Cabinet of Policy, Planning and Monitoring
National Directorate for Irrigation and Water Management
National Directorate for Agriculture and Horticulture
Ministry of Agriculture and Fisheries
The Democratic Republic of Timor-Leste

PROJECT FOR AGRICULTURE MASTER PLAN AND IRRIGATION DEVELOPMENT PLAN

Final Report

June 2015

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

SANYU CONSULTANTS INC.

RD
JR
15-038

PREFACE

In response to a request from the Government of The Democratic Republic of Timor-Leste, the Government of Japan decided to conduct a project, "PROJECT FOR AGRICULTURE MASTER PLAN AND IRRIGATION DEVELOPMENT PLAN" and entrusted the implementation of the project to Japan International Cooperation Agency (JICA).

JICA selected and dispatched a project team headed by Mr. Takanori TAKATSUKA of Sanyu Consultants Inc. and composed of members from said consultancy company between September 2013 and June 2015.

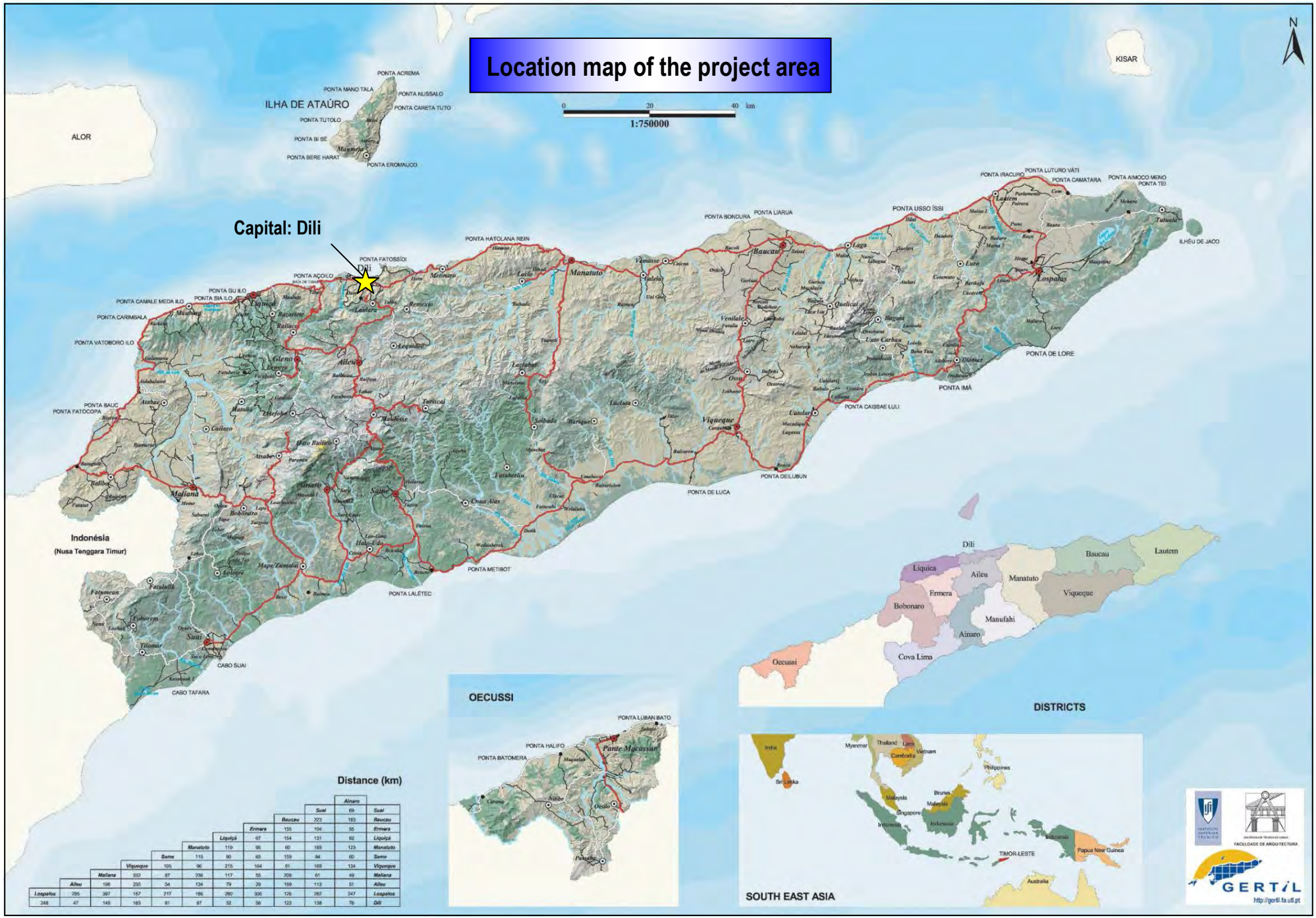
The team held discussions with the officials concerned of the Government of The Democratic Republic of Timor-Leste and conducted a series of field surveys at the project area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the implementation of master plan formulated under the project and priority projects identified therein, and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of The Democratic Republic of Timor-Leste for their close cooperation extended to the project.

June 2015

Makoto KITANAKA
Director General
Rural Development Department
Japan International Cooperation Agency



	Ainaro	Suai	Baucau	Ermera	Liquiçá	Manatuto	Same	Viqueque	Maliana	Aileu	Lospalos	Dili
Suai	69											
Baucau	183	273										
Ermera	55	104	155									
Liquiçá	62	131	154	67								
Manatuto	123	189	119	95	60							
Same	60	84	159	85	115	90						
Viqueque	134	169	61	164	215	96	105					
Maliana	49	61	208	55	236	117	87	332				
Aileu	51	113	126	79	134	54	61	230	198			
Lospalos	247	282	306	280	186	217	187	397	295			
Dili	76	138	122	58	87	61	83	149	47	248		

EXECUTIVE SUMMARY

(Master Plan)

1. Background and Objectives of the Project

1.1 Background

1.1.1 Approximately 65% of the national labor force is engaged in agriculture and/ or related industries in Timor-Leste. The agriculture sector plays an important role in the Timorese economy, accounting for 80% of non-oil exports and around 20% of non-oil GDP. The government of Timor-Leste has formulated the Strategic Development Plan 2011-2030 (hereinafter referred to as "SDP"), which stipulates that the agriculture sector is as one of the most important sectors in economic development. The SDP articulates strategies and targets "achievement of food self-sufficiency" by the year 2020. However, concrete plans to achieve those targets are not clearly described in the SDP.

1.1.2 Under such conditions, the Government of Timor-Leste officially requested to implement a technical cooperation project aiming at formulation of an agricultural master plan to the Government of Japan. In response to this, the Japan International Cooperation Agency (JICA) examined the proposed project and the Record of Discussions (R/D) for the "Project for Agriculture Master Plan and Irrigation Development Plan" was signed between JICA and MAF on 27 May 2013. Based on the R/D, JICA dispatched a mission in October 2013 for the Project.

1.2 Objectives and Project area

1.2.1 The objectives are to formulate an agriculture master plan to materialize the targets shown in the SDP and irrigation development plan including in preparation of a comprehensive irrigation scheme inventory and for formulation of priority projects, and develop the capacities of counterpart personnel for planning and implementing projects in the agriculture sector. The area of the Project covers entire area of Timor-Leste.

1.3 Overall working schedule

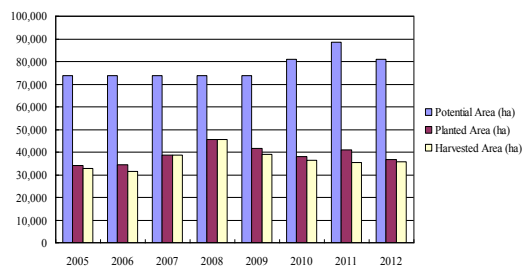
1.3.1 The Project was implemented in the following two phases.

Phase-1 (Sep. 2013 to Sep. 2014); Formulation of agricultural master plan and selection of priority projects

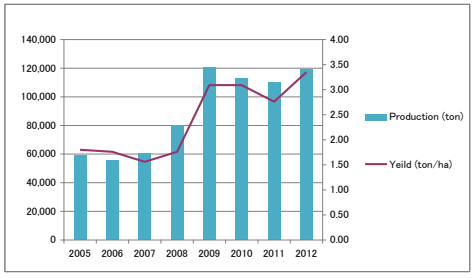
Phase-2 (Sep. 2014 to Apr. 2015); Formulation of priority projects

2. Future Prospect of Food Supply

2.1 MAF sets the production target of staple food crops, namely, rice and maize, for achievement of the SDP's target; "food supply will have exceed demand". As for rice production, it is considered difficult to attain the target due to the change of surrounding rice production.



Change of Paddy Planted Area and Unit Yield



Production and Yield of Paddy

2.2.1 Planted area was peaked 46,000 ha in 2008, however, the area has been decreasing since 2008. Consequently, the planted area in 2012 was decreased to 37,000 ha.	2.2.2 By disseminating the paddy cropping skill since 2009, the yield jumped to the level of around 3.0 ton/ha. Since then, the production and the yield are stagnant in the level from 100,000 to 120,000 ton and 3.0 to 3.5 ton/ha (source; NDAH, MAF).

2.2 There are many constraints for rice production due to many changes of the conditions.

2.2.1 Irrigation infrastructure is indispensable for farmers to subsist and maintain crop production, however, most irrigable areas are not properly managed since irrigation systems are not functional.

 425 Irrigation schemes, Total area; 34,359 ha	- Unstable intake from river (steep river, large fluctuation of water level and discharge) - Irrigation facilities are easily damaged by debris flow. Because of no river control facilities, flooding water often intrudes into farmland and irrigation faculties. As a result, earth and sand are deposited on them. - Construction cost of irrigation facility and removal cost of sedimentation are high. - Available amount of river water in dry season is not enough to irrigate full scale of dry paddy cropping. Rice farmers are reluctant to cultivate the dry paddy because they may face with lack of irrigation water.

2.2.2 Due to cheap imported rice, farmers can purchase the imported one during food shortage period.

2.2.3 Cash income opportunities from daily allowance in public works, pension system, fishing and other works are increased. Rice production farmers don't have much incentive for expanding paddy cropping.

2.2.4 In general, rice production farmers face with the difficulty to obtain labor force during busy farming season and other input materials such as high quality seed, fertilizer/ pesticide, etc. They do not have sufficient cultivation skill and market channels for domestically produced rice.

2.2.5 These compounded issues discourage rice production farmers to expand paddy cultivation.

2.3 Targets of maize and cassava production are considered to be realizable, if abnormal weather/ matters are not occurred. However, recent trend of national staple food is shifted from maize to rice, since the people can get imported rice easily at the markets and they prefer rice. Moreover, rice is becoming more important from the viewpoint of calorie intake.

2.4 Rice is imported to meet with national food demand. It means that the national food security is largely dependent on the import of rice with unexpected price fluctuation.

2.4.1 KONSSANTIL was established in November 2012, as the cross-cutting organization consisting of various ministries for national food security, which is chaired by the Minister of MAF. MAF is responsible for increase of food production.

Food Supply and Demand Estimation (from April 2013 to March 2014)

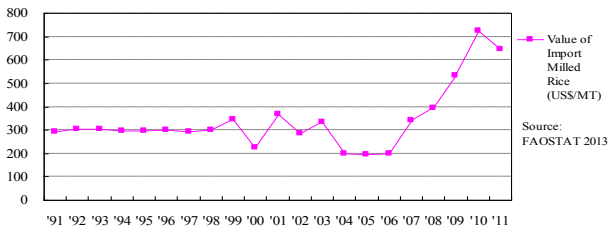
No.	Item	Rice (ton)	Maize (ton)
I.	Total availability from domestic source	70,299	100,789
II.	Total utilization	132,460	115,072
III.	Deficit/ Surplus	- 62,161	- 14,283
IV.	Required imports/ to be covered by other crops/ food	62,161	14,283

Source: Timor Leste Food Security Bulletin, Issue No. 5, July to September 2013

I. Including in opening stock and production estimation from main season and second season.

II. Including in food use, seed requirement, feed use, post-harvest losses and targeted closing stocks.

2.4.2 MAF estimates food supply and demand by quarter, and reports it to the KONSSANTIL. According to the table mentioned above, deficit of rice and maize are 62,161 tons and 14,283 tons, respectively. Apart from this estimation, rice is freely imported. Although it is hard to estimate accurate amount of the imported rice, the volume in 2013 is estimated at about 80,000 tons. For rice import, there are two routes, governmental one and private sector's one for commercial purpose. In 2013, governmental share and private one were estimated at 19% and 81 % of the total imported volume.



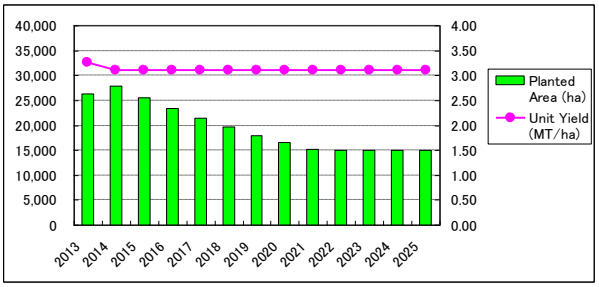
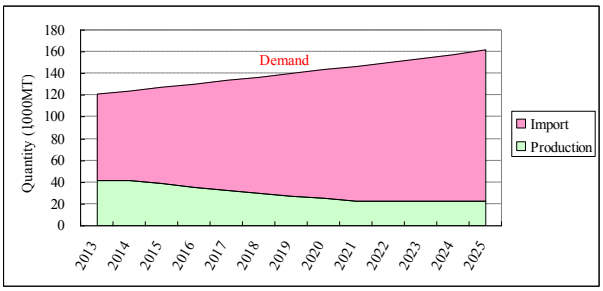
Trend of Import Rice Price (US$//MT)

2.4.3 The price of imported rice has jumped since 2008, in response to the soaring international cereal price in 2008. Timor-Leste needs suitable measure to cope with such price fluctuation, as a rice importing country.
The government has introduced the purchasing system of agricultural products such as paddy, maize and other major crops to stimulate such crop production. However, the system has not been well functioned as designed. Because of some operational problems, it has yet to be a sustainable system.

3. Forecasting Future Rice Production under the Current Constraints

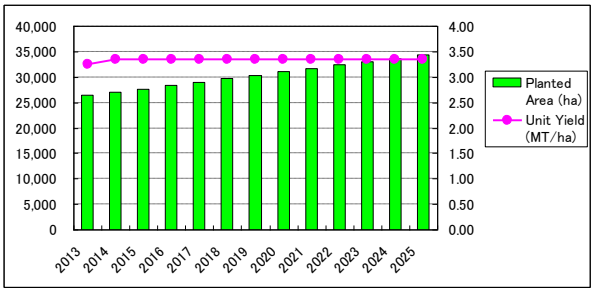
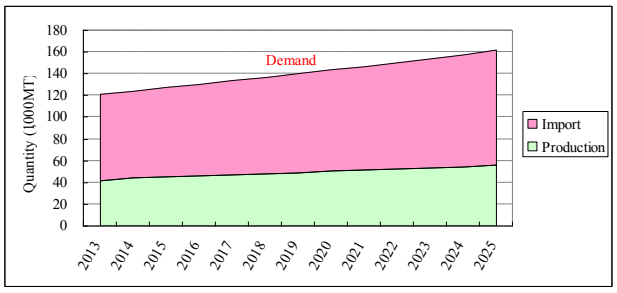
3.1 Rice self-sufficient rate in 2025 would be decreased from 35% in 2013 to 14%, in case that rice cropping area would be downward. This case might be brought from the change of agricultural surrounding such as; i) increase of the income opportunity from non-agricultural activities, ii) price of import rice is tending downward so that rice is enough cheap to purchase, iii) natural disaster such as drought and flood occurs frequently.

Pessimistic case (rice cultivating area would be downward.)

Basic condition (planted area and yield)	Simulation result
	
<Planted area> Decreasing until the minimum level "stop-line"(15,000 ha), <Yield> Maintaining the recent three years average (3.11 ton/ha)	<Milled rice production> Decease to 23,000 tons. <Self-sufficiency> Decrease to 14%.

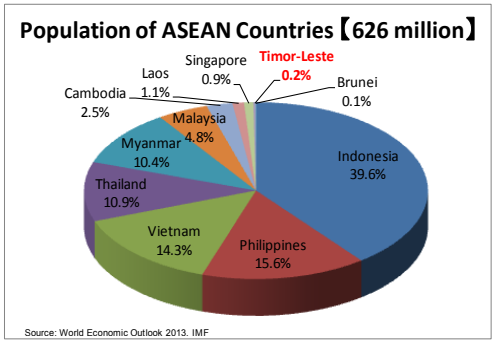
3.2 Rice self-sufficient rate in 2025 would be maintained at 35 %, same as in 2013, in the case that agricultural surrounding would be changed so that the rice production farmers can expand rice cropping.

Optimistic case（rice cultivating area would be recovered.）

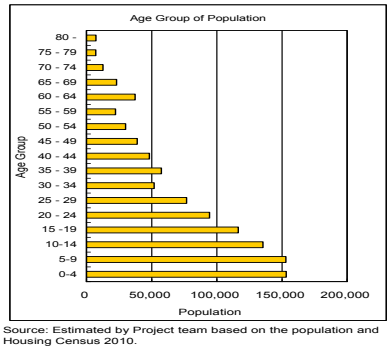
Basic condition (planted area and yield)	Simulation result
	
＜Planted Area＞Recovery to the irrigation area (34,359 ha), ＜Yield＞Maintaining the past maximum level (3.35 ton/ha)	<Milled rice production> Amounts to 56,000 tons. <Self-sufficiency> Maintain at 35%, same level as in the year 2013 estimation.

4. Agriculture Sector of Timor-Leste Compared with the ASEAN Countries

4.1 Timor-Leste has a plan to accede to the ASEAN. Timorese agriculture sector is important in terms of share of GDP and employment opportunity, however, the agricultural competitiveness is weak.



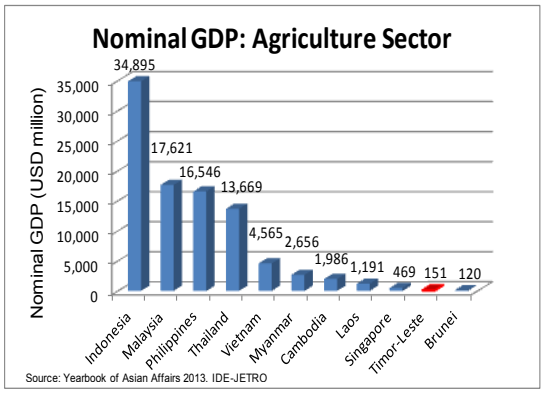
Comparison of Population of ASEAN countries



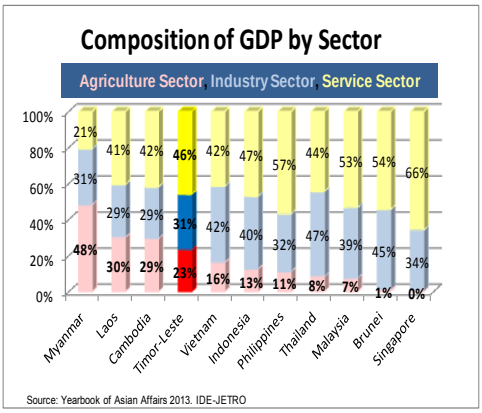
Population age structure

4.1.1 Indonesia has the biggest population, 250 million. If Timor-Leste joins to ASEAN, it is the second smallest country in the ASEAN countries, following the Brunei. Timor-Leste's total population is 1.06 million.

4.1.2 Annual growth rate of the population is estimated at 2.41%, high compared with the neighboring countries. According to the age structure, 53% of the total is occupied by the youth aged group under 19. In future, it will be required to ensure the employment for them.



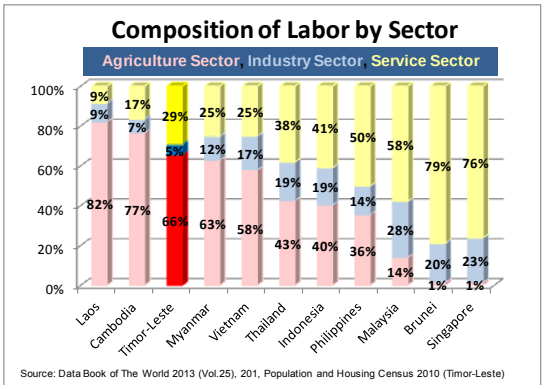
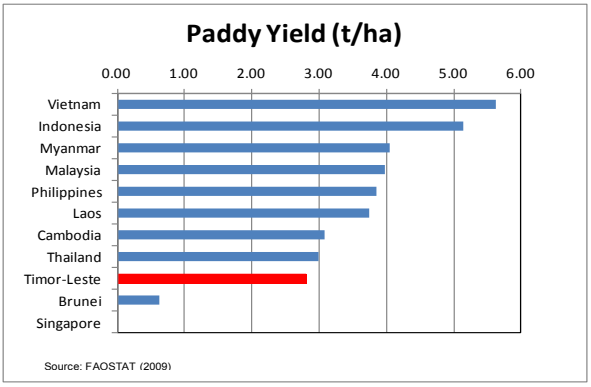
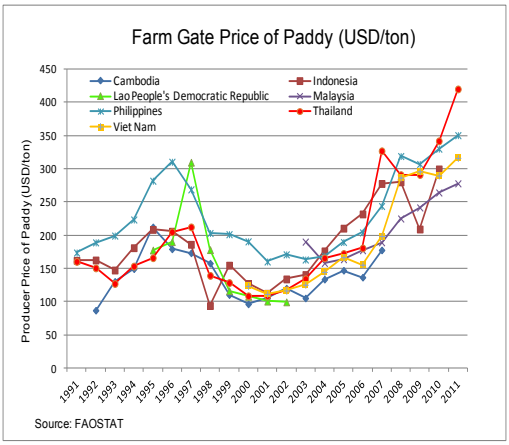
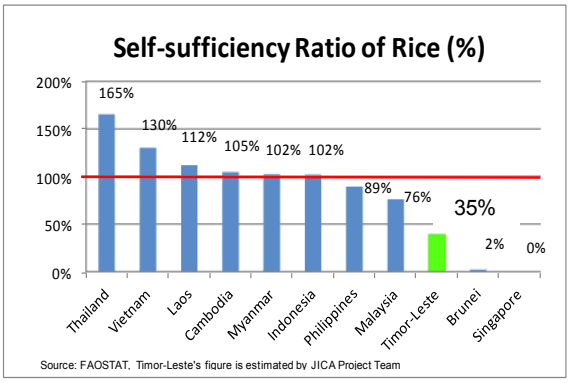
Economic Scale of Agriculture Sector



GDP Composition by Sector

4.1.3 Agriculture sector GDP in Timor-Leste is small compared with the ASEAN countries. Timor-Leste's GDP in 2012 including oil sector is US$5,579 million, Non-oil sector

4.1.4 Percentage of the agriculture sector's GDP in the According to the composition of GDP by sector among the ASEAN countries, GDP share of the Timor-Leste's

GDP, US$1,270 million, Agriculture sector GDP, US$236 million (Source: Timor-Leste's National Accounts 2000-2012, MoF). (US$151 in the above figure gotten from different source.)	agriculture sector is relatively in the high. Country's economic activity in non-oil sector is still dependent on the agriculture sector. (According to the data shown in 4.1.3, non-oil sector GDP is 19% and 23% in the above figure gotten from different source).
 **Composition of Labor by Sector**	 **Comparison of Paddy Yield**
4.1.5 According to the share of labor force by sector, Timor-Leste's agriculture sector is relatively high, 66%. The percentage of the employed population by districts in the sector is high, from 71% to 85%, except Dili. It means that agriculture sector is an important industry in rural area to ensure the employment opportunity.	4.1.6 According to the FAOSTAT (2009), paddy yield is classified into the low country group, except Brunei and Singapore. (According to the NDAH's data, it is reported from 3.0 to 3.5 ton/ha (2009-2012)).
 **Farm gate price of rice in the ASEAN countries**	 **Rice self-sufficiency in the ASEAN countries**
4.1.7 Timor-Leste's farm gate price of rice was estimated average $370/ton (2011) (source; NDA, MAF). It is in high level. International competitive power of the Timor-Leste's rice is low compared with those of the ASEAN countries.	4.1.8 Rice is the main food for the ASEAN countries. Rice self-sufficiency ratio in Timor-Leste is low, because rice is freely imported under the low tariff (2.5%) and people can readily purchase it.

4.2 Rice is a politically sensitive food crop for the ASEAN countries, therefore, they have taken some rice policies, respectively.

Rice Protective Policies Taken by the ASEAN's Main Rice Production Countries

Policy	Thailand	Vietnam	Indonesia	Philippines	Malaysia	Timor-Leste
Tariff on Rice*	30-50%	40%	30%	40-50%	20-40%	2.5%
Local Purchasing Scheme	○	○	○	○	○	△
Import Restriction	○	×	○	○	○	×

Note; *; Although zero tariff should be basically applied among AFTA (ASEAN Free Trade Area), tariff is set by countries.

○; applied, △; applied, but not settled. ×; not applied. Detail is referred to the section 4-6-2 in the main report.

4.3 Compared with the rice production condition in the ASEAN countries, Timor-Leste faces with the difficulties; i) Production scale is very small due to the small size of farmland, ii) Production cost for rice farming including in the input and labor cost is high, iii) Cost effectiveness for irrigation project is relatively low because of the steep river and the sloped land, iv) Transportation cost is high due to the poor road conditions. Considering these conditions, as a whole, the country has low advantage.

4.4 Considering such situations in Timor-Leste, in order to maintain the supply of local rice and agriculture-based employment in rural area, some rice policies have to be prepared.

5. Framework of Master Plan and Necessary Supporting Policies for Expanding Rice Production

5.1 SDP's target "Food supply will have to exceed demand (by 2020)" is the national development target. Judging from the progress, it will be hard to achieve the target. Considering the constraints as mentioned above, a realizable development goal for the Master Plan is set; ***Local rice production is increased for contributing to the national food security*** *(To decrease the import of rice and improve rice self-sufficiency)*.

5.2 Following two supporting policies have to be set for achievement of the development goal.

Policy	Objective
Productivity improvement supporting policy	Improve the irrigation system, rice farming, processing and marketing process to improve the rice productivity
Production incentive stimulating policy	Stimulate rice farmers' incentive so that they can expand rice production (Produced paddy/ rice is surely sold at profitable price)

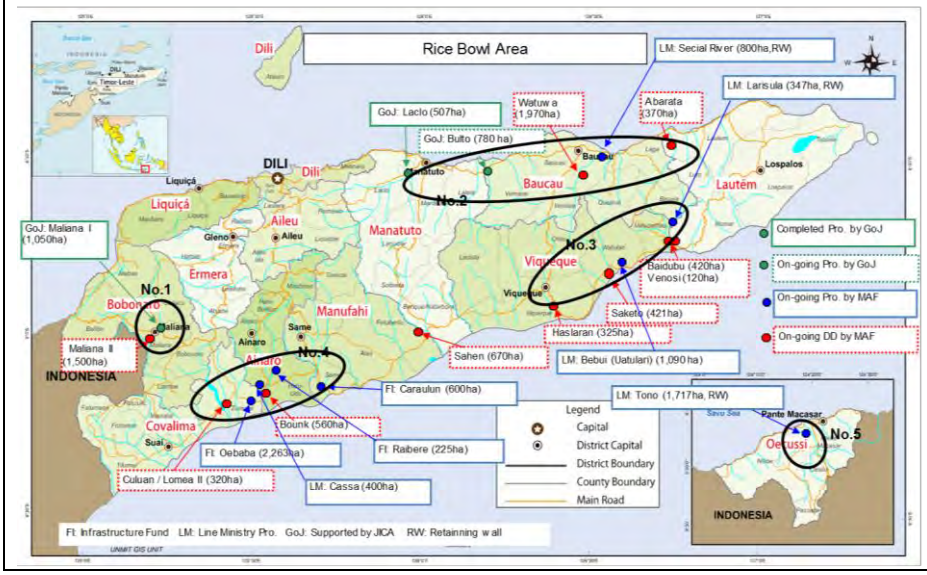
5.3 Policies for productivity improvement

5.3.1 Following 19 programs/ projects / institution are provided by development strategy and subjects.

Development strategy	Subjects	Measure	Program/ Project/ Institution
Irrigation system is improved.	Lack of irrigation water	Securement 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
	Removal of deposited sediment	Establishment of WUA and strengthening of operation and management Strengthening WUA capacity	5. Strengthening program for operation and management system of irrigation system
		Creation of farmers' ownership sense	6. Farmer 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
		Provision of river control works	8. Capacity development program of NDWIM for leading irrigation development project
Crop productivity is improved.	Lack of input materials	Obtaining of quality seeds	9. Program for obtaining quality seed and improved variety seed breeding
		Promotion of farm mechanization	10. Promotion program for private mechanization
		Provision of credit to obtain input materials	11. Establishment of agricultural fund system (Institution)
		Making use of local resources	12. Local resource circulative agriculture promotion project
	Low cultivation techniques	Dissemination of cultivation techniques	13. Dissemination program for cultivation technique
		Establishment of pest and diseases control	14. Strengthening program for pest and disease control

Development strategy	Subjects	Measure	Program/ Project/ Institution
		method	
		Establishment of manure management techniques	15. Establishment and dissemination program of manure management technique
	Weak farm management basis	Strengthening of integrated farming	16. Strengthening program of integrated farming with livestock breeding
Processing and marketing process is improved.	Non commercially oriented rice farmer organization	Training of local commercial rice farmers group	17. Training program for local commercial rice farmers for organizing cooperative
	Not developing local commercial rice market	Establishment of local rice value chain system	18. Rice value chain establishment project in rice production area
	Low local rice quality	Improvement of post-harvest processing process of local rice	19. Post-harvest processing improvement project of local rice

5.3.2 Program/ projects are applied based on the zoning of the agriculture production area.



From the viewpoint of rice production, agriculture area is classified into; i) rice bowl area, and ii) subsistent farming strengthening area. Suitable programs/ projects are selected based on the characteristic of the areas, which are implemented in accordance with the development direction.

Zone	Target area
Rice bowl area	Rice farming potential is relatively high, where local rice can be produced for commercial purposes. It is possible to produce large amount of rice, and to access to the market easily. Irrigation areas are mainly located in low-lying area. Estimated total irrigation area is 20,749 ha.
Subsistent farming strengthening area	Rice farming potential is relatively low, where surplus rice cannot be produced and production for home consumption has high priority, because of sloped topography and low market accessibility. Irrigation areas are mainly located in hills and sloped areas. Estimated total irrigation area is 13, 610 ha.

5.4 Production incentive stimulating policy

There are two policy options to enhance motivation of rice production farmers.

Policy option	Objective of the policy
Tariff policy	To control inflow of imported rice by erecting the tariff wall so that domestically produced rice can compete with the imported one.
Paddy purchasing system	To provide rice farmers with the market channels at profitable price.

6. Forecasting the Rice Self-sufficiency on the Production Incentive Supporting Policy Option

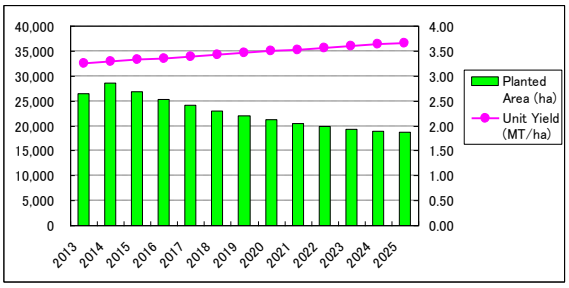
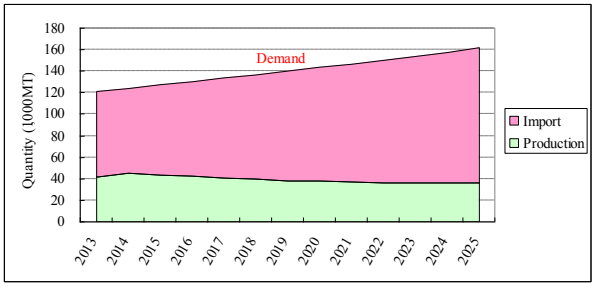
6.1 Rice self-sufficiency in 2025 was simulated by the following policy options.

Option	Production incentive supporting policy	Productivity improvement supporting policy
1	Paddy Purchasing system	19 programs/ projects / institution
2	Tariff policy (Tariff rate competitive with import rice)	19 programs/ projects / institution
3	Tariff policy (Tariff rate high enough to restrict importing rice)	Full scale application of 19 programs/ projects / institution

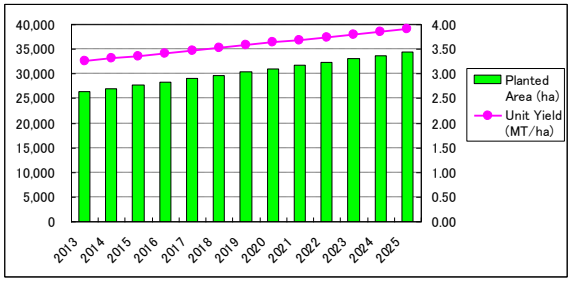
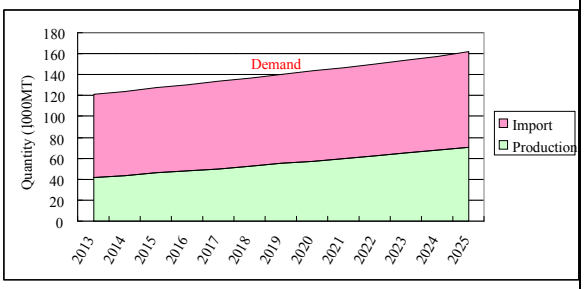
6.2 Case of the paddy purchasing system (option-1)

6.2.1 The future prospects for the rice production up to the year 2025 were simulated. Rice self-sufficiency forecasted is from **22 to 44 %**, largely depending on the change of socio-economic environment.

Pessimistic Case（Cropping area is decreasing）

Basic condition (planted area and yield)	Simulation result
	
＜Planted Area＞Adding 8,000 ha of irrigation area on the pessimistic case of the present condition. <Yield＞ Increase to 3.66 ton/ha.	<Milled rice production> Decreased to 36,000 tons. <Self-sufficiency> Decreased to 22%.

Optimistic Case (Cropping area is recovered on the change of the production environment)

Basic Condition (planted area and yield)	Simulation Result
	
＜Planted Area＞Recover to 34,359 ha of all irrigation schemes. ＜Yield＞ Increase to 3.90 ton/ha	<Milled rice production> Amounts to 71,000 tons <Self-sufficiency> Decreased to 44%.

6.2.2 The B/C is analyzed as less than 1.0, based on the cost-benefit analysis. .

Cost; Project cost for programs/ projects, Cost of purchasing paddy, Production cost of rice, Cost of imported rice

Benefit; Total value of rice production, Selling benefit of purchased paddy

6.3 Case of the tariff policy (tariff rate competitive with import rice) (option-2)

6.3.1 Tariff rate will be set to increase competitiveness of local rice with imported one. In case that national average price of domestically produced rice is equal to that of imported one, tariff rate is to be set at 40%. In another case that local rice price at Dili market is equal to that of imported one, tariff rate is to be 110%.

Simulation case

Case 0 : Tariff rate = 0%

Case 1 : Tariff rate = 40% (PES=0.21)

Case 2 : Tariff rate = 110% (PES=0.21)

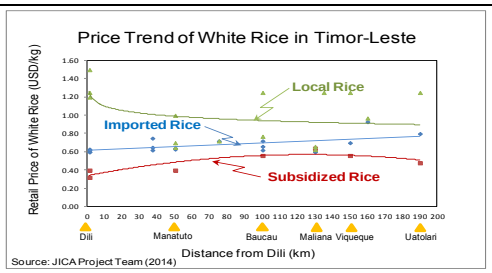
Case 3 : Tariff rate = 40% (PES=0.52)

Case 4 : Tariff rate = 110% (PES=0.52)

PES: Price Elasticity of Supply

PES=0.21; Agricultural Infrastructure: under developed,

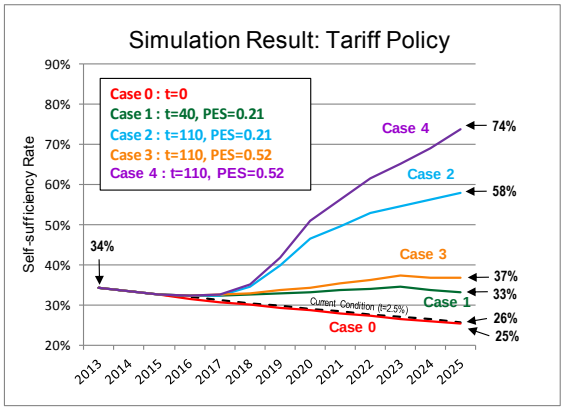
PES=0.52; Agricultural Infrastructure: developed



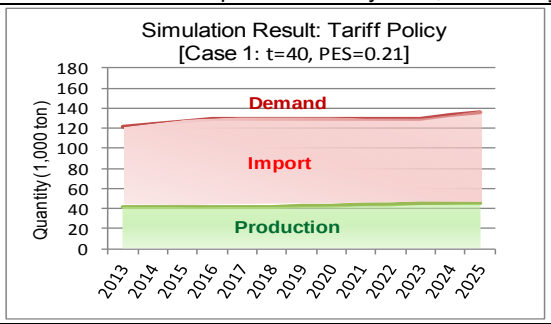
Rice price in Dili and Local market

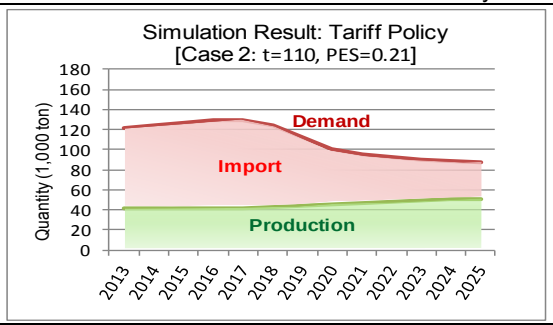
6.3.2 Forecasting rice self-sufficiency is based on the simulation result.

1) Raising tariff rate is effective to stimulate farmer's incentive and improve rice self-sufficiency.
2) Rice self-sufficiency rate will be 58-74% at the tariff rate 110%.
3) Price of rice in 2025 will be US$0.77/kg when tariff rate is zero (0) %, and US$1.64/kg when tariff rate is 110%.
4) Tariff revenue will be US$20 million in 2025 at the rate 110%. It may be necessary to spend it to protect the consumer, especially the poor.

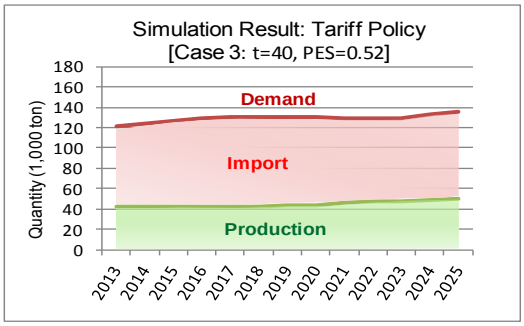


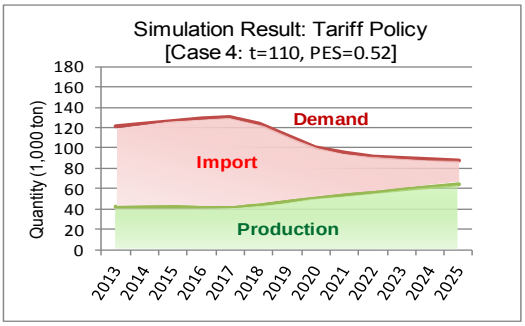
5) If subsistent farming is dominant and the programs/ projects are under development, reduction in consumption rather than increase in production may arise, which may contribute to increase of the rice self-sufficiency rate.





6) If commercial farming is developed by positive inputs, the result of tariff policy will be more effective and preferable.





6.3.3 Cost-Benefit analysis shows that B/C is more than 1.0, and NPV is positive when tariff rate is 110%.

Cost; Project cost for programs/ projects, Production cost of rice, Cost of import rice

Benefit; Total value of rice production, Tariff revenue

6.4 Case of tariff policy (tariff rate high enough to restrict import of rice) (option-3)

6.4.1 This policy aims at achievement of 100% rice sufficiency by local rice. High tariff rate to restrict rice import is set, and full scale programs and projects to improve rice productivity are applied to encourage rice production farmers.

6.4.2 60,000 ha irrigation area and 5.1 ton/ha yield are necessary to meet future rice demand, namely, 162,000 tons in 2025. Considering present irrigation area, 34,359 ha and yield, 3.0 to 3.5 ton/ha, large scale investment for water resource/ irrigation development, land reclamation, and rice productivity improvement are needed for 100 % rice self-sufficiency.

6.4.3 In order to promote this policy, social and economic validity of this investment including in setting such a high tariff rate should be approved by the government authorities. It is also required to provide a suitable food security policy to ensure national food supply during implementation of this option.

