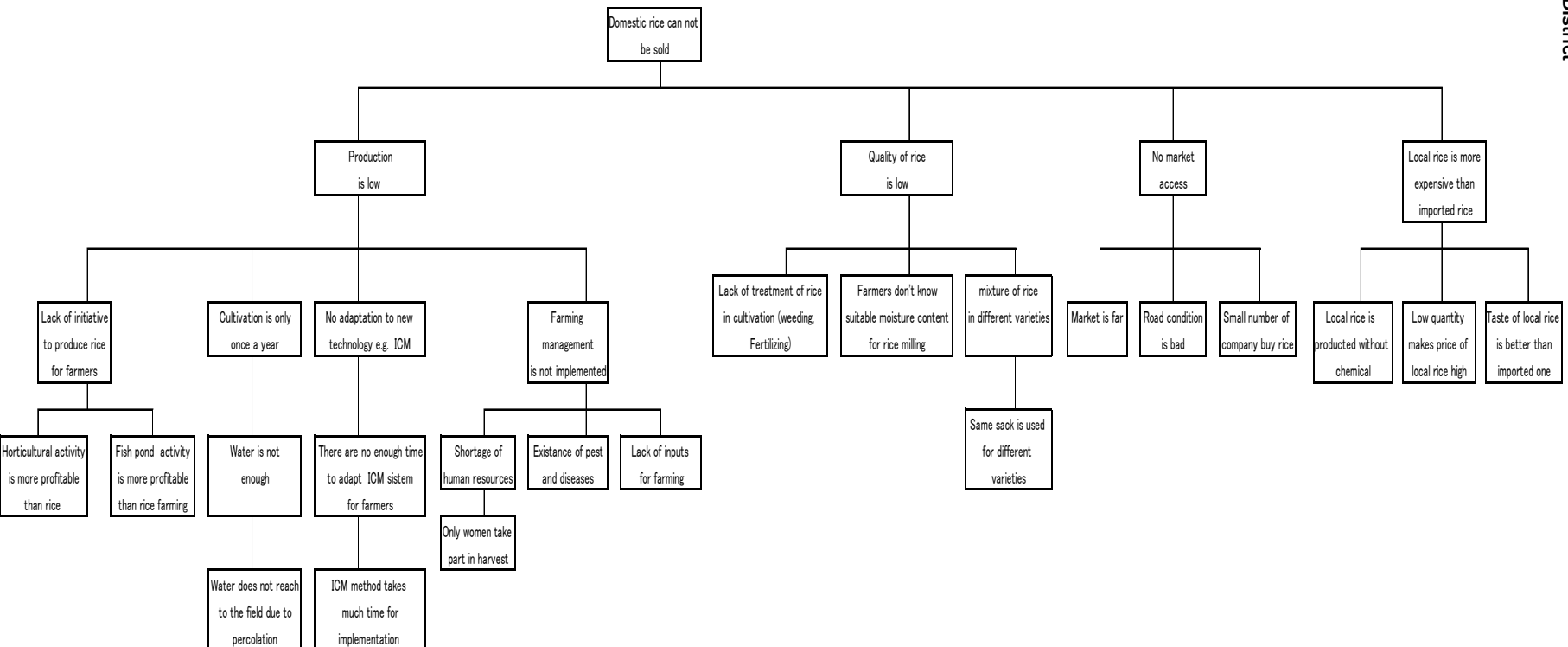
Needs of irrigation is the highest in all the sites according to the W/S results. Other matters, which the participants showed high interest, are farming (quality seeds, extension and so on) and distribution e.g. access to market. Based on the results, the candidates for the priority projects sites were determined considering necessity and effects of irrigation. In next step, the project sites, which have high potential of farming and distribution, were narrowed down from the candidates mentioned above. Finally, three sites in the Rice Bowl Areas and one site in the subsistent farming areas, four sites in total (two sites in Bobonaro District and two sites in Viqueque District) were selected as the target areas.

At the W/S, some participants pointed out that the local rice purchase system by MCIE does not function well and that rice production farmers have low motivation for rice production. Based on the opinions, it is proposed to formulate an action plan for embodiment of local rice purchase system by MAF as one of the priority projects.

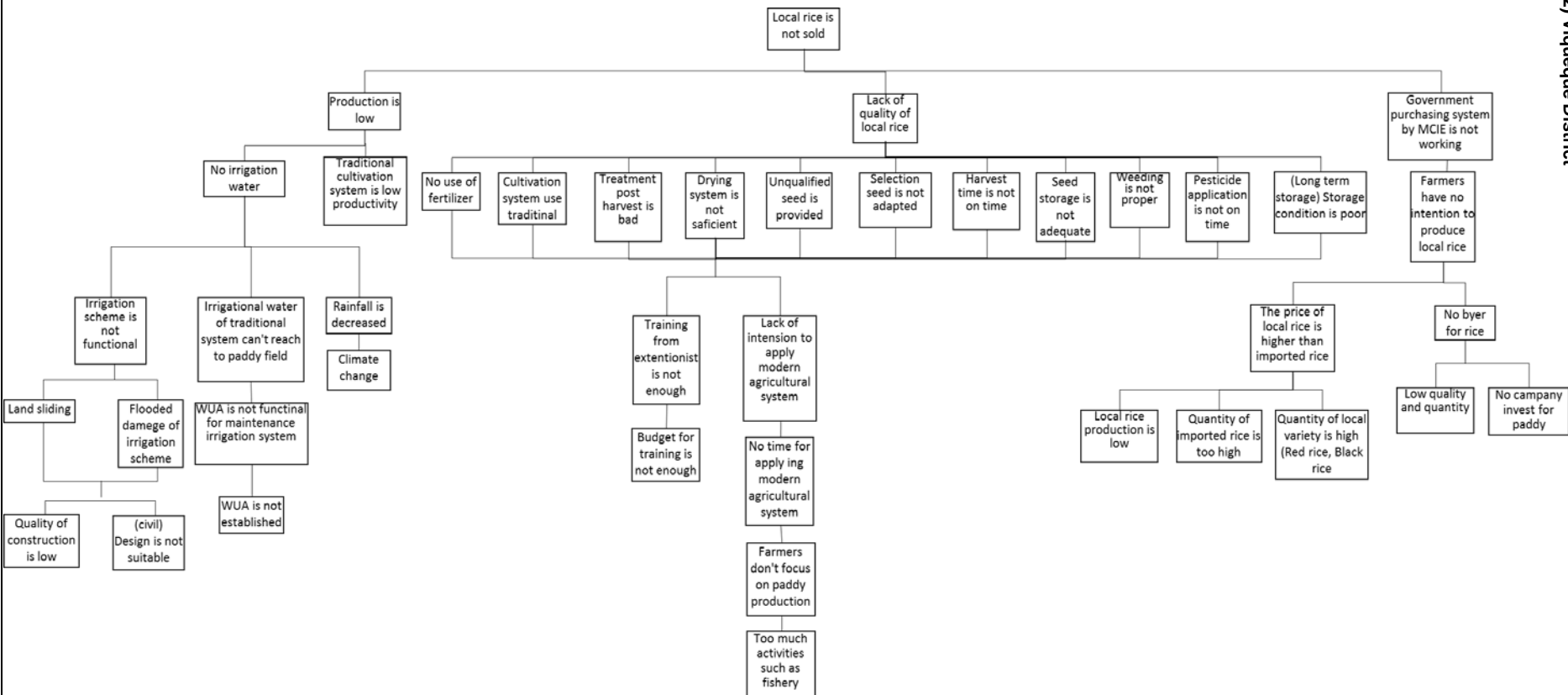
Problem analysis trees prepared by the participants in the W/S are attached in Annex as follows:

Annex: Problem analysis trees prepared by the participants at the W/S.