7. Agriculture Master Plan based on the Production Incentive Supporting Policy

7.1 Rice self-sufficient rate of each option is forecasted as follows.

Policy option	Forecasted rice self-sufficient rate
Paddy purchasing system (option-1)	22 - 44%
Tariff policy (option-2)	33 - 37% (tariff rate 40%), 58 - 74% (tariff rate 110%)

7.2 Rice self-sufficiency is the highest in case of 110% tariff rate. This policy will be able to stimulate rice farmers' incentive. On the other hand, since the rice price goes up, people may restrict rice consumption, so that they may demand substitute foods such as maize and cassava. To cope with this situation, it will be required to protect the consumers, especially, the poor, and to encourage farmers to cultivate substitutional food crops in their farmland, especially in the unfavorable irrigation area. Considering the negative impact on consumers' lives which might be brought about from this policy, it is difficult to introduce this tariff policy.

7.3 Paddy purchasing system has less advantages than the tariff policy (tariff rate; 110%) for rice production increase and improvement of rice self-sufficiency. On the other hand, this system has advantage to promote competitive agriculture and market-oriented farming. For this system, it is required to provide a well-designed sustainable system including the possible bearing of the paddy purchasing cost. Careful operation is also needed to compete with the imported rice in quality and price. Basic operation system for purchasing has been already established by MCIE. Thus, MAF can learn from the MCIE’s experience and incorporate the purchasing system into the rice production system.

7.4 Considering these situations, **Paddy purchasing system,** is presently proposed, as the most realistic policy, although it requires a political consensus and adjustment of the current system.

7.5 Supply and demand of agricultural products should be managed at free market mechanism instead of control by the government, it is, therefore, needed to improve current purchasing system. The change of mechanism, from government to free marketing system, should be incorporated in the improvement direction.

7.6 As for the paddy purchasing system, the government is continuously obliged to bear the expenses to purchase paddy. To lighten the burden on government, it may be necessary to introduce an integrated policy of paddy purchasing system and tariff policy. Tariff rate is set considering the burden on consumers. Revenue from the tariff may be provided as a capital for paddy purchase.

7.7 In ASEAN countries, zero tariff should be applied according to the AFTA (ASEAN Free Trade Area). It may be hard to set a new tariff, after affiliation with ASEAN. If the tariff policy would be selected, it is recommended to introduce the policy before affiliation.

8. Nationwide Implementation of the Agriculture Master Plan

8.1 The Master Plan is materialized by applying both policies mentioned above in the 425 irrigation areas. Programs/ projects are selected based on the condition of the areas.

Overall target;	Local rice production is increased thereby contributing to national food security
Project target;	Local rice production is increased through enhancing farmers' production incentive by improving enabling environment.
Project component;	- Production incentive stimulating policy (paddy purchasing system) - Productivity improvement supporting policy (irrigation, rice farming, processing/ marketing)
Project target area;	425 irrigation areas (Total area; 34,360 ha)
Implementation organization;	MAF

8.2 Implementation organization is MAF, which is responsible for increase of rice production. MAF is requested to take initiatives in materializing the master plan.

8.3 The agriculture master plan should be implemented by taking following three steps. Prior to the nationwide master plan implementation, the proposed priority projects should be implemented to strengthen the capacity of MAF.

Steps	Activities
1. Making governmental approval of the master plan (rice policy)	Master plan with governmental approval, Preparation of overall nationwide master plan implementation, Establishment of master plan implementation organization within the MAF, Discussion with MCIE on improvement of paddy purchasing system
2. Implementation of the priority projects (referred to the “Priority Projects”)	Implementation under the on-the-Job training manner for strengthening MAF implementation organization, Establishment of the implementation organization in central and district levels.
3. Nationwide master plan implementation	Necessity survey of 425 irrigation schemes, Selection of irrigation scheme based on the survey, Applying the policies, programs/ projects in the selected ones.

(Priority projects)

9. Selection of the Priority Projects

9.1 In order to materialize the master plan in the nationwide irrigation scheme, both policies, namely, productivity improvement policy and incentive stimulation policy, are applied in the country’s irrigation schemes. To do so, it is crucial to identify and fix expected issues for smooth implementation. The priority projects are regarded as pilots for nationwide master plan implementation.

9.2 Preparation of action plan for improving paddy purchasing system is selected from production incentive supporting policy, as one of the priority projects. From productivity improvement supporting policy, three (3) local rice production promotion projects in rice bowl areas and one (1) strengthening project of food production in subsistence farming area are selected. Priority project areas are selected from the existing 425 irrigation schemes. As the first step, candidate areas are listed from in terms of necessity of irrigation rehabilitation. At next step, they are narrowed down in view of development potential of rice farming and processing/marketing and finally, the priority project areas are selected.

9.3 Following five priority projects are selected as the pilot projects in prior to nationwide master plan

implementation.

Priority Project	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	*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	*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 Viquque district	*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	*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	*Ensure food security in household level through strengthening food production and integrated farming.*			*	*	

* ; Applied in the Priority Project

10. Preparation of Development Plan of the Priority Projects

10.1 Preparation of action plan for improving the paddy purchasing system

10.1.1 Paddy purchasing system is to secure market channels of domestically produced paddy, which surely stimulates rice production farmers for further production.

10.1.2 Since the areas of proposed two priority projects are targeted by the paddy purchasing system, it is proposed that MAF and MCIE launch the discussion for improving the system. Discussion progress should be reported and approved by the KONSSANTIL.

10.2 Priority project for local rice production in Halecou irrigation scheme in Bobonaro district

10.2.1 Area of Halecou irrigation scheme is 350 ha and its irrigation area is 252 ha. Irrigation system, rice production techniques and processing/ marketing system are to be improved by the project. Project implementation is expected to bring about paddy production increase from 247 ton to 1,463 ton. Although some farmers purchase rice during food deficit time at this moment, they will not have to do in future. In addition to this, 942 ton surplus rice for commercial purpose except for private use is produced. By diversification of market channels including sale to MCIE, increase of local rice production is achieved.

10.2.2 Project cost is estimated US$3,007,000. Since the EIRR is estimated 11.9 %, economic validity is high. In terms of the environmental and social consideration, no severe negative impact will be caused. Positive effects such as improvement of household income can be expected. As a whole, the project is judged to be feasible.

10.2.3 The development process is regarded as a local rice production/ market promotion model in wide range of rice market area, which can be applied into the similar rice marketing areas in the Bobonaro and Baucau districts.

10.3 Priority project for local rice production in Saketo irrigation scheme in Viqueque district

10.3.1 Contents of the project are almost same as in the above priority project in Halecou irrigation scheme. The project has 410 ha in total and its irrigation area is 287ha. Irrigation system, rice production skill and processing/ marketing are improved by the project. The project will result in paddy production increase from 378 ton to 1,005 ton. As a result, purchase of rice in food deficit time will not be needed. In addition to this, 504 ton surplus rice for commercial purpose except

for house consumption can be produced. The project diversifies the market channels including sale to MCIE for such commercial rice. Consequently, the project encourages the rice production farmers, and increase of local rice production is achieved.

10.3.2 Project cost is estimated US$1,320,000. Since the EIRR is estimated at 11.6 %, the economic feasibility is high. In term of the environmental and social consideration, no severe negative impact can be caused. As indirect effects, improvement of rice self-sufficiency and increase of household income are expected. The project is judged to be feasible as an overall evaluation.

10.3.3 This project is regarded as the local rice production/ market promotion model in remote area far from the rice market in Dili. The model can be applied into the similar rice bowl areas located in the south region, districts; Viqueque, Covalima and Ainaro.

10.4 Local rice market improvement project in Maliana wide area in Bobonaro district

10.4.1 Agricultural production area located in Maliana and Calico sub-districts has high potential for rice production and marketing. Marketing amount of paddy is roughly assumed 9,700 ton. However, it is unstable due to cheap imported rice and local rice market in not sustainable. It is difficult for the traders/ rice millers to get profits at the local rice market.

10.4.2 To cope with this situation, it is important to take integrated approach from production to market. It is necessary to provide incentives to rice production farmers, and collectors/ traders/ rice millers. Project aims at establishment of “Rice market center”, in which they can work together to generate rice market business.

10.4.3 The project takes the actions; i) improvement of rice quality and adding value on rice products, ii) reduction of marketing and selling cost, and iii) encouragement of rice production farmers.

10.5 Priority project for strengthening food production in Bikaliu irrigation scheme in Viqueque district

10.5.1 Bikaliu irrigation scheme has 50 ha in total and its irrigation area is 30 ha. The number of beneficiary is 203. The project is classified into small scale agricultural development projects. Main purpose is to ensure food production for home consumption. By constructing irrigation facilities and improving farming skill, paddy production volume is expected to be 25 tons. In addition to that, purchase of rice for house consumption can be reduced from present 22 ton to 12 ton. Diversified crops production from only paddy to other crops such as maize and vegetables are proposed, which can contribute to improvement of household account in the area.

10.5.2 Project cost is estimated US$393,000. EIRR is estimated 15.7 % and economic feasibility is judged to be high. In terms of the environmental and social consideration, no significant negative impact is expected. Overall, the project is judged to be feasible. By the project implementation, annual farm household income is expected to be increased from US$2,300 to US$4,900.

10.5.3 In Timor-Leste, 79% of the total 425 irrigation schemes are classified into the small scale traditional scheme and its mean irrigation area is 55 ha as well as in this area. Most of the farmers in such areas can’t produce enough rice for home consumption because of non-functional irrigation systems. This development model in the priority project area can be applied into such areas.

11. Implementation Plan of the Priority Projects

11.1 Establsihment of MAF implementation organization

11.1.1 The priority projects are regarded as pilots and they are implemented prior to the nationwide

master plan implementation. MAF is requested to take some preparatory actions; i) making political consensus among related ministries and budgeting for the priority projects, and ii) setting a implementation organization within the MAF, which covers four sections; paddy purchase, irrigation, rice farming, and processing/ marketing.

11.2 Necessity of capacity development in the implementation process of the priority projects

11.2.1 It is proposed to establish the new MAF implementation organization as mentioned above by recruiting staff from present related directorates. Probably, it will be difficult for the new organization to cover overall process, namely, planning, operation and management of those priority projects. Therefore, it is proposed to implement the project with the support by donors concerned for the capacity development.

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ABBREVIATIONS

AAP	Annual Action Plan
ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
ADN	National Development Agency
AEC	ASEAN Economic Community
ASEAN	Association of South East Asian Nations
BNCTL	National Commercial Bank of Timor-Leste
CIF	Cost, Insurance and Freight
CIMMYT	International Maize and Wheat Improvement Center
CLMV	Cambodia, Laos, Myanmar and Vietnam
Comoes	Portuguese Development Co-operation Agency
C/P	Counterpart
CPPM	Cabinet of Policy, Planning and Monitoring
CSP	Commercial Seed Producer
DDAF	District Directorate of Agriculture and Fisheries
DFAT (AusAID)	Department of Foreign Affairs and Trade (Australian Agency for International Development)
DG	Director General
EC	European Commission
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
FAO	Food and Agricultural Organization (of the United Nations)
FDI	Foreign direct investment
FOB	Free on Board
GAP	Good Agricultural Practice
GDP	Gross Domestic Product
GIS	Geographic Information System
GIZ	German Development Agency
GNI	Gross National Income
GoTL	Government of Timor-Leste
GPS	Global Positioning System
ICM	Integrated Crop Management
IEE	Initial Environmental Examination
IFAD	International Fund for Agricultural Development
ILO	International Labour Organization
IPM	Integrated Pest Management
IRCP2	Irrigation and Rice Cultivation Project in Manatuto Phase 2
IRCS	Improved Rice Cropping System
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency

KONSSANTIL	National Council on Food Security, Sovereignty and Nutrition in Timor-Leste
MAF	Ministry of Agriculture and Fisheries
MAFSP	Ministry of Agriculture and Fisheries Strategic Plan 2014-2020
MCIE	Ministry of Commerce, Industry and Environment
MED	Ministry of Economy and Development
MoE	Ministry of Education
MoF	Ministry of Finance
MP	Master Plan
MPW	Ministry of Public Works
MT	Metric Ton
MTIP	Medium Term Investment Plan 2014-2018
MTOP	Medium Term Operation Plan 2014-2018
NDA, MAF	National Directorate for Agribusiness
NDAECD, MAF	National Directorate for Agricultural Extension and Community Development
NDAH, MAF	National Directorate for Agriculture and Horticulture
NDE	National Directorate for Environment
NDFA, MAF	National Directorate for Fisheries and Aquaculture
NDFAM, MAF	National Directorate for Finance and Administration Management
NDFAT, MAF	National Directorate for Formation and Agricultural Training
NDFWM, MAF	National Directorate for Forestry and Watershed Management
NDICC, MAF	National Directorate for Industrial Crop and Coffee
NDIWM, MAF	National Directorate for Irrigation and Water Management
NDL, MAF	National Directorate for Livestock
NDP	National Development Plan
NDQB, MAF	National Directorate for Quarantine and Biosafety
NDR, MAF	National Directorate for Research
NGO	Non Governmental Organization
NLC	National Logistic Center
OJT	On the Job Training
PD	Project Document
RDP4	Rural Development Programme Phase IV
RDTL	Republica Democratica de Timor-Leste
SDP	Strategic Development Plan 2011- 2030
SEA	Strategic Environmental Assessment
SFSSNC	Secretariat of Foods Security and Sovereignty, Nutritional and Cooperation
SGR	Strategic Grain Reserve
SoL	Seeds of Life
SoS	Secretary of State
SRI	System of Rice Intensification
TLAAC	Timor-Leste Agriculture Advisory Council
TLMSP	Timor-Leste Maize Storage Project
TRWG	Traditional Water Group
UNDP	United Nations Development Program

UNTL	Universidade Nacional Timor Lorosa'e
USAID	United States Agency for International Development
WB	World Bank
WFP	World Food Programme
W/S	Workshop
WUA	Water Users Association

I. Master Plan

CHAPTER 1 INTRODUCTION

1-1 BACKGROUND AND OBJECTIVES

1-1-1 Background

Approximately 65% of the national labor force is engaged in agriculture and/ or related activities in the Democratic Republic of Timor-Leste (hereinafter referred to as "Timor-Leste"). The agriculture sector plays an important role in the Timorese economy, accounting for 80% of non-oil exports and around 20 % of non-oil GDP[1]. Timor-Leste, however, faces several constraints for prosperous agriculture and food security such as an unstable climate, insufficient irrigation facilities destroyed in the conflict at the independence time, limited financial resources, low farming capacity of farmers, lack of human resources in both the private and public sectors, as well as respective technical difficulties in each agriculture sub-sector. These constraints cause low agricultural production and productivity, low income for farmers and critical food and nutrition insecurity. For example, the yield of rice as a staple crop, is still at a stagnant low level of around 3.0 to 3.5 ton/ha[2], while this has improved from around 1.5 ton/ha in the middle of the 2000s. Compared with the Indonesia, yield difference is from 1.5 to 2.0 ton/ha.

The government of Timor-Leste has formulated the Strategic Development Plan 2011-2030 (hereinafter referred to as "SDP") in which the agriculture sector has been assessed as one of the most important sector in economic development. The SDP has articulated strategies and targets by 2015, 2020 and 2030, such as the "achievement of food self-sufficiency" by the year 2020 (it is estimated 65.1% in 2010[3]), "increasing of irrigation area" and "increasing average maize yield". However, concrete plans to achieve those targets are not clearly shown in the SDP. The Ministry of Agriculture and Fisheries (hereinafter referred to as "MAF"), which is in charge of the agricultural sector policy has formulated the "MAF Strategic Development Plan (2014-2020)" in which no concrete plans toward those targets are offered. While the agriculture sector has been recognized as one of the important sectors, only about two percent of national budget is allocated for it.

It is, therefore, necessary for MAF to develop a master plan which presents concrete ways to materialize the SDP's targets and will be basis of MAF's budget and human resource development plan in the future. However, MAF confronts some difficulties in preparing and budgeting for them due to technical limitations such as lack of planning capability and shortage of fundamental data/ information.

Under such conditions, the Government of Timor-Leste officially requested to carry out a technical cooperation project aiming to formulate an agricultural master plan and irrigation development plan. In response to this request, the Japan International Cooperation Agency (JICA) dispatched a detailed planning survey team for formulating the proposed project and the Record of Discussions (R/D) for the "Project for Agriculture Master Plan and Irrigation Development Plan", which was signed with the MAF on 27 May 2013. Based on this R/D, JICA dispatched a mission in October 2013 to perform the Project.

1-1-2 Objectives

- To formulate an agriculture master plan to materialize the targets shown in the SDP and irrigation development plan including in preparation of a comprehensive irrigation scheme inventory and for

[1] Source: Ministry of Agriculture and Fisheries Strategic Plan 2014-2020

[2] Source: NDAH, MAF

[3] Source: Estimated from the SDP

formulation of priority projects.

- To develop the capacities of counterpart personnel for planning and implementing projects in the agriculture sector.

Development targets of the agriculture master plan are focused on the following targets selected from the SDP.

- On-farm rice storage losses will have to be reduced from 20% to about 5% (By 2030).
- The food supply[4] will have to exceed demand (By 2020).
- The area of irrigated rice will have to be increased by 40% from 50,000 ha to 70,000 ha (By 2020).
- Average maize yields will have to be increased to 2.5ton/ha (By 2020).

1-1-3 Project Area

The area of this Project covers entire area of Timor-Leste

1-1-4 Counterpart Agency

Counterpart agency is the following National Directorate under the Ministry of Agriculture and Fisheries (MAF).

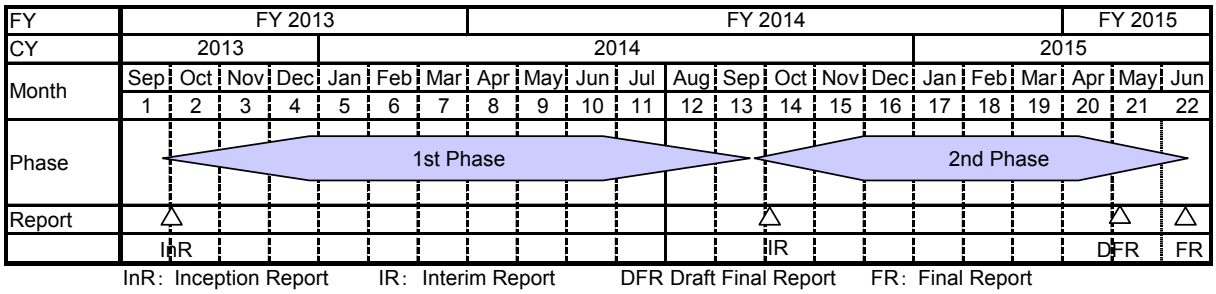
CPPM: Cabinet of Policy, Planning and Monitoring

National Directorate for Irrigation and Water Management (NDIWM)

National Directorate for Agriculture and Horticulture (NDAH)

1-2 OVERALL WORKING SCHEDULE

As indicated below, the Project is divided into two phases in 22 months implementation



InR: Inception Report IR: Interim Report DFR Draft Final Report FR: Final Report

Objectives and main working items of each phase are shown in below table.

Phase	1st phase	2nd phase
Objectives	- To prepare agriculture master plan, - To select priority projects related to the irrigation development plan	- To formulate the priority projects and prepare irrigation development plan.
Agriculture master plan	1) Analysis of current conditions in agriculture field and supporting projects 2) Analysis of development potential and development needs	

[4] Not included food import and stock.

Phase	1st phase	2nd phase
	3) Analysis of development constraints 4) Basic development policy and preparation of development plan	
Comprehensive irrigation scheme inventory survey	1) Design of survey format 2) Collection of existing relevant data 3) Preparation of survey plan 4) Conduct of the survey and compilation of collected data/ information 5) Preparation of comprehensive irrigation scheme inventory	
Irrigation development plan	1) Selection of priority projects 2) Preparation of survey plan for the priority projects	3) Preparation of the development plan of the priority projects based on the 2) in the 1st Phase) 4) Preparation of action plan
Environmental and social considerations	1) Examination of alternative plans based on the concept of "Strategic Environmental Assessment" including environmental and social considerations for selection of priority projects 2) Scoping for social and environmental considerations of the priority projects	3) Environmental assessment and preparation of mitigation measures against important environmental and social and considerations items and preparation of monitoring plan

CHAPTER 2 GENERAL CONDITIONS

2-1 NATURAL CONDITIONS

2-1-1 Geography

The land has a dramatic topography, total area of approximately 15,000 km^2, extended east and west of 265km and north and south 92km. The country is dominated by the Ramelau Range runs across the middle of the island from the eastern to the western tip. The highest point, Mount Tatamailau, is the top elevation of 2,963 m above sea level and less than 20 km from the sea. The topography of the island is formed by relatively short and steep slopes running down from the Ramelau Range to the island's north and south coasts. In the north side, relatively short and steep slopes run down from the mountains to the coast area. Coast zone is the precipitous cliff with limited low lying land. The south part is formed by relatively gentle slope and coast zone. Moist lowland areas are extended along the river running from the mountain areas, where are prone to occur flood and tidal flow intrusion, so that reclamation land is few.

The geology is derived from limestone and metamorphosed marine clays. This means the island has relatively unproductive. In most areas, it is compounded by the rapid decomposition of organic matter due to the tropical climate. Oil and natural gas are produced from the southern sea area, which support the national economy.

2-1-2 Topography and Geology

In terms of elevation, the country is divided into three zones, each with its own physical, cultural and economic characteristics. The zone, between 0 and 500 m, occupies approximately 65% of the total area, including a broad band along the south coast, and a narrow band along the north coast. Two-thirds of the country's population lives in this zone where most of the country's arable land has distributed. The middle zone lies between 500 and 1,500m, approximately 32% of the total land. This is the coffee-growing zone of the western highlands. The third zone, higher than 1,500m, is characterized by high annual rainfall, cool temperatures and poor, rocky soils.

The geology is derived from limestone and metamorphosed marine clays. This means the island has relatively unproductive. In most areas, it is compounded by the rapid decomposition of organic matter due to the tropical climate. The topography gives a serious effect on vegetation and erosion. Surface shallow soil is prone to be eroded so that soil erosion frequently occurs in the mountainous slope area during rainy season. High frequency of flood disaster occurs in the lowland areas. High levels of erosion greatly decrease soil fertility, damage natural and man-made water ways and water storage facilities. Flash flood and landslides are common throughout the country. Soil fertility is low for cultivation.

2-1-3 Climate

The island has a tropical monsoon climate with two distinct seasons, dry and rainy season. Rainy season begins around December and extends to April, usually with a northwest monsoon. In general, the south of the country is wetter than the north, and mountainous areas are wetter than lowland areas. Amount of rainfall is influenced under by topographic conditions with land elevation. Relatively lower rainfall is recorded in the low elevation coastal zone. On the other hand, the mountainous area has relatively higher rainfall. Dry season with south-eastern trade wind extends from May to November. Even in dry season, there is a little rainfall under the influence of the Range in the southern part of the island, where has two rainy seasons.

Based on the agro-climatic conditions, the land can be divided into six agro-climatic zones as shown in the Figure 2-1-1. The geographical area, annual rainfall, suitable agricultural crops are classified in the zones, as follows.

Figure 2-1-1 Agro-Climatic Zones

	Zone	Regional definition	Area (ha)(%)	Elevation (EL.m)	Annual Rainfall(mm)
	North Coast Lowlands	Lowland in the northern coast	147,000 (10)	<100 m	<1,000 m
	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	>1.500 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)

2-2 SOCIO- ECONOMIC CONDITIONS

2-2-1 National Economy

GDP of Timor-Leste in 2010 including the Oil sector is US$4,130 million, Non-oil sector's GDP is US$875 million. Per capita GDP of the Non-oil sector is US$766 million in 2010. According to the website information[1], GDP is estimated US$ 6,310 million (2012), US$6,150 million (2013) and US$5,710 million (2014)[2]

Table 2-2-1 GDP(Gross domestic products) of Timor-Leste (Million US$)

Items	2009	2010	2011	2012
GDP ($ million)	3,290	4,215	5,727	5,579
Oil sector	2,472	3,281	4,604	4,309
Non-oil sector	818	934	1,123	1,270
Gross national income (GNI)	2,556	3,295	4,724	4,690
Per Capita level ($)				
GDP	3,103	3,871	5,210	4,856
Oil sector	2,332	3,013	4,115	3,750
Non-oil sector	772	858	1,004	1,106

Source: Timor-Leste's National Accounts 2000-2012 General Directorate of Statistics, July, 2014

Looking at the share of the industry in the non-oil GDP in 2012, the sectors, namely, "public administration, defense, education, human health and social work activities" are majoy, accounts fro 22.6% of total amount. Agriculture, forestry and fishing sector accounts for 19.1%.

[1] Source; Website: http//ecodb.net
[2] Source; Website: http//ecodb.net

Table 2-2-2 Non-Oil Sector's GDP of Each Industry (Million US$)

Industry	2009	2010	2011	2012	(%)
Agriculture, forestry and fishing	173	191	193	236	(19.1)
Mining and quarrying	1	0	1	2	(0.2)
Manufacturing, mining and quarrying and other industry	12	11	11	12	(1.0)
Construction	139	155	248	239	(19.3)
Wholesale and retail trade, transportation and storage, accommodation and food service	183	187	203	222	(18.0)
Information and communication	38	45	56	62	(5.0)
Financial and insurance activities	4	3	8	9	(0.7)
Real estate activities	74	84	92	113	(9.1)
Professional, scientific, technical, administration and support services	7	25	30	34	(2.8)
Public admin., defense, education, human health and social work activities	148	175	216	279	(22.6)
Other service activities	58	66	47	39	(3.2)
Taxes less subsidies on products	-18	-6	-3	-11	
Non-oil value added, gross	818	934	1,103	1,236	
Statistical discrepancy			20	34	
Non-oil GDP	818	934	1,123	1,270	(100)

Source: Timor-Leste National Accounts 2000-2012. General Directorate of Statistics, July 2014

2-2-2 Administration and National Budget

(1) Administration

After the independence, the third presidential election was conducted in April 2012, and in July, National Parliament election was done. New cabinet was organized.

Government is formed by 15 Ministries as shown in Figure 2-2-1. National Development Agency (ADN: Agêneia desenvolvimento Nacional) under the Prime Minister' office is the organization who screens a series working process of bidding, Necessary process for irrigation facility construction works budgeted by infrastructure fund is screened by the ADN.

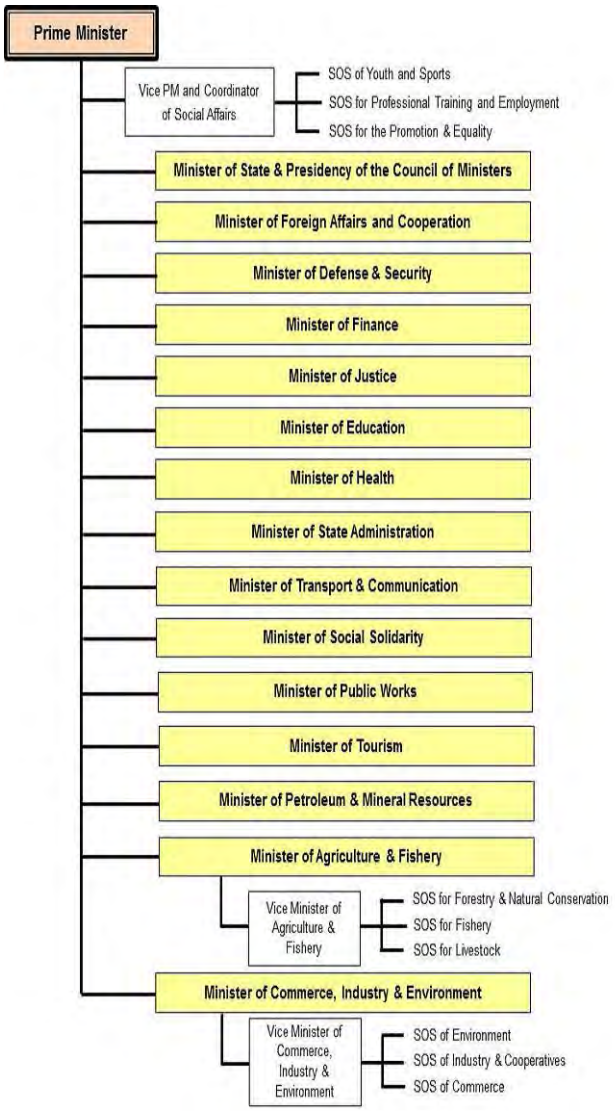


Figure 2-2-1 Government Organaization of Timor-Leste

(2) National Budget and MAF Budget

According to the "State Budget 2013 Overview Book1"(MoF), National budget from year 2011 to 2017 is made/ planned as shown in Table 2-2-3. The 2013 Budget is planned US$1,000 million (except for infrastructure fund).

Table 2-2-3 National Budget of Timor- Leste (2013) (US$'000)

	2011	2012	2013	2014	2015	2016	2017
Budget	579,664	893,499	1,000,694	1,010,724	1,047,098	1,085,151	1,124,902
Salary and Wages	110,834	138,822	160,531	166,216	172,845	179,740	186,905
Goods and Services	220,685	359,911	399,082	426,267	442,994	460,362	479,272
Public Transfers	141,423	234,626	238,985	238,231	247,113	256,610	265,816
Minor Capitals	26,180	44,288	49,595	50,039	51,999	54,033	56,152
Capital and Development	80,542	115,852	152,500	129,972	132,146	134,406	136,756

Source: State Budget 2013, Book 4B, Budget lines, Ministry of Finance
Excluded Infrastructure Fund

(3) Infrastructure fund

In addition to the budget allocated to the each ministry, infrastructure fund for provision of electric supply service, road, water and sanitation and petroleum development is incorporated into the national budget (see Table 2-2-4). Budget of electricity, petroleum and road programs occupies 63% of total infrastructure fund allocated. For the infrastructure fund of MAF, it is only for irrigation infrastructure, listed as the agriculture and fishery program. Share of allocated budget for this, however, is very small at 1.4% of the total fund.

Table 2-2-4 Infrastructure Fund (US$'000)

Description	2011 Revised Budget	2012 Budget after Virement and Rollover	2013 Final Budget		2014 Budget	2015 Budget	2016 Budget	2017 Budget
			Budget	(%)				
Electricity Program	448,742	301,821	173,904	24.5	91,500	89,000	49,000	35,000
MDGs (Millennium Development Goals)	51,207	117,517	88,013	12.4	81,500	65,000	65,000	61,084
Tasi Mane Development Program	18,925	123,038	139,402	19.7	184,000	269,355	330,500	400,000
Roads Program	39,976	114,380	115,973	16.4	166,803	115,180	85,570	45,900
Bridges Program		31,146	20,329	2.9	13,000	7,200	2,000	2,000
Airports Development program		9,467	9,467	1.3	26,000	24,000	20,000	20,000
Ports Program		10,700	10,975	1.5	21,783	29,000	35,000	50,000
Public Buildings Programs	15,417	49,862	48,991	6.9	97,921	65,568	17,300	
Water and Sanitation Programs		13,500	11,398	1.6	13,150	27,000	35,000	37,000
Informatics Programs	9,200	11,991	10,491	1.5	7,200	5,500		
Security and Defence Program	5,844	12,622	20,900	2.9	6,000	1,456		
Education Development Program	444	11,316	12,387	1.7	18,625	22,000	20,000	
Agriculture and Fishery Program*	2,634	9,228	9,953	1.4	26,853	37,045	20,749	10,000
Health Sector Program	4,654	6,430	2,650	0.4	3,396	3,000		
Social Solidarity Program	1,200	1,940	1,663	0.2	1,750	1,000	1,000	1,000
Urban & Rural Development Program	1,063	7,076	7,576	1.1	5,000	1,000		
Preparation of Design and Supervision-New Projects			25,218	3.6	33,168	35,199	38,909	42,254
Sub Total	599,306	832,033	709,289	100.0				
Loan Program		43,100	43,588		70,600	120,900	121,650	122,950
Total (include loans)		875,133	752,877					

Source: State Budget 2013, Special Funds, Book 6, Budget Book No. 6 and Analysis of SGP, 2012, Ministry of Finance
** All consists of Irrigation Development*

(4) National Budget 2014

National budget approved in January, is as follows.

Table 2-2-5 2014 National Budget (US$ Million)

Budget Item	2014 Budget ($ million)
State Budget (Expenditure)	**1,500.0**
Recurrent	*992.5*
Salary and Wages	176.8
Goods and Services	480.3

Budget Item	2014 Budget ($ million)
Public Transfers	335.5
Capital	*507.5*
Minor Capital	52.1
Capital and Development (including infrastructure)	455.3

Source: State Budget 2014 Budget Overview Book 1, Ministry of Finance

2-2-3 Administration and Population

Administration of the Timor-Leste is comprised by 13 districts and 65 sub-districts and 442 sucos. A Suco is formed by 7 to 8 villages (Aldeia). Minimum administration unit is the Suco. The districts are aggregated into 5 regions.

Table 2-2-6 Administration Division of Timor-Leste

District	District capital	Sub-district	Number of Suco
Region 1			
Baucau	Baucau	Baguia, Baucau, Laga, Quelicai, Vemasse, Venilale	59
Lautém	Lospalos	Iliomar, Lautém, Lospalos, Luro, Tutuala	34
Viqueque	Viqueque	Lacluta, Ossu, Uatucarbau, Watulari, Viqueque	35
Region 2			
Ainaro	Ainaro	Ainaro, Hatu-Udo, Hatu Builico, Maubisse	21
Manatuto	Manatuto	Barique-Natarbora, Laclo, Laclubar, Laleia, Manatuto, Soibada	29
Manufahi	Same	Alas, Fatuberliu, Same, Turiscai	29
Region 3			
Aileu	Aileu	Aileu Vila, Laulara, Liquidoe, Remexio	31
Dili	Dili	Atauro, Cristo Rei, Dom Aleixo, Metinaro, Nain Feto, Vera Cruz	31
Ermera	Gleno	Atsabe, Ermera, Hatólia, Letefohó, Railaco	52
Region 4			
Bobonaro	Maliana	Atabae, Balibó, Bobonaro, Cailaco, Lolotoe, Maliana,	50
Covalima	Suai	Fatululik, Fatumean, Forohem, Zumalai Maukatar, Suai, Tilomar	30
Liquiçá	Liquiçá	Bazartete, Liquiçá, Maubara	23
Region 5			
Oecussi	Pante Macassar	Nitibe, Oesilo, Pante Macassar, Passabe	18
Country		Total 65	442

Source：Population and Housing Census 2010, National Statistics Directorate

According to the 2010 census, total population of the country is 1,066 thousand. The census shows that average size of household is estimated at 5.8. Annual growth rate of population is 2.41%, high compared with that of neighboring countries[3].

[3] For example, Indonesia; 1.18%, Malaysia; 1.71%（Website:http//Wikipedia.org）

Table 2-2-7 Population of Timor-Leste

District	Area	Population		Popu. Density	Annual Growth Rate (%)	Average HH size
	(km^2)	2010	2004	2010	(2004-2010)	2010
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 Statistices Directorates

Looking at the population structure, 53 % of the total population is occupied by the youth aged group under 19 [4], as show in Figure 2-2-2, and they are concentrated into Dili. Youth unemployment is becoming major subject of this country. It is required for them to promote non-agricultural industry in urban area. Agriculture is the major industry. Agriculture and related industries are expected to generate employment opportunity.

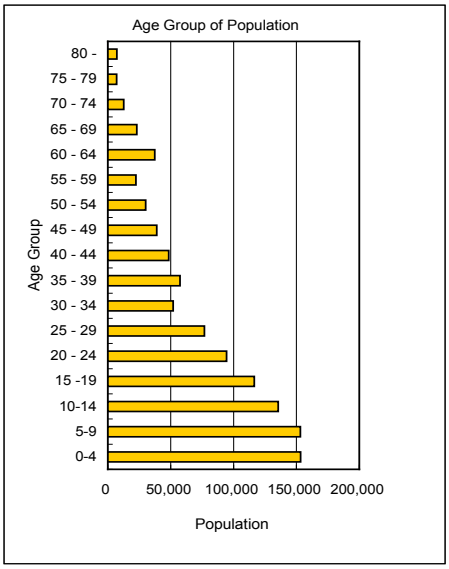


Figure 2-2-2 Population Structure

The population census shows employed population ten years and over by sector of employment as shown in Table 2-2-8. Employed population is 311,316 out of the 748,590 population aged ten years and over (if employed population aged 15 years and over, it is 302,992, out of 613,778 of population aged 15 years and over). Employed population by industry is shown as primary industry 204,355, occupied 65% of total employed population 311,316.

[4] Source: Timor-leste Labor Force Survey 2010, Population and Housing Census 2010. etc.

Table 2-2-8 Employed Population by Industry

Industry	Employed population	Share(%)
Primary	**204,355**	**66**
- Agriculture Forestry And Fishing	203,283	65
- Mining And Quarrying	1,072	-
Secondary	**15,554**	**5**
- Manufacturing	7,720	2
- Electricity Gas Steam And Air Conditioning Supply	249	-
- Water Supply Sewarage Waste Management And Remediation Activities	258	-
- Construction	7,327	2
Tertiary	**91,407**	**29**
- Wholesale And Retail Trade Prepair Of Motor Vehicles And Motor Cycles	18,259	6
- Transportation And Storage	6,833	2
- Accomodation And Food Service Activities	2,578	1
- Information And Communication	936	-
- Financial And Insurance Activities	539	-
- Real Estate Activities	61	-
- Proffesional Scientific And Technical Activities	264	-
- Administrative And Support Service Activities	7,287	2
- Public Administration And Defense Compulsory Social Security	24,470	8
- Education	11,907	4
- Human Health And Social Work Activities	4,016	1
- Arts Entertainment And Recreation	262	-
- Other Service Activities	6,017	2
- Activities Of Households As Employers Undifferentiated Goods/Services/Producing Activities Of Household For On Use	5,033	2
- Activities Of Estraterritorial Organisation And Bodies	1,769	1
- Not Enough Information	1,051	-
- Other (Not Elsewhere Classified)	125	-
Total	**311,316**	**100**

Source : Population and Housing Census 2010, National Statistices Directorates

Looking the district distribution of employed population engaged by primary industry, its share of each district except for Dili is from 71% to 85% of the employed population. Almost all employed population engages in agriculture and fishery sector. In Dili, only 14.6 % of employed population 60,801 engages in primary industry, smaller rate than the 74.3 % of tertiary industry (see Table 2-2-9).

Table 2-2-9 District Employed Population by Industry

District	Employed Population	Primary		Secondary		Tertiary	
		Population	%	Population	%	Population	%
Ainaro	18,853	15,186	80.5	504	2.7	3,163	16.8
Aileu	15,733	12,973	82.5	277	1.8	2,483	15.8
Baucau	32,130	22,904	71.3	766	2.4	8,460	26.3
Bobonaro	27,545	19,947	72.4	1,805	6.6	5,793	21.0
Covalima	16,680	12,698	76.1	469	2.8	3,513	21.1
Dili	60,801	8,874	14.6	6,775	11.1	45,152	74.3
Ermera	39,521	33,713	85.3	1,638	4.1	4,170	10.6
Liquica	18,223	13,572	74.5	784	4.3	3,867	21.2
Lautem	15,359	11,436	74.5	721	4.7	3,202	20.8
Manufahi	13,777	10,942	79.4	283	2.1	2,552	18.5
Manatuto	11,608	8,522	73.4	365	3.1	2,721	23.4
Oecussi	19,867	15,997	80.5	729	3.7	3,141	15.8
Viqueque	21,219	17,591	82.9	438	2.1	3,190	15.0
Total	311,316	204,355	65.6	15,554	5.0	91,407	29.4

Source: Population and Housing Census 2010

2-2-4 National Development Plan and Strategic Development Plan (SDP)

(1) National Development Plan

After independence in 2002, National Development Plan (NDP) had been presented, in which vision and strategies had been formulated for the country to the year 2020. Reduction of poverty, and sustainable and impartial economic development was stated as the vision by 2020 Since the development partner meeting in 2008, National Priorities was formulated by single year as a guideline for national development. "Agriculture and food security" in 2009 and "Road and Irrigation" in 2010 were put as the first priority.

(2) Strategic Development Plan (SDP)

Strategic Development Plan (SDP) has been prepared in 2011 as twenty year vision. It is the base of future development direction, consisted of the seven parts. Agriculture and rural development parts are mentioned in the Part-2: Social Capital, Part-3: Infrastructure Development, Part-4: Economic Development. As for agriculture sector, subjects and targets on the improvement of cropping technology, increase of food crop production and food self sufficiency are mentioned in the Part-4. In the Part-6: Economic Context and Macroeconomic Direction, target of non-oil per capita GNI is set US$5,690, aiming at taking the rank of upper middle income countries[5].