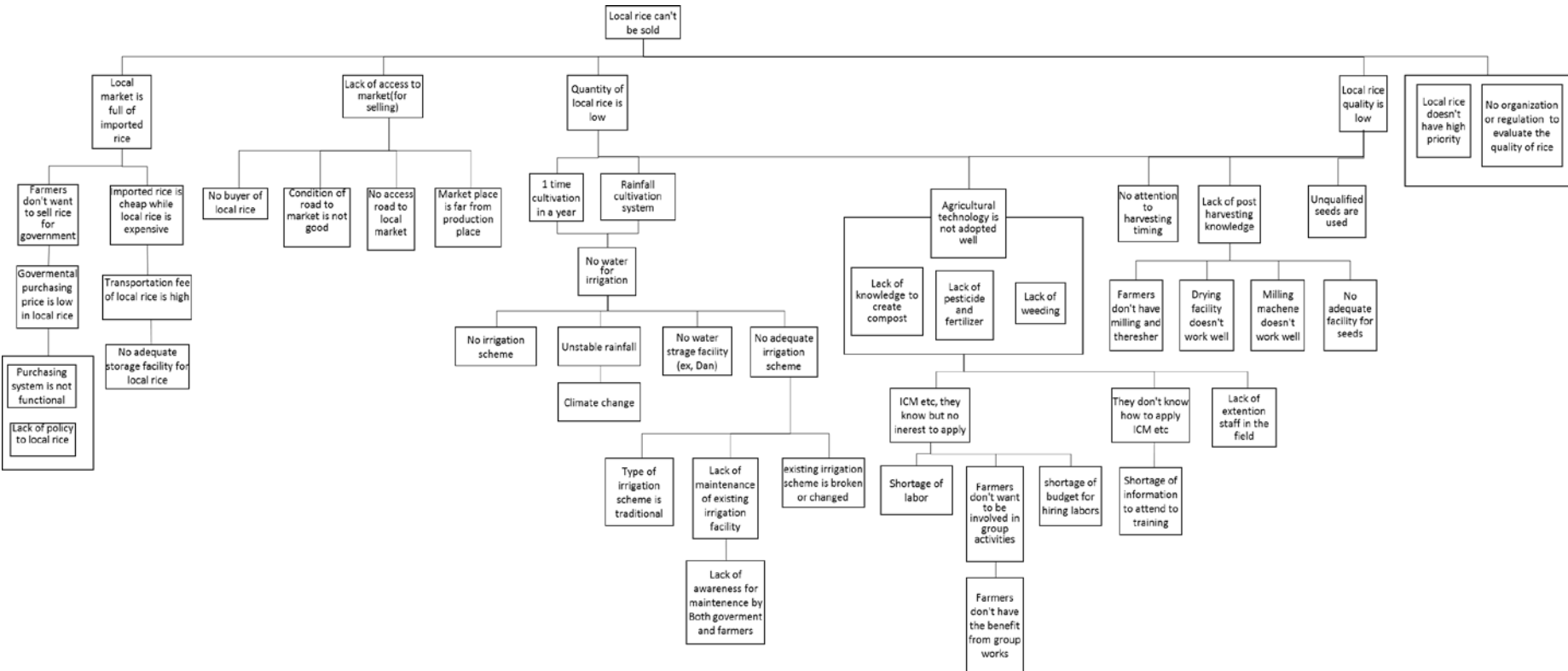
Problem Tree (1) Baucau District



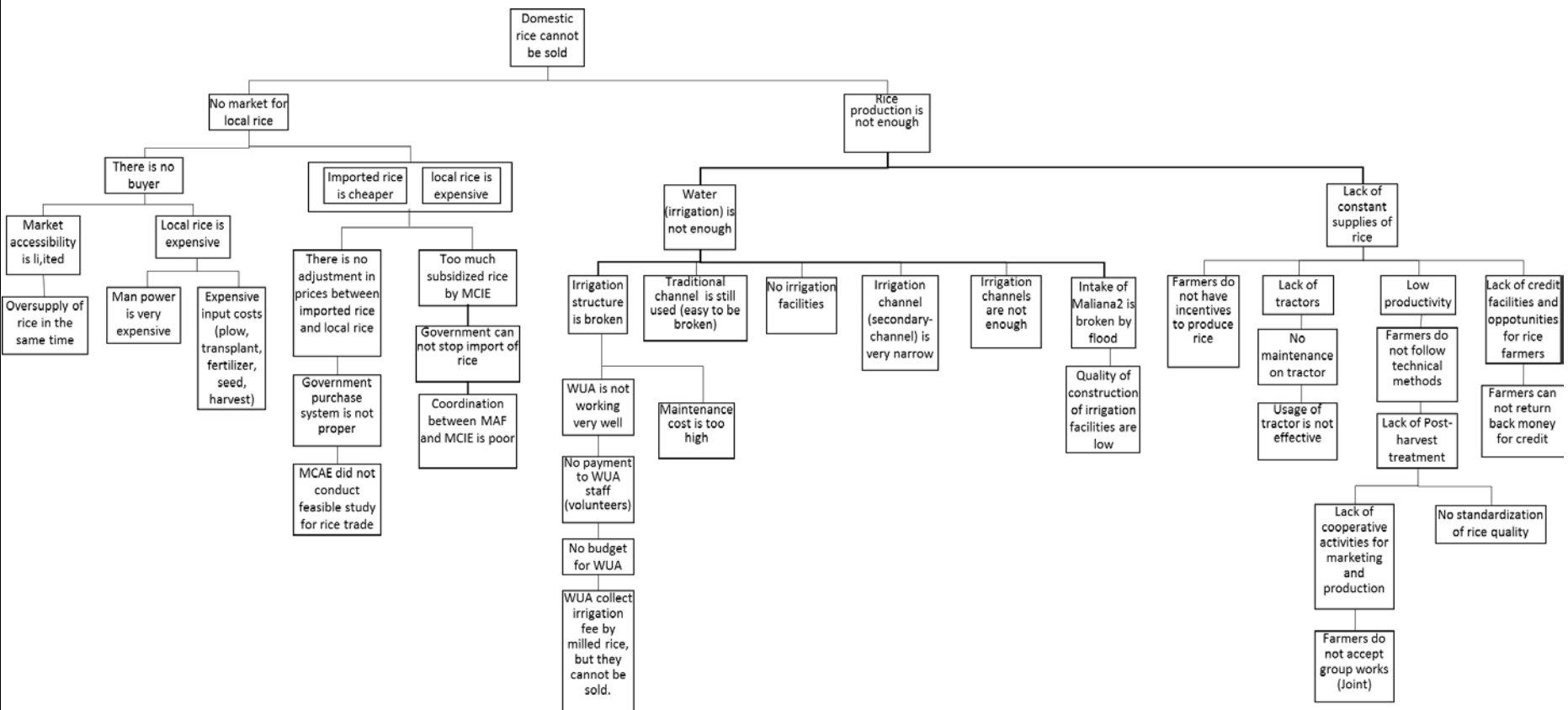
Problem Tree (2) Viqueque District



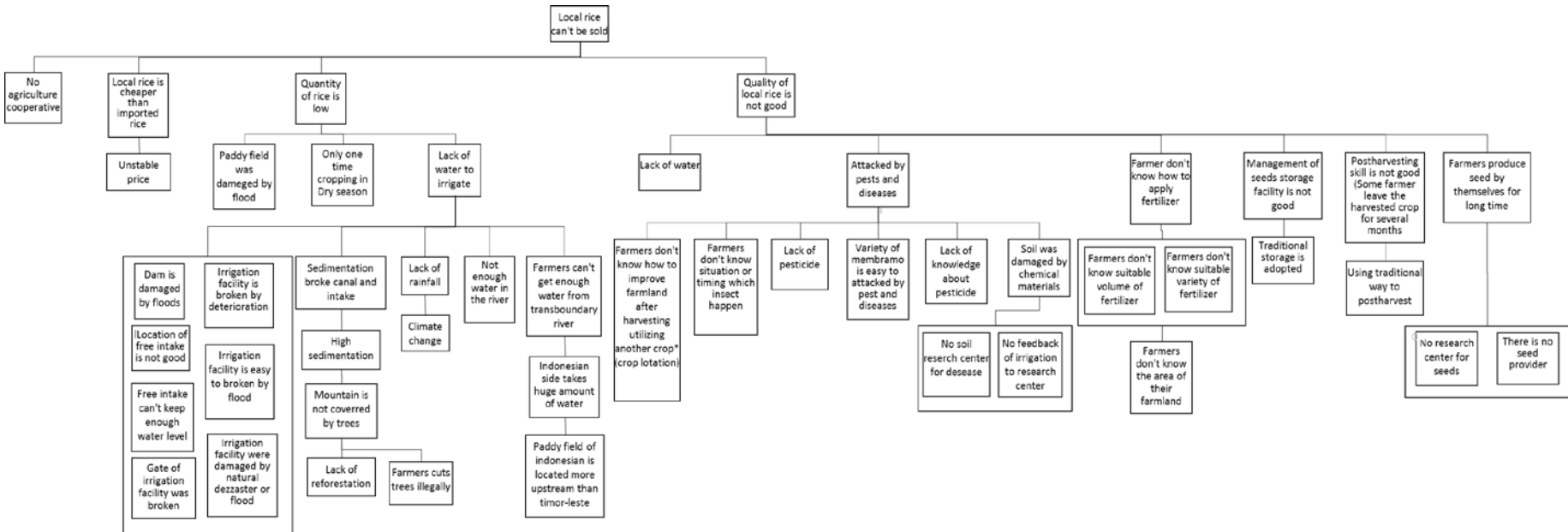
Problem Tree (3) Covallima District



Problem Tree (4) Bobonaro District



Problem Tree (5) Oecusse District



CHAPTER 2 ENVIRONMENTAL AND SOCIAL CONSIDERATION FOR THE PROPOSED PRIORITY PROJECTS

2-1 PROJECT COMPONENTS

As mentioned in Chapter 1, five priority projects are proposed¹ based on the Master Plan. Project No.1 is action plan formulation by MAF for embodiment of the proposed policy to promote farmers' motivation for rice production. On the other hand, Project No.2, No. 3 and No.5 consist of rehabilitation of existing irrigation facilities for improvement of the irrigation system and technical improvement of crop production and processing/marketing, while Project No.4 focuses on marketing improvement in plural irrigation schemes. The proposed components of the priority projects are as follows:

Table 2-1-1 Components of Proposed Priority Projects

No	Site	Project Name	Components	Irrigable area
1	Rice bowl areas	Action plan formulation of rice purchase system by MAF	<ul style="list-style-type: none"> Action plan formulation for rice purchase system by MAF and establish of a rice stock center 	-
2	Bobonaro District HALECOU area	Production increase project of domestically produced commercial rice	<p>[Irrigation] Rehabilitation of the existing intake with a flush gate, construction of a bed protection and river bank protection, setting of distribution or transition, and training for facility operation</p> <p>[Production improvement] Local resource circulative agriculture promotion project, strengthening program for pest and disease control, securement of breeding quality seed, extension of farming techniques for extension workers and installation of farm equipment</p> <p>[Marketing/distribution improvement] Direct sale of rice to market, sale of paddy to technical agriculture school of Moleana, high quality rice production, collective storehouse construction and training for farmer groups in market-oriented rice farming</p>	360ha
3	Viqueque District SAKETO area	Production increase project of domestically produced commercial rice	<p>[Irrigation] Participatory secondary and tertiary canal rehabilitation, river protection, setting of distribution or transition, sedimentation pond setting and training of maintenance techniques through participatory construction works</p> <p>[Production improvement] Local resource circulative agriculture promotion project, strengthening program for pest and disease control, securement of breeding quality seed, extension of farming techniques for extension workers & farmers and installation of farm equipment</p> <p>[Marketing/distribution improvement] Direct sale of rice to market, sale of paddy to technical agriculture school of Natabora, high quality rice production, collective storehouse construction and training for farmer groups in market-oriented rice farming</p>	410ha
4	Bobonaro District Maliana Wide Area	Distribution enhancement project of domestically produced rice	<p>[Marketing/distribution improvement] Improvement of rice milling, development of processed rice, integration of rice distribution from collection to middle trader, Training of rice production farmers, Establishment of a value chain system of domestic commercial rice, model farmers selection and</p>	-

¹ Detail project components of the priority project in this chapter are different from those in Chapter1, since final project components are determined based on the detail survey at pre-F/S level.

No	Site	Project Name	Components	Irrigable area
			introduction of proper post-harvest, Improvement of rice sale and collective sale	
5	5. Viqueque District BIKALIUI area	Substantially agricultural strengthening project	[Irrigation] Canal rehabilitation, rehabilitation of headworks, setting of distribution or transition, sedimentation pond setting and training of maintenance techniques [Production improvement] Local resource circulative agriculture promotion project, extension of farming techniques for extension workers & farmers, subsistence farming and integration of farming with livestock breeding	50ha

The proposed priority project 2, 3 and 5 have a potential to cause some adverse impacts, since they take structural measures while other priority projects do not. Therefore, this chapter focuses on those three priority projects. The locations of the priority projects are presented in the following figure:

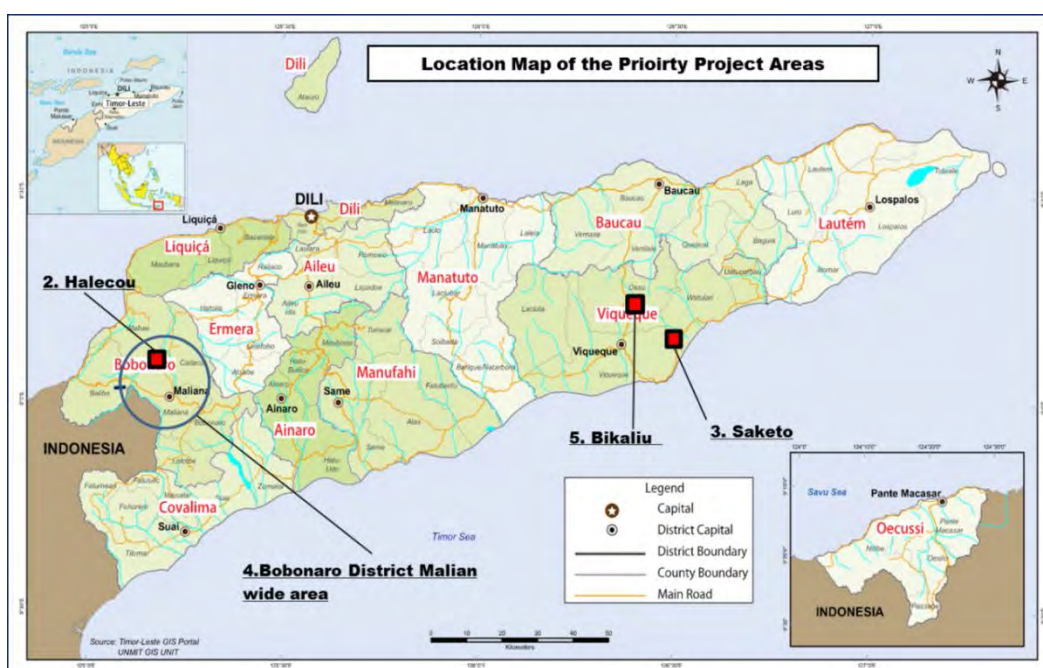


Figure 2-1-1 Location Map of the Proposed Priority Projects

(1) Halecou Irrigation Scheme

Halecou intake and the beneficial area are located on Ritabou Suco, Maliana Sub-district. The intake is located on just upstream of the Halecou irrigation scheme beneficiary area and the intake diverts water from the Nunura River for irrigation. Halecou irrigation scheme is surrounded by other irrigation schemes such as Malian I, which are target areas of the priority project 4.

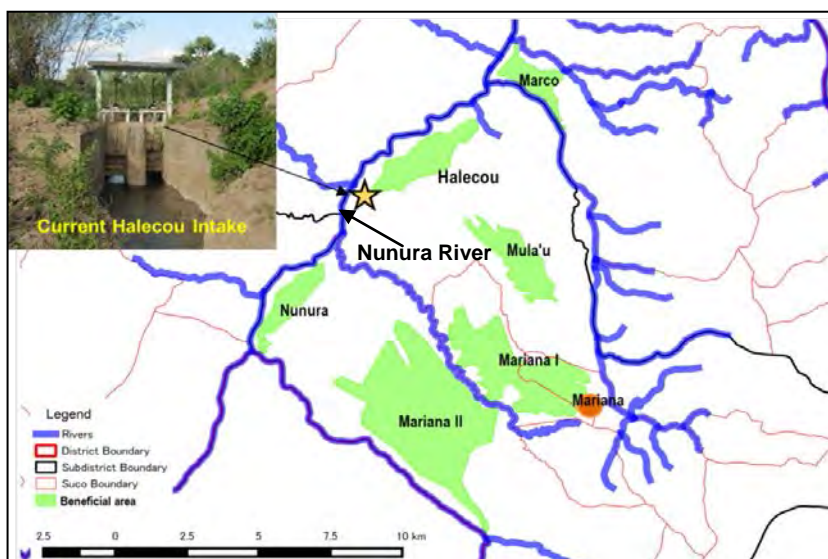


Figure 2-1-2 Location of the Priority Project in Bobonaro District

The location of Halecou site is illustrated in Figure 2-1-2.

Present Halecou intake is supposed to provide irrigation water to the beneficial area from the Nunura River by gravity. However, water course in the River has been changed very often due to floods, and it is difficult to divert sufficient water from the River to the intake. It is proposed to construct a bed protection for water guide at the upstream of the existing intake. It is planned that the collected water through the water guide is diverted to the intake, and the existing canal is rehabilitated together with a new flush gate. Six water transitions/distributions will be constructed. In addition, based on the request from the farmers, embankment protection against erosion will be implemented. The proposed layout is illustrated in following figure:



Figure 2-1-3 Proposed Layout of Halecou Site



(2) Saketo and Bikaliu Irrigation Scheme

In Viqueque District, two priority projects are proposed. One of them is “Production increase project of domestically produced commercial rice” in Saketo irrigation scheme. In this project, the secondary and tertiary canals within the beneficial area will be rehabilitated for smooth water distribution. The

Saketo irrigation scheme beneficiary area is located on Macadique Suco, Watulari Sub-district. Another project is “Substantially agricultural strengthening project” in Bikaliu irrigation scheme. The Bikaliu intake to be rehabilitated is located on upstream of beneficial area of the scheme. The beneficiary area is located on Uaguia Suco, Ossu Sub-district. The location of both priority project sites is illustrated as follows:

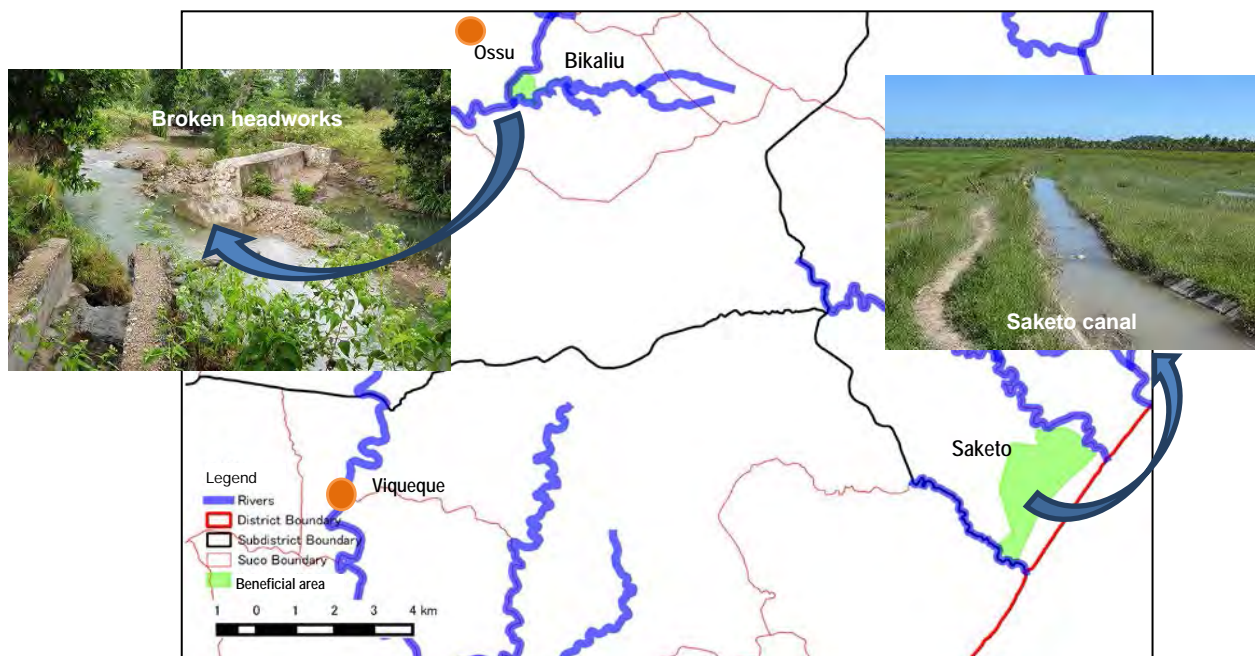


Figure 2-1-4 Location of the Priority Projects in Viqueque District

A series of bank protection studies by MAF (including 10 irrigation scheme feasibility studies) is going on. At this moment, it is very difficult to distribute water from the canals to the paddy fields in the beneficial area, since the bed of secondary and tertiary canals is lower than that of the paddy field. On the other hand, the headworks and main canal of the scheme are functional. Therefore, it is proposed to adjust elevation of the secondary and tertiary canals. The construction is not very difficult in terms of technical matters, and it is proposed to implement the works by the farmers mainly in participatory manners for the purpose of sustainability. Proposed layout of the works is illustrated as shown below:

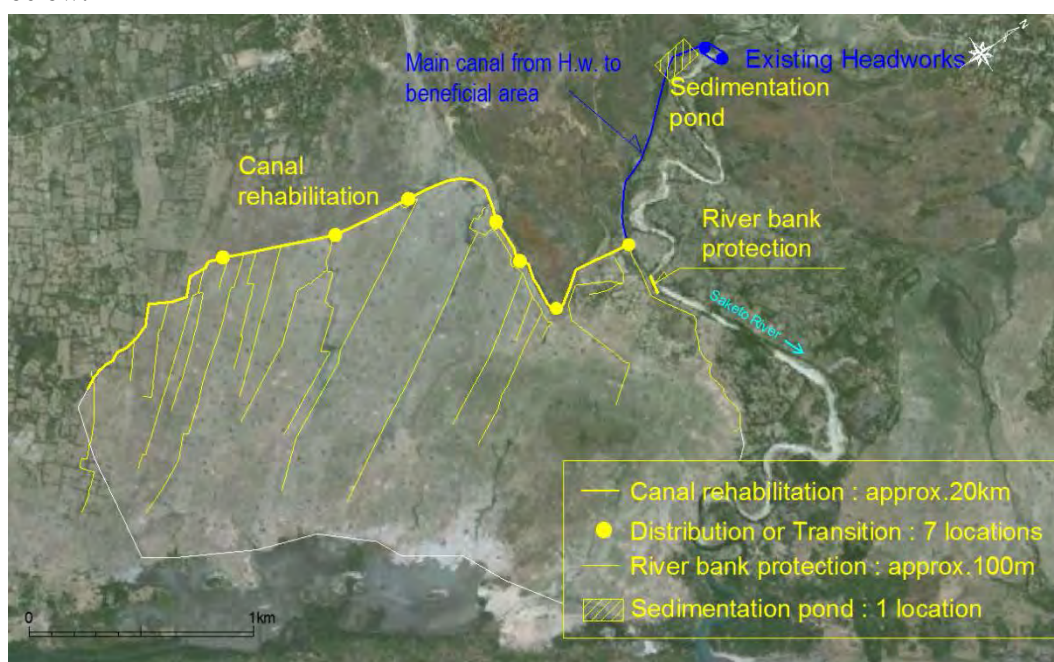


Figure 2-1-5 Proposed Layout of Saketo Site

In Bikaliu scheme, the farmers cannot use water as they like even in rainy season and they need stable irrigation water in that season. Existing headworks was broken by the flood just after construction in 2011. As a result, irrigation water cannot be diverted from the river to the canals, therefore, it is planned to rehabilitate the canals and construct a new headworks without gate at upstream of the broken one. It is expected that the maintenance of the headworks will be very easy. In case of flood, water will be overflowed to the downstream. Three distribution/transition for water diversion will be constructed as one of the components. The proposed layout of Bikaliu site is illustrated as shown below:

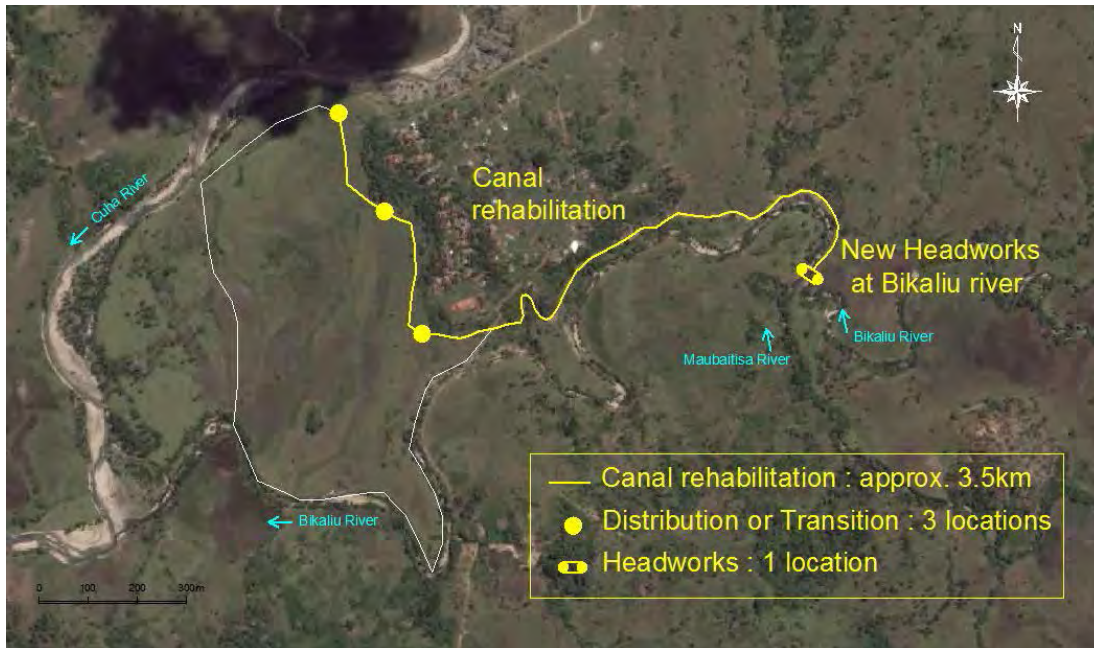


Figure 2-1-6 Proposed Layout of Bikaliu Site

General conditions in and around the target areas of the priority projects are described in following sub-chapters:

2-2 ENVIRONMENTAL AND SOCIAL CONDITIONS IN THE PROPOSED PRIORITY PROJECT AREAS

2-2-1 Natural Conditions

(1) Meteorological Conditions

(a) Bobonaro District

Monthly rainfall and temperature are presented in Figure 2-2-1. Simulated annual rainfall in Bobonaro District (at Ritabou Suco) is 1,354 mm² and the rainfall graph shows a clear tendency of dry season and rainy season. Monthly rainfall is in peak in January, around 250 mm, while it is very limited in August and September. On the other hand, monthly temperature is constant and it does not fluctuate through the year. Mean minimum and maximum temperatures are 23.9 degree and 31.4 degree, respectively.

(b) Viqueque District

Simulated annual rainfall in Viqueque District (at Uagua Suco) is 1,909 mm¹. Monthly rainfall from

² This amount is simulated by Seed of Life using the modeled worldclim data and Portuguese data.

December to May is around 250mm, while it is very limited from August to October. As well as Bobonaro District, monthly temperature is almost constant through the year. Mean minimum and maximum temperatures are 21.4 degree and 29.9 degree, respectively.

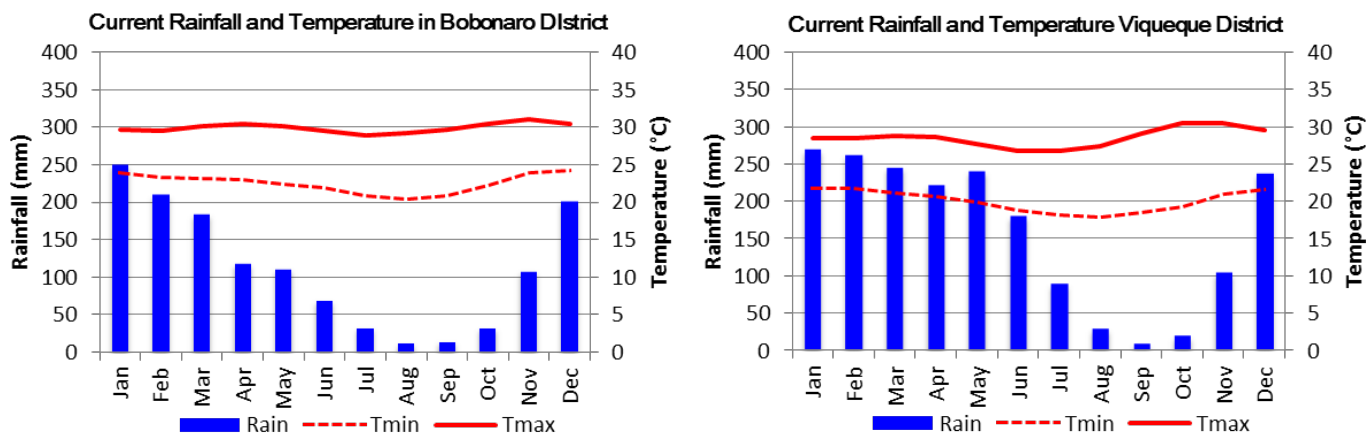


Figure 2-2-1 Monthly Rainfall and Temperature in Bobonaro District and Viqueque District

(2) Fauna and Flora

As mentioned before, 52 Protected Areas are identified in Timor-Leste by the NDFWM, however, no Protected Area is identified in and around the Halecou, Bikaliu and Saketo irrigation schemes as shown in Figure-1-5-5 in Chapter 1, moreover, it was confirmed by official personnel of the NDFWM that the protected area including “Wetland of national significance in Timor-Leste” is outside of all the priority project sites.

(a) Halecou Intake and its Beneficial Area

Surrounding area of the Halecou intake is non-farmland with some bushes and it is not used for farming very much, while there is a private farmland around 50 m downstream from the intake. Moreover, there is a holy tree³ nearby the Halecou intake, which should not be cut down. The beneficial area of the Halecou irrigation scheme is used as farmlands, where rice, maize, cassava, vegetables and grasses for livestock are cultivated.



³ People in Timor-Leste pay respect to holy stones or holy trees, since they believe that spirituals stay in such natural objects.

(b) Secondary and Tertiary Canals in Saketo Irrigation Scheme

The priority project in Saketo irrigation scheme focuses on rehabilitation of secondary and tertiary canals in the beneficial area. The targeted canals run through the farmlands, mainly, paddy field. Virgin nature has been already lost, no wild animals and native bush are cannot be observed. On the other hand, irrigation water in the canals flows substantially in rainy season, while very little water does in dry season.



(c) Bikaliu Intake and its Beneficial Area

Both sides of river around the existing Bikaliu headworks are private lands, and left side of the river is grassland, while right hand of the river is used for paddy cultivation in rainy season. Natural vegetation in and around the site is limited within the water course. Beneficial area of the Bikaliu irrigation scheme is owned by privates, however, any crops have not been cultivated since 1980s due to no irrigation water, and the land has been almost abandoned (see photo lower right). Therefore, there is no natural vegetation in the area.



2-2-2 Socio-Economic Conditions

(1) Population

Halecou site, Saketo site and Bikaliu site are located on Ritabou Suco and Atabae Suco in Bobonaro District, Macadique Suco in Viqueque District, and Uaguia Suco in Viqueque District, respectively. Population, number of households and population density of Sucos, where the priority projects are located on, are as shown below.

Table 2-2-1 Population by Sucos in the Priority Projects

Irrigation scheme	District/Suco	Population			Household	Family members/ household
		Total	Men	Women		
Halecou	Bobonaro District, Maliana sub-district					
	Ritabou	3,831	2,011	1,820	884	6.15
	Atabae	1,675	877	798	285	5.88
Bikaliu	Viqueque District, Ossu sub-district					
	Uaguia	1,126	571	555	243	4.63
Saketo	Viqueque District, Watulari sub-district					

Irrigation scheme	District/Suco	Population			Household	Family members/ household
		Total	Men	Women		
Saketo	Macadique	3,901	1,930	1,971	812	4.80

Source: National Statistics Directorate and UNFPA (United Nations Population Fund), 2010, Population Census Study

(2) Land Holding and Irrigation Rate

Average land holding area per household at each site varies very much, from 4.90ha in Halecou site to 11.09ha in Saketo site as shown in following table. Saketo site has much larger paddy field and grassland area compared with those in other two sites. As a whole, around half area of paddy field is irrigated while only less than 20% of upland crop field is irrigated.

Table 2-2-2 Land Holding Area per Household

Land Use	Halecou Site		Saketo Site		Bikaliu Site	
	Area	Irrigation Rate	Area	Irrigation Rate	Area	Irrigation Rate
Paddy field	2.00		4.86		2.16	
(Irrigated area)	(0.74)	37%	(2.40)	49%	(1.25)	58%
(Unirrigated area)	(1.26)	63%	(2.46)	51%	(0.91)	42%
Upland field	1.49		2.41		2.22	
(Irrigated area)	(0.13)	9%	(0.39)	16%	(0.39)	18%
(Unirrigated area)	(1.36)	91%	(2.02)	84%	(1.83)	82%
Grassland	1.28		3.28		1.65	
Residential area	0.79		0.50		0.41	
Others	1.10		0.04		2.44	
Total	4.90		11.09		8.89	

Source: JICA Study Team (Socio-economic survey),

(3) Household Income and Expenditure

Average household farm income and non-farm income in the priority project sites was studied (JICA Study Team, 2015) and the result is illustrated in the figure right. In all the sites, farm income is lower than non-farm income, which means that the people make a living by non-farming works mainly. Saketo site has the highest income in terms of both farm income and non-farm income among the three sites. In Bikaliu site, the percentage of farm income is very small compared with that of non-farm income.

Figure 2-2-3 shows breakdown of farm income (gross income except house consumption) and non-farm income in Halecou site. Benefit from livestock accounts for 66% of the total farm income, while income from rice production accounts for only 13% (=US\$75) and others including coconut oil and local wine production accounts for 12% of farm income. On the other hand, non-farm income has a diversity, and casual labor, business (shop operation), and salary (governmental officers) are main income sources.

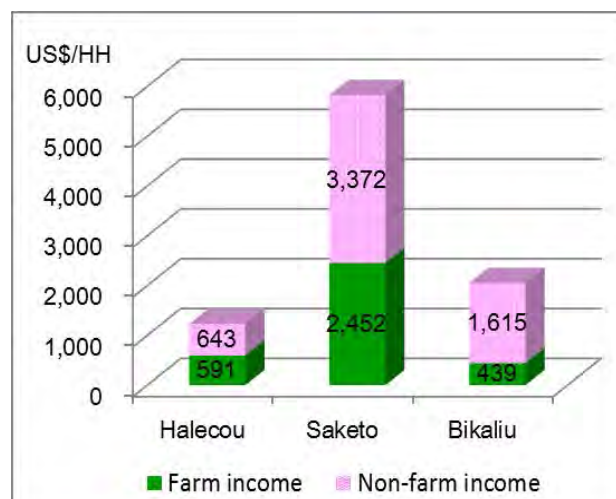


Figure 2-2-2 Farm Income and Non-farm Income in the Priority Project Sites

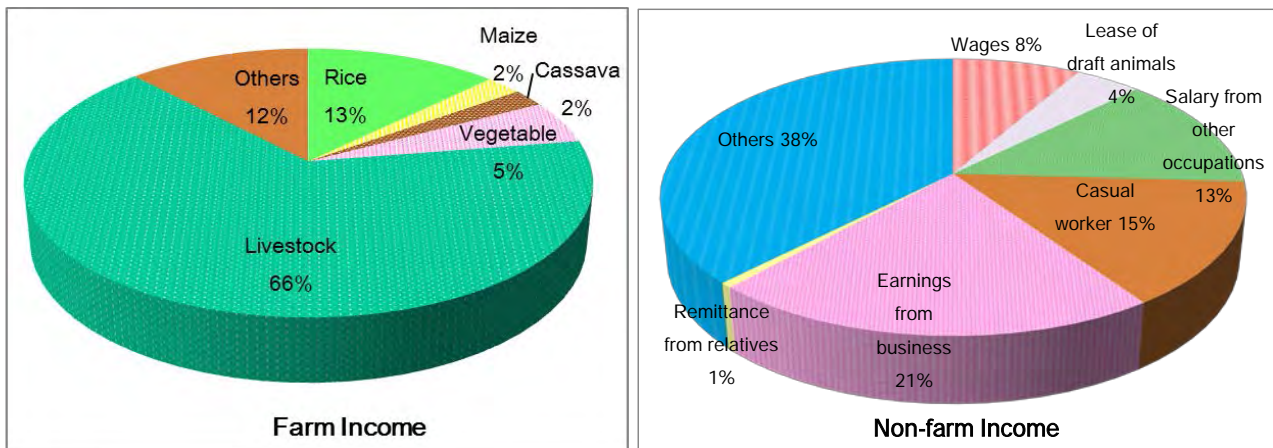


Figure 2-2-3 Farm Income and Non-farm Income in Halecou Site

Source: JICA Study Team (Socio-economic survey), 2015

Following figure shows breakdown of farm income (gross income except house consumption) and non-farm income in Saketo site. Benefit from livestock accounts for 48% of the total farm income, while income from rice production accounts for only 15% (=US\$377). Moreover, others of farm income including coconut oil, local wine and timber accounts for 35% of the total one. On the other hand, 18% of the total non-farm income is remittance (=around US\$600). Income from casual labor is very few, while sum of earnings from business (=26%) and salary from other occupations (=21%) account for around half of the total non-farm income. It can be said that the people in Saketo site can enjoy stable lives by non-farm income.

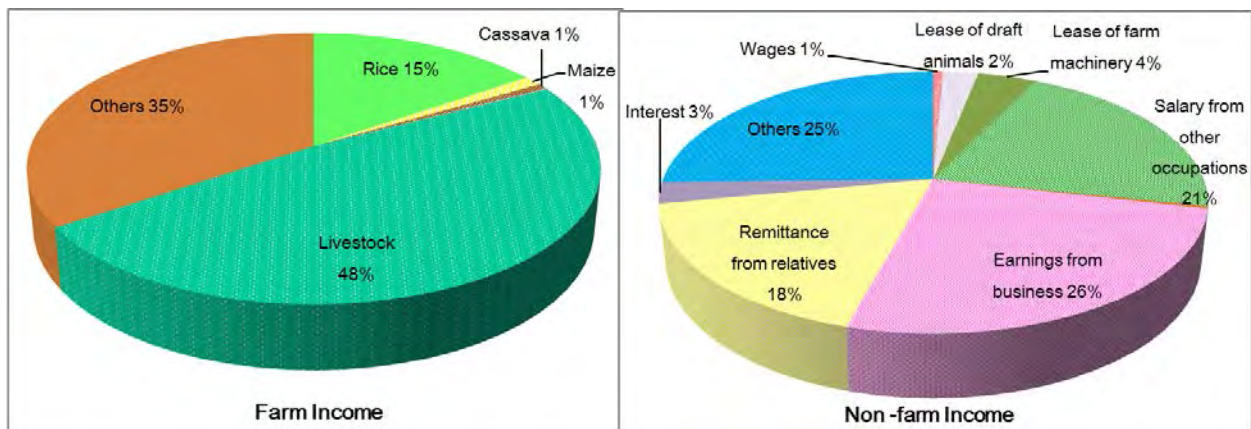


Figure 2-2-4 Farm Income and Non-farm Income in Saketo Site

Source: JICA Study Team, 2015

Figure 2-2-5 shows breakdown of farm income (gross income except house consumption) and non-farm income in Bikaliu site. Benefit from livestock accounts for 64% of the total farm income, while others including coconut oil and local wine production accounts for 33%. Rice is produced in the area, however, since the production is very limited, most of the harvested rice is consumed by the family members. As a result, there is no cash income from paddy production in Bikaliu site. On the other hand, non-farm income is various, and casual labor, business (shop operation), salary (governmental officers) and so on are main income sources.

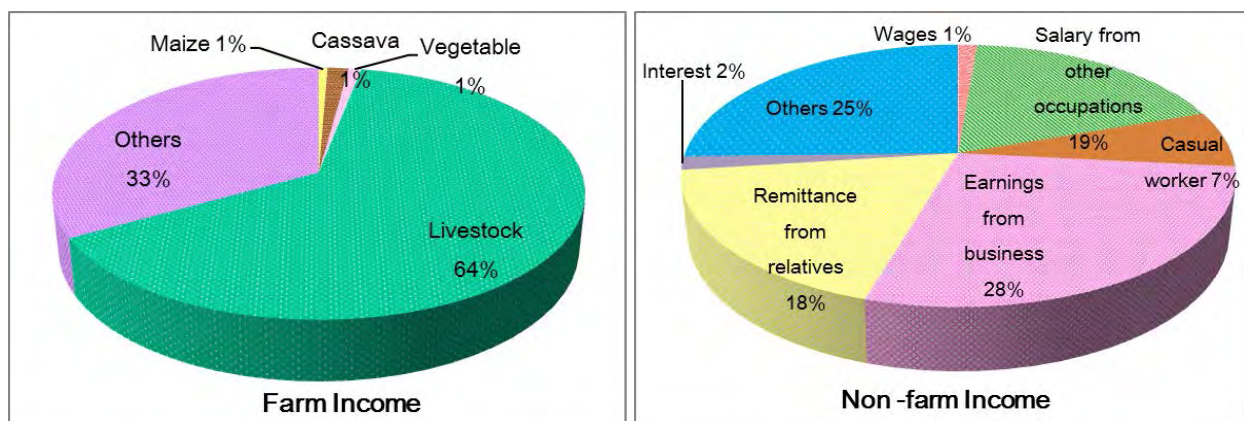


Figure 2-2-5 Farm Income and Non-farm Income in Bikalieu Site

Source: JICA Study Team, 2015

Food expense accounts for the highest percentage of total house expenditure in the priority project sites. Especially in Bikalieu site, the people cannot harvest sufficient rice for house consumption and they have to purchase rice, which results in high percentage of food in total expense, namely, 45%. On the other hand, expense of farm inputs accounts for 24% of total one in Saketo site, which means that the people can spend more money for production increase. Average annual expenditure per household at each priority project site is shown in Figure 2-2-6 and Table 2-2-3.

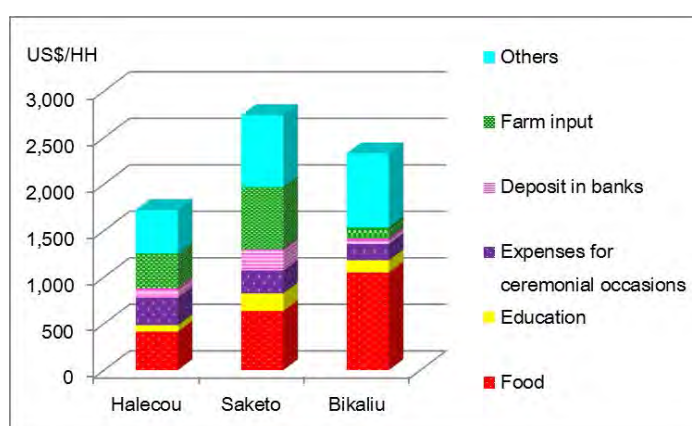


Figure 2-2-6 Household Expenditure in the Priority Project

Table 2-2-3 Annual Household Expenditure⁴

Expenditure Item	Halecou		Saketo		Bikalieu	
	Amount	Percentage	Amount	Percentage	Amount	Percentage
Food	412.44	24%	633.64	23%	1,047.43	45%
Tobacco and cigarettes	80.82	5%	65.28	2%	69.10	3%
Soap, shampoo, etc.	56.25	3%	48.73	2%	44.52	2%
Electricity & fuel	18.71	1%	31.99	1%	64.91	3%
House maintenance	70.96	4%	337.00	12%	237.79	10%
Clothing	103.09	6%	52.37	2%	65.13	3%
Medical care	18.98	1%	73.79	3%	103.52	4%
Education	69.42	4%	190.68	7%	132.52	6%
Recreation	10.84	1%	38.10	1%	24.95	1%
Expenses for ceremonial occasions	295.04	17%	245.64	9%	176.35	8%
Transportation and communication	37.65	2%	67.26	2%	72.24	3%
Remittance to relatives	22.48	1%	15.40	1%	52.30	2%
Land and house rent	0.50	0%	13.00	0%	14.78	1%
Deposit in banks	102.40	6%	228.49	8%	58.00	2%

⁴ In Figure 2-2-6, “Others” means all expenses except food, deposit in the bank, expenses for ceremonial occasions, while “Others” in Table 2-2-3 does not, which means that their values are different.

Expenditure Item	Halecou		Saketo		Bikaliu	
	Amount	Percentage	Amount	Percentage	Amount	Percentage
Taxes	0.60	0%	3.05	0%	8.69	0%
Loan repayment	8.00	0%	18.00	1%	17.55	1%
Farm input	372.81	22%	666.88	24%	117.23	5%
Others/ Halolia	39.00	2%	10.00	0%	21.94	1%
Total	1,719.99		2,739.30		2,328.95	

Source: JICA Study Team, 2015

Following table shows household income, expenditure and balance at each priority project site. The balances in Halecou site and Bikaliu site are minus, which means that the people are struggling to survive. They compensate for the deficit by debit from neighbors and relatives for according to the interview results (JICA Study Team, 2014). On the contrary, household account in Saketo is surplus.

Table 2-2-4 Annual Household Balance

Unit : US\$/household/year

	Halecou Site	Saketo Site	Bikaliu Site
Income (1)	1,235	5,824	2,054
Expenditure (2)	1,720	2,739	2,329
Balance (1)-(2)	△ 485	3,085	△ 275

Source: JICA Study Team, 2015

(4) Cultural Characteristics in the Rural Society

In the rural society, a traditional rite of passage, called as Tara Bandu, is having a large influence on the people's lives. Tara Bandu is a traditional law used by communities in Timor-Leste to regulate social relations among people as well as between people and the environment. Tara Bandu restricts access to and use of natural resources, and it constitutes a traditional protection and management mechanism ensuring sustainable resource use. Beside, traditional leaders, called as Kabube (Marino in Manatsuto District), are responsible for controlling water resource in the rural society. It has to be emphasized that the project which aims to develop water resource in rural area must take account of the presence of Kabube on the planning stage.

Roles of male and female in farming activities are not clear, and both men and women work together generally. However, there is a tendency that land preparation, irrigation and so on are mainly shouldered by men, while plantation and harvest are done by women mainly. Men's working hours for rice production is much longer than those of women, on the other hand, working hours of men and women for cassava and maize production are almost same. Concerning water fetching and firewood collection, women and children cover the works in many cases. Large livestock are mainly raised by men and boys.

2-3 LEGAL AND INSTITUTIONAL SYSTEM

Legal and institutional system for environmental and social consideration is mentioned in Chapter 1. According to the official personnel of Department of EIA, a Project Document for a proposed project shall be prepared and submitted to the Department. At this stage, implementation of the proposed priority projects has yet to be officially approved, therefore, it is not needed to prepare the Project Documents of the proposed priority projects at this moment.

2-4 EXAMINATION OF ALTERNATIVES

For the purpose of proper project component selection, alternatives including zero option for the proposed priority projects are examined. Not only environmental impacts but also technical aspects and cost effectiveness were considered. Regarding Halecou site, zero option, Option 1: Construction

of a bed protection for water guide and attachment of a flush gate to the existing intake, and Option 2: Construction of a fixed type weir with gates in the river were examined. Option 2 proposes large scale construction works, which would require high cost and give damages to the surrounding environment. On the other hand, Option 1 will not cause significant impacts on the environment considering its scale of construction works and it is cost-effective compared with Option 2. Therefore, it is concluded that Option 1 is recommended. The alternative examination result is as follows:

Table 2-4-1 Examination of Alternatives for Halecou Site

Option	Zero option	Option 1 Construction of a bed protection for water guide and attachment of a flush gate to the existing intake	Option 2 Construction of a fixed type weir with gates in the river
Construction site	-	In the River	In the River
Beneficial area	None	360ha	360ha
Technical matter	-	By means of the proposed water guide, it is possible to divert water constantly to the beneficial area. Moreover, the proposed flush gate can clear away earth and soil, which results in easy maintenance.	It can be relatively large scale and costly, since it is a cross sectional facility.
Cost	None	Since the proposed structure is small scale, it is possible to reduce the cost.	Since the scale is larger than that of Option 1, cost will be higher.
Impact on environment	None	Since the facility will be constructed in the river with small scale, the anticipated impact on environment can be limited.	Due to fixed type of weir, environmental impact can be expected to some extent.
Recommended option	Not recommended	Recommended	Not recommended

As for Saketo site, zero option, Option 1: Participatory construction works and Option 2: Construction works by the government were compared. In terms of environmental impacts, both options will not cause severe environmental impacts given that those construction works are rehabilitation of the existing secondary and tertiary canals. Participatory construction works will be applied for the Option 1, which makes possible to reduce the cost, and this process can contribute to enhancement of farmers' ownership. Therefore, Option 1 is recommended as the priority project in Saketo site. The examination result is described in the following table:

Table 2-4-2 Examination of Alternatives for Saketo Site

Option	Zero option	Option 1 Participatory construction works	Option 2 Construction works by the government
Construction site	-	In and secondary and tertiary canals	In and secondary and tertiary canals
Beneficial area	None	410ha	410ha
Technical matter	-	Simple and basic techniques applicable for the farmers are applied.	Rehabilitation works will be done by using construction machines.
Cost	None	Cost will be lower than that of Option 1 since farmers mainly participate in the construction works.	Construction cost can be high compared with one in participatory way
Impact on environment	None	No new construction proposed, environmental impacts caused by the project are very limited.	No new construction proposed, environmental impacts caused by the project are very limited.
Recommended option	Not recommended	recommended	Not recommended

Concerning Bikaliu site, zero option, Option 1: Construction of an intake type weir in the river and Option 2: Construction of a fixed type weir with gates, were compared. In terms of environmental impacts, there is no difference between Option 1 and Option 2, and both options will not cause severe

environmental impacts given that works of the both options are rehabilitation of the existing weir. On the other hand, the structure of the Option 2 is more complicated, which needs higher cost compared with that of Option 1, and it requires continuous maintenance after the construction completion. Therefore, it is recommended to select Option 1 as the suitable one. The examination result is as shown below:

Table 2-4-3 Examination of Alternatives for Bikaliu Site

Option	Zero option	Option 1 Construction of a intake type weir in the river	Option 2 Construction of a fixed type weir with gates
Construction site	-	In and around existing Bikaliu headworks (in the river)	In and around existing Bikaliu intake (in the river)
Beneficial area		50ha	50ha
Technical matter	-	Given that the river is very steep and the river width is small, the proposed weir can intake natural overflow without gates, which makes it possible to alleviate the adverse influence of water flow and rolling stones in case of flood. After the construction, maintenance is relatively easy.	It can be relatively large scale and costly, since it is a cross sectional facility. After the construction, since it is needed to open the gates whenever flood is occurred, maintenance can be difficult.
Cost	None	Relatively small considering that construction of fixed gate is not planned.	Since it is equipped with gates, construction and maintenance cost can be higher.
Impact on environment	None	There is the existing weir in the river, no significant adverse effect is expected.	There is the existing weir in the river, no significant adverse effect is not expected.
Recommended option	Not recommended	Recommended	Not recommended

2-5 SCOPING AND TOR FOR ENVIRONMENTAL EXAMINATION

Scoping of the Priority Project 2 (in Halecou site), 3 (in Saketo site) and 5 (in Bikaliu site) was done as shown below. In general, air pollution, water pollution, noise and so on will be generated by those projects during the construction period, however, the scale of impacts is relatively small and its duration is temporary. Moreover, any negative impacts are not expected during operation period.