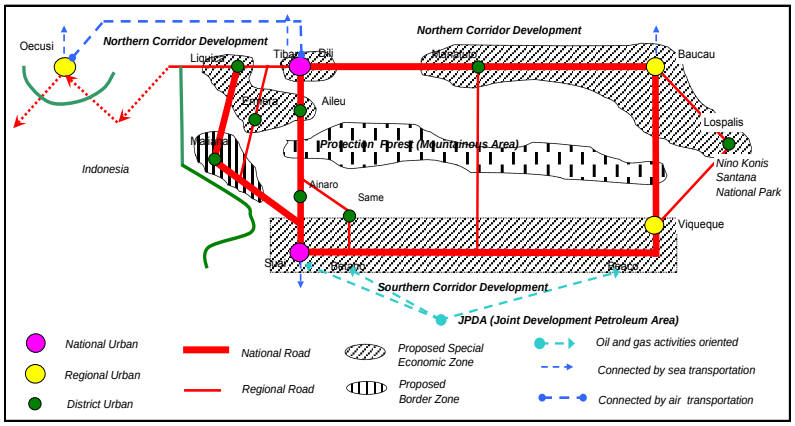


Figure 2-2-3 National Planning Framework

Timor-Leste's critical industry is put on three sectors of Agriculture, Tourism and Petroleum. National planning framework was formulated, in which three corridor development zones, i) northern corridor economic development zone (Dili – Baucau) , ii) border economic zone (Maliana), iii) southern corridor economic development zone (Suai – Viqueque) are proposed to promote to promote development of the three sectors. Central mountainous area is set as protection forest zone aiming to protect biodiversity and conserve water. As for tourism sector, above three zones with rich marine resources and Nino Konis Santana national park are considered as future tourism zones. Agriculture development should be planned consistent with these proposed corridor development zones.

(3) Development Target for Agriculture Sector

Development target for agriculture sector by 2030 is set in the SDP as follows.

Target year 2015
- The tonnage for rice (grain adjusted for losses) will have increased from 37,500 tonnes to 61,262 tonnes. - The productivity of maize will have increased from 1.25 to 1.54 ton per ha. - The Timor-Leste Agricultural Advisory Council will be formulating national policies for the sector and overseeing implementation. - Timor-Leste Research and Development Institute will be guiding and planning additional investment into research, development and extension for all major agricultural sub-sectors. - A comprehensive irrigation scheme inventory will have assembled a full inventory of existing irrigation systems to identify

[5]: World Bank categorizes upper middle income countries with GNI per capita between $3,946 and $12,195.

schemes that can be enlarged and new schemes that could be developed. - Dam and groundwater pilot projects will have been developed and the results used to inform further development. - There will have been increased capital investment in key crops such as coffee and vanilla, candlenuts and palm oil. - Traditional coastal fishing activities will have increase and fishing will have increased in the Exclusive Economic Zone. - A Forestry Management Plan and a National Bamboo Policy and Marketing Strategy will be in place. - Community-based nurseries will be planting one million trees nationwide every year.
Target year 2020
- The food* supply will have exceeded demand. - The area of irrigated rice will have increased by 40% from 50,000 ha to 70,000 ha. - Average maize yields will have increased to 2.5 t/ha. - At least 50% of fruit and vegetables will be grown locally. - Livestock numbers will have increased by 20%. - Coffee production will have doubled following the rehabilitation of 40,000 ha of coffee plantations. - There will be at least three types of aquaculture activities supporting coastal communities. - The fisheries sector will be export based and have expanded to include ocean fishing.
Target year 2030
- On-farm rice storage losses from 20% to about 5%. - Timor-Leste will have at least four niche cash crop products that can be consistently exported.

CHAPTER 3 PRESENT SITUATION OF AGRICULTURE SECTOR

3-1 MINISTRY OF AGRICULTURE AND FISHERY (MAF)

3-1-1 Organization Structure and Related Departments

(1) Organization Structure of MAF

MAF is responsible for planning and executing the policies covering agriculture, forestry, livestock, fisheries, rural development and irrigation development. The organization was reformed in June, 2014, as shown in Figure 3-1-1. This organization is being reorganized according to the reorganization of the Cabnet in February 2015.

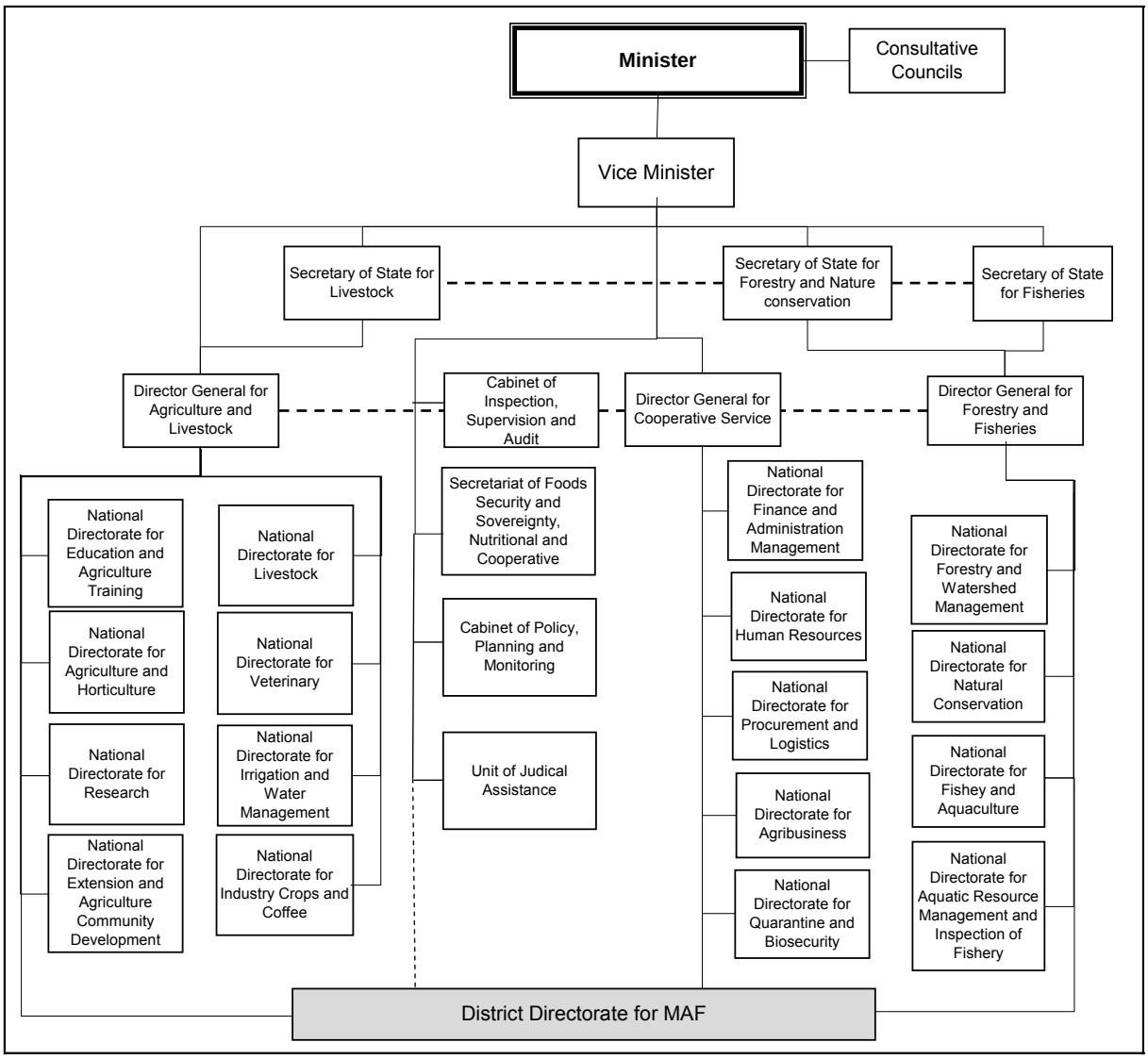


Figure 3-1-1 Organization Structure of MAF (Oct. 2014)

Since the beginning of 2008, staff was recruited at the Ministry. As the result, in 2014, the total number has increased to a total 2,240 staff in national and district offices. All directorates have average 2 to 5 staff in the districts.

Table 3-1-1 Number of MAF Staff

The Number of MAF staff by Grade

Grade	A(High)	B	C	D	E	F	G(Low)	Total
Number	4	43	145	454	752	707	135	2,240

Source:National Directorate of Administration and Finance, as of March, 2014.

Note: Grage E includes 352 extension workers.

The Number of MAF staff by educational background

Educational background	Doctor	Master	University graduate	High school				Junior high school				First term of junior high school	Elementary school	Total
				IV	III	II	I	Agriculture	Forestry	Fishery	Others			
Number of staff	1	29	402	10	121	5	27	615	21	16	578	211	204	2,240

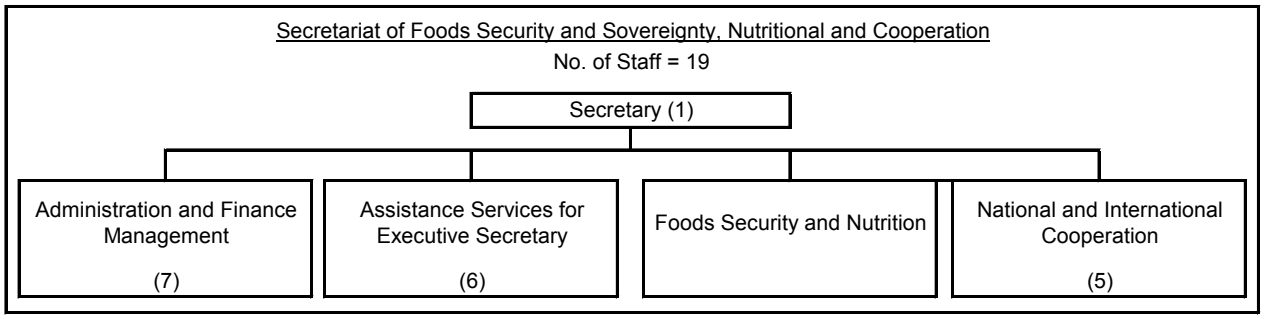
Source:National Directorate of Administration and Finance, as of March, 2014.

(2) Relevant Organization to the Project

For this project implementation, relevant organization and national directorate is Secretariat of Foods Security and Sovereignty, Nutrition and Cooperation (SFSSNC), Cabinet of Policy, Planning and Monitoring (CPPM) (former National Directorate for Policy and Planning (NDPP)), National Directorate for Agriculture & Horticulture (NDAH) and National Directorate for Irrigation & Water Management (NDIWM).

1) Secretariat of Foods Security and Sovereignty, Nutrition and Cooperation (SFSSNC)

Secretariat of Foods Security and Sovereignty, Nutrition and Cooperation (SFSSNC;) is newly organized in the reform in Octover 2014. Responsiblle is to ensure national food security and nutrition in MAF. It is consisted of four sections, as shown in the following figure.



Note; No. of staff is temporary number, under arrangement.

Figure 3-1-2 Organization Structure of CPPM (Feb. 2014)

2) Cabinet of Policy, Planning and Monitoring (CPPM)

This organization has the responsibility for making plan of agricultural development policy and overall agriculture development as a central organization. Responsibility of this organization includes coordination with external ministries and public organization to arrange development direction and related policies. CPPM is the key organization for MAF's development policy.

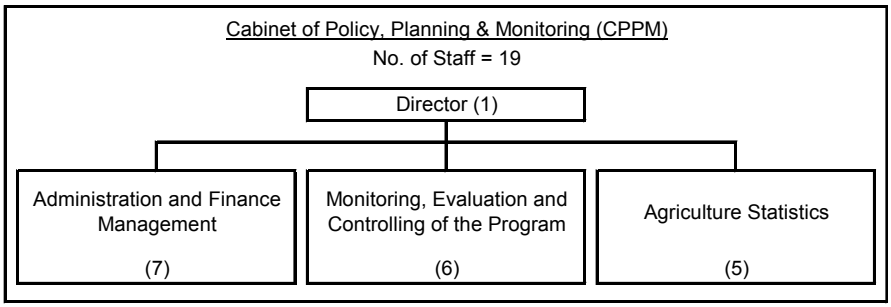
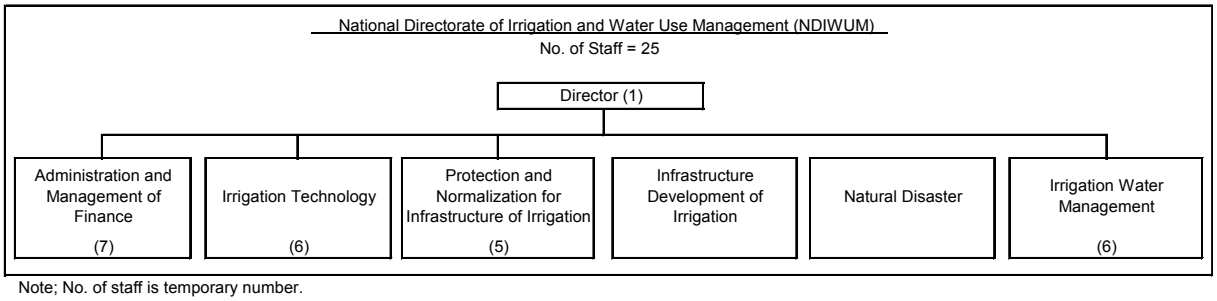


Figure 3-1-3 Organization Structure of CPPM (Oct. 2014)

3) National Directorate for Irrigation and Water Management (NDIWM)

This directorate is responsible for planning, implementation, monitoring and evaluation of irrigation development including water resources development, river bank management and water management for effective water irrigation water use. Organization structure is shown as follows.

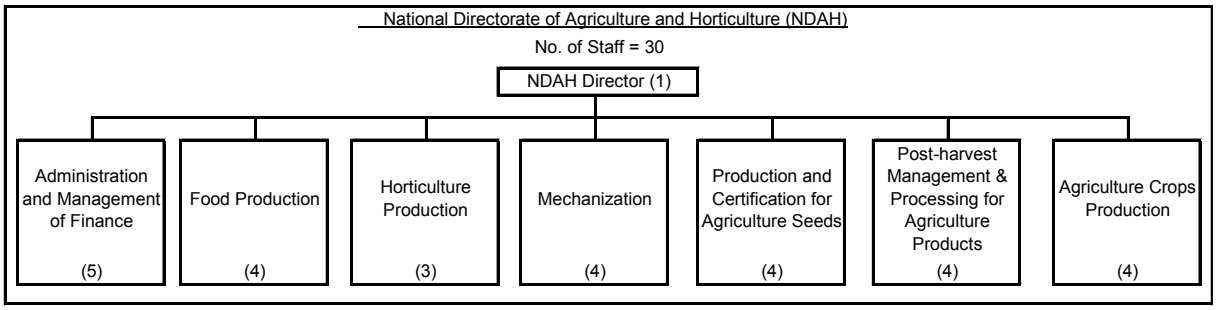


Note; No. of staff is temporary number.

Figure 3-1-4 Organization Structure of NDIWM (Feb, 2014)

4) National Directorate for Agriculture and Horticulture (NDAH)

NDAH has seven sections which cover comprehensive fields related with crop production and processing including seed production and seed certification as shown in Figure 3-1-5.



Note; No. of staff is temporary number.

Figure 3-1-5 Organization Structure of NDAH (Oct. 2014)

(3) Directorate for MAF district

District Directorate for MAF is organized under the MAF's degree "Direto-Lei No. 5/2014 Diploma ministerial No.9/GM/V/2014". Administration of Timor-Leste is characterized as top-down style, so that district office is functioned as a branch office. However, in recent year, national policy aiming for decentralization is promoted.

Organization structure is made by the District Directorate. It is typically organized as follows.

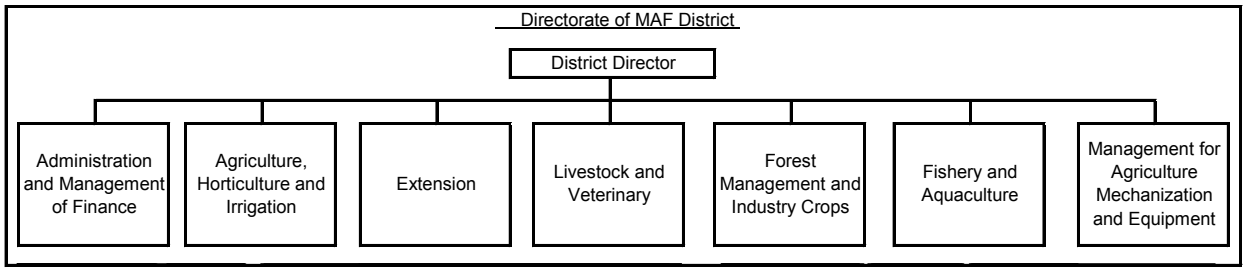


Figure 3-1-6 Typical Organization of District Directorate for MAF (Oct. 2014)

3-1-2 MAF Budget

(1) MAF budget plan

According to the "State Budget 2013 Overview Book1" (MoF), National budget from year 2011 to 2017 is made/ planned. The 2013 Budget is planned US$1,000 million (except for infrastructure fund).

Table 3-1-2 National Budget and MAF 2013 Budget Plan (US$'000)

Budget item	2011	2012	2013	2014	2015	2016	2017
State Budget	579,664	893,499	1,000,694	1,010,724	1,047,098	1,085,151	1,124,902
MAF Budget	13,289	16,787	25,164	26,108	27,094	28,118	29,128
(%: State Budget/MAF Budget)	*2.3*	*1.9*	*2.5*	*2.6*	*2.6*	*2.6*	*2.6*
Salary and Wages	4,655	5,423	5,886	6,114	6,353	6,601	6,854
Goods and Services	7,146	6,748	12,396	12,837	13,298	13,775	14,223
Public Transfers	500	524	1,000	1,040	1,082	1,125	1,170
Minor Capitals	988	577	699	727	756	786	818
Capital and Development		3,515	5,183	5,390	5,606	5,830	6,063

Source: State Budget 2013, Book 4B, Budget lines, Ministry of Finance
State budget and MAF budget excluded Infrastructure Fund

Budget except for infrastructure fund which allocated to MAF and three relevant organizations, CPPM (former NDPP), NDAH and NDIWM is shown as follows. (CPPM budget was made as the NDPP budget.)

Table 3-1-3 MAF and Related Directorate 2013 Budget Plan

Unit: $'000

	2011	2012	2013	2014	2015	2016	2017
MAF Budget	13,289	16,787	25,164	26,108	27,094	28,118	29,128
National Directorate							
NDAH	3,141	2,614	6,216	6,465	6,723	6,992	7,272
NDIWM	636	464	1,025	1,066	1,109	1,153	1,199
NDPP	777	179	200	208	216	225	234

Source: State Budget 2013, Book 4B, Budget lines, Ministry of Finance
Excluded Infrastructure Fund

Items	2011	2012	2013	2014	2015	2016	2017
NDAH	3,141	2,614	6,216	6,465	6,723	6,992	7,272
Salary and Wages	162	528	229	238	248	258	268
Goods and Services	2,692	2,056	5,987	6,226	7,476	6,735	7,004
(Operational material and suppy)	*(763)*	*(1,118)*	*(3,642)*	*(3,788)*	*(3,939)*	*(4,097)*	*(4,261)*
Public Transfers	-	-	-	-	-	-	-
Minor Capitals	298	30	-	-	-	-	-
Capital and Development	-	-	-	-	-	-	-
NDIWM	636	464	1,025	1,066	1,109	1,153	1,199
Salary and Wages	131	148	150	156	162	169	175
Goods and Services	394	316	875	910	946	984	1,024
Public Transfers	-	-	-	-	-	-	-
Minor Capitals	10	-	-	-	-	-	-
Capital and Development	-	-	-	-	-	-	-
NDPP	777	179	200	208	216	225	234
Salary and Wages	108	103	111	115	120	125	130
Goods and Services	623	74	86	89	93	97	101
Public Transfers	-	-	-	-	-	-	-
Minor Capitals	47	2	3	3	3	3	4
Capital and Development	-	-	-	-	-	-	-

Source: State Budget 2013, Book 4B, Budget lines, Ministry of Finance
State budget and MAF budget excluded Infrastructure Fund

(2) 2014 Budget

MAF Budget in 2014 approved by national assembly is 27.954 millions US$ which shares about 2% of whole national budget 1,500 millions US$. Although agriculture sector employing almost all people in rural area is an important industry, share of budget allocated

Table 3-1-4 2014 MAF Budget

Budget item	Budget ($'000)
State Budget	1,500,000
MAF Budget	27,954
(%: State Budget/ MAF Budget)	(1.9)
Salary and Wages	6,504
Goods and Services	15,085
Public Transfers	750
Minor Capitals	2,493
Capital and Development	3,122

Source: NDPP, MAF

to MAF is small.

Share of budget allocated to each division of MAF is 84 % for national directorate, 13% districts. As for allocation to each of national directorate and offices, share for NDAH, National Directorate for Forestry (NDF) and NDIWM is high, 18%, 16% and 15%, respectively (see Table 3-1-5). (2014 budget was made before MAF organization reformed.)

Table 3-1-5 2014 Budget of MAF and Each Office

Office	2014 budget (US$'000)	Share (%)	Breakdown of the Budget ($'000)				
			Salary and Wages	Goods and Services	Public Transfers	Minor Capitals	Capital and Development
MAF	27,954	100	6,504	15,085	750	2,493	3,122
Allocation for Central Office							
Office of the Minister	154		78	76	0	0	0
Office of the Deputy Minister	131		65	66	0	0	0
Office of Secretary of State for Livestock	123		63	60	0	0	0
Office of Secretary of State for Fisheries	110		63	47	0	0	0
Office of Secretary of State for Forestry	106		63	43	0	0	0
Office of the Director General	51		29	22	0	0	0
Office of Inspection and Finance	38		21	17	0	0	0
Office of Procurement	23		14	10	0	0	0
General administration	27		18	9	0	0	0
Sub total	764	3	413	350			
Allocation for National Directorate	23,450	84	3,817	14,031	750	2,493	3,122
Allocation for District Directorate							
Aileu	162		116	46	0	0	0
Ainaro	217		153	64	0	0	0
Baucau	369		275	94	0	0	0
Bobonaro	424		308	115	0	0	0
Covalima	365		258	107	0	0	0
Ermera	227		165	62	0	0	0
Lautem	355		257	99	0	0	0
Liquica	234		163	71	0	0	0
Manatuto	302		209	93	0	0	0
Manufahi	349		252	97	0	0	0
Oecusse	349		251	98	0	0	0
Viqueque	388		281	106	0	0	0
Sub total	3,740	13	2,686	1,054	0	0	0

Souce: NDPP, MAF

3-1-3 District Directorate for MAF

After the independence, the third presidential election was conducted in April 2012, and in July, National Parliament election was done. New cabinet was organized. Government is formed by 15 Ministries. Responsibility among ministries is still fluid. For agriculture and water resource development related to this Project, the following ministries are involved, besides MAF.

(1) Ministry of Commerce, Industry and Environment (MCIE)

Ministry of Commerce, Industry and Environment: MCIE, is formed under the Minister, Vice Minister and three Secretary of State. Related with MAF, importing rice and purchasing system of local products are operated by the “National Directorate of Procurement and Logistic” by applying the “Food Security Fund” established under the ministry. Under this directorate, rice and maize are importing and food supply for school feeding and humanitarian support is handling for national food security.

”National Directorate of Cooperative”, MCIE, has the duty related with the activities for Cooperative such as registration, nurturing and monitoring. ”National Directorate of Environment” is responsible for handling a series process of environmental assessment. (Duty on cooperative and environmental assessment which has been conducted so far by Ministry of Economy and Development, MED has been transferred to the MCIE.)

(2) Ministry of Public Works (MPW)

Ministry of Public Works (MPW) forms three Secretary States, "Secretary State of Public Works", "Secretary State of Electricity" and "Secretary State of Water Supply and Urbanization" and four sectors of Director General, and 16 National Directorate (See Figure 2-2-2). "National Directorate of Road, Bridge and Flood Control" is responsible for flood control. Responsibility related with river administration is not clearly defined among the related directorates. Law and regulation for water resources development is preparing.

National Development Agency (ADN: Agêneia desenvolvimento Nacional) under the Prime Minister' office is the organization who screens a series working process of bidding, Necessary process for irrigation facility construction works budgeted by infrastructure fund is screened by the ADN.

3-2 RELATED AGRICULTURAL DEVELOPMENT PLAN IN TIMOR-LESTE

3-2-1 The 5th Constitutional Government Program

The 5th Constitutional Government Program (2012-2017) has been announced to provide the contents for the SDP's development concept, as the program consistent with The 4th Constitutional Government Program. Future development direction related with agricultural sector is mentioned in the following sections.

The 5th Constitutional Government Program
3. Infrastructure Development
3.1 Roads and Bridges
Large scale investment program to upgrade, repair and improve our extensive system of national, regional and rural roads and ensure that this network is well maintained.
3.2 Water, Sanitation and Drainage
3.3 Electricity
4. Economic Development and Job Creation
4.1 Agriculture
4.1.1 Food security
Improvement of Timor-Leste's food security by using high yield varieties identified within the MAF, new crop production system and expanding on-farm grain storage.
4.1.2 Strategies for Commodities
4.1.3 Livestock and animal farming
Improvement of the 'Integrated Livestock and Animal Farming Plan'
Increase of livestock number by 20%.
4.1.4 Fisheries
4.4 Encouraging Jobs Growth
The Government will work to ensure that Timorese business people have the skills and support they need to identify business opportunities, start up a business, expand into new areas or markets, or start exporting.
4.4.1 Business and Investment Environment
The Government will give priority to building a business and investment environment that supports the development of a diversified private sector and the establishment of a new businesses and industries.
4.4.2 Public Private Partnerships
4.4.3 Timor-Leste National Development Bank
4.4.4 National Commercial Bank of Timor-Leste and Microfinance
The Government transformed the Timor-Leste Micro-Finance Institute into the National Commercial Bank of Timor-Leste, which already has branches in every district and reaches the sub districts with mobile banking vehicles. The Bank will provide services to individuals and to micro, small and medium enterprises.
4.4.5 Special Economic Zones
4.4.8 Business Development Centers
4.4.12 Agribusiness
The Government will encourage agribusiness services in the following areas: Market research, Market matching such as facilitating contract farming agreements, Developing market strategies, Business appraisal and planning, Policy

The 5th Constitutional Government Program
and advocacy, Training and technical assistance, Technology and product development, and Financing mechanisms. 4.4.13 Cooperative Sector Development Program 4.4.14 Land tenure **5. Consolidation of the Institutional Framework** **5.1 Economy Policy** 5.1.1 National Development Agency The National Development Agency is responsible for managing, monitoring and administering the SDP and large and complex national development projects.

Basic development concept for agriculture sector is put to shift the present farming from subsistent agriculture to market oriented agriculture. In the agricultural area, almost all rice farmers cultivate paddy to meet the demand of home consumption. On the other hand, commercial purpose rice production is practiced in the limited area. Present farming practice is characterized to be in the transmittal stage from subsistence to commercial farming. For further promotion to shift into market oriented agriculture, commercialization of produced local rice is the key subject. The 5th Constitutional Government Program emphasizes the strengthening agribusiness fields to promote commercial agriculture, and for developing it, it is important to give technical support to rice farmers through strengthening cooperative. This development direction is consistent with the subjects targeted in this project.

The National Development Agency (ADN) as mentioned in the section 5, organized under the Prime Minister Office is responsible for screening the working process of large scale projects. Related with this project, designing, bidding and implementation process of the irrigation rehabilitation projects are supposed to be screened.

3-2-2 MAF Strategic Plan (MAFSP)

MAF's development target is put on ensuring food security, poverty reduction, shifting from subsistent agriculture to commercial agriculture and livestock and fishery, and sustainable environment and conservation of natural resources. MAF has responsible for making necessary policy and planning, and executing them to achieve the MAF's development target.

MAF formulated the MAF Strategic Plan (MAFSP) based on the SDP. The MAFSP is prepared as "the road map" to realize the MAF's development target such as poverty reduction, improvement of food security and nutrition, employment promotion in agricultural field, contribution to economic growth. MAFSP is consisted of five mega programs of which the contents are shown as follows.

MAF's Strategic Plan Summary Matrix	
Vision	A Sustainable, competiveness and prosperous agriculture sector that eliminates poverty and supports improved living standards of Nation's people.
Development Objectives	a) Improve rural incomes and livelihoods, and reduce poverty; b) Improve household food and nutrition security; c) Support the transition from subsistence farming to commercial farming; and d) Promote environmental sustainability and the conservation of natural resources.
Strategic Objectives (Immediate Objectives)	1. Sustainable increase in the production and productivity of selected crops, livestock species, fisheries and forestry sub-sector.
	2. To enhance and improve market (domestic and export) access and value addition.
	3. To improve the enabling environment
	4. To ensure that MAF and related agencies are strengthened, appropriately configured and equipped to deliver on the National Strategic Development Plan and MAF's Strategic Plan.
	5. Natural resources conservation management and utilization

Mega Program 1: Production and Productivity	Mega Program 2: Markets and Value addition	Mega Program 3: Enabling Environment (Policy, Institutions, Infrastructure)	Mega Program 4: Organizational Strengthening	Mega Program 5: Natural Resources Conservation and Management
1.1: To enhance the contribution of agricultural research to sustainable agricultural production, food and nutrition security and poverty reduction.	2.1: To develop and implement safety standards and quality control assurance across crops, livestock, fisheries, and forestry products.	3.1: To establish a functional, clear and accountable policy and legislative framework and capacity for policy analysis and implementation.	4.1: To review the organizational structure, governance mechanisms and modalities of operation to ensure that MAF and related agencies are functioning as relevant modern client-oriented organizations.	5.1: Sustainable natural resources management and utilization.
1.2: To increase farmers' access to relevant information, knowledge, and technology through effective, efficient, sustainable and decentralized extension services.	2.2: To promote access and use of high quality inputs, planting, and stocking materials, and fishing equipment.	3.2: To ensure coordination and responsibilities are undertaken in a coherent manner leading to improved implementation and management of sector policies and programs.	4.2: To develop and implement a manpower development and capacity strengthening policy strategy and program to enhance the productivity of MAF staff.	5.2: Increase the knowledge, protection and utilization of bio-diversity within Timor-Leste.
1.3: To reduce losses through improved control of pests, vectors and disease.	2.3: To promote diversification and value addition activities within the sub sectors along the value chain.	3.3: To establish and maintain a functional agricultural statistics system providing timely & appropriate information to sector stakeholders, and assisting with MAF planning and management.	4.3: To develop and implement a knowledge management and communication strategy to facilitate effective decision-making and accountability.	5.3: Development and dissemination of environmentally friendly agricultural industry practices.
1.4: To develop water resources for agricultural production on the basis of sustainable irrigation, water for livestock and aquaculture.	2.4: To provide the necessary rural market infrastructure including appropriate structures to improve post-harvest losses.	3.4: To develop capacity for improved decision-making in planning, and budgeting accurate and up-to-date climate information and analysis.	4.4: To develop and implement an M&E strategy.	5.4: Promote the conservation of national and cultural heritage.
1.5: To increase the use of labor productivity enhancing technologies including appropriate mechanization and other farm management related practices.	2.5: To promote collective marketing, and support to Farmer Groups and Farmers' Associations.	3.5: To develop the necessary early warning and weather monitoring systems to help mitigate the impact of, and adapt to, climate variability.	4.5: To review the HR (Human Resource) policy and practices to provide the necessary skills and incentives skills and incentives to enhance the performance of MAF's staff.	
1.6: To accelerate production of selected strategic enterprises on the basis of specialization and agro-zoning	2.6: To promote private sector engagement in input supply and product marketing.		4.6: To develop and implement a partnership strategy for MAF.	
			4.7: To develop and implement a resource mobilization strategy to ensure adequate and sustainable funding for MAF.	

3-2-3 Medium Term Operation Plan (MTOP)

Medium Term Operation Plan (MTOP) (2014-2018) was prepared taking supports from external organizations and summarizing the discussion in the each national directorate. Mega Program in the MAFSP is mentioned as "the Program". Outline of the MTOP is summarized as follows.

1. Background and Introduction
   Background information and the linkages between the various planning processes explained.

2. Overview of MAF's Strategy and Budget Processes
   The vision, mission, development objectives, and the strategic objectives and the targets

3. Description of Programs 1-5
   Five Programs which reflect the Mega Programs shown in the MAFSP and sub-program. The number of projects by the program and total investment are summarized as follows.

Program 1: Sustainable Increase in Production and Productivity
- Sub-Program 1.1 Agriculture research
  - Component 1.1.1 Generating new technologies, practices and strategies
  - Component 1.1.2 Improved provision of new technologies and knowledge
  - Component 1.1.3 Improved agriculture research and development
- Sub-Program 1.2 Decentralized extension services
- Sub-Program 1.3 Improved pest control
- Sub-Program 1.4 Water resources for agricultural production
- Sub-Program 1.5 Mechanization
- Sub-Program 1.6 Accelerated production of selected enterprises based on specialization and agro-zoning
  - Component 1.6.1 Food and horticulture crop production
  - Component 1.6.2 Industrial crop production
  - Component 1.6.3 Fisheries production
  - Component 1.6.4 Livestock production
  - Component 1.6.5 Forestry production

Total investment in Program 1 (US$'000)

SO	SP	Sub-program	Projects	2014	2015	2016	2017	2018	5 years	% budget
1	1.1	Research	19	2,007	2,128	4,561	6,225	5,759	20.681	10%
1	1.2	Extension	9	3,336	3,126	3,764	3,946	4,027	18,198	99%
1	1.4	Water	9	2,785	3,043	3,320	3,055	3,354	15,557	8%
1	1.6.1	Food crops	14	13,005	16,911	21,447	25,764	30,404	107,530	53%
1	1.6.2	Industry. crops	6	3,800	3,700	3,700	3,700	3,700	18,600	9%
1	1.6.3	Fisheries	6	1,103	2,099	983	892	588	5,665	3%
1	1.6.4	Livestock	9	1,602	1,646	1,793	1,956	2,145	9,142	4%
1	1.6.5	Forestry	6	1,635	1,587	1,574	1,625	1,500	7,921	4%
			78	29,272	34,240	41,141	47,163	51,477	203,294	100%

SO: Program SP: Sub-program Projects: Number of project

Program 2 Improved market access and value addition
- Sub-Program 2.1 Safety standards and quality control
- Sub-Program 2.2 Promotion of quality inputs
- Sub-Program 2.3 Promotion of diversification and value addition
- Sub-Program 2.4 Rural infrastructure and collective marketing
- Sub-Program 2.5 Marketing and support for farmer groups
- Sub Program 2.6 Promotion of private sector engagement

Total investment in Program 2

SO	SP	Sub-program	Projects	2014	2015	2016	2017	2018	5 years	% budget
2	2.1	Safety/quality	7	440	400	360	360	360	1,920	12%
2	2.3	Diversify/value add	11	369	521	635	662	748	2,935	19%
2	2.4	Rural infra.	1	-	-	-	1,740	2,500	4,240	27%
2	2.5	Marketing/ groups	1	2,075	2,075	1,000	1,000	500	6,650	42%
2	2.6	Private sector	1	-	-	-	-	-	-	0%
			21	2,884	2,996	1,995	3,762	4,108	15,745	100%

SO: Program SP: Sub-program Projects: Number of project

Program 3 Improved enabling environment
- Sub-Program 3.1 Policy framework and capacity of policy analysis
- Sub-Program 3.2 Program coordination
- Sub-Program 3.3 Agricultural statistics and data bases
- Sub-Program 3.4 Climate information and analysis
- Sub-Program 3.5 Early warning system
- Sub Program 3.6 Summary of infrastructure requirements

Total investment in Program 3

SO	SP	Sub-program	Projects	2014	2015	2016	2017	2018	5 years	% budget
3	3.1	Policy f/work	1	100	100	50	50	50	350	3%

3	3.2	Program Coordination	1	125	150	150	100	100	625	6%
3	3.3	Statistics	3	704	1,751	182	121	199	2,957	27%
3	3.4	Climate	4	1,130	1,050	1,123	1,200	1,294	5,797	52%
3	3.5	Early warning	2	623	232	204	164	169	1,392	13%
			21	2,682	3,283	1,709	1,635	1,812	11,121	100%

SO: Program SP: Sub-program Projects: Number of project

Program 4 Organizational Development of MAF
Sub-Program 4.1 Support for MAF's reorganization and transformation
Sub-Program 4.2 Strengthening MAF's capacity
Sub-Program 4.3 M&E Strategy
Sub-Program 4.4 Support to develop complementary strategies

Total investment in Program 4

SO	SP	Sub-program	Projects	2014	2015	2016	2017	2018	5 years	% budget
4	4.1	Org'n & function	3	1,464	1,076	846	796	746	4,927	27%
4	4.2	Capacity	8	1,502	1,651	2,180	2,464	2,535	10,332	57%
4	4.3	M&E	1	280	250	275	300	330	1,435	8%
4	4.4	Compl. strategies	5	300	375	225	200	300	1,300	7%
			17	3,546	3,352	3,526	3,760	3,811	17,994	100%

SO: Program SP: Sub-program Projects: Number of project

Program 5 Natural Resources Conservation and Management
Sub-Program 5.1 Natural resources management
Sub-Program 5.2 Bio-diversity
Sub-Program 5.3 Environmentally-sustainable agricultural industry practices
Sub-Program 5.4 Natural and cultural heritage

Total investment in Program 5

SO	SP	Sub-program	Projects	2014	2015	2016	2017	2018	5 years	% budget
5	5.1	NR manag't	3	2,950	3,222	3,524	3,865	4,239	17,800	76%
5	5.2	Biodiversity	1	135	235	149	164	180	763	3%
5	5.3	Sustainability	2	456	509	599	712	822	3,098	13%
5	5.4	Heritage	1	359	378	344	378	416	1,875	8%
			7	3,900	4,244	4,616	5,119	5,657	23,536	100%

SO: Program SP: Sub-program Projects: Number of project

4. Investment Needs and Budget Analysis

5. Lessons Learned and the way forward

6. Annexes

3-2-4 Medium Term Investment Plan (MTIP)

Medium Term Investment Plan (MTIP) (2014-1018) was prepared based on the MTOP in order to ensure provision of materials and service required to materialize the mega programs in the MAFSP and projects in the MTOP. MTIP mentions that there is a financial difference between MAF budget allocated from national budget and investment estimated in the MTIP. For this, MTIP plans to appropriate the difference by means of internal arrangement in MAF and investment from related donors.

1.Budget for Each Program

Program 1: Sustainable increase in production and productivity
Program 2: Improved market access and value addition
Program 3: Improved enabling environment
Program 4: Organizational development of MAF
Program 5: National resources conservation and management

Budget for Each Program

Program	No. Projects	2014	2015	2016	2017	2018	Total
1	78	29,272	34,240	41,141	47,163	51,477	203,294
2	21	2,884	2,996	1,995	3,762	4,108	15,745
3	11	2,682	3,283	1,709	1,635	1,812	11,121
4	17	3,546	3,352	3,526	3,760	3,811	17,994
5	7	3,900	4,244	4,616	5,119	5,657	23,536
Total	134	42,285	48,114	52,987	61,439	66,865	271,690

2. Budget gap

The current funding scenario (2013) related to the MTIP reveals that MAF is allocated an operation budget of about US$13 million per year from the Government's national expenditure framework. The annual budget deficit was estimated by subtracting the available operational budget and Development Partners' commitment from the investment needed to implement this MTIP.

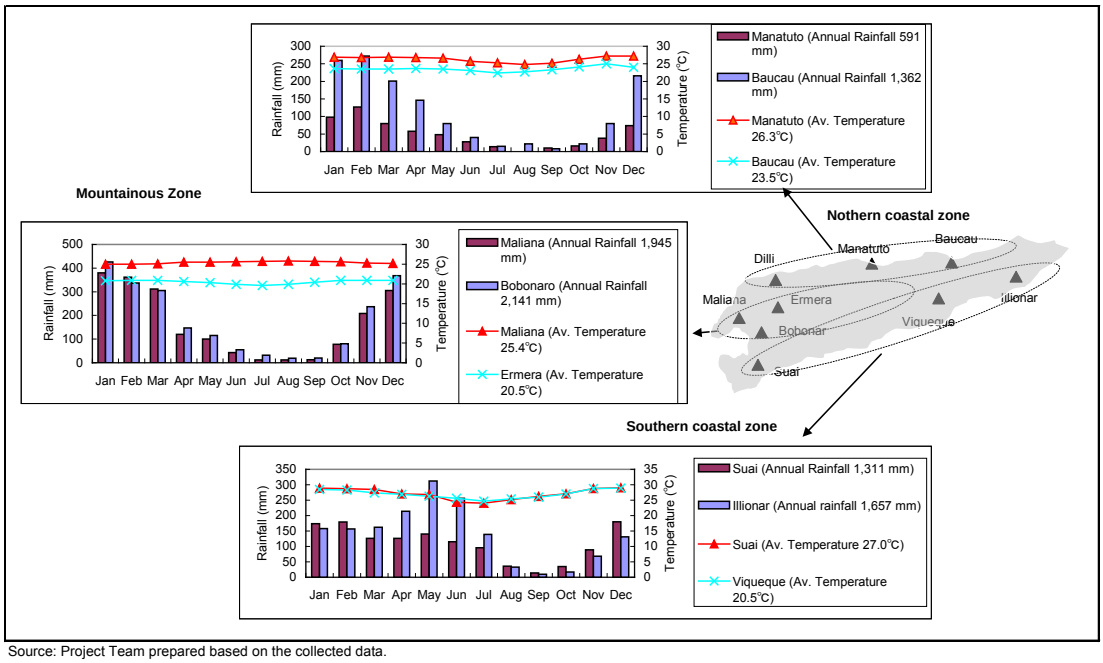
MTIP budget gap

Item	2014	2015	2016	2017	2018	Total
(1) Total investment required	42,285	48,114	52,987	61,439	66,865	271,690
(2) Annual budget allocated to MAF (GoTL's exp.)	25,143	26,149	27,194	28,282	31,110	137,878
(3) Less: MAF salaries and overheads	11,783	11,159	10,714	10,162	11,180	54,998
(4) MAF's available operation budget (2)-(3)	13,360	14,990	16,480	18,120	19,930	82,880
(5) Contribution by Development Partners and NGOs	15,858	13,239	6,109	2,760	3,520	41,486
(6) MAF's total operational budget (4)+(5)	29,218	28,229	22,589	20,880	23,450	124,366
(7) Budget deficit (1)-(6)	13,067	19,885	30,398	40,559	43,415	147,324
(8) Investment in infrastructure development	26,179	31,682	20,114	5,430	6,457	89,862
(9) Total deficit (7)+(8)	39,246	51,567	50,512	45,989	49,872	237,186

3-3 LAND AND WATER RESOURCES FOR CROP PRODUCTION

3-3-1 Meteorology

Annual rainfall and average temperature based on the Map atlas is less than 1,000 mm and temperature 25-27 degree in the northern coastal zone, more than 2,000 mm and 21-23 degree in the mountainous zone, from 1,000 to 2,000 mm and 25-27 degree in the southern coastal zone. Those of selected sites are shown as follows.



Source: Project Team prepared based on the collected data.

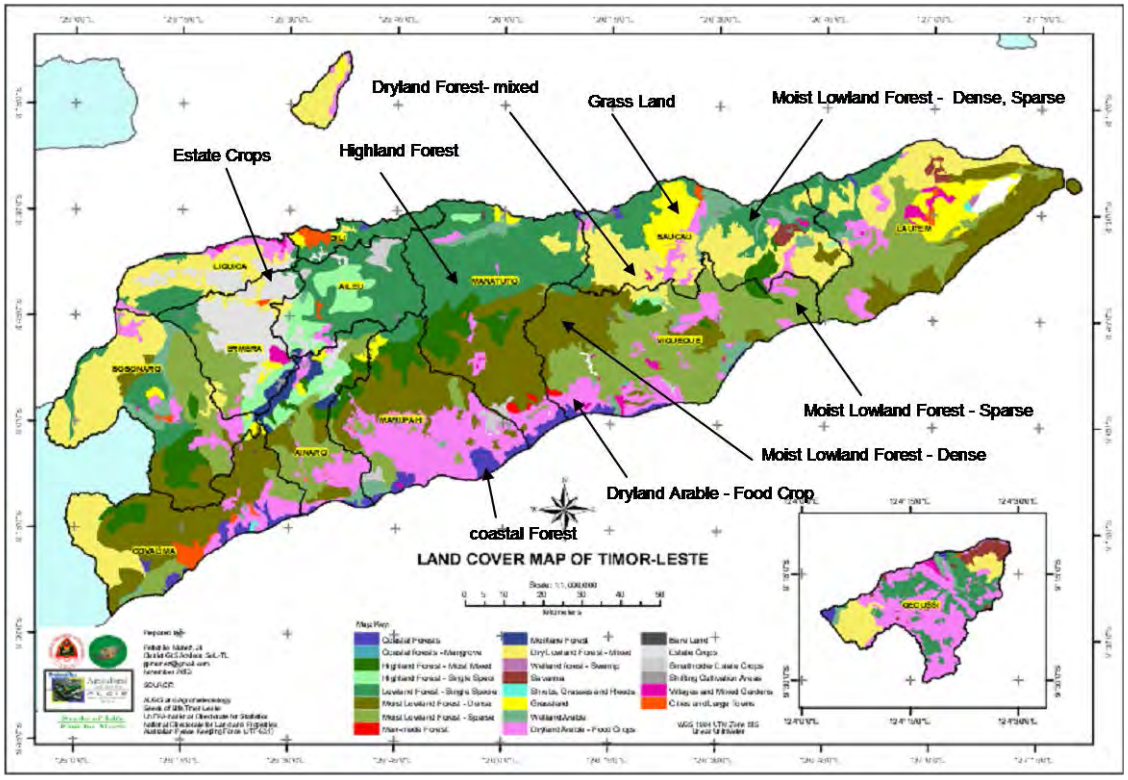
Figure 3-3-1 Monthly Rainfall and Temperature of the Selected Sites

3-3-2 Land Use

According to the "Land Cover Map", present land cover condition is divided into 22 areas. Land use is outlined from this classification as follows.

- Central mountainous area is almost occupied by highland forest. Largest area is classified into highland forest and moist lowland forest (dense or sparse). Corn and vegetables land is scattered in the highland forest and paddy field is made in the moist lowland forest.

- Highland region in the northern area, dry land forest is distributed and dryland forest mixed and grass land are distributed in the northeast area. Grass land is used as cultivated area.
- Estate crop land, coffee plantation area is located in the northwest region.
- In the southern hilled area, moist lowland forest (dense) area is widely distributed since the area has much rainfall than in the northern region. In the southeast region, around Viqueque district, most lowland forest (sparse) area is widely distributed, in which land use as the paddy is made along the river. Dryland arable - food crop is distributed from the southern hilled area to the lowland area. The area is used as rainfed arable land. Coastal forest is scattered in the southern lowland area, where can be used as paddy field, but, is easily damaged by flood and intrusion of salt water.
- There is much dry arable land in the Oecussi, where mainly used as crop production area.



Source: ALGIS

Figure 3-3-2 Land Cover Map

3-4 WATER RESOURCES

3-4-1 River Water

(1) Specification of rivers in Timor-Leste

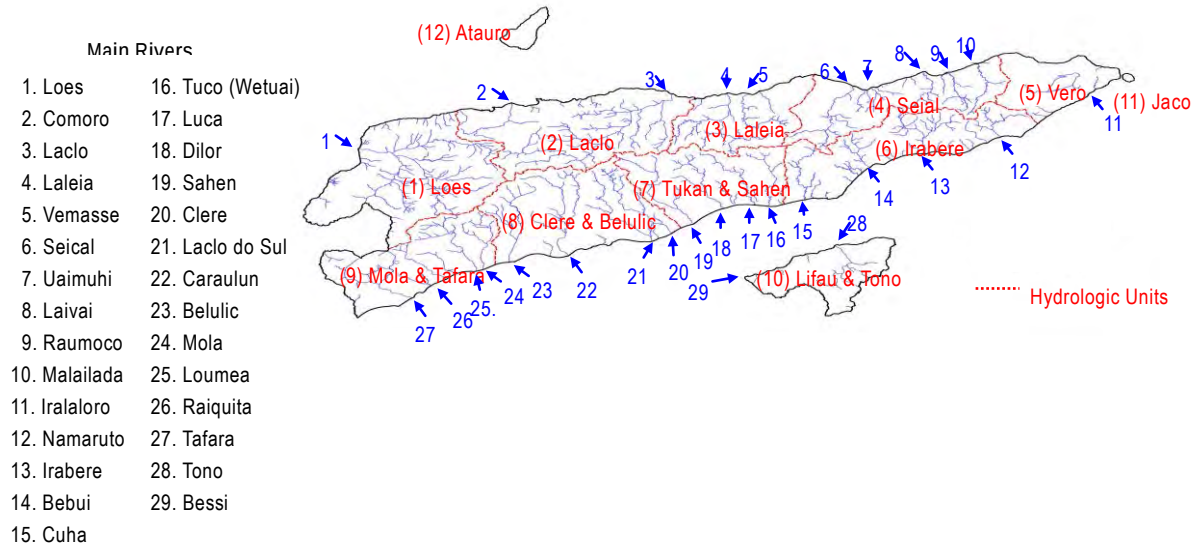
Timor-Leste has 29 main rivers and is divided into 12 hydrologic units shown in Figure 3-4-1 and

Table 3-4-1[1]. The average monthly river discharge of representative rivers in some hydrologic

[1] Assessment of Water Availability and Water Demand in Timor-Leste at River Basin Level, 2004, ADB

units is shown in the Figure 3-4-1. Flood season and draught season are very clear in every river.

Since water retention capacity of watershed is low and the slope of rivers is steep, rain happened in the mountainous area causes flood immediately. Furthermore, as huge area of national land is constituted of fragile geology such as limestone, rain causes sediment



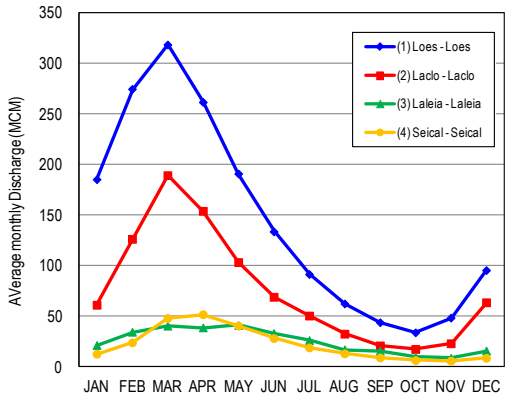
production as well and produced sedimentation is transferred to downstream by flood.

Figure 3-4-1 Hydrologic Units and Main Rivers

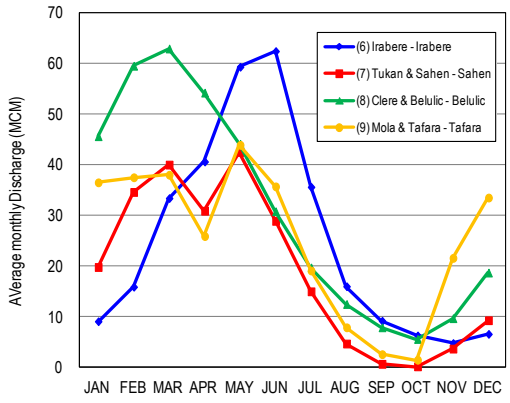
Table 3-4-1 Specification of Main Rivers

Hydrologic Unit	Main Rivers		Catchment	Length	Average Annula	Area
	No.	Name	Area (km²)	(km)	Discharge (MCM)	
(1) Loes	1	Loes	2,417.0	116	1,741	North
(2) Laclo	2	Comoro	248.0	33	93	North
	3	Laclo	1,297.0	98	913	North
(3) Laleia	4	Laleia	533.0	55	304	North
	5	Vemasse	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
	10	Malailada	170.0	36	91	North
(5) Vero	11	Iralaro	423.0	25	299	North
						South
(6) Irabere	12	Namaluto	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

Hydrologic Unit	Main Rivers		Catchment	Length	Average Annula	Area
	No.	Name	Area (km²)	(km)	Discharge (MCM)	
(7) Tukan & Sahen	16	Tuco (Wetuai)	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	Laclo do Sul	216.0	49	149	South
	22	Caraulun	554.0	52	385	South
	23	Belic	379.0	46	371	South
(9) Mola & Tafara	24	Mola	277.0	39	164	South
	25	Loumea	318.0	36	260	South
	26	Raiquita	111.0	27	99	South
	27	Tafara	360.0	45	304	South
(10) Lifau & Tono	28	Tono	499.0	50	311	Oecusse
	29	Bessi	338.0	45	217	Oecusse
(11) Jaco	-	-	11.0	-	-	Island
(12) Ataura	-	-	141.0	-	-	Island



(Northern area)



(Southern area)

Figure 3-4-2 Average Monthly River Discharge

The average amount of discharge mentioned in Figure 3-4-2 is estimated one by simulation model using limited data of rainfall and discharge measured from 1952 to 1974. At present planning or designing of facilities are conducted based on these observed/simulated data.

Observation of rainfall and river discharge in Timor-Leste were once stopped during Indonesia time and re-started from 2007. Although at present data for 7 years are stored as recent year's data, but not enough for planning or designing for facilities and observation should be continued. Furthermore, the observations have been conducted by each institution such as MPW, MAF or NGOs, by their own measure and observed data are stored and managed by each institution. As these kinds of data are not well useful, it is required to establish a institution in charge of observation and management of observed data, and to establish standards for observation.

(2) Trans boundary rivers

A part of watershed of Loes, Tafara, Tono, Bessi rivers is located in Indonesia and water of these rivers are important water source for Indonesia side too. Therefore development activities including agricultural development within these watersheds will reduce the available water for the other country and will be a conflict between 2 countries. However no agreement regarding to development activities in these watershed has not been concluded. In November 2014, MAF informed to Indonesian Government through Ministry of Foreign Affairs of Timor-Leste that MAF is ready to discuss with these trans boundary river matters.

3-4-2 Ground Water

(1) Hydrogeology divisions

National land of Timor-Leste is classified into 3 hydrogeology divisions shown as below based on rock texture, fracturing, lithology, age, extent and thickness[2].

1) Intergranular Porosity (Sedimentary)

The intergranuler porosity division includes sedimentary rocks and is present throughout Timor-Leste. Extensive deposits of sedimentary rocks and unconsolidated sediments area

[2] Vulnerability assessment of climate change impacts on groundwater resources in Timior-Leste, July 2012, Australian Government Department of Climate Change and Energy Efficiency

concentrated along the coast forming sedimentary plains and along river forming drainage line which becomes larger towards the coast. These deposits are identified at some inland area as well, such as near Lake Surubeco, around Same and near Maliana. Ground water flows in pore spaces between sediment grains.

From the view of ground water potential, this division is classified into i) Higher potential yield (sedimentary plain) and ii) Lower potential yield (drainage line along the rivers). However some areas of higher potential yield along the north coast have high salinity density.

2) Fissured Porosity (Karst)

The fissured porosity division is largely consists of the limestone rocks with karstic texture. This division exists throughout Timor-Leste. The older limestone (Permian to Cretaceous) mainly exists in the central mountains that run the length of the country from east to west. The younger limestone (Cenozoic) predominantly exists closer to the coast, particularly prominent in the eastern half of the country. Ground water flow the interconnected flow paths throughout the rocks.

From the view of ground water potential, this division is classified into i) Higher potential yield (younger limestone) and ii) Lower potential yield (older limestone).

3) Localized Porosity

The localized porosity division consists of 2 rock types, fractured rocks and confining unit.

i) Fractured Localized Porosity

The fractured localized porosity division consists of fractured, metamorphosed and crystalline igneous rocks and is concentrated in the west of country but is also present as smaller outcrops throughout. The rocks consisting of this division has little primary porosity and ground water flows along the fractures.

Ground water potential highly depends on the condition of each site. The areas with greater amount of fractures have high potential and ground water spring presets within this area.

ii) Confining Units Localized Porosity

The confining localized porosity is made up of fine grained, clay-rich, non-metamorphosed sediments and these clays are distributed throughout Timor-Leste. Clay-rich sediments prevent groundwater flow and ground water flow the porosity of sands and conglomerates existing between two clay-rich layers.

Locally these porous may be an important source of ground water but generally the ground water potential in this division is low.

Figure 3-4-3 Hydrogeology Map of Timor-Leste

(2) Potential aquifer yield

Potential aquifer yield map is created based on hydrogeology map. Hydrogeology division is classified into 3 zones shown as below considering the ground water potential, in this case availability.

1) Higher potential yield

This zone consists of Intergranular Porosity (sedimentary plane) and Fissured Porosity (younger limestone) and has aquifers with pervasive ground water.

2) Lower potential yield

This zone consists of Intergranular Porosity (drainage line along the rivers) and Fissured Porosity (older limestone). The availability of ground water is lower than a) Higher potential yield zone.

3) Others

This zone consists of Localized Porosity. Availability of ground water strongly depends on condition of each site therefore potential varies from place to place. To evaluate potential of each site, more surveys are required.

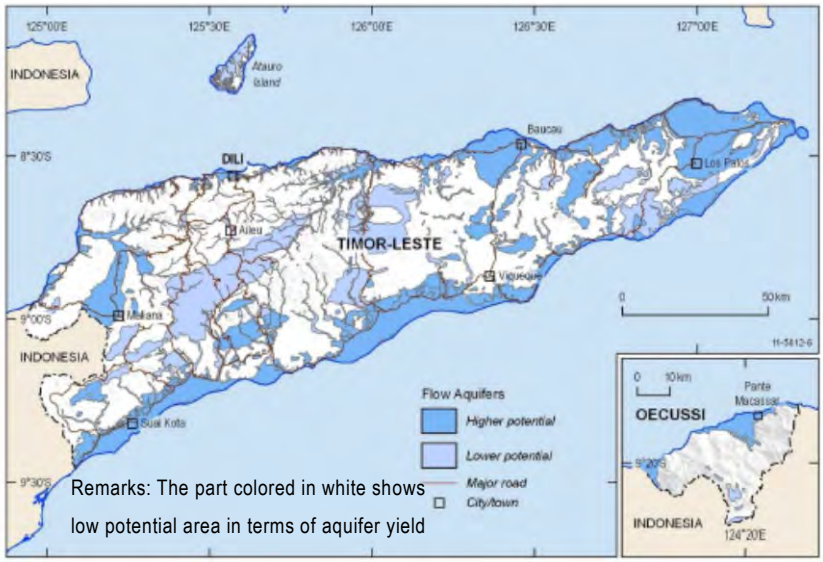


Figure 3-4-4 Potential Aquifer Yield Map

3-4-3 Law and Policy for Water Resources and Its Management

Planning, operation and management of water resources are conducted by each ministry, such as MPW and MAF, according to the purpose of each ministry's projects/programs and there are no common laws or policies to manage water resources. Against this situation, a law and 2 policies for water resources shown as below are under formulation. Formulation is mainly led by Secretary of State for Water Supply, Sanitation and Urbanization, MPW. Main National Directorate to formulate (1) and (2) is National Directorate for Water Control and Water Quality and (3) is National Directorate for Water Supply.

(1) National Water Management Law
(2) National Water Resources Policy
(3) National Water Supply Policy

The draft documents of each law and policy are already distributed to relevant ministries and are waiting comments. It is expected that these law and policies are approved by Cabinet in middle of 2015 but the schedule is tentative.

Outlines of each law or policy are show as below.

(1) National Water Management Law

This is a law aiming to: 1) ensure that water resources are managed in manner to meet the social and economic needs while protecting the environment and cultural values, 2) protect against the threat by floods and water related diseases, 3) promote access to water and 4) promote sustainable aquatic eco-system.

3 institutions are assigned as responsible institutions for water resources management. The roles of each institution are defined shown as below.

National Water Management Law
Table of contents (Draft)

Chapter I : General provisions
Chapter II : Institutional framework
Chapter III : Water resource management planning
Chapter IV : Authorization of water abstraction
Chapter V : Authorization process
Chapter VI : Bore Construction
Chapter VII : Flood protection, safety and contingency planning
Chapter VIII : Compliance and emergency
Chapter IX : Inspection and monitoring
Chapter X : Offence and sanctions
Chapter XI : Procedure
Chapter XII : Transition and final provisions

i) The National Water Resources Coordination Committee

This committee is a responsible institution for coordination of water resource management at national level, including but not limited to, reviewing and providing recommendations upon; a) policies, strategies, and plans developed by the Ministry and b) planned projects using or significantly affecting water resources initiated by any public or private party. This committee consists of representatives from relevant ministries.

ii) The Ministry

Ministries are responsible institutions for the conduct of water resource management mainly in respect of: a) developing policies, strategies, and legislation, b) developing of water resource management plan at national and hydrological unit levels, c) survey of water resources, d) data collection, analyzing, management and providing, e) monitoring quality and quantity.

iii) Local Government

Local Governments are responsible institutions to promote, monitor and collect data at watershed or aquifer level. Ministries are required to delegate related functions to Local Government to conduct these activities.

(2) National Water Resource Policy

This policy defines the Government's institutions and goals in water resources management to guide managers and to inform all stakeholders to enable participatory approach to share water resources.

This policy aims to: 1) ensure the people to access water resources, 2) encourage coordinated development of water sources for social, food security, economic and environment benefit, 3) empower the relevant authorities to develop and apply systems to manage, regulate and monitor the use and development of water resources.

National Water Resource Policy
Table of contents (Draft)

1. Introduction
2. Definitions
3. General principles
4. Role of the State and Member of the Government responsible for water resources
5. Customary and traditional practices
6. Development of specific types of water resources
7. Regulation and licensing of water resource development
8. Coordination arrangement
9. Trans-boundary water resources
10. Water conservation, protection of eco-systems and contamination of water resources
11. Water Disasters

It is one of character of this policy that dealing of customary and traditional practices of water resources in rural area is mentioned.

Large-scale applications such as large-scale dams or hydropower development are not the target for his policy. Requirement of another specific policy against these kinds of large-scale applications is mentioned in the policy.

(3) National Water Supply Policy

The purpose of this policy is to set out the long-term vision of access to water and to provide guiding principles for how this vision may be translated into future strategy and detailed planning. The objective of this policy is to supply water to all the population.

National Water Supply Policy
Table of contents (draft)

Section 1: Situation analysis
Section 2: Policy purpose
Section 3: Policy vision and objectives
Section 4: Policy guiding principles
Section 5: Policy statements
Section6: Institutional roles and responsibilities

4 policy statements shown as below are settled, and the principle and point of notice to implement each statement are mentioned.

i) Ownership and asset management

ii) Financing public water supply

iii) Service delivery (Planning, Investment, Design, Construction, Technology, Management, Operation and maintenance, Capacity building, and Monitoring and evaluation)

iv) Harmonization, alignment and coordination

MPW is assigned as a main institution to manage water supply but the tasks for other ministries are mentioned as well, for example establishment of drinking water quality standards is required to Ministry of Health. As for MAF, no concrete tasks are mentioned but collaboration and consultation with MPW on the design and construction of irrigation schemes which have existing or potential water supply for human consumption is required.

In these law and policies, measures of water resources management, especially technical measures, are not mentioned concretely. To implement water resource management at the site, technical guidelines for water resource management are required to be established.

3-5 PRESENT SITUATION OF THE AGRICULTURE PRODUCTION

3-5-1 Food Crop Production

(1) The cultivated area, yield and production of main crops

The amount of production of main food crops in Timor Leste, rice, maize and cassava, are 119,166t, 62,839t and 23,178t, respectively in 2012, as shown in Table 3-5-1[3]. Among three crops, lowland rice has most amounts of cultivated area and production. However, looking at the number of cropping farm household, maize cropping farmers is the most (see Table 3-5-2). There are many farmers who plant mixed with maize and cassava or sweet potates, and the production is active for home consumption in the sloped and mountainous area where paddy cultivation is difficult.

Table 3-5-1 The Cultivated Area, Yield and Production of Main Crops (2012)

Particular	Rice	Maize	Cassava	Sweet potato	Potato	Peanut	Soy bean	Mung bean	Upland rice
Potential Area (ha)	80,948	214,621	57,508	53,646	4,303	15,417	9,316	18,910	40,344
Cultivated Area (ha)	36,840	35,411	5,152	3,393	313	1,064	270	2,186	2,107
Harvested Area (ha)	35,590	35,304	5,085	3,119	310	1,056	232	2,128	2,102
Yield (ton/ha)	3.35	1.78	4.56	2.95	2.20	1.78	1.28	0.96	0.68
Production(ton)	119,166	62,839	23,178	9,197	1,143	1,875	298	2,034	1,422

Source : NDAH-MAF

Table 3-5-2 The Number of Household Cultivating Main Crops (2010)

Particular	Number of Households	Percentage	Cultivated Area (2010)	Cultivated Area / Household (ha/HH)
Total Households	184,652	-	-	-
Households in Crop Production	116,426	63.1%	-	-
Rice	45,672	24.7%	37,302	0.82
Maize	102,346	55.4%	70,255	0.69
Cassava	94,833	51.4%	6,936	0.07

Source : Census, 2010

The average cultivated area of rice, maize and cassava per farm household is not over one hector, 0.82ha, 0.69ha and 0.07ha respectively. Especially in the sloped mountainous area, these are cultivated in small size terrace field. Maize or cassava is cultivated in rainfed field in slash and burn farming style and around the house in flat area.

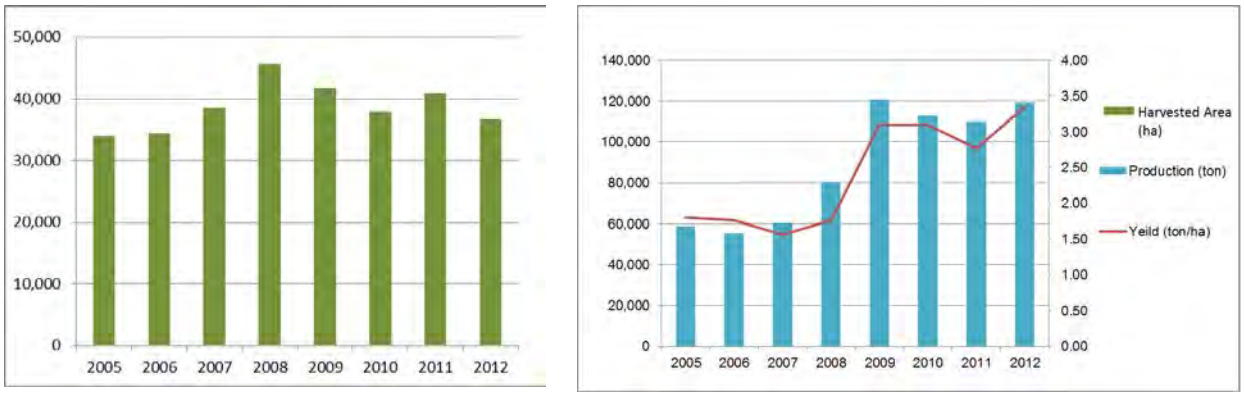
(2) Rice[4] production

The cultivated area of the rice is 35,590ha, yield is 3.35t/ha and its production is 119,166t in 2012. The production is almost doubled compared with 58,891t in 2005. The yeild of 2012 has increased by 85% compared with 1.8t/ha in 2005. The growth of yield is caused by disseminating rice cultivation techniques such as ICM or SRI which is supported by RDP (Funded by EU and implemented by GIZ and Camões - Instituto da Cooperação e da Língua, I. P.) or USAID, and grantis distribution of seed, fertilizer, pesticides and hand tractor from

[3] Yield is estimated by unit area sampling of farmers' paddy field in each district. Yield survey is conducted in farmers' paddy fields which are supplied chemical fertilizer or not by District Directorate of Agriculture and Fisheries. The reliability of the data of yield survey is not high because the way of selecting farmers and yield surevey are not consolidated nationwide.

[4] Although lowland rice and upland rice are cultivated in Timor-Leste, the amount of upland rice production is small and the potential of increase of production is low. So that only lowland rice is studied and examined in this report.

government.



Source : NDAH-MAF

Figure 3-5-1 The Harvested Area, Production and Yield of Rice (2005-2012)

The rice production and yield was leveled off after 2009 as shown in the Figure 3-5-1. The production was only increased to 120,000t from 100,000t, and the yield from 3.0t/ha to 3.5t/ha. Rice productivity could not be improved largely because farmers could not get good input materials such as high quality seed and fertilizer, etc. and, furthermore they don't to apply organic materials like compost to their paddy field. In particulary, there are few stores selling agricultural materials such as chemical fertilizer in the local area. Otherwise, there are few farmers who can make compost from dung of animals because of free gaizing of livestocks. Lack of the irrigation water owing to the collapse of irrigation facilities and the recent climate changes such as often flood or drought are regarded as other causes that production is stagnant.

Table 3-5-3 shows the average rice production from 2010 to 2012 and yield and cultivated area of each district. Total production of Bacau ditrict is the largest 35,777t. The cultivated area is also the largest, occupies 30% of total cultivated area. Calculating the ratio of the cultivated area to the potential area in each district, Baucau is also the highest with 82.2%. The average rice production in Viqueque, Bobonaro and Covalima districts exceeds 10,000t. 70% of production is occupied by those four districts where are the main rice production area in Timor Leste.

The average yield of rice has increased from 3.09t/ha to 3.35t/ha for three years. The increase is considered to bring from dissemination of cultivation techniques such as ICM or SRI, and gratis distribution of input materials as mentioned above. Although it has been increased, yield itsself of Timor Leste is still smaller than those of surrounding nations.[5]

Table 3-5-3 Potential Area, Cultivated Area, Yield and Production of Each District (Average of three years; 2010-2012)

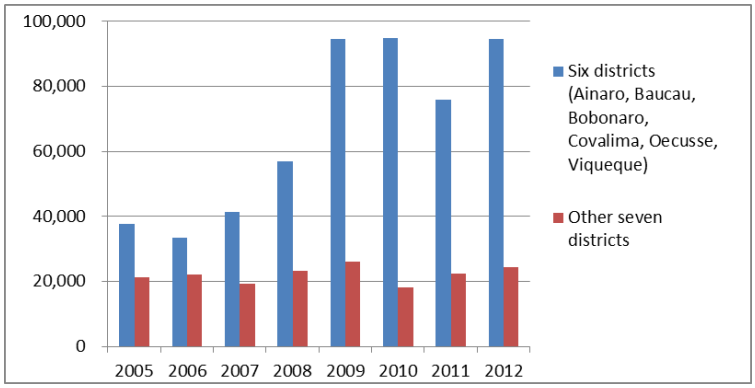
District	Potential Area(ha)	Cultivated Area (ha)	Cultivated Area /Potential Area (%)	Harvested Area (ha)	Yield (t/ha)			Total Production (t)
					2010	2011	2012	
Baucau	14,935	12,277	82%	12,277	2.72	2.50	3.63	35,777
Bobonaro	7,662	4,636	61%	4,544	3.80	3.52	3.25	16,180
Viqueque	9,620	5,504	57%	4,905	3.08	3.50	3.25	15,960
Covalima	10,059	3,728	37%	3,221	3.98	1.90	3.04	10,011
Lautem	3,864	2,388	62%	2,251	3.42	3.28	3.60	7,669
Manatuto	12,731	2,299	18%	2,299	2.46	2.63	3.00	6,302

[5] For example; rice yield of Indonesia is 5.1t/ha (FAOSTAT)

District	Potential Area(ha)	Cultivated Area (ha)	Cultivated Area /Potential Area (%)	Harvested Area (ha)	Yield (t/ha)			Total Production (t)
					2010	2011	2012	
Oecusse	5,705	2,878	50%	2,451	2.50	2.72	2.12	6,006
Ainaro	6,076	1,877	31%	1,123	3.62	2.00	4.94	4,551
Ermera	2,345	1,012	43%	965	3.10	3.40	3.23	3,086
Manufahi	7,662	1,169	15%	1,059	2.43	1.60	3.25	2,451
Aileu	776	541	70%	534	2.12	2.80	2.54	1,359
Liquica	1,866	223	12%	215	2.41	2.57	3.02	600
Dili	150	93	62%	56	3.24	3.00	3.25	177
Total:	83,451	38,624	46%	35,900	3.09	2.76	3.35	110,130

Source : NDAH-MAF

According to the recent rice production data, six distcrits of Baucau, Bobonaro, Ainaro, Covalima, Viqueque and Oecusse are regarded as the more productive districts of where parts are delineated as the rice bowl area. The eargently increasing of production amount is contributed from Baucau. According to the previous district officer of Baucau District of MAF, RDP or PDID[6] were carried out in Bobonaro. Cultivated area of rice was increased and agricultural machine and fertilizer were intensively inputed. Through the applying of the development projects of national and district level, movilization of agriculture extention workers, improvement of irrigation facilities, land prepareing service, and provision of tractors and agriculture inputs were implemented[7]. Almost of all rice produced in Baucau was consumed in Baucau district and surrounding area. And also imported rice was not cheap at that time. There are no detail data of contributing rate of input or technic, and it is difficult to calculate them.



Source : NDAH-MAF

Figure 3-5-2 Comparison Six District and Other DIstricts about Rice Production (ton) (2008-2012)

(3) Calculation of crop yield by MAF

Cultivated area, yield and production amount of main crops such as rice or maize is calculated by NDAH of MAF. Extension worker who is charge of each suco estimates cultivated area from hearing from famers or seeing the field directly. And then they estimate the yield of crops with the weighting of crops harvested and dried. The production datas of each suco are aggregate to estimate total production data of district. The production data of whole country is estimated with data of each district. More detail data of crop production are collected on each cultivation method in some areas by crop-cutting experiments.

The data of production amount and yield is not so correct due to individual difference of survey extension worker with interview or observation survey. Unutilizing of Grain Moisture Meter also affect for reliability of data. Yield survey which is suited to local technical level is carried

[6] PDID: Integrated District Development Planning

[7] In terms of the expansion of the GAP, comparison experimentations between the GAP and the conventional farming method in exhibition fields, practical performances in fields by the director of the agriculture directorate were conducted, which carefully conveyed the effects of the GAP to farmers in Baucau.

out by extention worker, however it is guessed that difference of area or individual difference influence the data of yield survey. It is necessary to set the standard or rule about yield survey in the whole country.

On the other hand, FAO also create the statistics data of production data of main crops.They carry out crop-cutting experiments in the farmers paddy field (around 120 households) selected randomly. They weight the production and measure the moisture content of it. They utilize the production data converted to 14 % of moisture content as production data

The difference of production data between MAF and FAO depend on the difference of the way of yield survey as above. It is not clear that improved cultivation method such as ICM is practiced in the paddy field which is surveyed by FAO. It is also unknown that chemical fertilizer or compost is inputed or not. On the other hand, the data of MAF include the result of farmers who practice improved cultivation method or input chemical fertilize to the paddy field. The difference of selecting the farmers influences the production data. The production data of NDAH of MAF is utilized in this report because the yield has increased in some area owing to introducing improved cultivation method or input materials.

(4) Rice cultivation techniques

Rice cultivation techniques extended in Timor Leste are classified into Integrated Crop Management (ICM), System of Rice Intensification (SRI) and Hybrid rice. MAF prepared some technical manuals for ICM and SRI with the support from the GIZ and USAID projects launched around the year 2005. Both ICM and SRI have been extended by district extention workers to farmers. The ICM was extended into the eastern region of Timor Leste and otherwise, the SRI in the western region. The Hybrid rice project has been conducted in cooperation with Chinese government in which trial cultivation on the farmland has been practiced in Manatuto and other some districts. Besides this project, in Manatuto district, the IRCP2 project was being implemented by JICA. In this project, IRCS (Improved Rice Cropping System) has been established, which is expected to promote to other simmiar rice production areas. Those cultivation techniques are categorized as the Good Agricultural Practice (GAP)[8].

Features of those rice cultivation practices of ICM, SRI Hybrid rice and IRCS, and conventional farming are summarized as follows.

1) Conventional farming

Plowing is carried out with human power, mainly by men, using the tools such as hoes. Harrowing is conducted by letting around ten buffalos run in the rice fields. Otherwise tractor is utilized by some farmers groups for plowing, harrowing and leveling. Farmers make nursery in the part of paddy fields and they transplant seedlings. The seedlings passed over a month after sowing are planted with its height as tall as 20cm. Some farmers directly broadcast the rice seed. Both male and female person works together in the transplanting stage. However, weeding is done manually by female.

Many farmers do not apply usually the chemical fertilizer and compost. However, few farmers directly input dung of livestocks to paddy field. Harvesting is mainly carried by women, althogut many children work with their family because of the lack of labor in busy farming

[8] GAP(Good Agricultural Practice) is originally a standard to produce safe farm products. The thing (management standard) which should be carried out in the daily farm management is GAP to produce farm products while obeying a law or an administrative guidance (standard). In the case of East Timor, GAP is defined as basic agricultural methods to raise agricultural production

season. Rice plants is left on the paddy field for a while after cutting, so that some of them are eaten by rat or bird and suffer losses by getting disease such as fungus because the rice ear is becoming wet. In addition, outbreak of the blast and the pest such as Brown leaf hopper often occurs. There are few farmers using the pesticide. It is hard to take an effective prevention measure in the conventional farming.

2) GAP

MAF had prepared the GAP manual about rice cultivation under the project of RDP2 in 2013. The GAP is considered as a method containing all rice cultivation process, so that the required stepes, calculation of neceaasry quantity of seed, fertilization calculation and pest and disease management, are included as the parts of the GAP. The GAP includes all improved cultivation method such as ICM. Currently ICM is disseminated in Viqueque district.

a) ICM

ICM (Integrated Crop Management) is outlined as a method of farming that keeps the balances between the running requirements for a profitable farming and the minimizing the responsibility to the human body and the sensitivity to the environmental impact. It includes the concept of IPM[9] (Integrated Pest Management) which practices to avoid waste, enhance energy efficiency and minimise pollution. Six basic components are included in ICM, such as planting high yielding variety adapted to region, using high quality seed, transplanting strong, whole seedlings produced in a modified mat nursery, transplanting one seedling per hill at 20cm distance from each other, stiring soil with weeder and appling fertilizer. By appling this ICM, increase result of the yield is surely observed in Timor Leste of where soil has poor nutritional condition. The ICM has been disseminated through the EU(GIZ) project since around 2003. It mainly targets the eastern region of the country including districts of Baucau, Viqueque and Lautem. A yield of 5t/ha was recorded at farmer's field plot in 2005[10].

b) SRI

SRI (The System of Rice Intensification) is referred to as input-saving and sustainable rice cultivation method, aiming at higher yield level of especially irrigated paddy field through the appropriate management of crop plant, soil, water application and manuring.Together with row planting in large distance square patterns, these principles support the growth of roots and the tillering. A strong root system gives positive impacts on plants' vegetative and reproductive phases via advanced nutrient uptake. The SRI is widely popularized now in the surrounding nations such as Indonesia, Cambodia and India.

In 2007 RDP II started to introduce the SRI to the two districts of Bobonaro and Covalima. In 2008/2009, 1,228 farmers have adopted this SRI. The average yield of 5.3t/ha and maximum yield of 10.0t/ha was recorded as the result. Currently, the SRI is being disseminated mainly by district extention workers in the Mailiana of Bobonaro district. Comparison between the SRI and the conventional farming was conducted at the same farmer's field in rainy season of 2013/2014.

The SRI is considered to be suitable for increasing the yield drastically. However, there are many difficulties under current farming condition in Timor Leste. These are to need much labor force in the working processes of transplanting and weeding, and seed selection with salt

[9] It is an ecosystem approach to crop production and protection that combines different management strategies, such as pheromone attractor, and practices to grow healthy crops and minimize the use of pesticides.
[10] Integrated Crop Management(ICM),SM CRSP, 2005

solution and intermittent irrigation techniques. If farmers would not receive appropriate technical support including in water management, production increase result might not be produced. In addition, farmers tend to avoid introducing the SRI because they are afraid of appearance of row planting in large distance square patterns. There is the example which a district has abandoned dissemination of the SRI. Generally, it is slightly difficult to spread it.

c) Hybrid rice

Hybrid rice project supported by Chinese Government was started to introduce in Manatuto district from 2008. Currently, it is cultivated on some farmer's paddy fields in district of Baucau, Viqueque, Bobonaro and Ainaro (see Table 3-5-4). Input materials including seed, chemical fertilizer and pesticide are distributed and technique how to cultivate is instructed to farmers as a package. The amout of sowing seed is estimated from twenty five (25) to fourty (40) kg/ha.

Table 3-5-4 The Amount of Distribution of Hybrid Rice (2013/2014)

District	Quantity of distribution(ton)
Manatuto	5
Baucau	6.5
Bobonaro	6
Viqueque	1.5
Ainaro	1.5
Total	20.5

Source : MAF-NDAH

The leaf of Hybrid rice infected with blast in harvest season. (Viqueque District)

Trial about growing rice seedling with plastic tray and seedling-throwing was practiced in the some part of farmer's paddy field. It's effective to reduce the labor force in comparison with conventional farming. However weeding is the hard problem on the seedling-throwing paddy fields. Since there were no effects of herbicide on that field, using herbicide is forced to stop. There are no any other ways except hand-weeding in the seedling-throwing fields.

About half of one hundred farmers in Manatuto applying hybrid rice have executed double cropping. As the result, yield of 7 to 9t/ha in rainy season and from 3 to 4t/ha in dry season was produced in the sub-district of Lacro (Manatuto). When the government rice purchasing system was once functioned, farmers produced surplus rice and sold it. Currently, the number of farmers cultivating double cropping has decreased because that purchaseing system has been stopped.

The whole farm was infected with blast and rice bug occurring in the trial in Bobonaro district. In the case aiming to disseminate the Hybrid rice, suitable measures to eradicate or control expected pests and disease should be established in advance. In the case of the spread, measures of pest and disease will be required in future because the promotion of pest and disease by the excessive manure is concerned about. In addition, farmers have to obtain the hybrid variety seeds every year and much amount of chemical fertilizer, so that it's difficult to disseminate the hybrid rice cultivation to farmers who are passive for commercial rice production.

d) IRCS

IRSC (Improved Rice Cropping System) is prepared in the project of IRCP1 in Manatuto district. This system is the method aiming to get maximum production by minimizing input and labor force. Activity such as sufficient leveling, good quality of seeds, row planting and weeding is the basic component for the IRCS. In this component, it is recommended to make the land level by tractor, to utilize recommended varieties tested in research center, to transplant by Jajar legowo system and to weed adequately by simple model weeder or lotary weeder.