The result of scoping for Halecou is as shown below:

Table 2-5-1 Scoping for Halecou Site

Environmental Parameters	Construction stage	Operation stage	Remarks
1. Air Pollution	B	D	Dust will be generated during the construction, however, the scale is small.
2. Water Pollution	B	D	Due to construction works, river water will be mud. However, the duration is limited to only construction stage. During operation, environment-friendly pest control will be introduced as a project component. Therefore, water quality deterioration due to excessive fertilizer and chemical application is not expected.
3. Waste	B	D	Waste resulting from the construction works is expected.
4. Soil Contamination	B	D	There is a possibility that oil leakage from the construction vehicles is expected.
5. Noise and Vibration	B	D	Noise and vibration will be caused by the construction works.
6. Ground Subsidence	D	D	The proposed construction works will not cause ground subsidence.
7. Offensive Odor	D	D	Offensive odor will not be expected.
8. Bottom sediment	D	D	Bottom sediment will not be damaged by the proposed works.

Environmental Parameters	Construction stage	Operation stage	Remarks
9. Protected area/Sanctuary	C	D	The proposed project area is outside of the protected area, however, it is needed to confirm whether there are some holy stones and holy trees.
10. Ground water	D	D	No impact on ground water is anticipated.
11. Hydrological Situation	B ⁻	D	During the construction, it is needed to suspend the river water flow of secondary and tertiary canals.
12. Topography and Geographical features	D	D	No topographic and geographical change is expected.
13. Involuntary Resettlement	D	D	No involuntary resettlement is anticipated.
14. Land Acquisition	B ⁻	D	Temporary land acquisition for material storing site will be needed.
15. Cultural heritage	D	D	There is no cultural heritage in and around the site.
16. Landscape	D	D	No big change of landscape is anticipated.
17. Indigenous and ethnic people	D	D	There is no Indigenous and ethnic people.
18. Livelihood	B ⁺	B ⁺	The construction works can provide job opportunities for the people. After the completion, they can enjoy stable irrigation water, which leads to improvement of their livelihood.
19. Existing social infrastructures and services	B ⁻	D	During the construction works, traffic jam can be caused.
20. Misdistribution of benefit and damage	D	D	Since there is no severe damage to the people, misdistribution of benefit and damage is not expected.
21. Social institutions	D	D	There will be no damage to the existing social institutions resulting from the construction.
22. Water Usage or Water Rights and Rights of Common	D	D	The proposed project is mainly repair work of the existing irrigation structure, no impact on water usage or water right will not be caused.
23. Gender	D	D	No gender issue by the project is anticipated.
24. Children rights	D	D	The project will not give impact on children's rights.
25. Hazards (Risk), Infectious diseases such as HIV/AIDS	D	D	The proposed construction works is not big scale, the farmers will be employed as labors. Therefore, infectious disease will not be caused.
26. Accidents	B ⁻	D	It is needed to pay attention to safety of labors and traffic control to minimize traffic accident by the construction works.
27. Global Warming	D	D	The proposed project will not result in global warming.

A⁺: large scale positive impact, B⁺ small-medium scale positive impact, C: unknown, D: no impact or negligible,

A⁻: large scale negative impact, B⁻: small-medium scale negative impact,

The result of scoping for the priority project in Saketo site is described as shown below:

Table 2-5-2 Scoping for Saketo Site

Environmental Parameters	Construction stage	Operation stage	Remarks
1. Air Pollution	B ⁻	D	Dust will be generated during the construction, however, the construction scale is small, and air pollution is also limited .
2. Water Pollution	B ⁻	D	Due to construction works, river water will be mud. However, the duration is limited to only construction stage. During operation, environment-friendly pest control will be introduced as a project component. Therefore, water quality deterioration due to excessive fertilizer and chemical application is not expected.
3. Waste	B ⁻	D	Waste caused from construction works will be generated.
4. Soil Contamination	B ⁻	D	Soil contamination by oil leakage from construction vehicles is scarcely expected.
5. Noise and Vibration	B ⁻	D	Noise and vibration will be caused by the construction works,

Environmental Parameters	Construction stage	Operation stage	Remarks
			however, the extent of the impact is very limited.
6. Ground Subsidence	D	D	The proposed construction works will not cause ground subsidence.
7. Offensive Odor	D	D	Offensive odor will not be expected.
8. Bottom sediment	D	D	Bottom sediment will not be damaged by the works.
9. Protected area/Sanctuary	C	D	The proposed project area is outside of the protected area, however, it is needed to identify some holy places.
10. Ground water	D	D	No impact on ground water is anticipated.
11. Hydrological Situation	B ⁻	D	During the construction, it can change the hydrological situation.
12. Topography and Geographical features	D	D	No topographic and geographical change is expected.
13. Involuntary Resettlement	D	D	No involuntary resettlement is anticipated.
14. Land Acquisition	B ⁻	D	There is a possibility that temporary land acquisition for a material storing site is needed.
15. Cultural heritage	D	D	There is no cultural heritage in and around the site.
16. Landscape	D	D	No big change of landscape is anticipated.
17. Indigenous and ethnic people	D	D	There is no Indigenous and ethnic people.
18. Livelihood	B ⁺	B ⁺	The construction works can provide job opportunities for the people. After the completion, they can enjoy stable irrigation water, which leads to improvement of livelihood.
19. Existing social infrastructures and services	B ⁻	D	During the construction works, traffic jam can be caused.
20. Misdistribution of benefit and damage	D	D	Since there is no severe damage to the people, misdistribution of benefit and damage is not expected.
21. Social institutions	D	D	There will be no damage to the existing social institutions resulting from the construction.
22. Water Usage or Water Rights and Rights of Common	D	D	The proposed project is mainly rehabilitation of the existing irrigation facilities, no impact on water usage or water right will not be caused.
23. Gender	D	D	No gender issue by the project is anticipated.
24. Children rights	D	D	The project will not give impact on children's rights.
25. Hazards (Risk), Infectious diseases such as HIV/AIDS	D	D	The proposed construction works is not big scale, the farmers will be employed as labors. Therefore, infectious disease will not be caused.
26. Accidents	B ⁻	D	It is needed to pay attention to safety of labors and traffic control to minimize traffic accident by the construction works.
27. Global Warming	D	D	The proposed project will not result in global warming.

A⁺: large scale positive impact, B⁺ small-medium scale positive impact, C: unknown, D: no impact or negligible,

A⁻: large scale negative impact, B⁻: small-medium scale negative impact,

The result of scoping for the priority project in Bikaliu site is as follows:

Table 2-5-3 Scoping for Bikaliu Site

Environmental Parameters	Construction stage	Operation stage	Remarks
1. Air Pollution	B ⁻	D	Dust will be generated during the construction, however, the scale is small and its impact will be relatively small.
2. Water Pollution	B ⁻	D	Due to construction works, river water will be mud. However, the duration is limited to only construction stage. During operation, recycle-oriented farming by using local materials and Integrated Pest Management will be introduced, and negative impact will be relatively small.

Environmental Parameters	Construction stage	Operation stage	Remarks
3. Waste	B ⁻	D	Waste caused from construction works will be generated.
4. Soil Contamination	B ⁻	D	Oil leakage from the construction vehicles is expected.
5. Noise and Vibration	B ⁻	D	Noise and vibration will be caused by the construction works.
6. Ground Subsidence	D	D	The proposed construction works will not cause ground subsidence.
7. Offensive Odor	D	D	Offensive odor will not be expected.
8. Bottom sediment	D	D	Bottom sediment will not be damaged by the works.
9. Protected area/Sanctuary	C	D	The proposed project area is outside of the protected area, however, it is needed to identify holy lands.
10. Ground water	D	D	No impact on ground water is anticipated.
11. Hydrological Situation	B ⁻	D	During the construction, it can change the hydrological situation since it is needed to suspend the river flow.
12. Topography and Geographical features	D	D	No topographic and geographical change is expected.
13. Involuntary Resettlement	D	D	No involuntary resettlement is anticipated.
14. Land Acquisition	B ⁻	D	There is a possibility that temporary land acquisition is needed.
15. Cultural heritage	D	D	There is no cultural heritage in and around the site.
16. Landscape	D	D	No big change of landscape is anticipated.
17. Indigenous and ethnic people	D	D	There is no Indigenous and ethnic people.
18. Livelihood	B ⁺	B ⁺	The construction works can provide job opportunities for the people. After the project completion, they can use irrigation water as need arises, which leads to improvement of livelihood.
19. Existing social infrastructures and services	B ⁻	D	During the construction works, traffic jam can be caused.
20. Misdistribution of benefit and damage	D	D	Since there is no severe damage to the people, misdistribution of benefit and damage is not expected.
21. Social institutions	D	D	There will be no damage to the existing social institutions resulting from the construction.
22. Water Usage or Water Rights and Rights of Common	D	D	The proposed project is mainly renovation of the existing construction, no impact on water usage or water right will not be caused.
23. Gender	D	D	No gender issue by the project is anticipated.
24. Children rights	D	D	The project will not give impact on children's rights.
25. Hazards (Risk), Infectious diseases such as HIV/AIDS	D	D	The proposed construction works is not big scale, the farmers will be employed as labors. Therefore, infectious disease will not be caused.
26. Accidents	B ⁻	D	It is needed to pay attention to minimize accidents by the construction works.
27. Global Warming	D	D	The proposed project will not result in global warming.

A⁺: large scale positive impact, B⁺ small-medium scale positive impact, C: unknown, D: no impact or negligible,

A⁻: large scale negative impact, B⁻: small-medium scale negative impact,

As mentioned before, expected positive impact is improvement of livelihood while some negative impacts such as water pollution, which are temporary, can be caused. Terms of Reference (TOR) to examine environmental impacts by each proposed project is described as shown below:

Table 2-5-4 TOR for Environmental Examination (for Halecou Site)

Environmental Parameters	Study Contents	Study Method
Air Pollution	<ul style="list-style-type: none"> General situations in the adjacent area of construction sites 	<ul style="list-style-type: none"> Confirmation of construction period and construction sites
Water Pollution	<ul style="list-style-type: none"> Data collection of other similar cases 	<ul style="list-style-type: none"> Data collection of other similar projects

Environmental Parameters	Study Contents	Study Method
Waste	<ul style="list-style-type: none"> Waste disposal method 	<ul style="list-style-type: none"> Data collection of other similar projects
Soil Contamination	<ul style="list-style-type: none"> Oil leakage from construction vehicles 	<ul style="list-style-type: none"> Confirmation of situations in other similar projects
Noise and Vibration	<ul style="list-style-type: none"> General situations in the adjacent area of construction sites 	<ul style="list-style-type: none"> Confirmation of location of hospital, school, residential areas and so on
Protected area/Sanctuaries	<ul style="list-style-type: none"> Identification of holy places around the proposed priority projects 	<ul style="list-style-type: none"> Site survey and interview to the people (identification of holy stones, holy trees and so on)
Hydrological situation	<ul style="list-style-type: none"> Examination of hydrological situations during construction works 	<ul style="list-style-type: none"> Data collection of other similar projects Site survey
Land acquisition	<ul style="list-style-type: none"> Identification of tentative land acquisition 	<ul style="list-style-type: none"> Interview to local people and official personnel Confirmation of the conditions in and around site
Existing social infrastructures services	<ul style="list-style-type: none"> Traffic jam due to the project 	<ul style="list-style-type: none"> Confirmation of road conditions Confirmation of situations in other similar projects
Accidents	<ul style="list-style-type: none"> Possibility of accident 	<ul style="list-style-type: none"> Confirmation of situations in other similar projects

Table 2-5-5 TOR for Environmental Examination (for Saketo site)

Environmental Parameters	Study Contents	Study Method
Air Pollution	<ul style="list-style-type: none"> General situations in the adjacent area of construction sites 	<ul style="list-style-type: none"> Confirmation of construction period, construction sites
Water Pollution	<ul style="list-style-type: none"> Information collection of other similar cases 	<ul style="list-style-type: none"> Data collection in other similar projects
Waste	<ul style="list-style-type: none"> Waste disposal method 	<ul style="list-style-type: none"> Data collection in other similar projects
Soil Contamination	<ul style="list-style-type: none"> Oil leakage from construction vehicles 	<ul style="list-style-type: none"> Confirmation of situations in other similar projects
Noise and Vibration	<ul style="list-style-type: none"> General situations in the adjacent area of construction sites 	<ul style="list-style-type: none"> Confirmation of location of hospital, school, residential areas and so on
Protected area/Sanctuaries	<ul style="list-style-type: none"> Identification of holy places around the proposed priority projects 	<ul style="list-style-type: none"> Site survey and interview to the people (identification of holy stones, holy trees and so on)
Hydrological situation	<ul style="list-style-type: none"> Examination of hydrological situations during construction works 	<ul style="list-style-type: none"> Data collection in other similar projects Site survey
Land acquisition	<ul style="list-style-type: none"> Identification of tentative land acquisition 	<ul style="list-style-type: none"> Interview to local people and official personnel Confirmation of the conditions in and around site
Existing social infrastructures services	<ul style="list-style-type: none"> Traffic jam due to the project 	<ul style="list-style-type: none"> Confirmation of road conditions Confirmation of situations in other similar projects
Accidents	<ul style="list-style-type: none"> Possibility of accident 	<ul style="list-style-type: none"> Confirmation of situations in other similar projects

Table 2-5-6 TOR for Environmental Examination (for Bikaliu site)

Environmental Parameters	Study Contents	Study Method
Air Pollution	<ul style="list-style-type: none"> General situations in the adjacent area of construction sites 	<ul style="list-style-type: none"> Confirmation of construction period, construction sites
Water Pollution	<ul style="list-style-type: none"> Information collection of other similar cases 	<ul style="list-style-type: none"> Data collection in other similar projects
Waste	<ul style="list-style-type: none"> Waste disposal method 	<ul style="list-style-type: none"> Data collection in other similar projects
Soil Contamination	<ul style="list-style-type: none"> Oil leakage from construction vehicles 	<ul style="list-style-type: none"> Confirmation of situations in other similar projects
Noise and Vibration	<ul style="list-style-type: none"> General situations in the adjacent area of construction sites 	<ul style="list-style-type: none"> Confirmation of location of hospital, school, residential areas and so on
Protected area/Sanctuaries	<ul style="list-style-type: none"> Identification of holy places around the proposed priority projects 	<ul style="list-style-type: none"> Site survey and interview to the people (identification of holy stones, holy trees and so on)
Hydrological situation	<ul style="list-style-type: none"> Examination of hydrological situations during construction works 	<ul style="list-style-type: none"> Data collection in other similar projects Site survey

Environmental Parameters	Study Contents	Study Method
Land acquisition	<ul style="list-style-type: none"> • Identification of tentative land acquisition 	<ul style="list-style-type: none"> • Interview to local people and official personnel • Confirmation of the conditions in and around site
Existing social infrastructures services	<ul style="list-style-type: none"> • Traffic jam due to the project 	<ul style="list-style-type: none"> • Confirmation of road conditions • Confirmation of situations in other similar projects
Accidents	<ul style="list-style-type: none"> • Possibility of accident 	<ul style="list-style-type: none"> • Confirmation of situations in other similar projects

2-6 EXPECTED ENVIRONMENTAL IMPACTS

In general, expected negative impacts caused by all the priority projects are air pollution, water pollution, soil contamination, land acquisition, hydrological change, traffic jam and so on, and they are temporary during only construction stage as mentioned before. Land acquisition will be needed in construction period, however, construction works will be limited to dry season. At present, the people in the priority project sites do not cultivate crops during dry season due to no available irrigation water, therefore, the damage to the people by the temporary land acquisition can be negligible.