In addition, it should be also introduced to grow healthy seeds with Dapok seedling using rice

husk charcoal and produce ratoons with improved method. Improved method to ratoon is introduced especially to farmers who want to cultivate rice two times. In that method, stubbles of rice are cut to five centimeter in high, and straw is utilized as organic fertilizer.

The IRCS is suitable for the fields where chemical fertilizer or compost can not be fully applied, because related farmers have no financial resources or they don't have commercial purpose for rice cultivation. The yield of around 3.0t/ha is expected to be the upper limit of IRCS. If the chemical fertilizer or compost can be applied as designed, it is required to guide the technique of manuring.

Table 3-5-5 Feature of Each Cultivation Method

Component	Conventional method	ICM	SRI	Hybrid use	IRCS*4
Feature	Traditional method of Timor-Leste	Method to manage totally soik, manure and prevention of pest and disease	Method to get high production by bringing out ability of rice	Method to use Hybrid variety and aim high production with high input	Method to aim maximum production by low input
Rand preparation	Human power (hoe), Animals (without equipment)	Plowing and harrowing by hand tractor	Plowing and harrowing by hand tractor. Good leveling	Hand tractor (It is mpossible to lend for free)	Good leveling by tractor
Variety	Traditional Varieties, Recommended varieties supplied by MAF-SoL	Improved varieties, ie IR64, Nakroma	Any variety	Hybrid variety (F1)	High quality varieties (IR64, Nakroma, Membramo, Marito*5)
Seed	Save after harvest, Select seeds from paddy field with good production, purchase from other farmers	Useing good seeds	Seed selection with salt water	Hybrid variety (imported from China)	High quality varieties (Seed selection with salt water test)
Nursery	Seed: 40～50kg/ha Direct seedling: 100kg/ha	Mat nursery 10 kg/ha	Tray nursery (using banana leaf) 5 kg/ha	Cell Tray, Tray nursery (using banana leaf, upland nursery) 25-40kg/ha	20 kg/ha ("Dapok" system *6)
Transplant	30～40 DAP*2, random or direct seedling	12－14 DAP Single planting Row planting by line marker 25x25cm or 30x30cm	8-12 DAP Single planting Square planting 25x25cm、30x30cm、50x50cm	18 DAP Square planting (Tray nursery)/ 25cmx25cm Shooting plant (Cell tray)	10-14 DAP Single or double planting Row planting (Jajar Legowo*7)
Weed	By hand	1st: 15DAT*3 2nd: 25 DAT 3rd: 35 DAT	Four times weeding with 10 days interval starting 10 DAT. By rotary weeder.	By hand	1st: 10-14 DAT 2nd: 21-24 DAT 3rd: 35-40 DAT By simple weeder and rotary weeder.
Manure	Without fertilizer and compost, input dung and urea of livestocks	Feed the plant concept Leaf Color Chart (LCC) Two application of chemical fertilizer	Feed the soil concept Compost preferred Chemical fertilizer optional	NPK:150kg, Urea:5kg/75kg	No part of IRCS (denpending on farmers finance)
Water Management	Water supply is managed by traditional water manager, and water is intaked to paddy field by individuals	1-3 cm of standing water level, Irrigate continuously up to around 80 DAT	Intermittent flooding with period of no standing water	3-5 cm of standing water level	No part of IRCS
Prevention of Pest and Disease	Not conducted	IPM	No part of SRI	Agricultural chemical	No part of IRCS (denpende on farmers finance)

Component	Conventional method	ICM	SRI	Hybrid use	IRCS*4
Harvesting	By hand (sickle), Rice is left in paddy field after harvest.	Harvest when 95 percent of grain is yellow.	No part of SRI	No part of Hybrid rice	(Harvest of ratoon*8)
Threshing and Drying	Footfall, Hitting on the stone, power threshing mill, Drying on the vinyl sheet	Thresh immediately after harvest. Dry grain evenly. at 14 percent moisture.	No part of SRI	No part of Hybrid rice	Pedal-operated thresher *9
The average yield*1	1.48t/ha	4.0t/ha	4.3t/a	6.7t/ha	3.37t/ha*10
Risk	Easy to be damaged by pest and disease, Low productivity.	Low sustainability because of necessity of work force and money for fertilizer.	Low sustainability because of necessity of work force	Low sustainability because of necessity of purchase of hybrid seed	The way of input is not included so that the yield is limited by this way.
Possibility of Dissemination	—	It is possible to disseminate by simple manual because many farmers already know ICM	It is better to disseminate intensively to farmers who have motivation.	It is difficult to disseminate continuously without supply of seed and agricultural materiarls.	It is possible to disseminate to farmers who don't have enough resource and labors.

*1: Source: NDAH, MAF, 2008
*2: DAP, Days after Planting
*3: DAT, Days after Transplanting
*4: IRCS include four basic components, sufficient leveling, good quality of seeds, row planting and weeding. However other recommended way is also written in parenthesis.
*5 High quality varieties were tested and recommended by Manatuto DOA (Foru varieties was recommended varieties of 2010)
*6: It is better to utilize DAPOK system with rice husk charcoal.
*7: Jajar Legowo is the method of row transplanting with making space by one raw. (25/50) x12.5cm, (20/40)x20cm
*8: The improved ratoon method is introduced to farmers who want to cultivate two times. Stubbles are cut to five centimeter in high, and straw is utilized for organic fertilizer.
*9: Utilizing of Pedal-operated thresher is recommended.
*10: IRCP2, Monthly report (December, 2013)

The cultivated area and the yield of ICM, SRI and Hybrid rice were added up based on the 2008 statistics data of NDAH. According to this, the yield of ICM, SRI and Hybrid rice are 4.0t/ha, 4.3t/ha and 6.7t/ha respectively. Those yields greatly exceed 1.72t/ha of the average of the conventional farming. It is considered that the high yield of ICM, SRI and Hybrid rice was affected by inputting compost or chemical fertilizer, in addition, increase effects from field leveling and weeding might be contributed. However, these cultivation methods are not spread widely because these should be disseminated with distribution of fertilizer and seed. The result is gradually generated.

MAF is aiming to increase yield and extend the cultivated area intensified by ICM, SRI and Hybrid rice. Although the increase of yield is lead by improvement crop management such as making nursery, line planting using line marker and weeding by rotary weeder, it is restrictive in the fields without input of chemical fertilizer or compost. It is necessary to research the soil condition and design the input of fertilizer in appropriate quantity and favorable time schedule for multiplication of the yield. And also, it is required to implement breeding or selecting of rice varieties and provide the manure management manual for each district in a research institute level. Compiled rice cultivation techniques are needed to spread to rice farmers.

On the other hand, the yield is affected by various losses of harvesting, threshing and drying on farm. As described above, there are on-farm loss caused by leaving the rice itself during the time for two or three days from harvesting until threshing in the field, in that time, the ear of

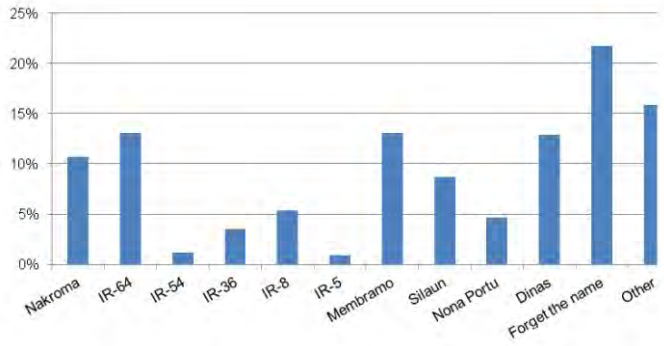
rice ear are eaten by rat or bird and infected by fungus as it is getting wet. There is much loss in the threshing time owing to the traditional technique (threshing by the step or throwing on the stone) and the over-drying because farmers tend to dry rice for long time. It is necessary to disseminate suitable post-harvest management techniques.

Malnutrition of the rice and the damage due to the pest and the delay of the harvesting time are considered as a cause of the immature rice and sterile rice. Those causes lead not only the yield reduction but also the degradation of rice quality such as broken rice, pecky rice and colored rice. It it required to produce whole rice grain through improving rice cultivation practice including in soil improvement.

(4) Rice varieties

1) Situation of rice cultivation of each varieties and improved varieties

SoL (Seeds of Life 11) supported by ACIAR (Australian Centre for International Agricultural Research) and International Rice Research Institute **(**IRRI), etc. has selected varieties of crops which are suitable for land, climate and condition of cultivation of Timor Leste. Then, SoL has recommended Nakroma (IRRI116) variety of rice. On the other hand, in 2011 Ciherang imported from Indonesia were distributed free of charge by MAF. Nakroma and IR-64 which have been already distributed were tested in trial plot of MAF's research center for few years. On the other hand, information about Chirerang such as characteristics of cultivation method was not given to not only farmers but also extension workers. From this situation, it is considered that potential yield is not achieved because farmers miss the proper cropping and harvesting time due to no characteristics information of that variety.



Note: 542 farmers of research object.
Source: SoL Baseline survey 2012

Figure 3-5-3 Percentage of Farmers Cultivating Each Varieties

According to the baseline survey of SoL, the farmers who cultivated the Nakroma were approximately 11% in 58 farm households among 542 farm households. IR-64, Membramo, Dinas and so on were cultivated each by 13% of the farm households. The reason that farmers select the Nakroma variety is reported to be good taste, higa productivity and free of charge. In the case of other varieties, basically almost rice farmers growing them intend to replant the variety they have planted before. Suitability to the local climate and the taste are also important factors. It can be said that farmers tend to avoid planting new variety.

2) Traditional varieties

Red rice (Fos meta or Iroito in Titon) and black rice (Fos metan) are cultivated mainly for self home consumption. However some red rice and black rice which had been produced as commercial rice in Uatolari and Uatucarbau of Viqueque district have been sold at high price in the markets of Dili via Baucau. Although those rices are preferred by Timorese because of good

[11] SoL is a program within the MAF with funding provided by the Ministry and Aus AID and the Australian Centre for International Agricultural Research (ACIAR). The SoL started testing new varieties of food crops in 2000. The object of this program is improving food security through increased productivity of major food crops. Ref. 3-11 1).

aroma and high nutritional value, they are not eaten frequently because of its high price.

Because red rice and black rice are apt to be damaged by pest such as rice bug and blast or mouse, there are many farmers quitting cultivation of them. In addition, most farmers obtain the seed from home seed- raising. It is thought that the yield of red rice and black rice have dropped because unevenness of period of ear emergence is seen under the influence of xenogeneic crossings or going feralfield biochemistry. It is said that rainfed cultivation is suitable for red rice and black rice, but the production is not stable due to unstable rain. However, as described above, they have higher cultivation potential as the commercial rice.

3) The caracteristices of representative rice varieties

The caracteristices of representative rice varieties are summarized as shown in Table 3-5-6. There are related informations of IRRI's rice varieties such as IR-64 or Nakroma, such as pest tolerance, disease tolerance and characteristics of cultivation. However the investigations about characteristics of local varieties have not been conducted so far. The test cultivation of rice varieties introduced from IRRI has been conducted by SoL and NDR of MAF. However, they have not tried to breed rice varieties. It is important to breed the local varieties and introduced varieties in order to make suitable varieties with favorable taste and quality for Timorese.

Table 3-5-6 The Characteristics of Rice Varieties

Pariculary	IR-64	Nakroma	Membramo
Cropping duration	90～120days	90～120 days	90～120 days
Resistance to pest and disease	Resistance	Resistance	Resistance
Time of promotion	The time of Indonesia	MAF／SoL	The time of Indonesia
Yield	4-8t/ha	4-8t/ha	4-10t/ha
Plant high and plant type	Short, strong and withstanding of wind	－	Long and many tillering
Tasty	Good taste and good smell	Good taste and good smell	Good taste and good smell
Advantage	Has advantage of cultivation in wholeTerritory	The recommendation by MAF	Delicious and sweet smelling
Disadvantage	－	－	Many of empty grain paddy
Share	About 30%	About 20%	About 30%
Remark		IRRI116 (Philippin)	Especially in Oecusse district
Items	Red rice	Black rice	Hybrid
Cropping duration	Over 120days	Over 120days	120days
Resistance to pest and disease	Resistance	Resistance	－
Time of promotion	Traditional variety	Traditional variety	In 2008 (China)
Yield	Under 4t/ha	Under 4t/ha	High yield variety
Plant high and plant type	Long and many tillering	Long and many tillering	－
Taste	Good taste and good for healthy	Good taste and good for healthy	－
Advantage	Used as identical of compost or mulsa. Conservation of agro-biodiversity. The highest price	used as identical of compost or mulsa. Conservation of agro-biodiversity The highest price	The production is highest by non hybrid variety.
Disadvantage	High more least 1 meter and easy to fractured and fall down	High more least 1 meter and easy to fractured and fall down	The variety has should be buy every year. Must input chemical fertilizer. Nonresistance to pest and

			disease.
Share	Under 10%	Under 10%	—
Remark			Trialed mainly in Manatuto.

Source : MAF-NDAH, GAPManual

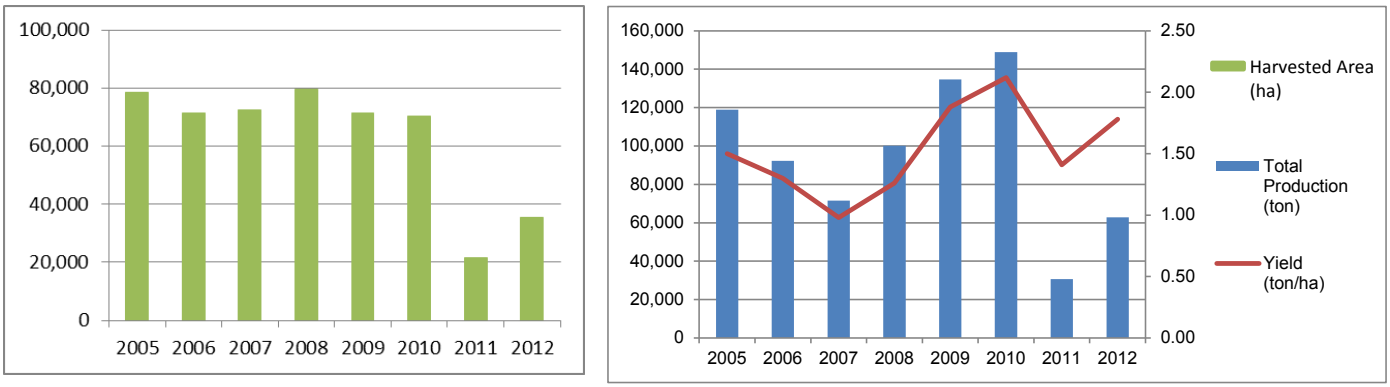
4) Seed production and the method of home seed-raising

SoL started a program to produce commercial seed and community seed through contarct farming. Currently amount of seed distributed from MAF is not enough to meet with farmers' demand. All farmers cannot get full amount of certified seeds. Many farmers utilize the seeds obtained from home seed- raising or from neighboring farmers through direct purchase or exchange. When they purchase or exchange the seed from neighboring farmers, they choose neighboring farmers who had produced much amount of paddy before or whose production had not been infected by any pest or disease.

When taking the seed from home seed- raising, almost farmers save it from all of harvested ones. Generally, if home seed- raising is continued, its yield and quality are usually decreasing. If such rice variety crosses other varieties or grass weeds, the characteristics become changed with large variations. For example, if the days of growth duration have variations, it is difficult to harvest at one time, so that, its yield will be certainly decreased. It is required to select good quality seeds, namely uniform in size, full, plump, free disease and insect, pure and good germination potential. In addition, it is important to improve how to save seeds by self collection. It is better to cultivate rice for seed and rice for grain separately. It is recommended to update the seeds having high purity produced in the fields which registrated and accepted by Specialized Agencies. Assuming that current method of seed production, update and collection is continued, it is important for the excellent seminal acquisition to provide the technical guidance for improving the self collection method for farmers.

(5) The amount of maize production

Maize has largest cultivated area among the main crops of Timor Leste. It is cultivated as a staple food particularly in mountain area. Both the production and the cultivated area were decreased until 2011 because of unstable cimate condition. The production was decresed to 30,666t. However, it was improved and increased to 62,389t in 2012, it means the two times of the 2011 production, however it was less than half of maximum of 148,891t of 2010. Spreading of rice which is easy to cock is one reason why maize production is decreasing.



Source : MAF-NDAH

Figure 3-5-4 The Harvested Area, Yield and Production of Maize (2005-2012)

The average amount of maize production for the three years (from 2010 to 2012) is shown in Table 3-5-7. The table is arranged by distrcts in much production amount order. According to this, districts of Lautem, Covalima and Baucau have produced large amount of maize.

Table 3-5-7 The Cultivated Area, Yield and Production of Maize (The Average of Three Years, 2010-2012)

District	Potential Area(ha)	Cultivated Area(ha)	Cultivated Area /Potential Area	Harvested Area (ha)	Yield(t/ha)	Total Production(t)
Lautem	20,000	7,257	36.3%	6,636	2.73	19,124
Covalima	56,113	5,100	9.1%	5,086	2.49	10,890
Baucau	16,000	4,756	29.7%	4,518	2.11	10,336
Bobonaro	25,477	5,695	22.4%	4,921	1.29	6,998
Viqueque	12,500	3,895	31.2%	3,174	2.10	6,135
Oecusse	19,435	7,517	38.7%	7,084	1.17	6,076
Liquica	5,000	1,965	39.3%	1,965	2.58	4,800
Ainaro	9,000	2,486	27.6%	1,841	2.90	4,317
Aileu	13,000	2,318	17.8%	2,309	1.88	4,011
Manatuto	19,896	1,887	9.5%	1,849	1.69	3,074
Manufahi	10,000	1,501	15.0%	1,435	2.24	2,760
Dili	3,200	1,051	32.8%	986	2.25	1,387
Ermera	5,000	621	12.4%	616	1.80	891
Total	214,621	46,048	21.5%	42,420	1.90	80,799

Source：MAF-NDAH

(6) Cultivation method of maize

SoL have disseminated the improved maize varieties such as Sele or Noi Mutin and tested their cultivation on the farmer's fields. Maize is cultivated in the whole country. The cultivation was prepared by the RDPIV in 2013, and the techniques have been extended to district extension warkers and farmers. Recommended method of maize cultivation is shown in Table 3-5-8.

Looking at the actual cultivation, few inputs of compost or chemical fertilizer are applied to the field. MAF has recommended intercropping and mixed cropping with legumes to make the atmospheric nitrogen fixed and fertilize the soil. However, the recommended croppings have not been practiced by farmers because the seeds of legumes are shortage and method of cultivation is not fully disseminated. As well as the conventional farming, works such as plowing and weeding are not conducted, and maize is cultivated with cassava, pumpkin and sweet potato.

Table 3-5-8 The Method of Maize Cultivation Recommended by MAF

Procedure		Remark
1	Using the high production varieties recommended by MAF	Sele、Noi Mutin、Na, etc.
2	Planting two grains seed inside one hole	Do not plant grains over four grains in the one hole
3	The recommendable distance of planting is:75 cm x 30 cm	
4	Intercrop the maize with beans for the good nutrition.	red bean, pea and long-bean, etc.
5	Weeding at least two or three times	The first weeding: within 2-4 weeks after planted. The second weeding: after first cleaning was done for 4 weeks.
6	Drying under the sun shine within 3-4 days. Threshing grains in the shade place.	※ conventional way to check the moisture contents: 1)Teeth chewing method, 2)The water appear in the bottle/inside jerry-can
7	Seeds/staple food Storing inside the clean and shut tightly drums	Fulfilling the corn grains into drum. Putting the drum on surface of wooden く。

Source：SoL, Tékniku Kuda Batar Ne'ebe Diak (Manual of maize cultivation)

In the "Project for Community-based Sustainable Natural Resource Management" (JICA), technical guidance included the bench terrace techniques, countour composting techniques and making liquid fertilizer is being conducted to maize fermers in Aileu district. Before the project

implementation, farmers had cultivated the maize on the slope after slash-and-burn. However after the project, farmers started to make a terrace so as to conserve water and soil nutrition and prevent the soil erosion. By applying liquid fertilizer made from natural resources, maize farmers could fruit five cobs per one plant, although had been only one or two cobs before the project. It was resulted that apply of the liquid fertilizer could produce larger size of the cobs. It is important to control and manage the field and manure for maize cultivation based on the filed's topographic and soil conditions.

(7) Varieties of maize

Research on suitable maize varieties and trial cultivation using pesticide or chemical fertilizer is conducted by SoL in Loes Research Center of MAF. The varieties suitable to Timor Leste are selected from the viewpoints of yield, tolerance of pest and disease and taste. Currently, the varieties of Sele, Noi Mutin and Suwan 5 are disseminated as MAF's recommended varieties.According to the SoL baseline survey, the diffusion rate of varieties of the Sele and Suwan 5 were 13% and 2% (see Figure 3-5-5). The rate is smaller than that of local varieties. The variety of Noi Mutin has been introduced from 2012 and currently, being cultivated experimentally on the farmer's field. The characteristics of three varieties of Sele, Suwan 5 and Noi Mutin are shown in Table 3-5-9. All three varieties are the high yield varieties. Sele and Noi mutin are one of the varieties of semi-flint corn and they are suitable for flour processing, feeding and industrial purpose.

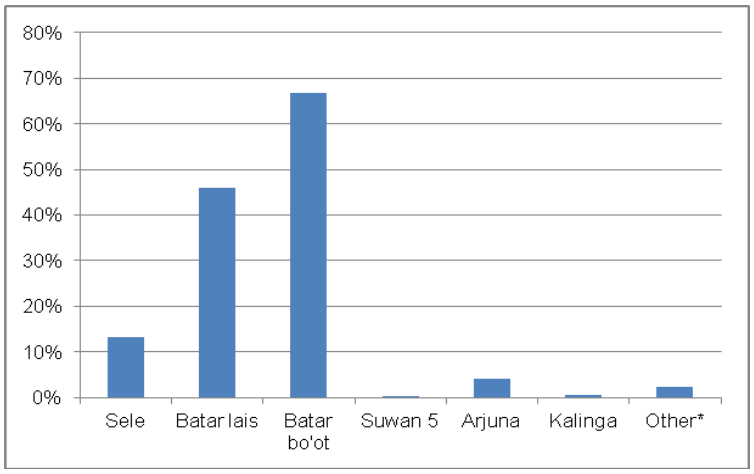


Figure 3-5-5 Percentage of Maize Production Farmers by Species

Note: The number of target farmers is 1,219. Source:SoL, Baseline Survey

Table 3-5-9 The Characteristics of Maize Varieties

Variety	Plant length	Growing Period	Yield	Remark
Sele	2.0m	105-115 days	3.12t/ha	Yellow color. Semi-flint corn. Yeild increased by 40% and 82% respectively on the farm land and on the field of research center. CIMMYT (Indian).
Noi Mutin	1.8m	105-119 days	2.1t/ha	White color. Semi-flint corn. Yeild increased by 25% on the farm land. Philippines.
Suwan 5	1.9m	105-115 days	3.52t/ha	Yellow color. Yeild increased by 45% and 105% respectively on the farm land and on the field of research center. Thai

Source : Handout of SoL/MAF

According to the SoL baseline survey, 61% of fermers save the maize seeds from the total harvet (see Table 3-5-10). In the case that the seeds are saved of home seed-raising, it is desirable to select from bigger cobs, massive cobs, uniform collor and center part of cobs. On the other hand, it is high possibility to cross with other varieties because maize is cross pollination (pollination occurs only when pollen is delivered to a flower from a different plant). Then, it is necessary to avoid mix planting with other varieties to sustain high yield.

Table 3-5-10 Method of Selecting of Corn Seeds

Corn seed selection techniques	Number of respondents	Percentage
Save seeds from the total harvest	908	61%
Select specific plants from the standing crop for seeds	290	20%
Select cobs after they are harvested	728	49%
Select seeds from a specific section of the cob	149	10%

Note: The number of target households is 1,478.
Source : SoL, Baseline Survey

(8) Calorie Intake by Staple Foods

Next table shows the consumtion state of rice, maize, and cassava from the view point of calorie intake. The three years averages in 2010 - 2012 were used for the population and the disposable weight of each crop. The self-sufficient ratios of each crop were calculated by weight base and calorie base. Rice occupies 74 % of the necessary consumption amount of the three crops by calorie base though it is 52 % by weight base since unit calorie of rice is high; 2.9 times of maize and 2.3 times of cassava.

Table 3-5-11 Calorie Intake by Staple Foods

	Unit	2010	2011	2012	Average	Necessary Consumption			Self-sufficient	Conversion	Necessary Calorie		Self-sufficient Calorie	
						kg/person	MT	%	Ratio, weight %	Calorie, kcal/100g	1,000 kcal	%	1,000 kcal	calorie %
Population	1,000	1,066	1,092	1,118	1,092	a)	-	-	-	b)	-	-	-	-
Rice	MT	55,239	47,947	58,371	53,852	106	115,785	52	46.5	360	416,827,754	74	193,867,965	46.5
Maize	MT	68,266	13,594	28,671	36,844	67	73,185	33	50.3	124	90,749,606	16	45,686,030	50.3
Cassava	MT	22,565	18,728	20,750	20,681	32	34,954	16	59.2	160	55,926,575	10	33,089,444	59.2
計	MT	146,069	80,269	107,792	111,377	205	223,925	100	49.7	-	563,503,935	100	272,643,439	48.4

Source of a): The values of rice and maize are shown by KONSSANTIL. The value of cassava is shown in "Timor-Leste: Poverty in a Young Nation, 2007".
Source of b): Calorie Count (http://caloriecount.about.com/)

Now, the difference between the necessary consumption and self-sufficient amount of rice, about 62 thousand MT is covered by import. If all necessary consumption of rice, about 116 thousand MT is supplied, the supply ratio of the three crops is 77 % by weight base and 88 % by calorie base. The necessary calorie of staple foods is taken from the three crops, supplementing from other foods such as wheat and beans.

3-5-2 Situation of Livestock Raising

Numbre of households involved livestocks and livestocks per households are shown in Table 3-5-12. The number of households who raise livestocks is 147,665, and farmers who raise chiken and pig are over 80%. The numbers of chicken and pig per household are 5.6 and 2.7. Livestocks are raised by free grazing. Livestocks are traded with high price in the market. Pigs and cows are especially traded in marriage. They have a worth as property. Demand of maize is expected to increase as the feed of those livestocks as the demand of meat is increasing with increase of population.

Table 3-5-12 The Number of Households Involved Livestock and Livestocks of Household

Livestock	Number of Household	Number of livestock	Number of livestock per HH
Households involved livestock	147,665	-	-
Chickens	124,658	702,474	5.64
Pigs	123,862	330,435	2.67
Goats	45,781	152,360	3.33
Cattles / Cows	43,028	161,654	3.76
Buffalos	19,119	96,484	5.05
Sheeps	6,957	41,854	6.02
Horses	27,691	57,819	2.09

Source : SoL, Baseline Survey

"Gracia Chicken Farm" is a company which sells chicken eggs to whole country. In 2014, that company farms about 82,000 chickens and make shipment about 36,000 eggs every day. The eggs are sold to Chinese company who distributes to each district. The neceaasy feed amount for raising chicken is around 8ton per day. Composition feed involving maize, rice bran and nutrition is imported from Vitamin from Indonesia. The feed made in Timor-Leste is not utilized, because it is difficult to sustain stable supply of feed in both quantity and quality aspects. The dung of chicken are sold to neighboring farmers by US$2 per 15kg with sack. Considering future livestock development prospect, it is important to support maize production for not only self consumption but also feed for livestocks, in which produced maize as the feed will be sold to the chicken and eggs farmers'groups.

3-5-3 Agricultural Subsidy Programme of MAF

NDAH (National Directorate for Agriculture and Horticulture, Ministry of Agriculture and Fishery) has distributed agricultural material to target farmers' groups as an agricultural subsidy programme. The distributed agricultural material mainly consists of 1) Seeds (rice and maize) and fertilizer, 2) Agricultural chemicals, and 3) Fuel used for agricultural machine in each district. The material is supplied to farmers' group through agriculture offices located in each district in Timor-Leste.

(1) Supplying system of seeds and fertilizer

The Department of Crop Production of NDAH has a responsibility to supply seeds and fertilizer as agriculture subsidy programme. Firstly, MAF selects the trader of the procurement for those agricultural inputs by tender. Then, the selected trader delivers the agricultural inputs to agriculture offices in all districts. The agriculture office supplies the provided inputs to farmers' groups. The target farmers' groups are selected based by the proposal submitted by the famers' groups. The farmers' group which adopt the MAF recommended technologies, such as SRI and ICM, has a priority of the selection.

Most of seeds and fertilizer for the subsidy programme are imported from Indonesia. However, the variety of seeds and the type of fertilizer to supply are not selected based on a concreate strategy. There are selected according to availability of stocks of Indonesian traders. MAF intends to increase domestic seeds instead of import seeds in the future. Since 2012, MAF has started to provide domestic seeds with the assistance of SoL. It is expected to increase distribution of domestic seeds gradually.

The amount of subsidised rice seeds was 265ton in 2012/2013 while the cultivation area in Timor-Leste was 36,800ha in 2012. With consideration that required seeds per ha is estimated as 35kg, subsidized seeds can cover 7,571ha, which is about only 4.9% of total cultivation area. The situation of distribution of seeds in 2011/2012 and 2012/2013, and also fertiliser in 2013 is summarised in the tables below.

Table 3-5-13 Distribution of Seeds to Districts (2011/2012)

District	Variety of Rice (ton)					Cultivation Area (ha)	Distribution per ha (kg/ha)
	IR64	Membramo	Inpari	Chierang	Total		
Origin	Indonesia	Indonesia	Indonesia	Indonesia			
Aileu	1	2	1	1	5	407.00	12.28
Ainaro	2	2	2	2	8	1,948.00	4.12
Baucau	2	2	1	1	6	11,098.00	1.85
Bobonaro	4	5	1	1	11	3,648.00	3.02
Covalima	2	2	3	3	10	3,526.00	2.84
Dili		3	1		4	80.00	50.00

Ermera	1	2	1	1	5	1,404.00	3.56
Lospalos	1	2	2	2	7	1,836.00	3.81
Liquica	1	2		2	5	364.50	13.71
Manatuto	2	2	3	3	10	2,789.18	3.59
Manufahi		2.75	1.95	4.3	9	804.00	11.20
Oecusse		10			10	3,735.00	2.68
Viqueque	2	3	2	3	10	5,200.00	1.92
Total	18	39.75	18.95	23.3	100	36,839.68	2.71

Source：NDAH-MAF

Table 3-5-14 Distribution of Seeds to Districts (2012/2013)

District	Tariety of Rice (ton)			Total (ton)	Cultivation Area (ha)	Distribution per ha (kg/ha)
	Nakroma	IR64	Ciherang			
Origin	Local Farmer	Indonesia	Indonesia			
Aileu	1	5	5	11	573.00	19.19
Ainaro	0	10	10	20	504.00	39.68
Baucau	5	20	10	35	9,846.20	3.55
Bobonaro	0	22	10	32	3,185.00	10.05
Covalima	1	10	7	18	1,615.00	11.15
Dili	4	4	3	11	80.00	137.5
Ermera	0	8	7	15	1,777.70	8.44
Lautem	0	10	8	18	907.00	19.85
Liquica	0	10	5	15	636.50	23.57
Manatuto	3	20	8	31	1,432.20	21.65
Manufahi	0	14	14	28	1,131.75	24.74
Oecusse	0	0	0	0	414.00	0
Viqueque	1	15	15	31	4,300.50	7.21
Total	15	148	102	265	26,402.85	10.04

Source：NDAH-MAF

Table 3-5-15 Distribution of Fertilizer to Districts (2013)

District	Type of Fertilizer (ton)			Total (ton)	Cultivation Area (ha)	Distribution per ha (kg/ha)
	Urea	TSP	KCL			
Aileu	0	0	0	0	573.00	0
Ainaro	8	6	4	18	504.00	35.71
Baucau	20	15	10	45	9,846.20	4.57
Bobonaro	20	15	10	45	3,185.00	14.13
Covalima	10	7.5	5	22.5	1,615.00	13.93
Dili	9	6.6	4	19.6	80.00	245.00
Ermera	4.4	3.3	2.2	9.9	1,777.70	5.57
Lospalos	6	4.5	3	13.5	907.00	14.88
Liquica	0	0	0	0	636.50	0
Manatuto	8	6	4	18	1,432.20	12.57
Manufahi	8	6	4	18	1,131.75	15.90
Oecusse	10	7.5	5	22.5	414.00	54.35
Viqueque	8	6	4	18	4,300.50	4.19
Total	111.4	83.4	55.2	250	26,402.85	9.47

Source：NDAH-MAF

Fertilizer is distributed to farmers' group as same as the distribution of seeds. The total amount of the distribution can cover 9.47kg per ha of the total cultivation area. In order to increase yield in future, it can be suggested to increase the distribution amount of fertilizer as well as promote farmers' groups to apply organic fertilizer.

(2) Supplying system of agricultural chemicals

As of distribution of agricultural chemicals, the Department of Food Protection of NDAH has a responsibility to carry out. Like the distribution of seeds and fertilizer mentioned above, the distribution of agricultural chemicals is not targeted to individual farmers but farmers' groups. The farmers' group, who wants to be supplied agricultural chemicals, are required to submit a proposal in advance to agriculture office in their district. The dealer, whom MAF purchases agricultural chemical, is selected by tender. The department of food protection of NDAH delivers the procured agricultural chemicals to the agriculture office in all districts based on the proposal submitted by the farmers groups. In agriculture office, extension officers are responsible for distributing agricultural chemical to farers groups. Since, the farmers' groups, who are practicing MAF' recommended farming technologies such as SCI and ICM, are prioritised to be distributed, the amount of distribution per ha is very limited. It is needed to increase inputs to achieve higher yield same as the situation of seeds and fertilizer supply.

Table 3-5-16 Distribution of Agricultural Chemicals (2012)

District	Type of Chemicals				Total (Litter)	Cultivation Area (ha)	Distribution per ha (Litter/ha)
	Insecticide (Litter)	Herbicide (Litter)	Fungicide (Litter)	Rodenticide (Litter)			
Aileu	154	48	14	22	84	407.00	1.88
Ainaro	154	48	26	22	96	1,948.00	0.05
Baucau	200	48	34	22	104	11,098.00	0.01
Bobonaro	300	48	14	22	84	3,648.00	0.02
Covalima	354	48	14	22	84	3,526.00	0.02
Dili	104	48	14	22	84	80.00	1.05
Ermera	200	48	14	22	84	1,404.00	0.06
Losparos	239	48	14	22	84	1,836.00	0.05
Liquica	164	48	14	22	84	364.50	0.23
Manatuto	209	48	14	22	84	2,789.18	0.03
Manufahi	269	48	34	22	104	804.00	0.13
Oecusse	400	48	14	22	84	3,735.00	0.02
Viqueque	204	48	14	22	84	5,200.00	0.02
Total	2,951	624	234	286	1,144	36,839.68	0.03

Source : NDAH-MAF

(3) Supplying system of fuel for agricultural machine

The Department of Mechanisation and Post-harvest of NDAH is conducting the distribution of fuel for agricultural machine. MAF used to provide hand tractors to farmers' groups before. Currently, MAF owns large tractors in the agriculture offices or the mechanisation centres in each district, and provides fuel to agriculture office to lease them to farmers' group for free. As of the process of procuring fuel by MAF, firstly, MAF makes a contract with a fuel dealer by competitive bidding. Then, MAF issues coupon tickets and provides them to each agricultural office. After that, the agriculture office makes an order to the fuel dealer, and the dealer delivers fuel to the agriculture office. Because of requiring these processes, it often takes a long time for delivering fuel after making the order.

Table 3-5-17 Distribution of Fuel for Agricultural Machine (2012/2013)

District	No. of Tractors	Distributed Fuel (Litter)	Allocated Budget (USD)
Aileu	8	6,400	9,600
Ainaro	15	12,000	18,000
Baucau	31	24,800	37,200
Bobonaro	31	24,800	37,200

District	No. of Tractors	Distributed Fuel (Litter)	Allocated Budget (USD)
Covalima	37	29,600	44,400
Dili	6	4,800	7,200
Ermera	13	10,400	15,600
Lautem	40	32,000	48,000
Liquica	11	8,800	13,200
Manatuto	33	26,400	39,600
Manufahi	32	25,600	38,400
Oecusse	21	16,800	25,200
Viqueque	37	29,600	29,600
Total	315	252,000	378,000

Source: NDAH-MAF

(4) Budget for agricultural material distribution of MAF

Supplying agricultural material such as seeds, fertilizer, and chemicals is considered as one of the main activities of NDAH. The budget for these activities was arranged as US$3,591,000 in the 2013 fiscal year. It is equivalent to 14.3% of the total budget of MAF. According to MAF's strategy mentioned in Medium Term Operation Plan (MTOP [12]), MAF considers that supplying agriculture material fully funded by the government will not be sustainable from a long term view. Therefore, MAF aims to involve private sectors so that agricultural material, which is currently supplied by MAF, will be procured from the market by farmers in the future. The following table explains the situation of budget arrangement for agriculture subsidy programme of MAF on fiscal year basis.

Table 3-5-18 Trend of Budget Arrangement for Distribution of Agriculture Material

Fiscal Year	2012	2013	2014
Budget for distribution of seeds, fertilizer, and chemicals (US$)	796,205	3,591,000	3,059,000
Ratio in the total budget of MAF	4.7%	14.3%	11.7%
Budget for fuel distribution (US$)	378,000	988,231	701,592
Ratio in the total budget of MAF	2.3%	3.9%	2.7%
Total budget of MAF (US$)	16,787,000	25,164,000	26,108,000

Source: MAF

3-5-4 Development Constraints in Crop Prodcution Activities

(1) Damage and losses by animals and insects

The majority of the farmers frequently suffer from crop damages and losses. Table 3-5-19 shows that more than 80% of farmers have experienced crop damages and losses. It is reported that for all crops, damages by animals such as domestic livestock and dogs, rodents or wild animals, are the most serious ones. Especially, for rice production, serious damage occurs by locusts in both irrigated and non-irrigated fields. The crop production is also damaged by too much rain and flooded. According to the field survey, the climate change such as heavy rainfall and drying causes big damage on crop production in recent years.

Table 3-5-19 The Factor of Damages and Losses of Main Crops

Particular	Corn		Rice		Cassava
	Irrigated	Non-irrigated	Irrigated	Non-irrigated	Non-irrigated
# of farmers reporting losses	21	1277	387	215	1296
Most important causes of damage or loss to crops (% of reported cases of losses or damages)					

[12] MTOP p53, Sub-Programe 2.2

Particular	Corn		Rice		Cassava
	Irrigated	Non-irrigated	Irrigated	Non-irrigated	Non-irrigated
Total # of causes mentioned by respondents	33	1,910	621	374	1,865
Domestic livestock and dogs	39%	15%	14%	7%	13%
Rodents (rats and mice)	30%	31%	36%	38%	30%
Other wild animals	15%	31%	8%	10%	42%
Locusts	-	1%	11%	9%	1%
Other pests & disease	3%	2%	14%	7%	2%
Fire	-	-	-	0.3%	0.3%
Too much rain	9%	16%	14%	21%	10%
Too little rain	3%	3%	2%	6%	2.0%
Theft	-	-	-	-	0.3%
Other cause of damage	-	1%	2%	0.3%	0.2%

Source : SoL, Baseline Survey

1) Damage by disease and the prevention

Many occurrences of rice bug and blast were observed in some paddy fields at the harvesting time from November to December in 2013. Besides these, bacterial leaf blight of rice and Tungro virus were also occurred. Emergence of insects such as stem borer which break into the stem and eat stem, and brown leaf hopper passing the bacteria pathogen of blast were reported.

MAF has distributed pesticides to the farmers for free through district agriculture directorate, however, its amount is not enough to cope with all of them. It is difficult to perfectly remove the pest and desease using the pesticides partially and temporarily. There is a case that using chemical pesticides has a possibility to develop occurance of pest and disease. It is necessary to reseach about making organic or microbe pesticides from natural resources available in local area under the situation that farmers cannot obtain commercial pesticides due to its high price, and establish and disseminate its know-how. It is importante for farmers level to make framework to prevent occurrence of such pest and disease in which it is introduced to practice the works such as weeding of grass in the surrounding area of paddy field, making healthy nursely, improving of aeration of the paddy field by weeding and disinfection of soil or seeds.

2) Damage by wild animals or domestic animals and the prevention

Double cropping is stopped because buffalos give damage to the paddy fields. In order to succeed the dry season cropping, it is required to take some measures such as surrounding the paddy field, negotiating with famers who raise baffalos and setting the limitation of pasturage area for raisng. Actually farmers who cultivate Hybrid rice in Manatuto district have made the agreement with related farmers in which if buffalos damage the paddy fields, they have to pay a fine

Damage of rats and mice is also serious problem that occurs nationwide. Rat and mice make a hideout (hole) in the ridge of paddy field and give damage to ears of rice before harvesting. In addition, storing rice is fed by rat, depending on its storing method. In order to prevent damage by rat or mice, traditional method such as capturing them by dog or sowing feces and urine of goat around the paddy fields is takenb by some farmers. Actually, there is no method to deal in rat and mice surely, however, prevention measures by repairing the ridge and using the rodenticide should be carried out.

(2) Input of organic materials or chemical fertilizers

Spreading cultivation practice such as ICM or SRI has been carried out. However, the rice yield has a certain limit in the case without input of fertilizer or compost. There are few farmers

utilizing compost as well as chemical fertilizer. Under the free graizing of livestocks, it will take much time to search, collect and process the way how to make the compost and natural pesticide from raw materials. Technical guidance to farmers should be continuously given by district extention workers or NGO to produce an organic fertilizer and natural pesticides.

◆Example of Local NGO Disseminating the Organic Fertilizer◆

The NGO, "Organisasaun Haburas Moris" is acting in Mariana sub-district of Bobonaro district where is advanced area of the rice production. The NGO makes and sells the 'Bokashi' compost using effective microorganisms made in Indonesia. The NGO shares the making method of the compost with district extention workers. Like this example, it is necessary to spread the techniqes such as making compost or liquid fertilizer by using local available material

In Oecusse district and the area which is close to the Indonesian border of Bobonaro district, farmers can purchace the chemical pesticides and fertilizers imported from Indonesia more easily than in other districts. However, there are few farmers to use purchased ones for rice cultivation purpose of self home consumption, because of few selling stores and expensive ones. In addition, in generall, access to other agricultural materials is very limited. This is one of the development constraints disturbing the yield increase. On the other hand, chemical fertilizer may affect to the soil and crops depending on the usage or kind. It is necessary to make a kind of the the standard (quantity, time) about the kind and the use of chemical fertilizer.

(3) Related problem with the disseminating activities of agricultural techiniques and the improvement awereness of farmers

Technical dissemination of mainly rice cultivation method is carried out by extension worker with support of donor such as RDP4 (see at the 3-9-1 Extension Agricultural Technology and Agricultural Mechanization Programme). It is necessary to improve continuousuly tecnicical development and to wide the area disseminated because a project implemented in the site is not permanent. On the other hand, farmers commonly consider that materials should be provided from nation. It is important for farmers to improve consciousness that they should carry out sustainable productive activities by themselves while receiving some support. In addition to a cultivation method, the basic education such as easy reading, writing and calculations are necessary to perform commercial agricultural production.

3-6 CURRENT SITUATION OF POST-HARVEST, PROCESSING AND MARKETING

3-6-1 Works on Post-harvest and Post-harvest Losses

(1) Definition of Post-harvest Losses

SDP mentions reduction of 'Onfarm Storage Losses' from current 20% to 5%. The yield using in the food balance calculation is the figure after the works of paddy ear drying, manual harvesting, threshing by foot, transporting to farmers' houses and scaling under supervision of MAF surveyors. Therefore, the 'Onfarm Storage Losses' stipulated in SDP mean the losses after transporting to farmers' house including storing, dehusking-milling, grading-packaging and transporting to retailers. Furthermore, the figure of 20% is mixture of the losses of rice and maize and taken by the maximum losses between 15% and 20% estimated by KONSSANTIL.

The definition of post-harvest losses by FAO is from paddy harvesting to milled rice transporting to consumers in quantitative and qualitative losses. In this section, the concept of post-harvest treatment is defined as the works from paddy harvesting to milled rice transporting to retailers, and 'Onfarm Storage Losses' from paddy storing to milled rice transporting is used

for the food balance calculation.

Definition of Post-harvest and Onfarm Storage Losses

Word	Target Crops	Working Process of Losses Occurred
Post-harvest Losses	Rice	Manual harvesting →ear drying →mechanical and manual threshing→packaging and transporting →storing →dehusking-Milling → grading-packaging→ transporting to retailers
	Maize	Manual harvesting →ear drying →storing with cobs →shelling →grading-packaging →transporting to retailers
Onfarm Storage Losses	Rice	(In the Yield Survey, the scaling is conducted after the works of foot manual threshing, onfarm drying and transporting to farmers'' houses.) String →dehusking-milling →grading-packaging →transporting to retailers
	Maize	(In the Yield Survey, the scaling is conducted after onfarm drying and transporting to farmers' houses with cobs and bracts.) Shelling-drying →storing →grading-packaging →transporting to retailers

(2) Post-harvest Treatment of Paddy and Quality of Milled Rice

1) Post-harvest Treatment of Paddy

The treatment methods on post-harvest of paddy are different phases in scale and efficiency among paddy for self-consuming and selling. The post-harvest losses for the selling paddy are relatively lower than the self-consuming paddy in case of Maliana (Bobonaro District) and Uatolari (Viqueque District). According to MAF, FAO and SoL reports, the 'onfarm storage losses' on food balance sheets on both rice and corn indicates at 15-20% (average at 17.5%). While, the study conducted by the lecture of the Department of Agricultural Economics, the University of Timor-Leste estimates at 9-22% (ave. 15.5%) for the self-consuming paddy and 9-12% (ave. 10.5%), though the losses are variable depending on the farming situations. The post-harvest losses are roughly estimated at 14% under the conditions of 70% for self-consuming and 30% for domestic selling, which is equivalent to 16,683 tons-paddy against the total estimated production at 119,116 tons-paddy in 2012. These losses are equivalent to the annual consumption of 80,000 people as the annual consumption per capita at 206kg-paddy/person/year and milling recovery ratio at 51.5%. The onfarm storage losses are calculated at 8.3% equivalent to 9,887tons-paddy/year.

The unique trading systems such as the traditional crop sharing between producers and landowners and threshing/milling services payment by actual paddy instead of cash are not considered in the calculation of the post-harvest losses. The 'crop sharing' is widely practiced in the areas of Laclo (Manatuto) and Bluto (Baucau-Manatuto) irrigation schemes. The peasant farmers agree the percentages from harvesting volumes and the cost burden with the landowners prior to cultivation. According to National Directorate of Agribusiness, it is estimated that 25% of farmers are peasants.

The following table shows the post-harvest losses estimated by the working procedure.

Table 3-6-1 Post-harvest Losses by Working Procedure for Self-Consumption Rice

Works	Description	Onfarm Storage Losses	Post-harvest Losses
Harvesting	Paddy is manually harvested about 30cm length of ear. The reapers and combine harvesters are not introduced, During harvesting, impurities and damaged grains by water shortage and stink bugs drops.	Not included	3-5%
Handling Paddy	Normally, dried paddy standing on fields is harvested. There is	Not included	–

Works	Description	Onfarm Storage Losses	Post-harvest Losses
Ear	not practice to dry paddy ear in the fields.		
Threshing	The farmers lay paddy ear on the tarpaulin (water-proof sheet), and thresh paddy by footsteps. In some areas engine-driven threshers have been introduced.	Not included	0.5-1.5%
Drying Paddy Grains	The farmers lay paddy grains on the tarpaulin for solar drying in front of farm houses to avoid bird damages. There are rarely existing concrete yards to dry grains.	Not included	0.5% or less
Storing by farmers	The farmers preserve self-consuming paddy in traditional stores such as high floor type store in all districts and hat type store in Oecusse. Majority of farmers use the packages of second-hand fertilizer sacks (HDPP bag). Some farmers procured 1 ton capacity of rice sacks hanging from the wooden beam of the store. During storing periods, the post-harvest losses caused by damages by rats can be occurred rather than damages by fungi.	5% or less	5% or less
Dehusking and Milling	The popular milling machines are one-pass type of small milling machines made of Agrindo-Satake (Indonesia) and Chinese makers. The recovery ratio is estimated at 50-55%. The reasons making the lower ratio are different shapes of grains due to insect damages and crushing of grains due to over drying of paddy. The inhabitants living in mountainous areas are milling necessary quantities of paddy by traditional wooden made hand mills (*Aisuak*), but this method become rare due to inflow of imported rice.	5-10%	5-10%
Grading	After milling by machines, farmers remove stones, remained husks and damaged grains by hands. In traditional milling, In the traditional way, farmers use the sieves made of palm leaves for winnow.	–	–
Total of Estimated Post-harvest Losses		5.0-15.0% (Average 10%)	9.0-22.0% (Average 15.5%)

Source: JICA Team based on the lecture of Faculty of Agriculture, University of Timor-Leste, 2014

Table 3-6-2 Post-harvest Losses by Working Procedure for Selling Rice

Works	Description	Onfarm Storage Losses	Estimated Losses
Harvesting	Farmers harvest paddy ears manually. The machineries such as a reaper and a combine harvester have never been introduced. The damaged grains by stink bugs or immature grains by water shortage are easy to drop. In the areas distributed seeds, the losses of harvesting can be depressed relatively.	Not included	1-3%
Handling Paddy Ear	Before threshing, the bundles of paddy ears are dried on the fields to remove moisture contents.	Not included	–
Threshing	The engine-driven threshing machines can be found in the most areas.	Not included	1-2%
Drying Paddy Grains	Farmers or traders fill paddy in HDPP sacks. Before long term storage, the paddy owners dry paddy by solar on tarpaulins (water-proof plastic sheets). The large concrete yard possessed by the private sector is found only in Maliana.	Not included	0.5% or less
Storing by farmers	The traders and millers keep paddy filling sacks in the stores to prevent from rain water and rats. Normally, the paddy is milled just before selling rice at local markets directly by producers or major local markets through traders.	0-1%	0-1%

Dehusking and Milling	The small-scale rice millers are existing in production areas with the capacities of milling machines at 1.2-1.4 tons/hour in Maliana and 0.3 tons/hour in other areas. The milling recovery is estimated in lower ratio at 55% or less due to different shapes of grains due to mixture of varieties and crushing of grains due to over drying of paddy.	5%	5%
Grading	After milling by machines, farmers remove stones, remained husks and damaged grains by hands. Some rice milling machines equip with the oscillating grader (shifter) or the de-stoner.	–	–
Transporting and storing	The traders and retailers store paddy or milled rice. The losses can be occurred by broken sacks and damages by rice weevils (*Sitophilus zeamais*).	0.5% or less	0.5% or less
Total of Estimated Post-harvest Losses		5.5-6.5% (Average 6.0%)	9.0-12.0% (Average 10.5%)

Source: JICA Team based on the lecture of Faculty of Agriculture, University of Timor-Leste, 2014

<Box.1>
The post-harvest losses including the works of harvesting, handling, threshing, drying, storing and transporting defined by FAO.
The immature grains are also included causes of the losses. The following table shows the average quantitative losses in East Asia Countries.

Table: Post-harvest Loses in South East Asia

Works	Minimum Losses	Maximum Losses
Harvesting	1%	3%
Handling	2%	7%
Threshing	2%	6%
Drying	1%	5%
Storing	2%	6%
Transporting	2%	10%
Total	10%	37%

Source:
http://www.fao.org/docrep/t0522e/t0522e04.htm

<Box.2>
Table: Major Specifications of Rice Milling Machine

Brand	Agrindo (Satake)	Agrindo (Satake)	Yanindo (Yanmar)	Unknown Chinese
Model	ARM1000	ACM1000F	YMM20	-----
Input Capacity	0.3-0.6 ton/hr	1.2-1.4 ton/hr	0.5-0.75 ton/hr	0-3-1.0 ton/hr
Power	25 HP	35 HP	16 HP	14-22 HP
Body	hopper, dehusker, winnower, miller	hopper, paddy separator, dehusker, winnower, miller, shifter, (de-stoner)	hopper, dehusker, winnower, miller	copy of Satake product
Confirmed Units	30 or more	2	2	10 or more

Source: JICA Team, 2014

(3) Rice Quality and Rice Taste Preference

The quality of local milled rice is affected by varieties, pre-harvest conditions and milling machines. Regarding to rice varieties, Timorese prefer rice taste containing lower amount of amylose with fragrance such as *Membramo* variety. The length/width and the shapes of grains are varied according to local varieties due to repeating natural-crossing. While, the distributed seeds by SoL project such as *Nakroma* and *IR-64* have stabilized characters in shape. In order to compete against imported rice in quality from the viewpoint of post-harvest treatments, the measures including renewal of seeds for unification in shapes, suitable paddy drying, sorting by head rice and broken rice and removal of impurities are required. Furthermore, the attention should be paid during storage of milled rice to propagation of the rice weevils.

Table 3-6-3 Comparison of Local Rice and Imported Rice in Quality and Taste Preference

Brand/ Variety	Origin	Rice Whiteness	Shape and Uniformity	Contents of Broken and Immature Rice	Contents of Impurities	Taste Preference
Local Rice (Nakroma)	Maliana, Uatolari, Baucau	Medium	medium grain, relatively uniformed	15-30%	< 0.5%	Good

Brand/ Variety	Origin	Rice Whiteness	Shape and Uniformity	Contents of Broken and Immature Rice	Contents of Impurities	Taste Preference
Local Rice (Menbramo)	-do-	Medium	medium long grain, relatively uniformed	15-30%	< 0.5%	Excellent
Local Rice (IR-64, IRRI Var.)	General paddy fields in TL	medium-low	medium-long grain, relatively uniformed	15-30%	< 0.5%	Acceptable
Local Rice (Locally fixed var.)	-do-	Low	medium-long grain, not uniformed	20-50%	< 1%	Good
Local Rice (Red rice, *Fos Eroito*)	Uatolari, Baucau	(red color, 0-70% milling)	long grain, uniformed	10-20%	< 0.5%	Excellent
Local Rice (Red rice, *Fos Eroito*)	Maliana	(light-red, 100% milling)	Short grain, Uniformed	20-40%	< 0.5%	Excellent
Local Rice (Black rice, *Fos Brakan*)	Uatolari	(0% milling)	long grain, uniformed	15-30%	< 0.5%	Excellent
Imported Rice (White rice, IR-22、IR-64)	Vietnam	High	long grain, uniformed	15%	0	Acceptable (very popular in TL)
Imported Rice (Fragrant rice)	Vietnam, Thailand	High	long grain, uniformed	10%	0	Good
Imported Rice (Basmati rice)	India	light-brown	long grain, uniformed	10%	0	Good (for special use)
Imported Rice (White rice)	Myanmar	High	medium-long, uniformed	10%	0	Good
Imported Rice (White rice, Kokuho)	USA	High	medium-long, uniformed	10%	0	Good (for special use)

Source: JICA Team, Feb., 2014

For upgrading of quality of local milled rice, the grading process after milling is important because the unification of grain sizes creates a value. For example, the reaction of consumers may different only separating 1.7mm-2mm grains and 2mm or more grains by using the sieve meshes. High contents of broken rice are unfordable for marketing, but the broken rice can be meet demands for porridge and create new category of commodities meeting Timorese food life. Separation of head rice and broken rice can be produced by introduction of a destoner and a sifter after milling process.

The high whiteness of grains can be achieved by quality seeds, sufficient fertilizer application and renewal of rice milling machines or replace of rubber rolls, but general consumers tend not to pay attention. Rather than whiteness of rice, promotion of brown rice and 50-70% milled rice would be more significant. The malnutrition of local inhabitants is critical especially for Vitamin B containing in brown rice. But it is required to conduct marketing tests and promotion of brown rice, because more fire power and pressure pans are required for cooking of brown rice. Half milled rice can be produced after unification of rice grain sizes.

(4) Post-harvest of Maize

The onfarm storage losses for maize have been reported by various organizations; at 30% by

FAO, at 12% by TLMSP (IFAD Maize Storage Project promoting metal bins to store maize grains) and at 13.4% by the baseline survey of SoL. These differences would be caused by surveyed years, places and maize varieties. SoL has been developing and releasing maize seeds and seeds/seedlings for other crops. The foundation seeds of Sele variety had been introduced from India CIMMYT, which variety is a hard grain categorized in flint maize with relatively higher durability against pests and high yields. SoL has also released PO7 variety, which is origin from the Philippines CMU pollinated with Var12. These two varieties have better yields than local varieties, but inferior in damaged by pyralid larva. The losses occur during storage attacked by rats and fungi such as Aspergillus flavus. MCIE had the bitter experience of local purchased maize rejected by Timor Global due to detection of Aflatoxin. The project coordinator points out that the prevention from losses can be achieved by drying before storing into metal bins.

The post-harvest working process and losses is shown in Table 3-6-4. Accumulated onfarm storage loses are calculated at 14.9-18.0%, while the food balance sheet prepared by KONSSANTIL estimates at 15-20%. If the onfarm storage losses are at 18.0%, the lost amount was beyond 11,300tons against production 62,800tons in 2012. In order to reduce the large losses, the projects on improvement on household-level storage had been implemented by IFAD, USAID, FAO and Care International.

Table 3-6-4　Post-harvest Treatment of Maize

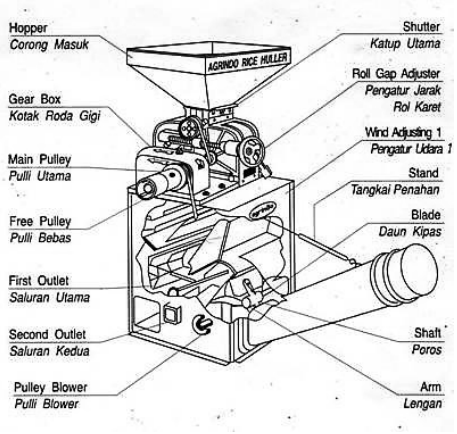
Works	Description	Onfarm Storage Losses	Estimated Losses
Harvesting	Farmers harvest maize ears manually.	Not including	0.5% or less
Drying maize ears	Normally the ears are dried in harvesting time. As needed, the ears are dried with husks hanging with trees. The methods can be protected from wild birds and rats.	Not including	－
Shelling and drying maize kernels	Farmers remove husk leaves and silks、shell manually and dry kernels on the tarpaulin sheets by sun light. The manual-operated maize shellers are developed in Baucau artisans, but the quality should be improved comparing with cheap Chinese-made shellers. The shelling recovery rate is 70% in average for uninfected ears.	0.5% or less	0.5% or less
Storing* Traditional Method Improved Method	Farmers store the ears without shelling. The storing methods are hanging with roof beams of traditional stores, beams above kitchen stoves, tree tops with small roofs or just tree branches in front of houses. Some farmers store ears without husk leaves in sacks. FAO and USAID are promoting local-made metal bins. IFAD is promoting recovery conventional second-hand metal bins (drum cans, 200lit capacity) charging at 10-20US$/pc. Some farmers use plastic containers, but the containing capacity is limited.	Store 13.9%、 Tree 17.0% Sack 14.8% Metal barrel 16.1% Plastic container 5.2%	Store 13.9%、 Tree 17.0% Sack 14.8% Metal barrel 16.1% Plastic container 5.2%
Transporting	The products are sold in the shapes of whole or crashed kernels to major markets. In harvest season, green maize with cobs and husks is sold.	0.5% or less	0.5% or less
Total of Estimated Post-harvest Losses		14.9～18.0%	15.4～18.5%

Remarks)　The losses in storing are based on data of Commissioned Study, Complementarity Between Maize Seed Production and Good Storage, Jan. 2013. The losses by fungi in the former MTCI purchasing system are not considered in the figures.
Source : JICA Study Team, 2014

3-6-2　Milling Recovery of Rice

In the rice producing areas, rice milling machines are operated for local demands. The most popular models are Indonesian Agrindo made (licensed manufacturing by Satake) one-pass type

rice milling machines (capacity: 300-750kg/hr) shown in the right figure. Also, the Chinese made milling machines in illegal copy design are prevailing. In recent trend, some rice millers procure Yanindo (licensed manufacturing by Yanmar) made combine type rice milling machines (capacity: 600kg/hr) in Maliana. There is a case to procure Agrindo made milling mini-plant (capacity: 1.2-1.5ton/hr) equipped with pre-cleaner, dehusker, miller and grader in Maliana. For the renewal machines, the buyers use their own money or NGOs supports not using financial schemes.



One-Pass Rice Mill Made by Agrindo

In Maliana and Baucau as the largest rice production areas, some rice millers have renewed the rice milling machines. As the results, the milling recovery has been improved from 50% to 55% with whiteness of grains. However, the degraded milling machines provoke larger milling losses and lower quality. The Chinese milling machines copied the Satake's design implicate lower performance resulting higher broken ratio, lower whiteness and lower milling recovery. The milling quality is deeply involved in contents of immature and damaged grains, over drying in fields and seeds at the production stage.

The transaction mode of the millers is to charge milling fees at the averages at US$1.50 per 35kg-paddy sack or US$2.00 per 50kg-paddy sack. The brans as a byproduct of milling belong to the paddy owners, but the husks are abandoned in spites that husks can be utilized a source of energy. The milling fees are almost same in the country at US$0.04/kg-paddy. MCIE paddy purchasing system would negatively effect on the incentive to invest on rice milling machines for rice mill owners.

In Suco Uatolari in Viqueque, the specialty rice is produced, milled and marketed including red/black unpolished rice. In this area, the milling machines made by Satake had been introduced since 10 years ago. According to interviews to the rice mill owners, the milling recovery is estimated at between 50 and 53% depending on paddy conditions. Milled rice is directly sold to consumers at Baucau and Dili markets by the women group of Makariki Village in Suco Uatolari. Milling paddy are scaled by 5-gallon square cans and charged at 1 gallon unit. The milling charge method scaled by square cans is more reasonable than the charge method by various sizes of sacks in other areas out of Viqueque District. For storing, each farmers keep paddy in houses or high floor stores packaged by sacks or nipper made bins. Farmers dry paddy by sunlight before milling.

The large-scale warehouse with 1,000tons storing capacity with 20m×20m drying concrete yard had been constructed at Suco Uatolari as the appurtenant work of Bebui Irrigation Project, but the facilities had been not accepted by farmers and abandoned due to political issues such as fails of MTCI purchasing system and top-down decision-making. It indicates the importance of farmers' participatory approaches for the project formation regarding post-harvest and marketing of agricultural products.

The descriptions of rice millers in Maliana and Uatolari are shown in Table 3-6-5 and Table 3-6-6. The milling recovery ratio is depending on producing conditions, unity of grain shapes and moisture contents of paddy, but the models of rice milling machines and its maintenance status are deeply related. Presently, the market share of Satake and Agrindo is occupied more than 70%, and remains are Chinese machines. By means of measurement of milling recovery by above machines, the milling recovery in the whole country can be estimated.

It is supposed that the milling recovery has not been reached to 60% mentioned in the food balance sheet prepared by KONSSANTIL from the site survey, and estimated at 50-55%. The reasons are:

i) Lower performance of rice milling machines except Satake/Agrindo and Yanindo,

ii) Ununiformity of grain sizes, which makes large grains mill more,

iii) Over drying, which leads to crash grains during friction of milling parts and defecates them as brans,

iv) Poor maintaining specially for the parts of the rubber rolls and the milling meshes, and

v) Limited numbers of medium-large scale rice milling plants (no functions of pre-cleaning).

Table 3-6-5 Descriptions of Rice Millers in Maliana, Bobonaro District

Type of Owner	Milling Machine	Intro-duction	Trans-action	Descriptions
1. Private	Chinese Daiichi SB10D	2004	Milling service	Milled rice shows many broken and low whiteness grains. Milling fees are US$2.00 per 50kg-paddy sack and US$1.50 per 35kg-paddy sack.
2. Private	Indonesian Yanmar ECH/YMM20	2013	Milling service	The machines were procured from Atambua, West Timor, and had been operated since Jan. 2014. The milling recovery reaches to 55% with better whiteness and acceptable. Milling fees are US$2.00 per 50kg-paddy sack and US$1.50 per 35kg-paddy sack.
3. Private	Chinese unknown (to be renewed to Yanindo)	2004	Milling service/ Milled rice selling	The owner procured Yanmar/Yanindo made combine rice milling machines in Jan. 2014. The milling recovery is improved from 50% less to 55%. The owner stores paddy in nipper-made 1ton capacity bins on the wooden tables in the traditional store. As the humidity in the store is almost same as ambient one, the owner dry paddy several times by sunlight. Milling fees are US$2.00 per 50kg-paddy sack and US$1.50 per 35kg-paddy sack.
4. Farmer's group	Chinese unknown	2009	Milling service only for member	The rice milling machine is owned by the farmer's group 'Haburas Secar', which is assisted by Movimento Cooperativo Economico – Agricola, NGO supported by Oxfam-New Zealand since 1999. The group is going to export to NZ by fair trade. But the performance of the machine is very low and the group wishes to renew it.
5. Credit Cooperative	Chinese unknown	2006	Milling service only for member	The credit cooperative union 'Lakon Nakukun Mosu Naroman' (CU LaNaMoNa) owns the rice milling machine. CU LaNaMoNa is third largest cooperative in the capital scale at US$200,000 in the country and act not only financing but also leasing agricultural machineries and servicing rice milling. The cooperative members can bring paddy and sell rice to other members or exchange to consumable commodities.
6. Church Society	Indonesian Agrindo (Satake) SB100	1985	Milling service to neigh-bors	The Catholic mission procured the rice milling machine and the maize flour milling machine to provide working opportunities. As the machines are maintained well, the milling recovery is estimated at 52% with higher whiteness. The machine is driven by the electric motor. Milling fees are US$2.00 per 50kg-paddy sack and US$1.50 per 35kg-paddy sack.
7. Private Trader	Indonesian Agrindo (Satake)	2011	Milling for MCIE &	SORTE Trading Group Pte. operates the rice milling mini-plant. The company traded with the former MTCI at 674tons-rice in 2010 and 281tons-rice in 2011, but

Type of Owner	Milling Machine	Intro-duction	Trans-action	Descriptions
	80M		own paddy	stopped due to delay payment. The milling recovery is beyond 55%. The machine is equipped with the grader to separate head and broken rice, and procured from Surabaya.
8. Private Trader	Chinese Daiichi Unknown Model	2009	Milling for MCIE & own paddy	The trader supplied 908tons-rice in 2009, 146tons-rice in 2010 and 111tons-rice in 2011 to the former MTCI. The machine is a friction milling type called as Engelberg rice huller, and the milling recovery is less than 50%.

Source: JICA Study Team, 2014

Table 3-6-6 Descriptions of Rice Millers in Watulari, Viqueque District

Type of Owner	Milling Machine	Intro-duction	Trans-action	Descriptions
1. Private	Japanese Satake SB100	2003	Milling service	The milling demands are high for red/black rice and Nakroma rice. The milling fee is fixed in the Suco at US$0.50 per square bin (18liter, 12kg-paddy). Some rice millers make scales in the bin, and charge by 10¢ unit. This detail charging system is not found in Maliana and other areas.
2. Private	Indonesian Agrindo (Satake) SB100	2005-2009	Milling service	

Source : JICA Study Team, 2014

The rice milling machines are also existing in the areas of Baucau-Venilare, Seiçar-Laga (Baucau), Betano (Manufahi), Zumalai ～ Suai (Covalima), Manatuto, Vemasse (Bulto), Viqueque-Ossu, Uatolari-Watkarabau (Viqueque), Tono (Oecusse) and so on. Probably, about 100 units of rice milling machines are operating in the country. The various owners are operating such as traders, farmers, merchants and other business men, but the latest model of milling machines are found in 3 sites in Maliana, 1 site in Baucau, 1 site in Manatuto (by JICA project) and 5 units of mobile types in Oecusse.

3-6-3 Rice Value-chain and Marketing

The distribution channels of paddy and milled rice can be divided into 2 routes for local rice and imported rice. Local rice chains are consisting of self-consumption, private sector marketing and MICE purchasing. Imported rice chains are consisting of private sector marketing, strategic storage and subsidized distribution. Majority of marketing channels are self-consumption of local rice and private sector marketing of imported rice. Standard

(1) Current Marketing Status of Local Rice

Local rice is rarely marketed outside and consumed by producers, their relatives or village inhabitants. Surplus rice is found in the limited rice production areas such as Maliana (Bobonaro), Uatolari (Viqueque), Samalari-Seiçar-Laga (Baucau), and Panta Makassar (Oecusse).

Non-glutinous rice including traditional fixed varieties, Nakroma, IR64 and Chitora is distributed in villages in lowlands and neighboring village in highlands. The value-added specialty rice including black rice (Fos Metan), red rice (Fos Eroito) and fregnant rice (Membramo) is distributed to town markets. The transactions among villagers and relatives are practiced in cash and barter. For example, one head of swine or goat can be exchanged to 140kg paddy. As Timorese put importance on ceremonial functions, paddy can function as cash in rural areas.

The sales of local rice are commonly done by vendors or producers. As a new challenge, the agricultural cooperative in Sargilos, Laga, Baucau distribute milled and packaged local rice at the rate of 1 ton/month to the supermarkets in Dili, which case is indicative to create branded local rice.

MCIE (MTCI) purchasing system for local products has been reviewed year by year. In 2005, the former MTCI used to store and mill paddy collecting from ASC (Agricultural Services Companies) supported by MAF, however, the system was collapsed due to mishandling of cash flow. After that, MTCI had purchased milled rice from traders, who tried to mix local rice with cheaper imported rice. Again, MTCI decided to purchase paddy from traders at double prices of actual market prices. In 2012, the system was also collapsed due to delay of payment. In 2014, MCIE purchases 500tons paddy equivalent to 1% of production through registered agricultural cooperatives. In the latest system, the buying price from farmers was announced at US$0.75/kg-paddy, which was also more expensive than actual trading price at US$0.40-0.50/kg-paddy. It means that MCIE will face certain amounts of deficits.

Regarding the commodity export, the traders should apply to Export and Import Dep., MCIE, and can export the applied commodity after approval. However, the possibility that Timorese milled rice is moved to Atambua, West Timor cannot be denied.

(2) Current Marketing Status of Imported Rice

The distributing volume of commercial imported rice is more than production volume of local rice. There are many origins of countries and varieties for imported rice. The main is Vietnamese ordinary rice distributing to the whole country, while the specialty rice is found in Dili such as fregnant rice from Thailand and Vietnam, ordinary rice from Myanmar and Basmati rice from India. The rice are imported by the licensed traders by MCIE and sold by retailers. For distributing to the isolated villages in mountains far from Dili, the three steps of transactions made by middlemen stand i) between Dili wholesaler and transporter to district markets, ii) between transporter and district level traders and iii) between district level traders and Suco level retailers. The transaction modes with transporting costs to isolated villages make the pricing-up of imported rice. However, the selling prices are still lower than local rice in most of markets. In 2008, the year of Lehman's shock, the rice prices were jumped up and rice were disappeared in markets. Rural people consumed the carbohydrates from the substitute foods such as maize and cassava. It is a fact that these upland crops are important for food security in the country.

MCIE is mandated to manage strategic stock of rice by imported and local rice and to supply humanitarian-aid rice for disaster victims and vulnerable groups. The rice storage volume is adjusted by quarterly periods. Three stock warehouses with the total capacity of 15,000tons are located at Tibar, Liquiça District. MCIE also operates two former ASC warehouses with the total capacity of 2,000tons at Maliana for locally-purchased paddy. The part of the stocked rice should supply to disaster victims and vulnerable groups and monitor deliveries, however, the humanitarian-aid rice diverts to general markets. Furthermore, MCIE releases the part of stocked rice during high pricing periods as subsidized rice. The system is desirable for consumers. Meanwhile, it is disadvantage for producers and paddy farmers will not have incentives to store paddy in longer periods and invest to construction of stores.

(3) Aspects on Rice Marketing

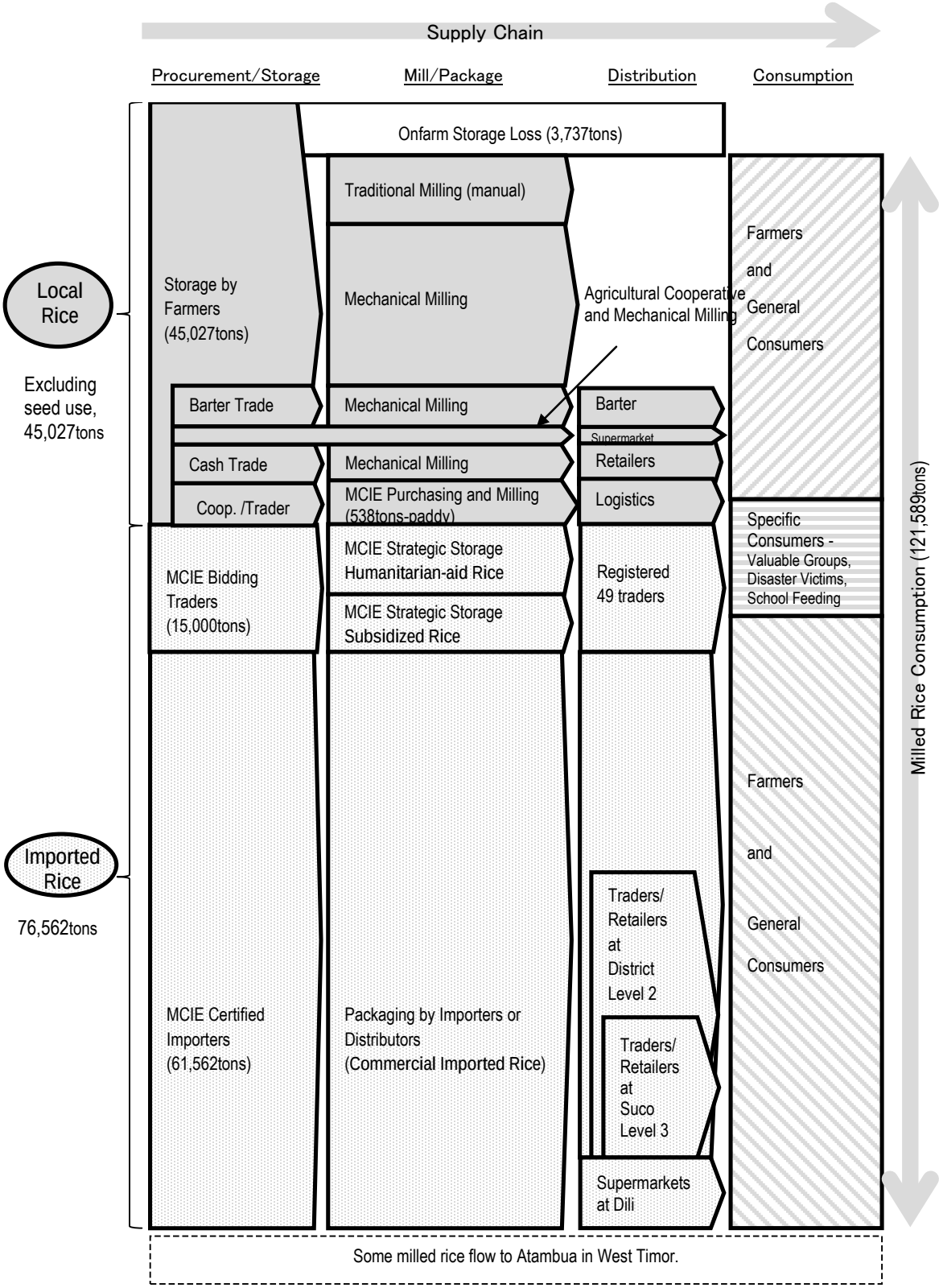
The aspects on rice marketing in Timor-Leste are unique and shown as follows:

- It is estimated that imported rice occupies 64.5% of total consumed rice in 2012, therefore,

the prices of imported rice impacts on pricing of local rice. The target of self-sufficiency 100% set by SDP will not achieve, if the international prices continue stable lower. However, the government should consider risks depending on imported rice due to extraordinary disasters in rice export country by climate changes, international economic crisis such like the 2008 case and increasing rice demands in the world.

- For distribution of imported rice, multiple middlemen are involved, therefore, the rice prices tends to more expensive in the isolated village far from Dili.
- The surplus of local rice in the production areas is estimated at about 30%, and about 70% of local rice is consumed by the producers, their relatives and the villagers.
- The inflow of imported rice is effective on depression of consumer's prices. Meanwhile, MCIE purchases local paddy at the price of 50% additional of farm gate prices. These contradictory pricing policies cause deficit resell of local rice. Other problem is that MCIE does not inspect quality of paddy.
- In long term aspects, the demands of rice have been increasing even in rural areas by the result of constant inflow of cheap Vietnamese rice (broken 15%).
- The quite limited volume of local rice is available at US$15.0 per 10kg package and sold by the supermarkets in Dili at the rate of 1.0ton per month. The selling price is equivalent to Thai Jasmine Rice. It proves that certain clients to consume local rice exist in Dili.
- Market exploration for the specialty rice including sticky rice, half milled rice, no-broken rice/ broken rice and processing-use rice should be conducted, because they are commonly found in Association of South East Asian Nations (ASEAN) counties.
- Maliana traders used to sell milled rice to West Timor. It is better to negotiate with Indonesian provincial government of Nusa Tenggara Timur for food security in West Timor. There are opportunities to sell quality Timorese rice to Atambua or Kupang.

The diagram for flow and volume of paddy and milled rice is shown in Figure 3-6-1.



Remarks : The tonnages show in milled rice base. The figures were referred to various statistics and data of MAF and MCIE in 2013.

Figure 3-6-1 Marketing Channels of Local Rice and Imported Rice

3-6-4 Estimated Rice Balance Based on Marketing Survey

The post-harvest losses are taken the average of rice and maize, and the losses are not clear from harvesting or farm gate storing. It can be assumed that yield surveys are implemented in good conditions of plots. There are possibilities

In this calculation, the yields are measured in good harvesting conditions. According to SoL survey, 56% of irrigated rice farmers had experiences of losses in the preharvest stage due to rats, pests, diseases and heavy rainfall. Therefore, it is suspected that the official data of yields are estimated higher than actual yields (Table 3-6-7).

Table 3-6-7 Losses in Preharvest（SoL）

Main Staple Grains	Rice		Maize	
Area	Irrigated	Rain-fed	Irrigated	Rain-fed
No. of Answers	387	215	21	1,277
Losses Occurred	56%	31%	1%	87%
Major Reasons of Losses				
Rodents (rat)	36%	38%	30%	31%
Livestock/ dogs	14%	7%	39%	15%
Wild animals	8%	10%	15%	31%
Locusts	11%	9%	0	1%
Pests and Diseases	14%	7%	3%	2%
Rainfall Damages	14%	21%	16%	9%
Draught Damages	2%	6%	3%	3%

Furthermore, it was confirmed that damages by pests, disease and floods in the field survey conducted by JICA team. It is estimated that the preharvest losses would beyond 10-30% depending on districts. The rice demand/supply balance is shown in Table 3-6-8 considering the said preharvest losses, onfarm storage losses at 8.3% and milling recovery at 51.5%.

Table 3-6-8 Rice Demand/Supply Balance by District Based on JICA Survey

District	Paddy Production 2012	Planted Area 2012	Seed Requirement 35kg/ha	Paddy excluding Seed	Preharvest Losses in Percentage	Preharvest Losses in Weight	Onfarm Storage Losses 8.3%	Paddy excluding Losses	Milled Rice 51.5%	Population 2010	Estimated 2.41%/year 2012	Food Use 106kg/person 2012	Deficit/ Surplus 2012	Supply/ Demand Ratio	Rank of Surplus	Rank of Surplus Ratio
	(ton)	(ha)	(ton)	(ton)	(%)	(ton)	(ton)	(ton)	(ton)	(persons)	(persons)	(ton)	(ton)	(%)	2012	2012
	1	2	3		4		5		6	7	8	9				
Aileu	1,034	407	14	1,020	10	918	76	943	486	44,325	46,487	4,928	-4,442	9.9	8	11
Ainaro	9,623	1,948	68	9,555	30	6,688	555	9,000	4,635	59,175	62,062	6,579	-1,944	70.5	5	5
Baucau	40,286	11,098	388	39,897	30	27,928	2,318	37,579	19,353	111,694	117,143	12,417	6,936	155.9	1	1
Bobonaro	11,856	3,648	128	11,728	10	10,555	876	10,852	5,589	92,049	96,539	10,233	-4,644	54.6	10	6
Covalima	10,719	3,526	123	10,596	30	7,417	616	9,980	5,140	59,455	62,355	6,610	-1,470	77.8	4	4
Dili	260	80	3	257	10	231	19	238	123	234,026	245,442	26,017	-25,894	0.5	13	13
Ermera	4,535	1,404	49	4,486	10	4,037	335	4,151	2,138	117,064	122,774	13,014	-10,876	16.4	12	10
Lautem	6,610	1,836	64	6,545	20	5,236	435	6,111	3,147	59,787	62,703	6,647	-3,500	47.3	6	7
Liquica	1,083	359	13	1,070	10	963	80	990	510	63,403	66,496	7,049	-6,539	7.2	11	12
Manatuto	8,368	2,789	98	8,270	30	5,789	480	7,789	4,012	42,742	44,827	4,752	-740	84.4	3	3
Manufahi	2,613	804	28	2,585	30	1,809	150	2,435	1,254	48,628	51,000	5,406	-4,152	23.2	7	9
Oecusse	5,281	2,491	87	5,194	20	4,155	345	4,849	2,497	64,025	67,148	7,118	-4,621	35.1	9	8
Viqueque	16,900	5,200	182	16,718	30	11,703	971	15,747	8,110	70,036	73,452	7,786	324	104.2	2	2
Total	119,166	35,590	1,246	117,921	26	87,431	7,257	110,664	56,992	1,066,409	1,118,429	118,554	-61,562	48.1	-	-

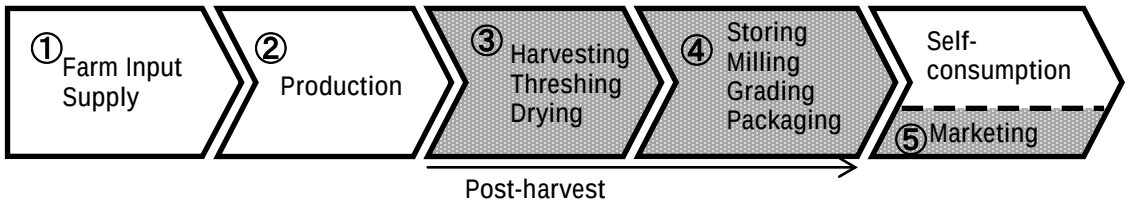
Source : 1-2 MAF-NDAH, 3 MAF Food and Nutrition Security Office, 4-6 JICA Team, 7-9 MAF Food and Nutrition Security Office and KONSSANTIL

The total deficits of rice in 2013 at the annual consumption rate of 106kg/person are estimated at 60,183tons in KONSSANTIL and 61,562tons in JICA survey. Locally-produced rice were supplied insufficiently in all districts except Baucau and Viqueque. The self-sufficiency of rice excluding strategic storage was only 48.1%. Total 76,562tons of rice including deficits at 61,562tons and storage 15,000tons were required to import equivalent to 64.5% of whole consumption in 2013. MCIE provides licenses to traders for rice import and releases strategic storage. However, the supply structure of rice is very vulnerable against a sharp rise of international rice prices.