2-7 RESULTS OF THE ENVIRONMENTAL EXAMINATION

(1) Halecou site

Air Pollution:

Dust will be generated during the construction works. There is one house for the gate keeper near the Halecou intake while there are no schools or hospitals in and around the site. Considering that the construction site is located on farmland mainly, and expected impact will be relatively small and the duration will be limited to only construction period.

Water Pollution:

During the construction period, mud water will be caused by the civil works. However, it is temporary and the period is limited to only construction phase.

Waste:

Soil residue due to the construction works will be stored around the site. Proper waste management is needed.

Soil Contamination:

Oil leakage from the construction vehicles will be caused, however, the scale is very small.

Noise and Vibration:

There is no residential area, school, hospital and so on except the gate keeper’s house, which means that the impact of noise and vibration by the project is limited. After the completion of the works, no noise or vibration is expected.

Protected area/Sanctuaries:

There is a holy tree just near the intake and it is not allowed to cut down the tree, therefore, it is needed to avoid any damages to the tree during the



construction period.

Hydrological situation:

It is needed to stop the water flow for the construction works for a while, therefore, any countermeasures should be taken to minimize the impact, e.g. coffer dam construction.

Land acquisition:

The proposed new constructions are bed protection for water guide and water distributions, and others are rehabilitation of existing facilities. Therefore, permanent land acquisition is not necessary. However, it is needed to secure some places as a material storing site. It will be set on the hill at the right of the Halecou intake. There is the gate keeper's house on the hill, the house was constructed by the government for the intake maintenance and the land ownership of the hill belongs to the government according to him. Although it is planned to use a part of hill as a stock yard during the construction, he does not have to move to another site. It means that temporary acquisition of private land will not be anticipated. Even though some other lands have to be acquired, it will be limited to only dry season, when the people do not cultivate any crops.

Existing social infrastructures and services:

Due to increase of construction vehicles, traffic jam will be caused. Proper operation of vehicles for decentralization will be necessary.

Accidents:

There is a possibility of traffic accidents and any other accidents by the construction works. It is needed to implement traffic control and regular maintenance of construction vehicles.

(2) Saketo site

Air Pollution:

The target secondary and tertiary canals pass through the beneficial farmlands and there is no house or hospital, and the expected air pollution due to the construction works is very limited.

Water Pollution:

During the construction period, mud water will be caused by the civil works. However, considering that very little water flows in the canals during the dry season, the extent of water pollution is negligible.

Waste:

Soil residue due to the construction works will be stored around the site, and it can be recycled for other purposes.

Soil Contamination:

Oil leakage from the construction vehicles will be caused, however, the scale is very small since the proposed works will be done by the farmers mainly.

Noise and Vibration:

The lands around the construction sites are used for agricultural purpose and there is no residential area, school, hospital and so on around the construction site. Therefore, the extent of negative impact is limited.

Protected area/Sanctuaries:

There is an altar around the headworks, however, given that there is no plan to rehabilitate the headworks, no damage to the altar is anticipated.

Hydrological situation:

It is needed to stop the water course for the construction works within the construction stage. However, the construction period will be limited to dry season, and the farmers cannot cultivate any crops in this season, since water in the secondary and tertiary canals is very scarce at this moment. Therefore, even though hydrological condition is changed due to the construction works, it will not give any damages to the people.

Land acquisition:

Permanent land acquisition is not necessary, however, it is needed to secure some places as a material storing site around the sites. It is possible to use farmlands which are not used during dry season.

Existing social infrastructures and services:

Due to increase of construction vehicles, traffic jam will be caused. Proper operation of vehicles for decentralization will be necessary. However, the magnitude will be limited.

Accidents:

There is a possibility of traffic accidents and any other accidents by the construction works. It is needed to implement traffic control and regular maintenance of construction vehicles.

(3) Bikaliu site

Air Pollution:

Dust will be generated by the construction works to some extent, however, there is no house or hospital around the construction site, the impact is negligible.

Water Pollution:

During the construction period, it is thought mud water will be generated, however, the impact is tentative.

Waste:

Soil residue and other waste due to the construction works will be stored around the site, and it can be recycled for other purposes.

Soil Contamination:

Oil leakage from the construction vehicles will be caused, however, the scale is very small and it is limited to only construction period.

Noise and Vibration:

There is no residential area, school, hospital and so on around the construction site. Therefore, the extent of negative impact is very limited.

Protected area/Sanctuaries:

There are holy stones at two points and a holy tree around the Bikaliu intake. It is possible to shift them to other sites for the construction works according to the people, and it is needed to organize a

ceremony to calm the spirituals within the tree and stones.



Holy tree 100m upstream from the headworks



Holy tree and stone around the headworks

Hydrological situation:

It is needed to suspend the water course during the construction works, therefore, any mitigation measures should be taken.

Land acquisition:

The proposed construction is rehabilitation of the broken weir in the river, therefore, permanent land acquisition is not necessary. However, place for a material storing site around the site is to be secured and it will be set on the river banks of the weir. Right river bank is paddy field in rainy season while left river bank is grass land, and both river banks are not used for agricultural purpose in dry season. Ownership of the lands belongs to privates. It is planned that construction will be implemented in dry season, therefore, any negative impacts to the land is not expected.



Left river bank (grassland)



Right river bank in dry season (paddy field)

Existing social infrastructures and services:

Due to increase of construction vehicles, traffic jam will be caused. Proper operation of vehicles for decentralization will be necessary. However, the magnitude will be limited.

Accidents:

There is a possibility of traffic accidents and any other accidents by the construction works. It is needed to implement traffic control and regular maintenance of construction vehicles.

Overall environmental evaluation for the three priority projects is illustrated as shown below:

Table 2-7-1 Environmental Evaluation for Halecou Site

Environmental Parameters	Scoping		Evaluation		Remarks
	Construction stage	Operation stage	Construction stage	Operation stage	
1. Air Pollution	B ⁻	D	B ⁻	D	Dust will be generated during the construction, however, there is no residential area except the gate keeper's house. The scale of impact is very small.
2. Water Pollution	B ⁻	D	B ⁻	D	Mud water will be generated due to the construction works. However, no negative impact is expected after the construction completion.
3. Waste	B ⁻	D	B ⁻	D	Waste such as soil residue resulting from construction works will be generated.
4. Soil Contamination	B ⁻	D	B ⁻	D	Oil leakage from the construction vehicles is expected. However, the extent is very limited.
5. Noise and Vibration	B ⁻	D	B ⁻	D	Noise and vibration will be caused by the construction works. However, the impact will be very small, since there is only one house around the site.
6. Ground Subsidence	D	D	N/A	N/A	-
7. Offensive Odor	D	D	N/A	N/A	-
8. Bottom sediment	D	D	N/A	N/A	-
9. Protected area/Sanctuary	C	D	B	D	The proposed project area is outside of the protected area, on the other hand, there is a holy tree which cannot be cut down.
10. Ground water	D	D	N/A	N/A	-
11. Hydrological Situation	B ⁻	D	B ⁻	D	During the construction, river water flow will be suspended and temporary water course should be set up.
12. Topography and Geographical features	D	D	N/A	N/A	-
13. Involuntary Resettlement	D	D	N/A	N/A	-
14. Land Acquisition	B ⁻	D	B	D	Temporary land acquisition is necessary for material storing, however, it will not be big scale and needed in dry season only.
15. Cultural heritage	D	D	N/A	N/A	-
16. Landscape	D	D	N/A	N/A	-
17. Indigenous and ethnic people	D	D	N/A	N/A	-
18. Livelihood	B ⁺	B ⁺	B ⁺	B ⁺	During construction works, the people will be hired as labors. In the operational stage, stable water distribution can contribute to production improvement. Consequently, only positive impacts on livelihood are expected.
19. Existing social infrastructures and services	B ⁻	D	B ⁻	D	Traffic jam due to increase of vehicles is expected. However, it will be temporary and not significant.
20. Misdistribution	D	D	N/A	N/A	-

Environmental of benefit and damage	Scoping		Evaluation		Remarks
21. Social institutions	D	D	N/A	N/A	-
22. Water Usage or Water Rights and Rights of Common	D	D	N/A	N/A	-
23. Gender	D	D	N/A	N/A	-
24. Children rights	D	D	N/A	N/A	-
25. Hazards (Risk), Infectious diseases such as HIV/AIDS	D	D	N/A	N/A	-
26. Accidents	B ⁻	D	B ⁻	D	There is a possibility of accidents by the construction works or traffic accident.
27. Global Warming	D	D	N/A	N/A	-

A⁺: large scale positive impact, B⁺: small-medium scale positive impact, C: unknown, D: no impact or negligible,

A⁻: large scale negative impact, B⁻: small-medium I scale negative impact,

Table 2-7-2 Environmental Evaluation for Saketo Site

Environmental Parameters	Scoping		Evaluation		Remarks
	Construction stage	Operation stage	Construction stage	Operation stage	
1. Air Pollution	B ⁻	D	B ⁻	D	Dust generation due to construction works is expected. However, its extent is very limited.
2. Water Pollution	B ⁻	D	B ⁻	D	During construction period, water could be mud, however, the impact is temporary and relatively small.
3. Waste	B ⁻	D	B ⁻	D	Soil residue will be generated due to construction work and it will be recycled as material of banking or will be deposited in the neighboring non-cultivated lands.
4. Soil Contamination	D	D	B ⁻	D	Oil leakage from the construction vehicles will be caused.
5. Noise and Vibration	D	D	B ⁻	D	There is no house or hospital around the construction site, and scale of noise and vibration is very small. Therefore, it can be said that noise/vibration by the project is limited.
6. Ground Subsidence	D	D	N/A	N/A	-
7. Offensive Odor	D	D	N/A	N/A	-
8. Bottom sediment	D	D	N/A	N/A	-
9. Protected area/Sanctuary	C	D	D	D	There is an altar around the intake of headworks. However, the altar will not be damaged by the construction works.
10. Ground water	D	D	N/A	N/A	-
11. Hydrological Situation	B ⁻	D	B ⁻	D	There is very little water in the canal during dry season, and the impacts by the construction works will be negligible.
12. Topography and Geographical features	D	D	N/A	N/A	-
13. Involuntary Resettlement	D	D	N/A	N/A	-
14. Land acquisition	B ⁻	D	D	D	Permanent acquisition will not be caused since it is rehabilitation works. Temporary land acquisition for

Environmental	Scoping		Evaluation		Remarks
					material storing is necessary, and private lands around the weir will be used. However, crop planting is done in rainy season only at present, while construction works will be implemented only in dry season. Consequently, no direct negative impact due to the material storing site setting is expected.
15. Cultural heritage	D	D	N/A	N/A	-
16. Landscape	D	D	N/A	N/A	-
17. Indigenous and ethnic people	D	D	N/A	N/A	-
18. Livelihood	B ⁺	B ⁺	B ⁺	B ⁺	The farmers will be employed as labors during the construction stage and they can use irrigation water in the operation stage.
19. Existing social infrastructures and services	B ⁻	D	B ⁻	D	Due to use of construction vehicles, small scale traffic jam is expected.
20. Misdistribution of benefit and damage	D	D	N/A	N/A	-
21. Social institutions	D	D	N/A	N/A	-
22. Water Usage or Water Rights and Rights of Common	D	D	N/A	N/A	-
23. Gender	D	D	N/A	N/A	-
24. Children rights	D	D	N/A	N/A	-
25. Hazards (Risk), Infectious diseases such as HIV/AIDS	D	D	N/A	N/A	-
26. Accidents	B ⁻	D	B ⁻	D	There is a possibility that accident can be caused during construction works, the possibility is very low.
27. Global Warming	D	D	N/A	N/A	-

Table 2-7-3 Environmental Evaluation for Bikaliu Site

Environmental Parameters	Scoping		Evaluation		Remarks
	Construction stage	Operation stage	Construction stage	Operation stage	
1. Air Pollution	B ⁻	D	B ⁻	D	Dust generation due to the construction works is expected. However, there is no residential area around the site, therefore, the impact is very limited.
2. Water Pollution	B ⁻	D	B ⁻	D	During the construction works in the river, mud water will be generated.
3. Waste	B ⁻	D	B ⁻	D	It is expected that residue of construction material is generated.
4. Soil Contamination	B ⁻	D	B ⁻	D	Oil leakage from the construction vehicles will be caused.
5. Noise and Vibration	B ⁻	D	B ⁻	D	There is no house or hospital around the construction site, and scale of noise and vibration is very small. Therefore, it can be said that noise/vibration by the project is limited.
6. Ground Subsidence	D	D	N/A	N/A	-
7. Offensive Odor	D	D	N/A	N/A	-
8. Bottom	D	D	N/A	N/A	-

Environmental sediment	Scoping		Evaluation		Remarks
9. Protected area/Sanctuary	C	D	B ⁻	D	There are two holy stones and one holy tree near the construction site. However, if a ceremony to calm the spirituals is organized, it is possible to move them to other sites according to the people.
10. Ground water	D	D	N/A	N/A	-
11. Hydrological Situation	B ⁻	D	B ⁻	D	During the construction works, it is needed to suspend the current water flow and to set temporary water course.
12. Topography and Geographical features	D	D	N/A	N/A	-
13. Involuntary Resettlement	D	D	N/A	N/A	-
14. Land acquisition	B ⁻	D	D	D	Permanent acquisition will not be caused since it is rehabilitation works. Temporary land acquisition for material storing site is necessary and private lands around the headworks and canals will be used. However, crop planting is done in rainy season only at present, while construction works will be implemented only dry season. Consequently, no direct negative impact due to the material storing site setting is expected.
15. Cultural heritage	D	D	N/A	N/A	-
16. Landscape	D	D	N/A	N/A	-
17. Indigenous and ethnic people	D	D	N/A	N/A	-
18. Livelihood	B ⁺	B ⁺	B ⁺	B ⁺	Construction works provide job opportunity for the people, and, in operation stage, the farmers can access to stable water for farming. Therefore, only positive impacts on livelihood are expected.
19. Existing social infrastructures and services	B ⁻	D	B ⁻	D	Traffic jam will be caused during the construction works.
20. Misdistribution of benefit and damage	D	D	N/A	N/A	-
21. Social institutions	D	D	N/A	N/A	-
22. Water Usage or Water Rights and Rights of Common	D	D	N/A	N/A	-
23. Gender	D	D	N/A	N/A	-
24. Children rights	D	D	N/A	N/A	-
25. Hazards (Risk), Infectious diseases such as HIV/AIDS	D	D	N/A	N/A	-
26. Accidents	B ⁻	D	B ⁻	D	There is a possibility of accidents by the construction works or traffic accident.
27. Global Warming	D	D	N/A	N/A	-

2-8 MITIGATION MEASURES

As discussed before, some negative impacts would be caused during the construction stage and it is needed to propose mitigation measures against the expected environmental issues that are mentioned above. During operation period, no negative impacts are expected, therefore, mitigation measures during only construction stage have to be examined. Draft environmental management plan by the priority project are as follows:

Table 2-8-1 Environmental Management Plan for Halecou Site (Draft)

No.	Environmental parameter	Proposed EMP	Implementing Organization	Responsible Organization	Cost
Construction stage					
1	Air pollution	<ul style="list-style-type: none"> ● Setting of temporary enclosure ● Utilization of construction machines equipped with gas emission reduction system ● Regular check and full maintenance of construction vehicles ● Water spray in and around entrances of construction sites 	Construction contractor	MAF	Included in construction cost
2	Water Pollution	<ul style="list-style-type: none"> ● Waste water treatment by means of treatment pond is implemented before water discharge into rivers ● Detoured stream 	Construction contractor	MAF	Included in construction cost
3	Waste	<ul style="list-style-type: none"> ● Waste classification, proper dumping, recycle, and minimization of waste ● Recycle of soil residue ● Proper disposal of waste which cannot be reused to dismantling operator 	Construction contractor	MAF	Included in construction cost
4	Soil Contamination	<ul style="list-style-type: none"> ● Proper management of construction vehicles and regular check of vehicles 	Construction contractor	MAF	Included in construction cost
5	Noise and Vibration	<ul style="list-style-type: none"> ● Setting of temporary enclosure ● Utilization of construction machines with less noise and vibration ● Not to work during nighttime 	Construction contractor	MAF	Included in construction cost
6	Protected area/Sanctuary	<ul style="list-style-type: none"> ● There is a holy tree, and it is needed to pay special consideration not to cut down it. 	Construction contractor	MAF	Included in construction cost
7	Hydrological situation	<ul style="list-style-type: none"> ● During construction period, the stream is detoured to minimize negative impacts to the downstream. ● Utilization of large-size sandbags to stabilize the river banks ● Minimization of excavation 	Construction contractor	MAF	Included in construction cost
8	Existing social infrastructures and services	<ul style="list-style-type: none"> ● Decentralization of construction vehicles by disperse traveling route to minimize traffic jam 	Construction contractor	MAF	Included in construction cost
9	Accidents	<ul style="list-style-type: none"> ● Proper management of construction vehicle operation to minimize centralization ● Instruction on compliance with prescribed routes, speed, to drivers of construction vehicles ● Proper management of working environment 	Construction contractor	MAF	Included in construction cost

Table 2-8-2 Environmental Management Plan for Saketo Site (Draft)

No.	Environmental parameter	Proposed EMP	Implementing Organization	Responsible Organization	Cost
Construction stage					
1	Air pollution	<ul style="list-style-type: none"> Utilization of construction machines equipped with gas emission reduction system Regular check and full maintenance of construction vehicles Water spray in and around entrances of construction sites 	Construction contractor	MAF	Included in construction cost
2	Water Pollution	<ul style="list-style-type: none"> Waste water treatment before discharge into rivers 	Construction contractor	MAF	Included in construction cost
3	Waste	<ul style="list-style-type: none"> Classification waste dumping, recycle, and reduction of waste Recycle of soil residue Proper disposal of waste which cannot be reused to dismantling operator 	Construction contractor	MAF	Included in construction cost
4	Soil Contamination	<ul style="list-style-type: none"> Proper management of construction vehicles and regular check 	Construction contractor	MAF	Included in construction cost
5.	Noise and Vibration	<ul style="list-style-type: none"> Setting of temporary enclosure Utilization of construction machines with less noise and vibration Not to work during nighttime 	Construction contractor	MAF	Included in construction cost
6	Existing social infrastructures and services	<ul style="list-style-type: none"> Decentralization of construction vehicles by disperse traveling route 	Construction contractor	MAF	Included in construction cost
7	Accidents	<ul style="list-style-type: none"> Decentralization of construction vehicles by disperse traveling route to avoid traffic accident Compliance with specified construction routes and legal speed Proper management of working conditions 	Construction contractor	MAF	Included in construction cost

Table 2-8-3 Environmental Management Plan for Bikaliu Site (Draft)

No.	Environmental parameter	Proposed EMP	Implementing Organization	Responsible Organization	Cost
Construction stage					
1	Air pollution	<ul style="list-style-type: none"> Setting of temporary enclosure Utilization of construction machines equipped with gas emission reduction system Regular check and full maintenance of construction vehicles Water spray in and around entrances of construction sites 	Construction contractor	MAF	Included in construction cost
2	Water Pollution	<ul style="list-style-type: none"> Waste water treatment pond setting and operation before discharge into rivers 	Construction contractor	MAF	Included in construction cost
3	Waste	<ul style="list-style-type: none"> Classification waste dumping, recycle, and reduction of waste Recycle of soil residue Proper disposal of waste which cannot 	Construction contractor	MAF	Included in construction cost

No.	Environmental parameter	Proposed EMP	Implementing Organization	Responsible Organization	Cost
		be reused to dismantling operator			
4	Soil Contamination	<ul style="list-style-type: none"> Proper management of construction vehicles and regular check 	Construction contractor	MAF	Included in construction cost
5	Noise and Vibration	<ul style="list-style-type: none"> Setting of temporary enclosure Utilization of construction machines with less noise and vibration Not to work during nighttime and to use detour in the residential area 	Construction contractor	MAF	Included in construction cost
6	Protected area/Sanctuary	<ul style="list-style-type: none"> There is a holy tree and holy stones around the construction site, and it is needed to organize a ceremony to calm the spirituals, if it is needed to move them to other places. 	Construction contractor	MAF	Included in construction cost
7	Hydrological situation	<ul style="list-style-type: none"> During construction period, a temporary coffer dam is set up, so that the people can use the water as before. 	Construction contractor	MAF	Included in construction cost
8	Existing social infrastructures and services	<ul style="list-style-type: none"> Decentralization of construction vehicles by disperse traveling route 	Construction contractor	MAF	Included in construction cost
9	Accidents	<ul style="list-style-type: none"> Decentralization of construction vehicles by disperse traveling route to avoid traffic accident Compliance with specified construction routes and legal speed Proper management of working conditions 	Construction contractor	MAF	Included in construction cost

2-9 MONITORING PLAN

Anticipated environmental impacts for all the priority projects are expected to be temporary in the construction phase, and related monitoring will be implemented during the period. Since the environmental parameters are air pollution, water pollution, waste and noise and so on, those items shall be monitored. However, as mentioned before, there is no environmental standard in Timor-Leste. Moreover, measuring equipment of air pollution or noise/vibration are not used in the country, even in some projects funded by WB or ADB⁵. Considering the situations mentioned and extent of air pollution and other impacts are relatively small, visual observation and mitigation measures as monitoring method is proposed. Draft monitoring plans for the priority project are presented as follows:

Table 2-9-1 Environmental Monitoring Plan for Halecou Site

Environmental parameter	Indicator	Monitoring site	Frequency	Responsible organization	Responsible organization
Construction period					
Air pollution	Dust (visual observation)	Construction site	Weekly	Contractor	MAF, NDE
Water Pollution	Turbidity (visual observation)	Construction site	Weekly	Contractor	MAF, NDE
Waste	Waste management	Construction site	Weekly	Contractor	MAF, NDE

⁵ According to an International Environmental Expert who is working for road upgrading projects under the Ministry of Public Works, which are funded by ADB and WB, quantitative environmental monitoring is not implemented since there are no equipment and laboratories. Therefore, only physical observation and mitigation measures as monitoring methodologies are applied.

Environmental parameter	Indicator	Monitoring site	Frequency	Responsible organization	Responsible organization
Soil Contamination	Proper management of construction vehicles	Construction site	Weekly	Contractor	MAF, NDE
Noise and Vibration	Complaint from the neighboring people	Construction site	Through the construction period	Contractor	MAF, NDE
Protected area/Sanctuary	To avoid damaging to the holy tree	Construction site	Through the construction period	Contractor	MAF, NDE
Hydrological situation	Complaint from the neighboring people	Construction site	Weekly	Contractor	MAF, NDE
Existing social infrastructures and services	Road conditions such as traffic jam	Construction site	Weekly	Contractor	MAF, NDE
Accidents	Working environment proper management of construction vehicles	Construction site	Weekly	Contractor	MAF, NDE

Table 2-9-2 Environmental Monitoring Plan for Saketo Site

Environmental parameter	Indicator	Monitoring site	Frequency	Responsible organization	Responsible organization
Construction period					
Air pollution	Dust (visual observation)	Construction site	Weekly	Contractor	MAF, NDE
Water Pollution	Turbidity (visual observation)	Construction site	Weekly	Contractor	MAF, NDE
Waste	Waste management	Construction site	Weekly	Contractor	MAF, NDE
Soil Contamination	Proper management of construction vehicles	Construction site	Weekly	Contractor	MAF, NDE
Noise and Vibration	Complaint from the neighboring people	Construction site	Through the construction period	Contractor	MAF, NDE
Existing social infrastructures and services	Road conditions	Construction site	Weekly	Contractor	MAF, NDE
Accidents	Working environment	Construction site	Weekly	Contractor	MAF, NDE

Table 2-9-3 Environmental Monitoring Plan for Bikaliu Site

Environmental parameter	Indicator	Monitoring site	Frequency	Responsible organization	Responsible organization
Construction period					
Air pollution	Dust (visual observation)	Construction site	Weekly	Contractor	MAF, NDE
Water Pollution	Turbidity (visual observation)	Construction site	Weekly	Contractor	MAF, NDE
Waste	Waste management	Construction site	Weekly	Contractor	MAF, NDE
Soil Contamination	Proper management of construction vehicles	Construction site	Weekly	Contractor	MAF, NDE
Noise and Vibration	Complaint from the neighboring people	Construction site	Through the construction period	Contractor	MAF, NDE
Protected area/Sanctuary	To avoid damaging to the holy tree	Construction site	Through the construction period	Contractor	MAF, NDE
Hydrological situation	Complaint from the neighboring people	Construction site	Weekly	Contractor	MAF, NDE
Existing social infrastructures and services	Road conditions	Construction site	Weekly	Contractor	MAF, NDE
Accidents	Working environment Proper management of	Construction site	Weekly	Contractor	MAF, NDE

Environmental parameter	Indicator	Monitoring site	Frequency	Responsible organization	Responsible organization
	construction vehicles				

It is necessary to prepare monitoring formats for monitoring activity. Comments obtained from the people through the monitoring and response by the government also are needed to be recorded. Draft monitoring forms of the Project are shown in the following table.

Table 2-9-4 Draft Monitoring Form for Halecou site

(1) Response and actions by the government

Comments and response	Monitoring results
Number and contents of comments from the people	
Number and response to the comments from the government	

(2) Pollution

Environmental Parameter	Monitoring Item	Survey point	Frequency
Air pollution	Dust	Construction site	Once per week
Water pollution	Turbidity	Construction site	Once per week
Noise and vibration	Complaint from the people	Construction site	Once per week
Soil contamination	Oil leakage	Construction site	Once per week

(3) Natural Environment

Environmental Parameter	Monitoring item	Monitoring results	Measures taken
Waste	Disposal of construction waste		
Protected area/Sanctuary	Consideration into the holy trees or stones		

(4) Social Environment

Environmental Parameter	Monitoring item	Monitoring results	Measures taken
Social service	Traffic condition		
Accident	Number of accidents	Incidence per 1000 residents	

Table 2-9-5 Draft Monitoring Form for Saketo site

(1) Response and actions by the government

Comments and response	Monitoring results
Number and contents of comments from the people	
Number and response to the comments from the government	

(2) Pollution

Environmental Parameter	Monitoring Item	Survey point	Frequency
Air pollution	Dust	Construction site	Once per week
Water pollution	Mud water	Construction site	Once per week
Noise and vibration	Complaint from the people	Construction site	Once per week
Soil contamination	Oil leakage	Construction site	Once per week

(3) Social Environment

Environmental Parameter	Monitoring item	Monitoring results	Measures taken
Social service	Traffic condition		
Accident	Number of accidents	Incidence per 1000 residents	

Table 2-9-6 Draft Monitoring Form for Bikaliu site

(1) Response and actions by the government

Comments and response	Monitoring results
Number and contents of comments from the people	
Number and response to the comments from the government	

(2) Pollution

Environmental Parameter	Monitoring Item	Survey point	Frequency
Air pollution	Dust	Construction site	Once per week
Water pollution	Mud water	Construction site	Once per week
Noise and vibration	Complaint from the people	Construction site	Once per week
Soil contamination	Oil leakage	Construction site	Once per week

(3) Natural Environment

Environmental Parameter	Monitoring item	Monitoring results	Measures taken
Waste	Disposal of construction waste		
Protected area/Sanctuary	Consideration into the holy trees or stones		

(4) Social Environment

Environmental Parameter	Monitoring item	Monitoring results	Measures taken
Social service	Traffic condition		
Accident	Number of accidents	Incidence per 1000 residents	

2-10 STAKEHOLDER MEETING

2-10-1 Planning of the Priority Projects

Five strategies are proposed in the framework of the Master Plan as mentioned in Chapter 1, out of them, three strategies, namely, “Strategy 1: Irrigation system is improved”, “Strategy 2 Crop productivity is improved”: and “Strategy 3: Processing and marketing process of local rice is improved” have relations directly with the farmers. Considering the conditions, nineteen (19) programs/projects in total are proposed to achieve those three strategies mentioned above. The proposed 19 programs/projects are as shown below.

Strategy	Program/Project
Strategy 1 : Irrigation system is improved.	1. Intake weir construction project
	2. Tube well construction project
	3. Regulating pond construction project
	4. Small irrigation water storage pond/ tank construction project for smallholders
	5. Strengthening program for operation and management system of irrigation system
	6. Farmers participation irrigation related facilities construction project
	7. River control facility construction project for protection of irrigation system and farmland
	8. Capacity development program of NDIWM for leading irrigation development project
	9. Program for obtaining and breeding quality seed
Strategy 2 : Crop productivity is improved.	10. Promotion program for private mechanization
	11. Establishment of agricultural fund system
	12. Local resource circulative agriculture promotion project
	13. Dissemination program for cultivation techniques
	14. Strengthening program for pest and disease control
	15. Establishment and dissemination program of manure management technique
Strategy 3: Processing and marketing process of local rice is improved.	16. Strengthening program of integrated farming with livestock breeding
	17. Training for farmer groups in market-oriented rice farming
	18. Rice value chain establishment project in rice production area
	19. Post-harvest processing improvement project of local rice

For the purpose of participatory planning and examination of the priority projects, a series of W/S, which the farmers, MAF personnel, NGO concerned, rice millers and so on participated, was organized. The W/Ss were organized at Bobonaro District and Viqueque District, respectively, which cover the proposed priority projects. The dates and number of the participants are shown in the following table:

Table 2-10-1 W/S Participants List

Participants	Bobonaro District (10 th October 2014)	Viqueque District (24 th October 2014)
DOA officer	2	2
Extension staff	7	2
Gate keeper	1	0
WUA	3	1
Village chief	2	2
Aldeia chief	0	6
Farmers	9	3
Leader of farmers	3	0
Rice miller	1	1
NGO	2	3
Total	30	20

At the W/S, all the nineteen proposed projects/programs regarding 1) irrigation improvement, 2) crop production improvement and 3) improvement of processing/marketing were explained by a MAF staff. After that, voting to the higher priority programs/projects by the participants was implemented for ranking of them. Each participant was given 3 scores and 1 score for “Developing Strategy 2” and “Developing Strategy 3”, respectively. On the other hand, it is difficult to reflect the participants’ opinions in “Developing Strategy 1”, since it is needed technical knowledge for this matter, voting on the proposed projects/programs of Strategy 1 was not done.