3-6-5 Issues on Post-harvest and Marketing of Local Rice

In order to compete with imported rice, MAF should have strategies on local rice in A) strengthening on competitive pricing, B) improvement of quality and value-adding. The major constrains on value-chain are shown in Table 3-6-9.

Table 3-6-9 Constrains by Value-Chain of Local Rice



①	②	③	④	⑤
A. Constrains on Competitive Pricing				
The costs on tilling and paddling are increasing, and the plot size is small. The farmers do not have capitals to procure power tillers. Chemical fertilizers and pesticides/ fungicides are not available. The input provision by MAF to farmers is not financially sustainable and creates unfairness among farmers.	In most of the areas, the yields are lower than Indonesia. Labor costs on works of fertilizer application, transplanting, paddling, weeding, additional fertilizer application and pest control are increasing. In rain seasons, the farm road cannot be passed. Crop sharing rates with landowners are high at 50% of harvest. Most of farmers are scaring water shortage during sooting-flowing stages, and tend to avoid two cropping in one year.	Increase of labor costs are critical for harvesting, threshing and drying due to shift of workers from agriculture to construction. Introduction of combine harvesters and drying machines are not practical, if considering maintenance abilities of general farmers and unavailability of after-sales-services by agents.	The economic incentives to invest on renewal of rice milling machines are not high. Large-scale marketing of milled rice has not been developed to reduce the costs. The costs on collection of paddy are high due to lack of cooperatives/ groups and no joint-use storing facilities There are no incentives to grade milled rice with broken rice due to no rice related products.	The consumer prices of local rice are easily affected by imported rice prices. When imported rice is not supplied in the markers due to escalation of international prices, local rice also jump up. Transporting costs are very expensive due to high costs of fuels and high fuel consumption (narrow, bendy and sloping road structure). There are no rice marketing groups. MCIE does not issue the export licenses of local milled rice to West Timor to avoid mixture of imported rice. MCIE purchases limited volume of paddy in high prices than market prices.
B. Constrains on Quality Improvement and Value-adding				
The MAF recommended seeds and local fixed-variety seeds are insufficiently available. To cope with insufficient chemical fertilizers and chemical pesticides/ fungicides, the farmers' groups for organic fertilizer production are not prevailed.	Damage rice can be found frequently due to pests and diseases such as sting bugs and rice blast bacteria. Dead rice and milky rice are found frequently due to lack of water supply during flowering stage. Many farms do not practice radical technologies of ICM or SRI.	The sufficient space and labors for drying are not available. Solar drying is commonly conducted, but it is not suitable at the end of rain seasons to control moisture contents. Wet paddy affect on whiteness of milled rice. Harvesting in dry season tend to	Packaging materials should import from Indonesia in higher prices. In milled rice, contents of damages grains, impurities and broken grains are higher. Whiteness of rice is generally low. Damages during storage are frequent attacked	The visual quality of local rice is lower than imported rice. In the local markets, the quality of rice is not relating to the prices. Transactions for retailing are primitive; use of different sizes of cans and pricing in 10 ¢ or 25 ¢ unit. There are no rice

There is no introduction of niche rice such as sticky rice.		over drying on fields, if harvesting is delay. This causes appearance of broken rice.	by rats, rice weevils and fungi. The labors for grading after milling are expensive.	quality standards, even for MCIE purchasing system. Branding of rice is not promoted. There is no processing industry to use rice such as noodles and cakes.

In order to cope with the above constrains, MAF, international/ local organizations and privates have been implementing various projects shown in Table 3-6-10.

Table 3-6-10 Major Rice Related Activities Classified by Value-Chain

1) Farm Input Supply	2) Production	3) Harvesting, Threshing, Drying	4) Storing, Milling, Grading, Packaging	5) Marketing
Provision of small credits to member farmers by credit cooperatives Provision of loans to agricultural cooperatives by NGO Extension of natural farming technologies by NGO (Oxfam、Care International, World Vision, CRS, Local NGOs) Seed multiplication of disease durable and high yield varieties and seed business commercialization by MAF and SoL Breeding of local fixed varieties under bio-diversification project by MAF and GIZ Subsidized provision of inputs by MAF	Extension of appropriate technologies for paddy farming by MAF, GIZ, JICA and NGOs such as GAP Rehabilitation of irrigation facilities by MAF, JICA, WB and NGOs Capacity building of extension officers and the department by MAF and GIZ Trials of bio-fertilizers and bio-control methods by MAF Strengthening of WAUs by JICA (Manatuto) Machinery services by MAF	Traditional cooperation among farmers called *Hanesan* Joint-works among agricultural cooperatives Threshing services by privates Provision of tarpaulin sheets for solar drying	Renewal of rice milling machines in Maliana and Baucau by privates Training on rice milling technologies for extension workers by MAF Subsidized provision of metal bins and plastic containers for storage of seeds (FAO, IFAD, USAID) Financial support of large-scale rice mill in Baucau (Ausaid)	Sales of branded rice by Sargeilos Agric. Cooperative and Secar Agric. Cooperative Sales of specialty rice by rural women group (Uatolari-Makadiki Group) Promotion of local agricultural products including rice under SIPI (One Village One Product Movement) supported by JOCV Strengthening of various types of cooperatives by MCIE MCIE paddy purchasing system (but negative impact)

Current actives seem to concentrate inputs and production, and post-harvest and marketing actives are not so focused. It is expected that improvement of post-harvest technologies can conduct upgrading of rice quality or value-adding under the rice marketing improvement programs. Among the current MAF activities, the program of SIPI (One Village One Product Movement) supervised by NDA is effective on sales promotion of quality local rice produced by farmers' groups or practical farmers. The large-scale rice mill constructed under Market Development Facility Program coordinated by Ausaid is also expected to promote local rice.

For strengthening of the price competitiveness, production costs (the currently at US$0.19/kg-paddy) should be depressed by increase of yields and control of rats, pests and diseases. Simultaneously, consciousness of farmers should be driven to sales and production of high quality rice. MAF should provide circumstances that i) Farmers can decide the market demanding varieties, ii) Farmers can increase of yields in low costs and iii) Farmers consider quality of paddy/rice and iv) Farmers have alternative marketing channels, not by direct supports of inputs.

For rice production and marketing, the functions of private sector should be strengthened. The business on tilling, harvesting and milling services can lead to reduce the costs to compete with imported rice. The current machinery services of MAF may provide negative impacts on fostering private activities. The project activities to produce metal bins (small silos) or weeding machines by DFAT, IFAD, GIZ and USAid are very small scale, but they can provide opportunities to develop local cottage industries, which are very important approaches for improvement of post-harvest stages.

3-7 IRRIGATION

3-7-1 Irrigation Scheme and Irrigation Area Based on Existing Survey

According to inventory survey which is conducted from Dec. 2013 to Jun. 2014, 425 irrigation schemes are idenified in Timor-Leste (refered to Table 3-7-1). Surveyed irrigation schemes are categorized into three (3) classifications which follows MAF criteria. Table 3-7-1 shows the number of irrigation scheme of each district. Figure 3-7-1 shows the location of irrigation scheme and Table 3-7-2 shows the result of survey for each district. Detail of inventry survey of irrigation shceme is shown in the Appendix. The collected data through inventory survey is installed in the system of ALGIS so that they could easily use for management of entire irrigation scheme and make irrigation project for the future.

Classification	Description
Technical Scheme	Weir, Intake facility and canal are constructed in scheme
Semi-Technical Scheme	Intake facility is only constructed in scheme Intake volume might be changed readily due to altering of water stream alignment.
Traditional Scheme	Intake water directly come from river by simple earth and bolder weir. This irrigation way is applied for small scheme

Table 3-7-1 Summary Table on Irrigation Inventory (in 2014)

District	Number of scheme	Number of each scheme class in 2014			Irrigated Area of each classified scheme in 2014				Potential area
		TC	S	TR	TC	S	TR	Total (ha)	Total (ha)
Aileu	9	1	2	6	30	105	132	267	377
Ainaro	15	0	4	11	0	248	900	1,148	5,199
Baucau	152	2	1	149	1,066	207	7,754	9,027	17,359
Bobonaro	29	2	9	18	930	3,232	731	4,893	6,884
Cova Lima	19	2	6	11	692	668	1,322	2,682	4,647
Dili	2	0	1	1	0	10	38	48	125
Ermera	14	0	7	7	0	593	592	1,185	1,167
Lautém	47	2	1	44	103	944	1,815	2,862	2,743
Liquiçà	7	0	2	5	0	217	469	686	916
Manatuto	54	0	6	48	0	1,966	2,509	4,475	6,093
Manufahi	11	1	4	6	850	305	377	1,532	8,332
Viqueque	40	6	4	30	1,871	702	1,823	4,396	8,173
Oecusse	26	9	17	0	399	759	0	1,158	4,487
	425	25	64	336	5,941	9,956	18,462	34,359	66,501

*1) Classification of "Technical scheme : TC", "Semi-Technical scheme : S", "Traditional scheme : TR" in this Survey does not necessarily match with classification of facility by MAF. For example, Traditional scheme by MAFs classification lead the river water to the intake by cofferdam. Some of Traditional scheme, however, consist of wet masonry at intake without gate, which is conformity with classification of Semi-Technical scheme according to MAFs classification. Therefore, classification between Semi-Technical scheme and Traditional scheme are mixed partly and not clear definition. In here, these classifications can be evaluated general trend of the situation or development on irrigation facility

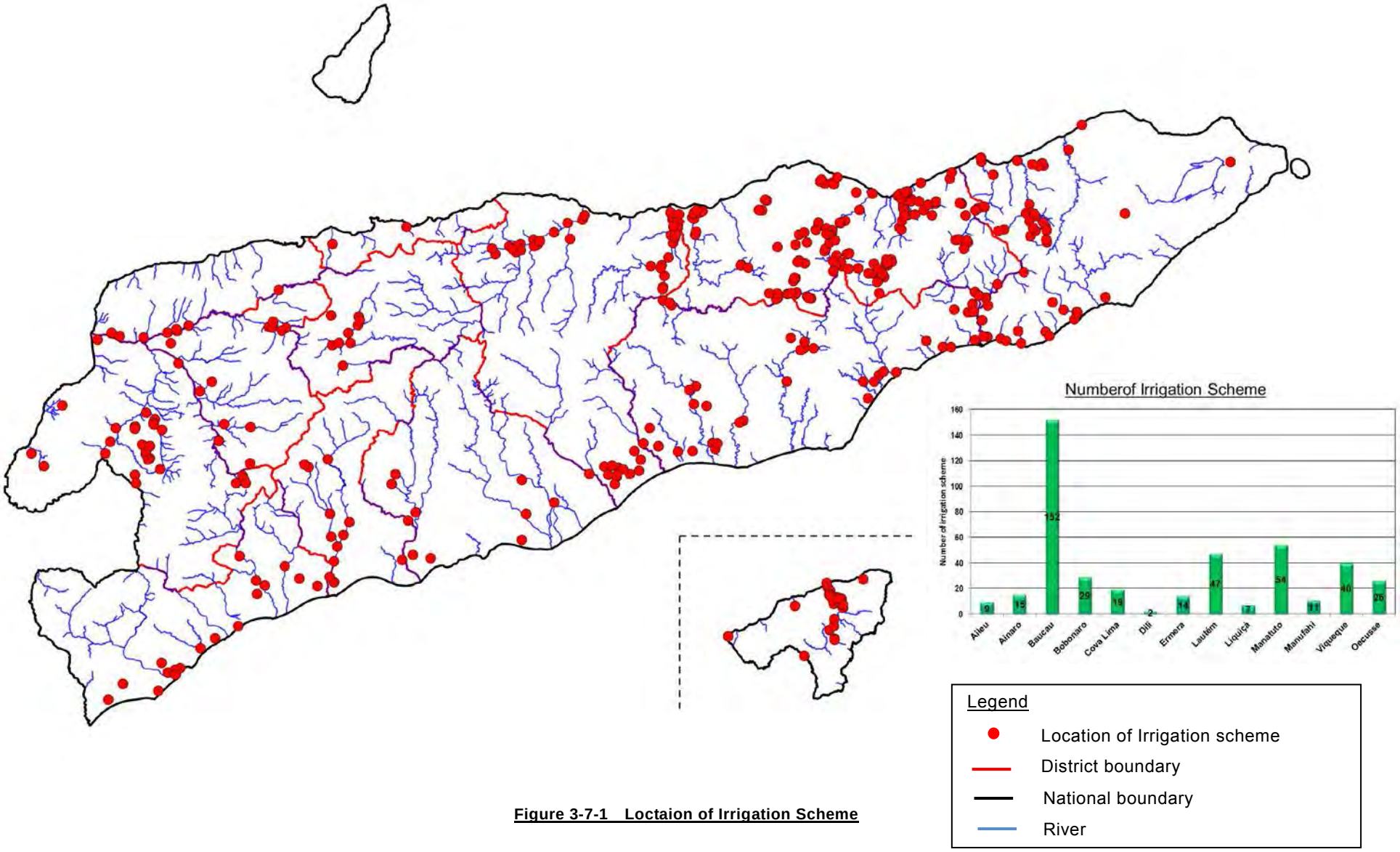


Figure 3-7-1 Loctaion of Irrigation Scheme

Table 3-7-2 Summary of Inventory Survey(1/2)

Name of district		Aileu	Ainaro	Baucau	Bobonaro	Cova Lima	Dili	Ermera	Lautém	Liquiçà	Manatuto	Manufahi	Viqueque	Oecusse	Total
1. Basic information of irrigation scheme															
	# of irrigation scheme	9	15	152	29	19	2	14	47	7	54	11	40	26	425
	Present irrigated area (ha)	267	1,148	9,027	4,893	2,682	48	1,185	2,862	686	4,475	1,532	4,396	1,158	34,359
	Ratio of ~10ha	0%	0%	7%	3%	0%	0%	7%	15%	0%	11%	0%	8%	27%	
	Ratio of 10~50ha	78%	47%	30%	38%	16%	100%	64%	53%	14%	39%	36%	15%	42%	
	Ratio of 50~100ha	22%	13%	10%	14%	26%	0%	0%	9%	14%	19%	18%	30%	12%	
	Ratio of 100~250ha	0%	13%	28%	24%	26%	0%	14%	19%	71%	19%	36%	10%	19%	
	Ratio of 250~500ha	0%	27%	20%	10%	0%	0%	14%	2%	0%	9%	0%	30%	0%	
	Ratio of 500~750ha	0%	0%	5%	0%	5%	0%	0%	0%	0%	4%	0%	0%	0%	
	Ratio of 750~1000ha	0%	0%	0%	3%	26%	0%	0%	2%	0%	0%	9%	0%	0%	
	Ratio of 1000ha~	0%	0%	1%	7%	0%	0%	0%	0%	0%	0%	0%	8%	0%	
		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	Number of ~10ha	0	0	10	1	0	0	1	7	0	6	0	3	7	35
	Number of 10~50ha	7	7	45	11	3	2	9	25	1	21	4	6	11	152
	Number of 50~100ha	2	2	15	4	5	0	0	4	1	10	2	12	3	60
	Number of 100~250ha	0	2	43	7	5	0	2	9	5	10	4	4	5	96
	Number of 250~500ha	0	4	31	3	0	0	2	1	0	5	0	12	0	58
	Number of 500~750ha	0	0	7	0	1	0	0	0	0	2	0	0	0	10
	Number of 750~1000ha	0	0	0	1	5	0	0	1	0	0	1	0	0	8
	Number of 1000ha~	0	0	1	2	0	0	0	0	0	0	0	3	0	6
		9	15	152	29	19	2	14	47	7	54	11	40	26	425
	Potential irrigated area (ha)	377	5,199	17,359	6,884	4,647	125	1,167	2,743	916	6,093	8,332	8,173	4,487	66,501
	Ave. present irrigated area per 1 scheme	29.7	95.7	103.8	203.9	178.8	24.0	91.2	71.5	114.3	101.7	153.2	157.0	46.3	
	Planed irrigated area (ha)	377	5,199	17,359	6,884	4,647	125	1,167	2,743	916	6,093	8,332	8,173	4,487	66,501
	Ave. planed irrigated area per 1 scheme	41.9	346.6	114.2	237.4	244.6	62.5	89.8	58.4	152.7	112.8	757.5	204.3	172.6	
	# of household	474	3,970	13,435	3,996	6,675	70	1,543	2,373	1,507	4,824	5,997	17,420	1,890	64,174
	Ave. # of household	53	265	89	138	351	35	110	50	215	89	545	436	73	
Variety of irrigation structure															
	# of structure	17	20	348	61	30	4	26	67	11	120	20	66	54	844
	Weir	1	0	3	2	1	0	0	1	0	0	1	6	1	16
	Intake	7	5	152	22	5	2	12	11	4	50	4	15	10	299
	Canal	9	15	157	29	19	2	14	47	7	54	11	40	26	430
	Pump	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pond / lake	0	0	36	8	5	0	0	8	0	16	4	5	17	99
Constructed yr.															
	Unknown	22%	27%	87%	41%	47%	0%	86%	91%	86%	91%	27%	43%	35%	
	Bebre 1970s	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	1970s	0%	0%	1%	3%	0%	50%	0%	4%	0%	6%	0%	0%	27%	
	1980s	22%	0%	0%	3%	5%	0%	14%	2%	14%	0%	0%	3%	23%	
	1990s	22%	0%	3%	14%	16%	0%	0%	0%	0%	2%	9%	13%	8%	
	2000s	22%	0%	5%	31%	16%	50%	0%	2%	0%	2%	18%	20%	8%	
	2010s	11%	73%	4%	7%	16%	0%	0%	0%	0%	0%	45%	23%	0%	
Rehabilitated yr.															
	Bebre 1960	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	1970s	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	1980s	0%	0%	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	0%	
	1990s	0%	0%	1%	0%	0%	0%	0%	0%	0%	9%	0%	0%	4%	
	2000s	11%	0%	5%	17%	0%	50%	7%	9%	0%	9%	0%	0%	27%	
	2010s	67%	7%	7%	14%	0%	0%	21%	0%	29%	24%	27%	10%	15%	
Weir and Intake	Ave. Height(m)	1.84		1.37	1.84	1.65	4.50	0.88	3.03	1.20	1.14	1.16	1.69	1.75	
	Ave.Span #	1.20		0.79	1.33	1.00	1.00	1.00	1.00	1.00	1.26	1.00	1.00	1.00	
	Ave.Width / 1 span	1.37		1.30	1.53	1.44	2.50	1.75	2.25	1.40	2.39	1.40	3.84	2.90	
	Ave.Gate #	1.20		0.14	1.21	1.00	2.00	0.43	1.00	0.00	1.13	1.00	1.63	2.00	
Canal	Ave. length of canal (m)	365	1,163	900	1,285	1,943	950	908	832	807	2,597	1,308	1,727	598	
	Ave. Width of canal (m)	1.01	0.84	1.08	1.05	1.69	0.95	1.11	1.57	1.72	1.58	1.14	1.02	1.08	
	Ave. Width of Height (m)	0.64	0.73	0.76	1.51	1.10	0.8	0.67	1.03	0.88	0.92	0.71	0.90	1.28	
Pond / Lake	Ave. Diameter (m)	#DIV/0!	#DIV/0!	8.62	6.71	8.00	#DIV/0!	#DIV/0!	2.50	#DIV/0!	200.00	30.00	60	70.00	
	Ave. Depth (m)	#DIV/0!	#DIV/0!	1.68	1.21	1.00	#DIV/0!	#DIV/0!	0.80	#DIV/0!	4.3	1.60	15	1.00	
2. Problem of structure															
Weir and Intake	# of irri. scheme which answered existing problem	7	5	103	22	8	2	11	14	5	34	3	14	17	245
Variety of problem	# of respondents who answered existing problem	22	4	185	39	25	4	26	23	16	85	6	25	39	499
	Damage of structure	23%	25%	33%	15%	32%	0%	27%	43%	19%	35%	50%	48%	36%	
	Deterioration (weaken function)	18%	50%	16%	5%	32%	25%	12%	39%	25%	18%	17%	20%	18%	
	Un-operation gate	14%	0%	3%	3%	0%	25%	12%	4%	19%	6%	0%	0%	8%	
	Difficulty of keeping water level	18%	0%	5%	28%	8%	25%	23%	4%	13%	2%	0%	8%	5%	
	Obstruction of water delivery	14%	25%	40%	46%	28%	25%	27%	9%	13%	31%	33%	24%	28%	
	High maintenance cost	14%	0%	3%	3%	0%	0%	0%	0%	13%	8%	0%	0%	5%	
	Maintenance cost in year, if any	150,000		250,000	50,000						55,000			500	
Canal	# of irri. scheme which answered existing problem	8	13	130	20	13	2	9	41	5	26	10	36	11	324
Variety of problem	# of respondents who answered existing problem	17	35	225	27	29	8	21	113	14	75	27	87	24	702
	Damage of structure	0%	29%	32%	7%	24%	25%	29%	34%	29%	29%	37%	37%	33%	
	Deterioration (weaken function)	24%	17%	20%	11%	45%	25%	19%	35%	29%	25%	33%	22%	33%	
	Un-control of gate	12%	0%	0%	7%	0%	0%	14%	2%	7%	4%	0%	0%	0%	
	Difficulty of keeping water level	35%	14%	4%	11%	0%	25%	24%	14%	7%	7%	0%	6%	4%	
	Obstruction of water delivery	29%	40%	43%	59%	31%	25%	14%	14%	29%	28%	30%	36%	25%	
	High maintenance cost	0%	0%	1%	4%	0%	0%	0%	1%	0%	7%	0%	0%	4%	
Pump		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Pond / lake	# of irri. scheme which answered existing problem	0	0	15	6	1	0	0	2	0	1	0	2	3	30
Variety of problem	# of respondents who answered existing problem	0	0	13	6	1	0	0	2	0	1	0	2	10	35
	Damage of structure			31%	17%	0%			50%		0%		0%	30%	
	Deterioration (weaken function)			15%	0%	100%			0%		0%		100%	30%	
	Un-operation gate			0%	0%	0%			0%		0%		0%	30%	
	Difficulty of keeping water volume			54%	83%	0%			50%		100%		0%	10%	
	High maintenance cost														
3. Problem of irrigation scheme															
	# of respondents who answered shortage of water	8	12	133	21	19	2	12	38	5	33	11	38	15	347
	Frequency of occurrence: every yr.	78%	20%	70%	66%	100%	100%	86%	79%	71%	57%	100%	43%	46%	
	Frequency of occurrence : a few in 5 yrs	0%	73%	6%	0%	0%	0%	0%	0%	0%	0%	0%	50%	8%	
	Frequency of occurrence : a few in 10 yrs	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	# of respondents who answered flood influence	8	12	101	21	7	2	10	33	3	38	8	26	14	283
	Frequency of occurrence: every yr.	67%	7%	55%	72%	26%	100%	71%	64%	43%	52%	27%	28%	54%	
	Frequency of occurrence : a few in 5 yrs	11%	73%	6%	0%	11%	0%	0%	4%	0%	0%	45%	38%	0%	
	Frequency of occurrence : a few in 10 yrs	0%	0%	0%	0%	0%	0%	0%	2%	0%	2%	0%	0%	0%	
	# of respondents who answered shortage of workers	6	0	6	0	0	0	0	0	1	5	0	0	1	19

Table3-7-2 Summary of Inventory Survey(2/2)

Name of district		Aileu	Ainaro	Baucau	Bobonaro	Cova Lima	Dili	Ermera	Lautém	Liquiçà	Manatuto	Manufahi	Viqueque	Oecusse	Total
4.WUA (Water Users Association) and Traditional water group (Tr.WG)															
# of respondents who answered WUA or Tr.WG exist		9	15	143	26	19	1	14	6	5	28	11	40	26	343
	(Ratio of existance in scheme)	100%	100%	94%	90%	100%	50%	100%	13%	71%	52%	100%	100%	100%	
Variety of group	WUA	0%	0%	0%	23%	0%	0%	0%	0%	0%	4%	36%	13%	42%	
	Traditional. WG	100%	100%	100%	77%	100%	100%	100%	100%	100%	96%	64%	88%	58%	
	Others	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
# of group	1 group	44%	0%	77%	50%	0%	0%	14%	50%	40%	14%	9%	18%	27%	
	2~3 groups	33%	0%	13%	38%	0%	100%	50%	0%	0%	4%	0%	8%	50%	
	4~5 groups	0%	0%	3%	8%	0%	0%	29%	0%	0%	0%	0%	0%	4%	
	6~7 groups	0%	0%	0%	0%	0%	0%	7%	0%	0%	0%	0%	0%	0%	
	8~10 groups	0%	0%	0%	0%	0%	0%	0%	0%	60%	0%	0%	0%	12%	
	>10 groups	11%	0%	0%	4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
# of respondents who answered membership or water fee exist		0	0	1	17	0	0	0	0	0	2	0	0	0	20
Way of pay the fee	Membership fee by US$ (# of group)	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	
	Ave : US$/ha				10.0						5.0				
	Water fee by US$ (# of group)	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Ave:US$/ha				1.1										
	Membership fee by rice (# of group)	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	
	Ave:kg/ha				50.0										
	Water fee by rice (# of group)	0.0	0.0	1.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	Ave:kg/ha			20.0	29.0										
# of Group which change membership or water fee		0	0	1	6	0	0	0	0	0	1	0	6	0	14
Times of meeting in yr.	Ave	5.4		1.3	1.0		1.0	2.1	1.0	1.0		2.0	2.2	2.0	
	0 times / no answer	44%	100%	2%	4%	100%	0%	0%	50%	0%	100%	91%	68%	0%	
	1 times	33%	0%	92%	92%	0%	100%	36%	50%	100%	0%	0%	0%	58%	
	2 times	0%	0%	3%	4%	0%	0%	50%	0%	0%	0%	9%	25%	12%	
	3 times	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%	12%	
	>3 times	22%	0%	2%	0%	0%	0%	14%	0%	0%	0%	0%	0%	19%	
Activity of group	Operation of gate	56%	0%	5%	42%	0%	100%	21%	0%	20%	7%	0%	20%	35%	
	Maintenance of gate	56%	0%	5%	46%	0%	0%	0%	0%	0%	4%	0%	5%	8%	
	Canal cleaning	100%	100%	94%	96%	100%	100%	100%	100%	100%	100%	100%	100%	96%	
	Rehabilitation of canal	67%	0%	6%	8%	0%	0%	0%	0%	20%	7%	0%	0%	69%	
	Operation of pump	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Maintenance of pump	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
	Others	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
The reason for un-establishment of WUA or Tr.WG															
	No answer or unknown		No answer	No answer		No answer		No answer				No answer	No answer	No answer	
	The reason for un-establishment														
	Some obstruction for establishment	0	0	0	1	0	0	0	42	0	22	0	0	0	65
	Under establishment	0	0	0	1	0	0	0	0	0	2	0	0	0	3
	No need to establish	1	0	0	1	0	0	0	0	1	4	0	0	0	7
	Already expired	0	0	0	0	0	1	0	0	1	1	0	0	0	3
	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5. Crop (Respondents who is extension stuff or representative of Group)															
Average income per one farmer by all of crop production : $/yr		493	1,103	864	1,125	810	375	618	416	850	560	873	1,076	296	9,459
kind of the agricultural prod	Rice	100%	100%	87%	97%	100%	50%	93%	72%	57%	81%	100%	100%	92%	
	Maize	100%	27%	20%	76%	11%	50%	71%	2%	43%	37%	64%	0%	4%	
	Beans	56%	0%	10%	17%	0%	50%	29%	2%	0%	22%	18%	0%	4%	
	Cassava	67%	0%	9%	38%	0%	50%	21%	2%	0%	41%	0%	0%	0%	
	Potato/Sweet Potato	78%	0%	11%	10%	0%	50%	21%	0%	0%	37%	0%	0%	0%	
	Other														
Rice (by interview)															
	Conduction of double cropping	67%	7%	17%	61%	16%	—	31%	6%	0%	9%	0%	20%	46%	
	cultivated paddy area : Dry season(ha)	54.00	20.00	573.00	1498.00	340.00	—	143.00	10.00	0.00	204.00	0.00	1450.00	826.00	5,118
	cultivated paddy area : Rainy season(ha)	238.00	2305.00	9637.50	4919.00	1766.00	—	959.00	981.50	29.00	3699.00	989.00	4385.00	2329.00	32,237
	Harvest: Dry season(kg)	8,950	500	24,070	37,600	66,880	—	6,510	500	0	0	0	35,660	12,630	193,300
	Harvest: Rainy season (kg)	22,550	348,470	681,890	87,400	349,250	—	16,565	18,860	700	1,440	246,000	121,370	30,860	1,925,355
The reason for not double cropping															
	Water shortage	3	10	83	7	15	0	7	24	3	18	7	27	12	216
	Shortage of workers	0	0	29	0	0	0	1	4	0	1	0	0	0	35
	No need double cropping	0	0	8	1	0	0	0	0	0	1	0	0	2	12
	Shortage of buffalo	0	0	26	0	0	0	0	2	0	3	0	0	0	31
	Other reason	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	# of area which is milling machine	1	8	111	16	16	1	4	4	0	1	7	32	5	206
	The respondents who has purchased the rice (by interview)	4	15	73	11	19	0	9	3	0	41	11	40	11	237
	Price of rice by purchase (US$/kg)			0.5	0.5										
	Volume of rice by purchase (kg)														
	The respondents who has sold the rice (by interview)	3	12	33	19	14	0	5	1	0	8	10	39	15	159
	Bring to market by own	33%	100%	46%	53%	71%		33%	0%		23%	80%	95%	76%	
	sell price : $/kg	1.25	0.35	0.5	0.45	0.35						0.35	0.36	0.57	
	By trader	33%	0%	10%	8%	29%		0%	0%		54%	20%	2%	12%	
	sell price : $/kg	1.25			0.5	0.36					1.92	0.35	0.35		
	Sell at own house	33%	0%	44%	39%	0%		67%	100%		23%	0%	2%	12%	
	sell price : $/kg	1.25		0.5	0.31						5		0.25	0.5	
Maize (by interview)															
	ha (Ave)	4.67	5.67	10.74	47.10	1.00		19.63	2.50	7.00	0.37	1.00		2.00	
	kg/yr (Ave)	98	1,072	1,794	2,090	200		1,831	75			1,575			
Use of fertilizer (by interview)															
	The respondents who answered "yes"	6	0	13	3	0	0	1	2	0	7	0	0	24	56
How to get	By own	2	0	13	3	0	0	1	2	0	1	0	0	21	43
	By MAF	5	0	11	1	0	0	0	0	0	7	0	0	3	27
	By others (NGO etc)	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Use of Insecticide (by interview)															
	The respondents who answered "yes"	6	0	49	19	0	0	7	1	2	20	0	0	25	129
How to get	By own	4	0	41	19	0	0	2	1	0	1	0	0	22	90
	By MAF	4	0	42	10	0	0	5	1	2	20	0	0	0	84
	By others (NGO etc)	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Use of weedicide (by interview)															
	The respondents who answered "yes"	1	0	9	19	0	0	4	0	0	2	0	0	25	60
How to get	By own	1	0	9	19	0	0	2	0	0	2	0	0	22	55
	By MAF	1	0	7	9	0	0	3	0	0	0	0	0	0	20
	By others (NGO etc)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Social condition (Respondents who is extension stuff or representative of Group)															
Usage the irrigation water	Drinking water	22%	0%	29%	29%	0%	0%	14%	0%	0%	23%	0%	0%	35%	
	Washing clothes and take bath	89%	100%	68%	96%	100%	0%	100%	100%	71%	100%	100%	100%	100%	
	For livestocks	100%	100%	97%	100%	100%	100%	79%	89%	100%	96%	100%	84%	100%	
	Others	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Variety of Women's works	Works for livestocks	100%	0%	20%	82%	0%	100%	86%	91%	100%	0%	0%	0%	100%	
	Land preparation	100%	0%	16%	4%	0%	100%	93%	6%	86%	0%	0%	0%	100%	
	Planting	100%	100%	96%	96%	100%	100%	100%	94%	100%	100%	100%	100%	100%	
	Harvesting	100%	100%	100%	96%	100%	100%	100%	94%	100%	100%	100%	100%	100%	
	Others	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
The respondents who answered "yes" for famer's works sharing of women		9	15	137	28	19	1	14	32	7	45	11	38	26	
The respondents who answered "yes" for Participants of women for the meeting, who has right		9	0	49	14	0	1	13	3	4	4	0	2	23	122
The respondents who answered "yes" for Effect of Conflict (by interview)		0	0	0	0	0	0	0	0	0	0	0	0	0	0

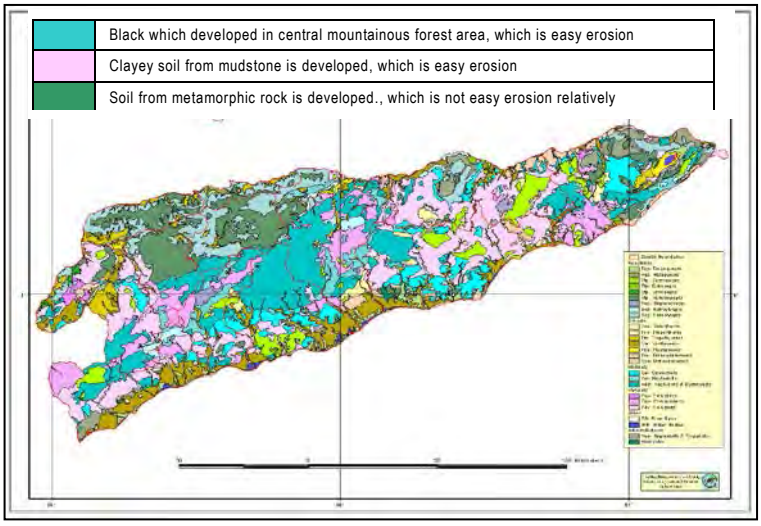
3-7-2 Actual Situation of Iirrigation

(1) Feature of river discharge and intake from river

Almost irrigation schemes rely on the river water, therefore the irrigation water depends on the pattern of hydrological river discharge. In general, considering the association between actual situation of irrigation water and hydrological river discharge, the following features are shown;

- In almost river, Hydrological river discharge is proportional to the rain fall in short term, due to the nothing of reservoir in upstream area.

- Vegetation at catchment area is shown that the north area is observed the sparse dried forest area which is few vegetation cover and the south area is observed dense forest. As the feature of soil condition, these are shown as followings; i) in central mountainous area, organic matter of light specific gravity and small size clay which are easy washed out by rain fall can be relatively well observed, ii) in west-north area, wall rock which consist of black soil and clayey soil is few ingredients, in addition, the soil erosion and wash out it are few occasion relatively, iii) At gentle slope area on in north and south, clayey soil area which easily wash out is relatively well observed (refer to Figure 3-4-3). Erosion of soil and it is washed out to river by rain fall occur in almost catchment area.



Surce：ATLAS 2010

Figure 3-7-2 Land Cover Soil in Timor-Leste

- Associating with these features, the feature of river discharge is proportional to rain fall which is short term, and river water level is extremely changed. Therefore, the irrigation water might be difficult to take properly in conformity with irrigation schedule.

- Steep slope rivers which classify major type in Timor Leste accompanies the washed out soil. Hence, the soli and bolder flow into the irrigation facility in taking water from river and it cause the priority problem.

- Above situation, the water stream in river is changed frequently depend on river discharge. It might cause the difficulty of water intake in dry season.

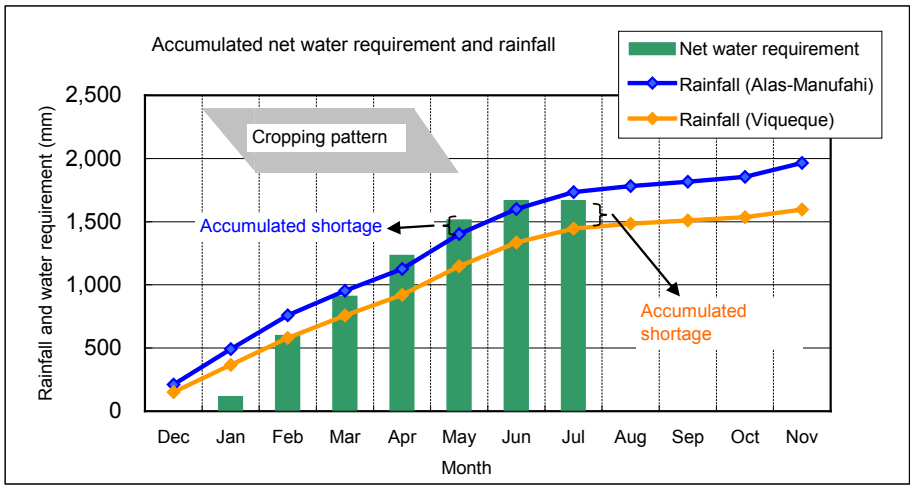
(2) Actual situation of irrigation for rice crop

The double cropping of rice is conducted in limited area, even if the area is functional irrigation scheme. Although south area is assumed to be available to double cropping of rice, actually, the small number of farmers conducts double cropping of rice. As the actual situation of rice crop, the area where it is much rain fall, conduct the single rice cropping in conformity with timing of rain fall. On the other hand, the area where it is less rain fall and functional irrigation facility even partly, conduct generally the single rice cropping with rain fall and/or supplemental irrigation.

In single rice cropping, the planting commence in conformity with raining. The degree of

dependency on irrigation depends on rain fall. The rain fall at rice filed have a certain range from 1000mm/yr at low plane area in downstream to 2500mm/yr at mountainous area (refer to Figure 3-7-3).

The area of annual rain fall from 1,500mm to 2,000mm, where it is Viqueque and Manufahi district, are analyzed about relation with the rain fall and irrigation water in order to dependency of rain fall for irrigation. As the result of analysis, it is shown on Figure 3-7-3. The figure shows the relation with the cumulative rain fall from commencement of rainy season to December and the cumulative irrigation water from January to June in dry season. According to the Figure, although the dependency of irrigation water observe the difference depending on the timing of rain fall, actual effective rain fall and infiltration related soil condition, area which has 1,500mm/yr of rain fall is almost available to crop the rice by only rainfall.



Rainfall/ Net water requirement	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Monthly								
Rainfall (Alas-Manufahi) (mm)	212	280	267	195	173	276	198	134
Rainfall (Viqueque) (mm)	152	215	213	177	165	226	188	109
Net water requirement (mm)		111	484	310	325	281	151	0
Accumulated								
Rainfall (Alas-Manufahi) (mm)	212	492	759	954	1,127	1,403	1,601	1,735
Rainfall (Viqueque) (mm)	152	367	580	757	922	1,148	1,336	1,445
Net water requirement (mm)		111	596	905	1,230	1,511	1,662	1,662

Source; Estimated by JICA Study Team

Figure 3-7-3 Cumulative Rain Fall and Irrigation Water

The rainy area few rely on the irrigation water. The area which is rainy and little sedimentation at middle mountainous is available to crop rice with more stable activity than low plane area which rely on river water.

In the feasible area for double cropping, the constraints of double cropping is caused by the unstable water source, deterioration of irrigation function by inflow of soil, shortage of work force, low price of rice in market, high priority of self-sufficient/preservation and crop failure. Unstable water is caused by river discharge in short term, extreme difference water level between rainy and dry season, restraints of take water due to changing water stream in river, and flowing soil and bolder into irrigation facility. The solution for these issue and restraints requires the huge investment, it obstruct the development of irrigation project in the economic view.

(3) Hydrological and Meteorological survey

According to inventory survey which is conducted from April 2013 to April 2015, for 13 month,

the hydrological and meteorological observation equipment are stationed. The location of equipment is illustrated in following picture. (Appendix shows the detail of observed data in survey)

Stationed observation equipment are planned to install in ALGS system. MAF will continue to survey after this survey. The operation of system, however, has been managed by donors. In order to autonomous manage and operate system, SoL, GIS, Camoes, FAO and etc. should cooperate each other, and give the technical and financial support.