The priority ranking results of W/S in Bobonaro District are presented in the following tables. The highest priority was given to fund system establishment, since some farmers have experiences to get fund from other project funds before and they want to get it again. Apart from agricultural fund, pest/disease control and breeding quality seed and disease/pest control got attention from the participants. Both sites showed low interest in integrated farming with livestock. Concerning marketing/processing improvement, the term “value chain” is seemingly a new terminology for the participants, priority on this matter was low.

Table 2-10-2 Raking of Project Component in Bobonaro (a) Crop Production Improvement

Ranking	Halecou site			5 irrigation scheme in Mariana		
		Project Component	score		Project Component	score
1	No.11	Establishment of agricultural fund system	15	No.11	Establishment of agricultural fund system	23
2	No.14	Strengthening program for pest and disease control	12	No.9	Program for obtaining and breeding quality seed	17
3	No.15	Establishment and dissemination program of manure management technique	8	No.13	Dissemination program for cultivation techniques	13
4	No.9	Program for obtaining and breeding quality seed	8	No.14	Strengthening program for pest and disease control	10
5	No.12	Local resource circulative agriculture promotion project	4	No.12	Local resource circulative agriculture promotion project	9
6	No.10	Promotion program for private mechanization	2	No.10	Promotion program for private mechanization	8
7	No.13	Dissemination program for cultivation techniques	1	No.16	Strengthening program of integrated farming with livestock breeding	2

Ranking	Halecou site			5 irrigation scheme in Mariana		
	Project Component		score	Project Component		score
8	No.16	Strengthening program of integrated farming with livestock breeding	0	No.15	Establishment and dissemination program of manure management technique	0

Table 2-10-3 Raking of Project Component in Bobonaro (b) Improvement of Processing/Marketing

Ranking	Halecou			5 irrigation scheme in Mariana		
	Project No.		score	Project No.		score
1	No.19	Post-harvest processing improvement project of local rice	6	No.17	Training for farmer groups in market-oriented rice farming	10
2	No.17	Training for farmer groups in market-oriented rice farming	5	No.19	Post-harvest processing improvement project of local rice	8
3	No.18	Rice value chain establishment project in rice production area	1	No.18	Rice value chain establishment project in rice production area	3

The priority ranking results of W/S in Viqueque District are presented in the following tables. In Bikaliu site, pest/disease control is the most urgent issue for the people, consequently, the Project No.14 was the most popular. The participants from the Bikaliu site said that conventional natural pesticide is not useful or they cannot access to chemical pesticide. “Project No. 16” and “Project No.9” got high scores, while “Project No. 10” did not get people’s attentions. On the other hand, in Saketo, “Project No.9” got the highest interest. In both Bikaliu and Saketo, farming machines was not paid attention, while MAF central has a willingness to promote private mechanization.

Concerning Processing/Marketing, any clear tendency among the participants from Bikaliu was not identified. However, it became clear that the people from Saketo are interested in “Project No.17”.

Table 2-10-4 Raking of Project Component in Viqueque (a) Crop Production Improvement

Ranking	Bikaliu			Saketo		
	Project No.		score	Project No.		score
1	No.14	Strengthening program for pest and disease control	16	No.9	Program for obtaining and breeding quality seed	9
2	No.16	Strengthening program of integrated farming with livestock breeding	8	No.13	Dissemination program for cultivation techniques	8
3	No.9	Program for obtaining and breeding quality seed	7	No.12	Local resource circulative agriculture promotion project	6
4	No.15	Establishment and dissemination program of manure management technique	6	No.14	Strengthening program for pest and disease control	5
5	No.11	Establishment of agricultural fund system	6	No.16	Strengthening program of integrated farming with livestock breeding	2
6	No.13	Dissemination program for cultivation techniques	3	No.11	Establishment of agricultural fund system	2
7	No.12	Local resource circulative agriculture promotion project	2	No.15	Establishment and dissemination program of manure management technique	1
8	No.10	Promotion program for private mechanization	0	No.10	Promotion program for private mechanization	0

Table 2-10-5 Raking of Project Component in Viqueque (b) Improvement of Processing/Marketing

Ranking	Bikaliu			Saketo		
	Project No.		score	Project No.		score
1	No.18	Rice value chain establishment project in rice production area	6	No.17	Training program for rice farmers for organizing commercially oriented organization	11
2	No.19	Post-harvest processing improvement project of local rice	3	No.19	Post-harvest processing improvement project of local rice	3
3	No.17	Training for farmer groups in market-oriented rice farming	3	No.18	Rice value chain establishment project in rice production area	2

Regarding agricultural fund system, participants showed high interest in Bobonaro District, however, given that this is institutional matter and beyond the priority projects, this component was excluded from the priority projects. Furthermore, taking consideration into the socio-economic survey, individual interviews to the farmers, outcomes by other donors, technical training of Integrated Pest Management, introduction of improved/quality seeds and so on are proposed as the components in the “Strategy 2: Crop production is improved”. In “Strategy 3: Processing and marketing process of local rice is improved”, sale of paddy to the Technical Agriculture School, establishment of farmers’ groups, set-up of rice centers and so on were examined. Eventually, the components of priority projects were determined as mentioned in Chapter 2-1.

2-10-2 Consultation Meeting

For the purpose of the explanation to the people about the priority projects, especially, negative impacts by the projects, consultation meetings were organized in February 2015.⁶ At first, the process of the proposed project components selection, for example, results of interviews to the farmers were considered in the planning, was presented to the participants. It was emphasized that expected negative environmental impacts by the proposed projects are temporary and small-scale. Moreover, it was explained that whether the project will be implemented has yet to be decided and it is still proposal level. The presentation was covered by the official personnel of NDIWUM, Dili. Following table shows the dates and participants of the consultation meetings.

Table 2-10-6 Dates and Participants of the Consultation Meeting

Date	20 th Feb., 2015	24 th Feb. 2015	25 th Feb., 2015
Participants	Mariana wide area and Halecou site in Bobonaro District	Saketo site in Viqueque District	Bikaliu site in Viqueque District
MAF officer (District)	3	3	2
Extension staff	5	4	4
Sub-district officer	1	0	0
WUA	3	0	0
Traditional community leader	2	0	0
Village chief	1	2	0
Aldeia chief	2	0	0
Farmer	4	1	14

⁶ In Bobonaro District, two priority projects, covering Mariana wide area and Halecou site, are proposed, and the beneficial area of Halecou is target area of the both Priority Project 2 and Priority Project 3. Therefore, the consultation meeting was for Mariana wide area and Halecou site organized together.

Date	20 th Feb., 2015	24 th Feb. 2015	25 th Feb., 2015
Leader of farmers	0	1	0
Cooperative	1	0	0
NGO	2	0	0
Private Company	3	0	0
Environment (District)	1	1	1
Total	28	12	21

After the explanation of the priority projects, the participants presented their comments or questions. In general, they showed high expectation toward the project implementation and nobody expressed objection to the projects. Questions and answers are described as shown below:

Table 2-10-7 Questions and Answers at the Consultation Meetings

(1) Bobonaro District (Mariana wide area and Halecou site in)

Speaker	Comment on the Proposed Project	Response from the Study Team
Staff of Environment Department, District	It is needed to involve District level staff of Environment Department, in implementation stage of the priority project.	We have a plan to request the Environment Department, District in implementation stage.
NGO	Somebody throws away garbage into the canals. It is needed to give warnings to such a person.	The proposed priority project includes capacity development of O&M of the irrigation facilities.
MAF staff	Not only farmers but also extension staff have to be target of the technical training concerning crop production and processing/ marketing. It is requested that MAF is involved in operation of rice center.	It is planned that both the farmers and extension staff are target of the project. Moreover, MAF staff are requested to join in operation of the rice center.
Farmer	I purchase rice from some farmers and resell it to other buyers, however, even though 200 bags of rice are needed, only 60 bags are available. Sufficient quantity of rice from the farmers is necessary.	At this moment, linkage between farmers who want to sell and buyers is weak. Therefore, the project will diversify and strengthen the marketing channel of rice.

(2) Saketo site

Speaker	Comment on the Proposed Project	Response from the Study Team
Farmer	How many percentage of the possibility for the project implementation?	The proposed project is at planning stage, it is very difficult to answer the degree of certainty.
Staff of Environment Department, District	Which category is the proposed project classified into in terms of environment? Environment Department, (District level) has not received the Project Document of the priority project. An official document is necessary for the project implementation.	The proposed project includes irrigation, and it is regarded as Category B considering it is a rehabilitation work of existing facilities. Final decision whether the project is implemented has yet to be done, preparation of the Project Document is not needed at this moment.

(3) Bikaliu site

Speaker	Comment on the Proposed Project	Response from the Study Team
Farmer	High quality construction in the project implementation is needed. In the past, construction works were done by one local contractor, however, the works have not been completed.	It is not decided yet whether the project is implemented, therefore, it is very difficult to make a commitment to do it.
MAF	If the proposed project included rehabilitation works of existing facilities, why the consultation meeting is needed?	According to the regulation of Timor-Leste and JICA Guideline concerning environment, it is needed to organize a consultation meeting at early stage.
Farmer	We are ready to contribute to the project, if it will be implemented.	—



2-11 NECESSITY OF LAND ACQUISITION

As mentioned before, stockyard for construction material is needed during the construction stage, however, it is limited to only construction period in dry season. Given that cultivation is not implemented in dry season, negative impacts on production activities of the people are not expected, temporary land acquisition is needed, though. Therefore, it is judged that compensation for the project is not necessary. Furthermore, involuntary resettlement by the project is not expected.

2-12 LEGAL FRAMEWORK FOR LAND ACQUISITION AND INVOLUNTARY RESETTLEMENT

As mentioned in Chapter 1, any regulations concerning land acquisition and involuntary resettlement in Timor-Leste is still under discussion at the parliament as of February 2015.

2-13 SCOPE OF THE LAND ACQUISITION

Due to the project, temporary land acquisition is expected, however, the duration is limited to only dry season, when cultivation is not implemented. Therefore, it can be said that negative impacts on the production activity in the target areas is not expected, therefore, compensation for the tentative land occupation is not necessary.

2-14 COMPENSATION MEASURES

Land acquisition and involuntary resettlement which require compensation are not expected in the proposed priority projects.

2-15 GRIEVANCE HANDLING

Not applicable.

2-16 IMPLEMENTATION STRUCTURE

Not applicable.

2-17 IMPLEMENTATION SCHEDULE

Not applicable.

2-18 COST AND FUND

Not applicable.

2-19 MONITORING STRUCTURE AND MONITORING FORM

Not applicable.

2-20 CONSULTATION MEETING

As mentioned in 2-10-2, the consultation meetings to explain about temporary land acquisition have been already organized. There was no objection and questions from the participants at the meetings.

2-21 CHECKLIST

Category	Environmental Item	Main Check Items	Yes (Y) No (N)	Confirmation of Environmental Considerations
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been officially completed? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	a) N b) N c) N d) N	Priority project components have been just proposed and they are pre-F/S level. After official approval of the proposed project implementation, a series of procedures for environmental consideration will be started.
	(2) Explanation to the Public	(a) Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public? (b) Are proper responses made to comments from the public and regulatory authorities?	1) Y 2) Y	Stakeholder meetings to explain the proposed priority project were organized and the expected environmental impacts were presented. Since no severe environmental impact is expected, the participants did not object.
	(3) Examination of alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	Alternative plans for each construction works focusing on environmental impacts have been proposed.
2 Mitigation Measures	(1) Water Quality	(a) Are considerations given to water pollution of the surrounding water bodies, such as rivers and groundwater by the effluents or leachates from irrigation ponds? Are adequate use/disposal standards for chemicals, such as fertilizers and agrochemicals established? Is a framework established to increase awareness of the standards among farmers? (b) Do effluents and ambient water quality of the surrounding water bodies comply with the country's effluent standards and ambient water quality standards?	(a) N (b)-	Since crop production in environmental friendly manner will be promoted, e.g., Integrated Pest Management and manure made from local materials, negative impact will be negligible. Moreover, there is no water quality standard in Timor-Leste.
	(2) Soil Contamination	(a) Is there a possibility that impacts in irrigated lands, such as salinization of soils will result? (b) Are adequate measures taken to prevent soil contamination of irrigated lands by agrochemicals, heavy metals and other hazardous substances?	(a) N (b) N	(a) Not applicable (b) Since crop production in environmental friendly manner will be promoted, e.g., Integrated Pest Management and manure made from local materials, negative impact will be negligible. However it is noted that there is

Category	Environmental Item	Main Check Items	Yes (Y) No (N)	Confirmation of Environmental Considerations
				no water quality standard for irrigation in Timor-Leste to control excessive chemical application and other polluted water.
	(3) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a) -	Not applicable
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	There are no protected areas in and around the proposed priority sites. The proposed sites are determined considering location of protected areas and it is needed to avoid such areas as the project sites. .
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that hydrologic changes, such as reduction of the river flow, and seawater intrusion up the river will adversely affect downstream aquatic organisms, animals, vegetation, and ecosystems? (e) Is there a possibility that the changes in water flows due to the project will adversely affect aquatic environments in the river? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?	(a) N (b) N (c) - (d) N (e) N	(d) There are plans to change water course in some priority projects, however, another water course will be set not to cause big environmental damages. No severe damage to ecosystem is expected. The proposed sites are determined considering location of ecologically valuable lands and it is needed to avoid such areas as the project sites.
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socio-economic studies on resettlement? (d) Is the compensations going to be paid prior to the resettlement? (e) Is the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to	(a) N (b) - (c) - (d) - (e) - (f) - (g) - (h)- (i) - (j) -	Temporary land acquisition due to the priority projects is needed, however, it will not give damage to the production activities of the sites, since farming during dry season is not implemented at this moment and the construction works of the priority projects will be implemented in dry season only. Moreover, no resettlement is needed for the project implementation.

Category	Environmental Item	Main Check Items	Yes (Y) No (N)	Confirmation of Environmental Considerations
		properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?		
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect the downstream fisheries and other water uses? (c) Is there a possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced?	(a) N (b) N (c) N	(a) Rehabilitation of canals is beneficial for the local population. (b) Main construction works are rehabilitation of existing irrigation facilities. Therefore, excessive water use is not expected. (c) No new water way is planned, water related diseases cannot be newly introduced.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a) N	(a) There are some holly trees and holly stones. It is possible to avoid them or to move them in other sites after necessary ceremony.
	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a) N	There is no special landscape.
5. Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a) Y (b) - (c) -	(a) Some mitigation measures such as temporary enclosure are proposed. (b) Severe negative impact on the natural environment is not expected. (c) There is no social damage to the surrounding people.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) Are the items, methods and frequencies of the monitoring program adequate? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) Y	(a) Since there is no monitoring equipment and laboratories in Timor-Leste, it is proposed to implement physical observation and mitigation measures regularly as well as other donors do. (c) MAF will monitor the environmental impacts in construction phase. (d) Draft monitoring format is attached in the report.
6. Note	Note on Using Environmental Checklist	(a) If necessary, the impacts to trans-boundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as trans-boundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a)N	