Table 3-7-3 Location of Meteorological Observation by JICA Project

No.	Name of River	Name of station	District
1	Laclo	Manatuto	Manatuto
2	Vemasse	Vemase	Baucau
3	Secal	Seical	Baucau
4	Irabere	Irabere	Viqueque
5	Sahen	Sahen	Manufahi
6	Caraulun	Caraulun	Manufahi

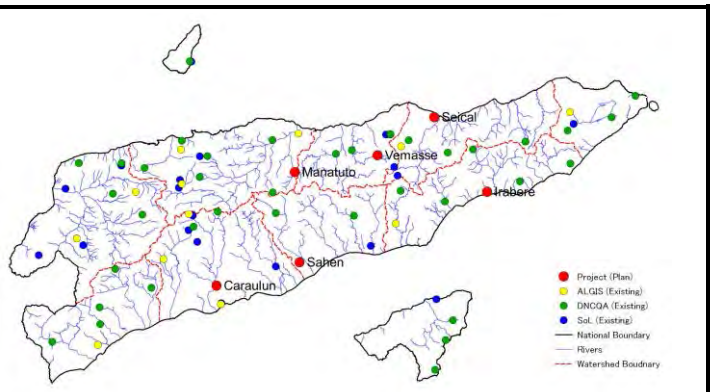
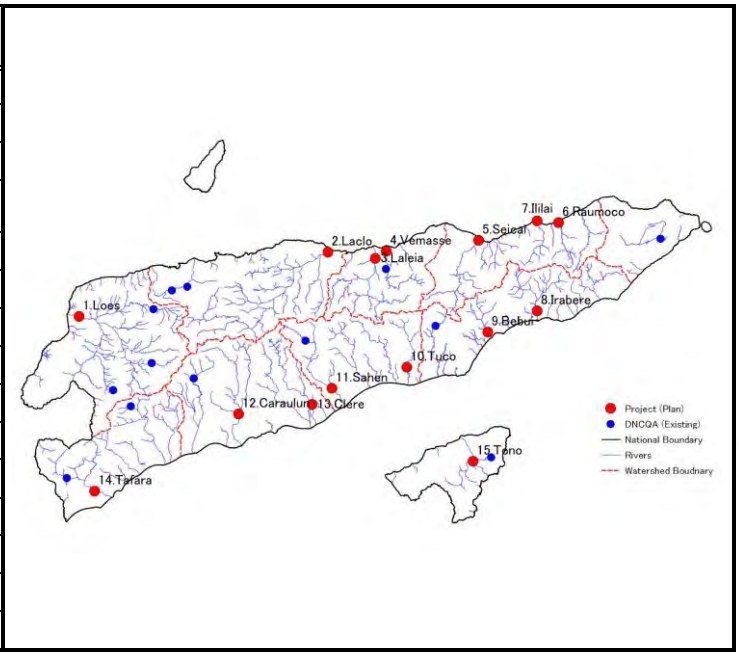


Table 3-7-4 Location of Hydrological Observation by JICA Project

№	Name of Rivers	Water Gauge	Auto Level
1	Loes	√	
2	Laclo in Manatuto	√	
3	Laleia	√	
4	Vemasse at Vemasse Bridge	√	
5	Seical		√
6	Raumoco	√	
7	Ililai	√	
8	Irabere	√	
9	Bebui		√
10	Tuco	√	
11	Sahen	√	
12	Caraulun		√
13	Clere	√	
14	Tafara	√	
15	Tono	√	



3-7-3 On-going Irrigation Project by MAF

MAF has been planning and implementing the large irrigation project targeted to entire districts under NDIWM. These irrigation project classify into as followings; "Completed project", "On-going project", "On-going DD". These are shown on "Table 3-7-5", "Figure. 3-7-4" (Actual cutivated area and expected irrigable area are the assumed figures.). The project classify into "by Government of Japan : GoJ", "by Infrastructure Fund : FI", "by Line Ministry : LM".

Table 3-7-5 Major Irrigation Project Area by MAF

Agency*1	Irrigation scheme	District	Design area (ha)
	Completed		
GoJ	Maliana I	Bobonaro	1,050
GoJ	Laclo	Manatuto	1,007
	Sub-total		***2,057***
	Under construction		
GoJ	Bulto	Manatuto/Laleia	1317(780)
FI	Caraulun	Manufahi	1,015
FI	Raibere	Ainaro	225
FI	Oebaba	Covalima	2,362
LM	Cassa	Ainaro	400
LM	Larisula	Baucau	347
LM	Secial	Baucau	800
LM	Bebui	Viqueque	1,090
LM	Tono	Oecusse	1,717
	Sub-total		***8,736***
	Under designing		
LM	Watuwa	Baucau	1,970
LM	Sahen	Manufahi, Manututo	670
LM	Bonuk	Ainaro	560
LM	Abarata	Lautem	370
LM	Venosi	Lautem	120
LM	Baidubu	Viqueque	420
LM	Haslaran	Viqueque	325
LM	Saketo	Viqueque	421
LM	Culuan/Lomea II	Covalima	320
LM	Maliana II	Bobonaro	1,500
	Sub-total		***6,676***
	Grand total		***17,469***

Note*1: FI: Infrastructure Fund (over 1.0 million), LM: Line Ministerial Project, MAF (under 1.0 million over $5,000), GoJ: Supported by JICA

MAF has the three (3) implementing project, Ribele, Oebaba, Caraulum. These projects are sometimes suspended by the flood during the construction works. MAF afraid that construction works could not be finished in planned duration. According to the site visit and observation, it is assumed to cause of lack of supervision for planning, design, and construction. In addition to these projects, NDIWM is conducting FEASIBILITY STUDY AND DETAILED DESIGN SERVICES AND FOR 10 IRRIGATION SCHEMES which contract with Indonesian consultants.

The works of the study aim mainly at design of the structures. In addition, alhough the project benefit is assumed to be conducted double cropping with 200% in targeted scheme, almost of these targeted schemes are not capable of the water potential by study of river water potential (refered to the section 5-2-4). These projects might be planed and studied without examination of water potential, therefore realization of project purose is assumed to be difficult.

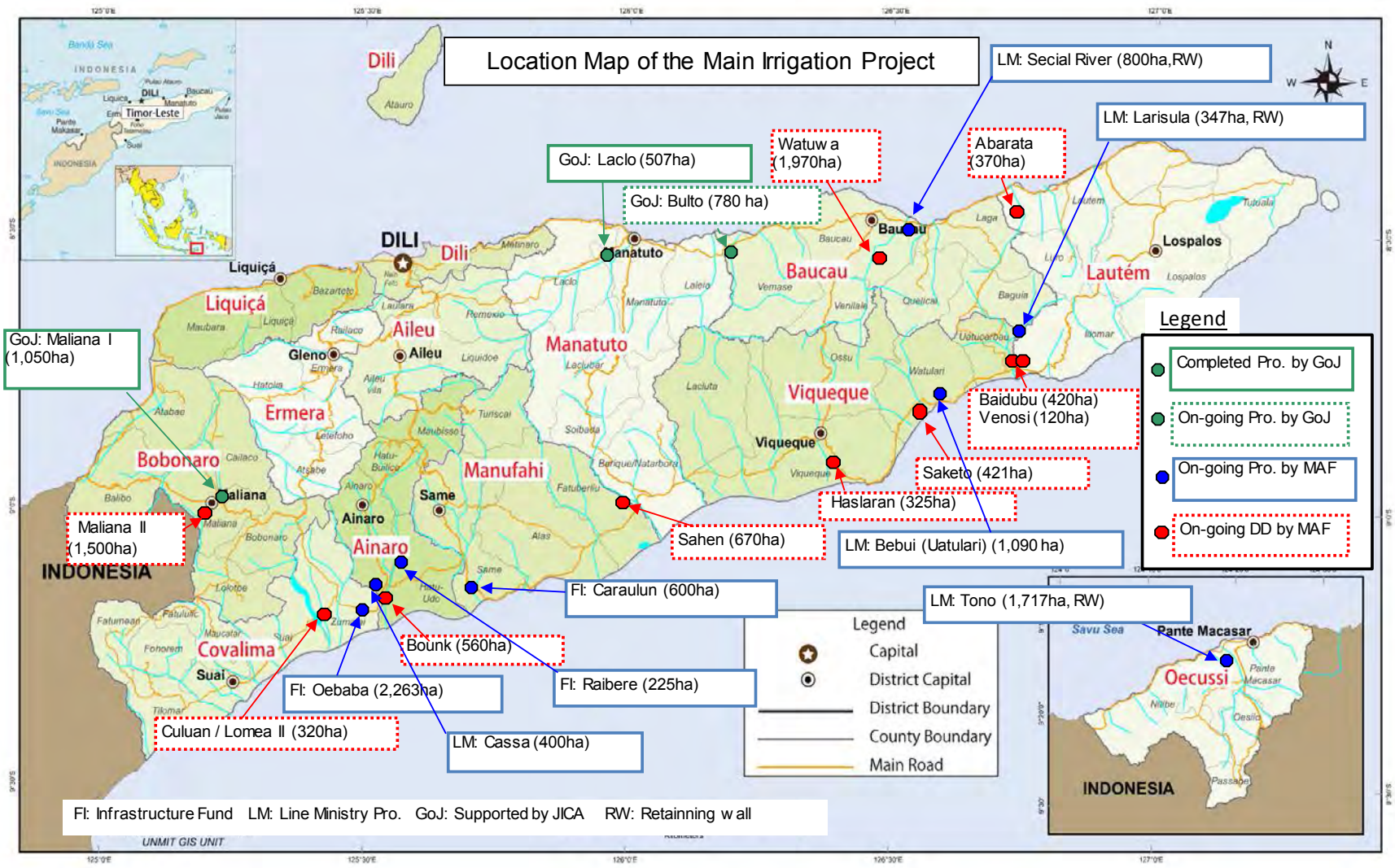


Figure 3-7-4 Area of Major Improvement of Irrigation Facility by MAF (Completion/On-going/DD: Planting : as of Jan. 2014)

3-7-4 Maintenance and Operation of Irrigation Facility

As a premise of description for the maintenance and operation of irrigation facility, Technical and semi-technical scheme are focused (refer to 3-7-1 Irrigation Scheme). In traditional scheme, maintenance and operation activity is almost unclear demarcation, because this scheme is few permanent facility and structure and representative of organization or community for maintenance works is generally obscure. Therefore, in general, the farmer used to gather depending on the necessity of maintenance works.

(1) Regular maintenance activity

The operation of gate at intake and main canal is mostly in charge of traditional water operators. Basically, the operators for branch canal who are selected from famer belong the service area which separate each canal, gather to the meeting and decide the regulation of water allocation, then they operates gate along the decided rules. However, in general, traditional water operators have a responsibility of not only intake and main canal, but also branch canal for the gate operation and water allocation.

(2) Periodical maintenance activity

A certain sedimentation in front of intake can be flashed out by gate if the facility equip with flash gate. However, unless it flash out enough or flash gate is equipped originally, the sedimentation must be removed by excavated works periodically. Although these works should be required the heavy machine such as bulldozer, excavator, Organization such as water group or water users association does not usually possesses these machine. In usual, the district office of DDAF possesses heavy machine. (In Lacro in Manatuto, the schemes possesses the heavy machine, but it is out of order in visiting of team)

In a sedimentation pond (sand trash) which is related facility of intake, the sedimentation must be removed periodically. This work should be required heavy machines such as bulldozer, tractor and excavator. (In Lacro in Manatuto, the contractor near the area removes sedimentation at pond without charge due to their transaction of sand.)

Cleaning of main and branch canal is periodical maintenance works. In general, all of famers in service area participate and conduct the cleaning at commencement of irrigation in one (1) time yearly

In Maliana in Bobonaro district, famers clean main canal when team visit there on 6th Dec. 2013 which is conformity with their maintenance schedule. In Laclo irrigation scheme, there is 14 branch canal, cleaning for it be done by farmers in service area. As for main canal, famer has responsibility for main canal which is at upstream of branch gate on main canal as well as responsibility for all of branch canal.

The scheme of intake without weir and gate, make the temporary bolder weir which is piled up stone by farmers in order to secure intake water from river. This temporary weir is broken and flashed away by flood, so farmer need to reconstruct it before commencement of irrigation. For example, Farmers in Bitopa irrigation scheme in Oequsse construct temporary weir in twice yearly, because they crop rice in twice yearly.

(3) Support from government

NDIWM MAF is responsible for the support of maintenance and establishment of WUA. In 2013, budget of maintenance for irrigation facility is US$ 27,000, which is allocated to six (6) main irrigation schemes such as Maliana I, Lacro, and etc. through the district office in MAF.

This budget, however, is fluctuate in every year because allocated schemes are decided by actual acquired budget from government.

3-7-5 Water Users Association and Traditional Water Group

(1) Establishment of WUA

The operation and maintenance of irrigation schemes have been practiced by traditional water groups (TRWG) in the country.

The Water Resources Law has been enacted by the National Directorate of Water Management of Ministry of Public Works. The Article 17 of the said Law prescribes as follows;

1. The member of the Government responsible for water resources shall promote the establishment and operation of water management groups and water user associations respectively for the management of water supply for domestic use and irrigation.
2. To access public funds or support or technical assistance, the establishment of a water management group or a water user association and its statutes shall be approved and registered with the member of the Government responsible for water resources.
3. The Government shall issue regulations concerning water management groups and user associations.

In pursuit of the purpose of the above provisional law, the National Directorate of Irrigation Water Management of MAF has enacted the Law of Water Users Association. WUAs have been established based on the Law and the establishment is still in progress. The organization of model WUA according to model statute is shown below

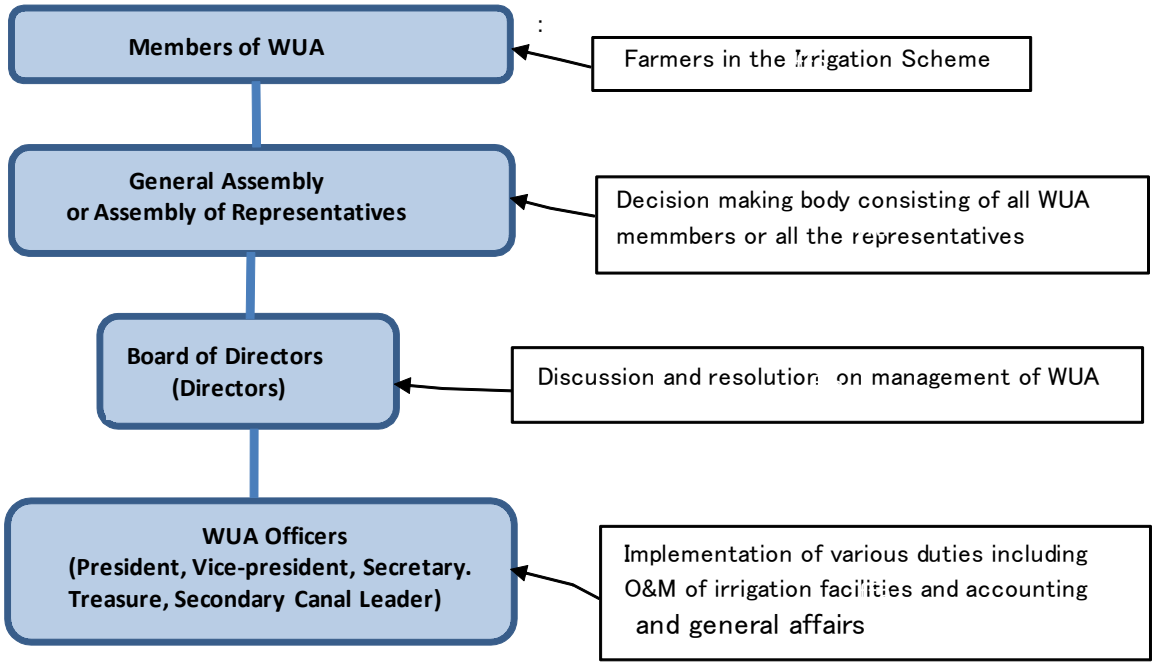


Figure 3-7-5 Organization Chart of Model WUA

It should be noted that Secondary Canal Leaders are included to WUA Officers instead employing technical staff, which means those Secondary Canal Leaders play the role to manage all the general technical matter.

There is no auditing function in WUA organization. The unit to audit Board of Directors and WUA Office should be given to the WUA organization.

Table 3-7-6 Number of WUA and Traditional Water Groups in Targeted Irrigation Scheme and Situation of Water Fee

District	No.of Irrigation scheme	Type of Water Group		Water Group Total		Collection of Water Fee	
		Authorized WUA	Traditional Water Group	Number	% in Irrigation Scheme	Number	%
Aileu	9	0	9	9	100%	0	0%
Ainaro	15	0	15	15	100%	0	0%
Baucau	152	0	143	143	94%	1	1%
Bobonaro	29	6	20	26	90%	17	65%
Cova Lima	19	0	19	19	100%	0	0%
Dili	2	0	1	1	50%	0	0%
Ermera	14	0	14	14	100%	0	0%
Lautém	47	0	6	6	13%	2	33%
Liquiçà	7	0	5	5	71%	0	0%
Manatuto	54	1	27	28	52%	0	0%
Manufahi	11	4	7	11	100%	0	0%
Viqueque	40	5	35	40	100%	0	0%
Oecusse	26	11	15	26	100%	0	0%
Total	425	27	316	343	81%	20	6%

*) Source: Inventory survey in 2014 by JICA

The existing condition of water groups and the progress of establishment of WUAs are clarified by the Irrigation Scheme Inventory Survey which was conducted from Dec 2013 to March 2014 as following table.

There are altogether 343 irrigation schemes (81%) which have some kind of water group among targeted 425 irrigation schemes in the inventory survey, which means that operation and maintenance of the irrigation facilities practiced in systematic way to a certain extent. However, irrigation schemes with institutionally authorized Water Users Association are only 27 schemes (6%).

MAF has been instructing the existing irrigation schemes to establish institutionally authorized WUA. The progress of establishments differs in the districts. For example, in Oecusse District, the District Agriculture Office has instructed and recommended all the irrigation schemes to establish WUA and assigned irrigation officers to support the irrigation schemes to manage the procedure of establishment.

When an institutional WUA is established, the operation and maintenance of the irrigation facilities will be carried out with close cooperation of WUA officers, Suco-Organization Officers, Leaders of Secondary Canals and Member Farmers of WUA. The operational structure is given in figure 3-7-6.

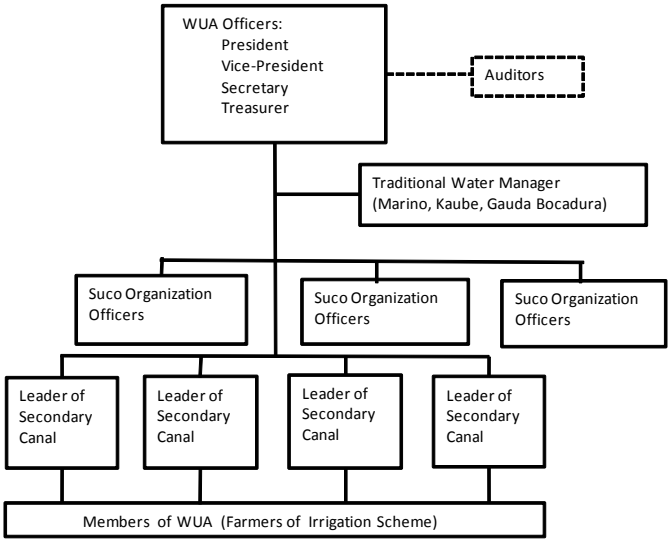


Figure 3-7-6 Operational Structure of the WUA

The establishment of WUA is a prerequisite for starting the new irrigation projects. However, it

would be almost impossible to establish WUAs if the establishing procedure is left to the effort of farmers themselves alone. In fact, it is usual way that district irrigation officer support the establishment of the WUA.

(2) Water fee

Up to now, WUAs have been established in some of the Technical Schemes and Semi-technical Schemes in the country which comply with provisional law, the National Directorate of Irrigation Water Management of MAF. It is rather difficult to collect membership due even if WUA is established. The working expenditures of WUA depend on the income collected from the members as the water fee. It is rather difficult to collect water fee from the WUA members except WUA members of limited number of technical schemes, because in most of the schemes, the water from the irrigation facilities cannot be distinguished from the natural inflow from rivers or the rain water from the surrounding field. In the limited number of technical schemes where the all the irrigation water is supplied from the irrigation facilities, water fee is collected. For example in Maliana 1 Irrigation Scheme, water fee is collected by agriculture product (paddy) in accordance with area irrigated.

In Laclo Irrigation Scheme in Manatuto District, water fee is collected in either cash US$30/ha or paddy 70kg/ha. Based on the cultivated land 250ha, the water fee could be collected 250ha x US$30/ha=US$7,500.

However actually collected amount of water fee is about US$2,000, which is very low rate of collection. The low rate of collection of irrigation fee makes the financial foundation of WUA very weak.

MAFs officer might operate the gate as gate keeper. In case of Maliana in Bobonaro district, the collection of water fee is fairly well managed in Maliana 1 Irrigation Scheme, the salary of the gate keepers is not paid by the WUA, but it is born by MAF District Office.

(3) Support from government

The procedure of establishment of WUA and the development and training of WUA are supported by district irrigation officers. In year 2010 when provisional law of the WUA standard regulation was enacted, the government budget of US$14,000 was allocated for the training of WUA staff and US$300-US$400 was distributed to each WUA. No budget has been allocated ever since.

(4) Traditional water manager

There are traditional water managers in the existing irrigation schemes. They usually play important roles in the WUAs. They are called by different names according to the different districts. The followings are examples of the calling names of the district.

Table 3-7-7 Example of Traditional Water Group

Name	District
Marino	Manatuto District
Kauboe	Oecussi District
Guarda Bocadura	Bobonaro District

Most of these traditional water managers are hereditary. They are often appointed as gate keepers when the modern irrigation facilities are completed and the WUAs are established.

It is common that these traditional water managers have reward. For example, in Laclo Irrigation Scheme of Manatuto District, the WUA pay US$50/month for 10 months per year to 4

marinos. In Maliana 1 Irrigation Scheme of Bobonaro District, the district agriculture office paid US$136/month to Guarde Bocadura who are appointed as a gate keeper.

3-8 RURAL SOCIO ECONOMICS

3-8-1 Rural Society

(1) Characteristics of Rural Society

In contrast to Indonesia which is the largest Muslim population country in Asia, 99% of Timor-Leste population is Christian. On the other hand, the traditional Melanesian religion is also widely spread and consists of a part of their culture, since majority of the population is Melanesian. In some cases, Melanesian religion has priority over Christianity in their society, especially in rural area.

In rural society, a traditional rite of passage named Tara Bandu is having a large influence. Tara Bandu are traditional laws used by communities in Timor-Leste to regulate relations between people and groups as well as between people and the environment. Tara Bandu restrict access to and use of natural resources and spaces and as such constitute 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 for its planning.

(2) Financing in Rural Area

Since legislation of Land Law in Timor-Leste has not been enforced, utilizing a land right as collateral for accessing loan is not practiced. Farmers in rural area are likely not to have any resources other than their farm land so it can be observed that their access to finance is generally limited. In such a situation, following financial source which rural farmers are currently able to access can be listed as followings.

1) Finance in Informal Sector

It is observed that neighbor farms, who belonging to same community in rural area, are lending and borrowing money to each other. Generally, repayment is done by their harvested commodity, for example, 1 bag of paddy, which is about US$15 in market price, is given to a lender instead of money. Generally, this type of loan puts burden on a borrower.

2) Credit Union

There are 59 cooperatives established as credit unions in Timor-Leste. Those cooperatives provide loan to member from saving as a cooperative. For example, the cooperative named Lakon Nakukun Mosu Naroman located in Bobonaro district can be described as successful cooperative since they have 962 members at the moment in 2014 and saving of US$200,000. In this cooperative, members are not required collateral for their loan, however, there are strict rules to grant repayment from the member. One who want to be a member of the cooperative has to be recommended by two current members and so on.

3) Financing from NGOs and Donors

NGOs or donors are also providing loan to farmers in rural area. Movimento Cooperativa Economica-Agricola (MCE-A) which is a NGO having a main office in Dili and 30 branches over Timor-Leste can be listed as one of such an institution. MCE-A mainly focuses on promoting SRI technology in rice cultivation but also providing loan programme to its member

farmers' group. The member farmers' groups utilise loan from MCE-A to purchase farm inputs as well as tractors. MCE-A also supports farmers' group to formulate business plan so that they can repay their loan. Beside, MCE-A can be flexible about term for payment in case of poor harvest due to unfavourable weather.

As of other NGOs which are specialized in micro finance in Timor-Leste, there are Moris Rasik and Tuba Rai Metin. Both NGOs focus on providing loan to small entrepreneurs. Especially, Moris Rasik has 90% of female members and adopts a method of Gramin Bank in Bangladesh. Moris Rasik requires repayment every second week. So, it is not likely to be suitable for farmers since farmers generally cannot expect income for repayment the until harvest season. Yuba Rai Metin has experimentally provided loan programme targeting to farmers in Rikisha district since 2011. In this loan programme, amount of repayment in every month can be started from US$5 and the rest amount of repayment can be paid in the harvest month.

One of the Characteristics of micro finance in Timor-Leste is to formulate a group of debtors. If one of the group members cannot repay his repayment, the other group members have to repay for him. In this way, grouping debtors to make them as grantors is the way to secure repayment of the loan so that one who does not have collateral can access financing service.

4) Financing from National Commercial Bank of Timor-Leste (BNCTL)

In 2011, Timor-Leste Micro-finance is transformed to BNTCL. At the moment of January 2014, BNTCL has about 2070 members and about US$7,000,000 of total amount of the loan. A limit of the loan is US$2,000 for farmers who grow coffee and US$1,000 for the other farmers. It takes 2 weeks to receive loan from BNCTL after submitting application. Likewise the NGOs mentioned above, BNTCL adopts group guarantor system to secure collecting repayment. In addition to the loan programme, BNCTL provide basic training in terms of financial management to its member farmers. BNCTL is probably the most suitable financial service to rural farmers, however, it seems to be difficult to utilize its loan programme to purchase expensive material such as tractors due to the limit of loan amount.

As mentioned above, there are three major financial institutions targeting private sector, namely Moris Rasil, Tuba Rai Metin, and BNCTL. Each institution are operating in nationwide of Timor-Lest as they have brunches in each district. Detail information of them is shown in below table.

Table 3-8-1 Major Financial Institutions for Private Loan in Timor-Leste

Name of Institution	Establish Year	No. of Branches	Mode of Loaning	Interest Rate	Loan Amount	Repayment Period	Interval of Repayment	Nature of Loan
National Commercial Bank of Timor-Leste	2011	13 (All Districts)	Group	18%/Year	US$100 - US$1,000 (Original Farmer)、US$100 – US$2,000 (Coffee Farmer)	By the time of harvesting	Every month	Suitable for farmer
Moris Rasik	2000	13 (All Districts)	Group	15% - 18%/Year	US$100 - US$2,000	25 weeks - 75 weeks (depends on amount of loan)	Every 2 weeks	Suitable for small business
Tuba Rai Metin	2001	12 (All Districts except Ainaro)	Group	1.5%/Month	US$50 - US$300	4 months - 12 months	Every month	Suitable for small business (partially for farmer)
			Individual*	2.0%/Month	US$400- US$5,000	8 months - 24 months		

* Guarantor from relatives is required

Although, the existence of financial service mentioned above can be observed, it is seemed to be still limitative in terms of scale of loan amount and covered area. Therefore, development of financial system which can reach to rural farmers is needed as the government strategy to grant farmers to procure necessary agricultural material which is required to promote their commercial farming. In specific, it can be suggested that MAF takes an initiative to establish an agricultural system fund. Regarding this, it can be suggested to establish interest subsidy system to provide supports for farmers to reduce interest rate of their loan, and credit guarantee system to provide credit guarantee to farmers who cannot provide collateral for their loan to the financial institutions.

In order to examine the role of interest subsidy system and credit guarantee system, the agricultural loan system of Timor-Leste in future can be assumed as the table below. Based on the caraceristics of the funds, it can be divided three types of loan programmes, such as 1) loan utilized for facilitating national agricultural strategy, 2) loan utilized for facilitating commercial agriculture, and 3) loan utilized for stable agricultural production and increasing house income.

As of) loan utilized for facilitating national agricultural strategy, government should take initiative to provide loan programmes utilized for the activity such as large scale farmland consolidation, countermeasure against natural disaster, and so on. As of the 2) loan utilized for facilitating commercial agriculture, private sector should provide loan programs for purchasing agricultural machine and adopting advanced agricultural technology. However, the government is expected to indirectly support by providing interest subsidy system and credit guarantee system. Then, for 3) loan utilized for stable agricultural production and increasing house income, private financial institute such as bank and NGOs should be a main service provider for this criteria of loan.

Table 3-8-2　Expected Agricultural Loan System of Timor-Leste in Future

Criteria of Loan	Payment period	Subject to Finance	Loan Providers	Remarks
1) Loan for National Agricultural Strategy ・ Financing in conformity to agricultural policy of the country （Such as large scale field maintenance, etc.） ・ Financing for disaster prevention, etc.	Long Term (about 1～10 years)	Large scale farmer and farmers group	Government provide loan programme	Objective of loan is to promote agricultural policy and to establish safety net.
2) Loan for facilitating commercial agriculture ・ Loan for facilitating agricultural machine ・ Loan for adopting advanced agricultural technology ・ Loan for starting agricultural business, etc.	Long Term (about 1～5 years)	Commercial farmer and farmers group (cooperative)	Private financing institution, NGOs	Private institution and NGOs provide financial service. Besides, government support indirectly through “interest subsidy system” and “credit guarantee system”.
3) Loan for utilized for stable agricultural production and increasing house income ・ Loan for purchasing agricultural inputs ・ Loan for starting small agricultural business, etc.	Short term (within 1 year)	Stallholder farmer	Private financing institution, NGOs	Instead of government, private sectors should provide direct support in this loan criterion.

Source: JICA Study Team

3-8-2 Agricultural Infrastructure

(1) Electricity

According to the census, an electrification rate of Timor-Leste has been improved up to 38.0% in 2010 since it was 25.6% in 2001. However, there is still a significant gap of the electrification rate between urban and rural area as 82% in urban area and 20% in rural area. With the Timor-Leste government efforts, the coverage area of providing electricity is expanding rapidly, since Baucau used to be the only area which has 24 hours electricity supply out of Dili, however, now a days, there are several areas which have a permanent power supply. The government of Timor-Leste has started to install meters in houses in rural area to collect electricity fees. In such situation, ETDL (Electricidade de Timor Leste) currently operates a programme to provide the electricity meters to rural households for free of charge. However, the number of meters subjected to be distributed is still small. It is seemed to take a time to establish the system of appropriate electricity tolling in nationwide.

Farming activity in the future, it can be suggested to utilize underground water pumped up by a motorized pump. However, as the situation mentioned above, the system to collect electricity fee for using such a motorized pump has not been established yet. It will be greatly affected for pumping irrigation whether there is such a collecting fee system or not. Considering that pumping irrigation is relatively costly, it should be limited to utilize for supplemental water supply in small scale rice cultivation, growing horticulture crops, and so on.

(2) Water Supply

The provision of uniform water supply service in nationwide was addressed by the Water Law which has been enforced since 2004. However, according to the census, there are only 67.1% of households in rural area can access to safe water against 91.0% in urban households. Although, the Water Law defines that the government of Timor-Leste has a responsibility for citizens to secure an access to safe drinking water, it distinguishes the water supply services system in rural area from urban area.

Table 3-8-3 Ratio of Households Who Can Access to Safe Drinking Water

Type	Toal	Urban	Rural
Safe Dringking Water	65.9%	91.0%	57.1%
Un-Safe Drinking Water	34.1%	9.0%	42.9%

Source : Census 2010

As of construction of water supply facility in rural area, it is done by construction companies or local NGOs that contract with the government. Type of water supply system in rural area varies from a hand pump which covers one to two households to a piping network system which runs several kilometers through several villages. Although, the government recommends piping network system, there are a lot of hand pumps can be seen in country wide mainly because of assistance of donors. Rain harvesting is not likely to be seen in Timor-Leste. Operation and maintenance of water supplying facility is delegated to the local community or water users' gourp (GMF).

The projects of the water supply sector in rural area which have been conducted so far can be listed as Rural Water Supply and Sunitation Programme (RWSSP) founded by AusAID, and District Water and Sanitation for Health (DWASH) founded by USAID.

(3) Roads

A traffic network in Timor-Leste consists of around 1,426 km of national roads, 869 km of

district roads, and 3,025 km of rural roads. However, it is seen that proper road maintenance has not been done and around 90% of the roads of Timor-Leste are in poor conditions. The road network is generally constructed to the Indonesian pavement standard of 4.5 metres width with lined masonry drains and two lane steel truss bridges. Comparing with international standard, it can be said that the road network of Timor-Leste is narrow. That causes increasing cost for transportation in the nation.

In rural area where 70% of population in Timor-Leste is living, the road network is poor condition. It is indicated that 3.5% are in good condition, 27% in fair condition, 52.7% in bad condition and 16.2% in very bad condition. Roads are generally narrow with no shoulders on many sections, particularly in mountainous areas. Around 40% of rural roads are less than three metres wide, around 50% are between three and five metres wide and around 10% are wider than five metres.

In rural area where 70% of population in Timor-Leste is living, the road network is poor condition. It is identified that 3.5% of the rural road is good condition, 27% is fair, 52.7% is bad, and 16.2% is very bad. Since 40% of the rural road is less than 3m wide, there are many roads which are dangerous when vehicles are passing, especially mountain area. In such a situation, the government of T-mor-leste formulated Strategic Action Plan (SDP) to set the development goal to conduct necessary maintenance for rural roads by 2015 by establishing Rural Road Master Plan with support from AusAid. in this connection, SDP defined prioritized sections of rural roads for maintenance as a following list.

Table 3-8-4 Section of Rural Road for Repair and Maintenance Prioritized by SDP

	Section of Road	District
1	Suai-Maucatar	Covalima District
2	Maubisse Junction - Hatubuiliku	Ainaro District
3	Baqui - Passabe	Oecusse Ambeno District
4	Buihamau - Luro	Lautem District
5	Same Junction - Alas	Manufahi District
6	Alas - Turiscai	Manufahi District
7	Tilomar - Fohorem	Covalima District
8	Maliana - Atabae	Bobonaro District
9	Uatulali - Laisorolao	Viqueque and Baucau District
10	Lospalos - Lore - Iliomar	Lautem District
11	Com - Trisula	Lautem District
12	Laclubar Junction - Soibada	Manatuto District
13	Welaluhu - Fatuberliu	Manufahi District
14	Turiscai - Soibada - Salau - Manatuto Village	Manatuto and Manufahi District
15	Salau - Natabora - Viqueque	Manatuto and Viqueque District
16	Dotic - Fatuberliu	Manufahi District
17	Waudeberec - Alas	Manufahi District
18	Manatuto Junction - Laclo - Remexio - Aileu Junction	Manatuto and Aileu Distirict
19	Beloi - Atauro Villa	Dili District
20	Beloi - Biqueli	Dili District

Source: Strategic Development Plan

3-8-3 Gender Mainstreaming

According to SDP (Strategic Development Plan) and MAFSP (Ministry of Agriculture and Fishery Strategy Plan), it is clearly defined that empowerment of women has to be taken account in order to develop agricultural sector in Timor-Leste. MTOP emphasises that gender

mainstreaming should be included in planning and activity in each department under MAF. For this purpose, MAF has the budget to conduct gender mainstreaming activities.

Following this strategy, MAF established the Gender Unit under its organization and three officers from the DNPP were dispatched to it. However, the Gender Unit was currently not functioning since those officers are transferred. In order to attain the objective defined in SDP and MAFSP, the structure of MAF to conduct activities of gender mainstreaming has to be reviewed.

In the agriculture sector, men and women share nearly an equal role. However, gender related duties are often culturally defined. For example, nearly all rice/ maize traders and millers are men; whereas, nearly all fruit and vegetable traders/retailers are women. These gender roles are probably based on the fact that women are often needed to tend to their children's' needs. Consequently, there is a strong preference for work which does not entail travel. Vegetable market stall management can be undertaken while looking after children, as compared to rice and/or maize collection which cannot. Vegetable selling has the added advantage of being relatively clean as compared to meat and/or fish selling, thus minimizing children's exposure to health hazards. Table 3-8-5 depicts most prevalent gender roles in the agriculture sector. As is apparent, women play a vital role in both agricultural production and marketing.

Table 3-8-5 Roles of Men and Women in Agriculture Sector

No.	Activity	Male	Female
1	Clearing/Cultivating	Responsible	-
2	Planting	Secondary	Primary
3	Weeding	Share	Share
4	Harvesting	Secondary	Primary
5	Storing	Responsible	-
6	Threshing	Secondary	Primary
7	Selecting Seeds	Secondary	Primary
8	Pounding	-	Responsible
9	Cooking	-	Responsible
10	Rice/ Maize Trading	Responsible	-
11	Rice/ Maize Milling	Responsible	-
12	Vegetable Trading	Secondary	Primary
13	Retail Trading	Secondary	Primary

Source: Base Maize Production and Storage in Timor-Leste, Oxfam 2006; Expanded by Consultant

3-8-4 Land Ownership

Legislation of Land Law in Timor-Leste has not enforced yet. So, it makes identifying land ownership very difficult. Ministry of Justice is currently carrying out a survey for confirming land ownership in nationwide by contracting with a Portuguese consultant company from 2014 to 2020.

In the situation of rural area, the land ownership is heredity succeeded. People living in rural area have historically cultivated in narrow land of mountain regions. So, it is predicted that claiming land ownership over such a small land will be problem everywhere in the country in the future. Functioning of land registration system causes difficulties for farmers to utilizing their land as collateral for accessing loan. Besides, landless farmers commonly pay about 50% of their harvest to landowners for leasing farm land.

3-9 AGRICULTURAL SUPPORTING STRUCTURE

3-9-1 Extension Agricultural Technology and Agricultural Mechanization Programme

(1) Extension Agricultural Technology

In 2013, 392 extension workers were assigned to district, sub-district and suco. One senior extension worker was assigned to each 12 districts except Dili whose responsibility is to guide the district extension workers and organize their activities. Basically, one extension worker is placed in each village. But actually, he works in plural villages depending on the circumstances of the district.

The motorbikes were lended to the extension workers so that they can visit their responsible villages. Covering area has been expanded by the supply of motorbicycle. Disseminating activities is becoming more active. On the other hand, it is reported that there are lack of materials for dissemination and some demands for recording devices such as digital camera or PC. At present, in the RDPIV project, technology transfer to the extension workers have been carried out. For further expansion and improvement of disseminate activities, it is necessary to improve and reorganize the technology expansion system and update the materials for dissemination.

Table 3-9-1 The Number of Extension Workers and Motorbike and Main Crops of Each District

District	Senior Extension Worker		Coordinator		Extension Worker		Total	Sub-District	Suco	EW / Suco	Number of Motorbike	Main Crops
	Men	Women	Men	Women	Men	Women						
Aileu	1	0	4	0	10	4	19	4	21	0.7	10	CF, HC, T
Ainaro	1	0	3	1	14	5	24	4	31	0.6	12	CF, HC
Baucau	1	0	5	1	38	4	49	6	59	0.7	27	R, HC, CS, T
Bobonaro	1	0	6	0	38	6	51	6	50	0.9	33	R
Cova - Lima	1	0	7	0	27	4	39	7	30	1.0	31	R, CS
Dili	0	0	2	0	2	0	4	6	31	0.1	1	HC
Ermera	1	0	5	0	22	4	32	5	52	0.5	8	CF, T
Lautem	1	0	5	0	16	1	23	3	23	0.7	21	
Liquica	1	0	3	0	19	1	24	5	34	0.6	23	CF
Manatuto	1	0	6	0	23	2	32	4	29	0.9	23	R, CS
Manufahi	1	0	4	0	27	1	33	6	29	1.0	32	CF
Oecusse	1	0	4	0	14	5	24	4	18	1.1	5	R, CS
Viqueque	1	0	4	1	30	2	38	5	35	0.9	26	R, CS, T
Total	12	0	58	3	280	39	392	65	442	0.7	252	

Note: Abbreviation of main crops are as follows. R: Rice, CF: Coffee, CS: Cassava, T: Taro, HC: Horticultural Crops. Maize is main crops of all district.

Source: MAF-NDAECD

The low level of technique and low motivation of extension worker are problem according to the field survey. It is necessary for extension worker to have a capacity for applying various levels of techniques because farmers of Timor-Leste cultivate a multiple of crops such as mainly rice or maize. Moreover it is difficult to purchase easily agricultural materials.

The training to extension workers has been performed in RDPIV, however improvement of the further technology and the ability that can support flexibly in the farme's field are necessary. The collaboration with extention workers and NGOs will supplement the activities of extention workers in the point of techniques.

There is a problem about low motivation of extention workers not only in Timor-Leste but also in other countries. It is difficult to improve their motivation. It is importanto to introduce the skill evaluation system of extention worker, however it is recommended to promoto the short term activities that production is shown through the fair or media. It is one of the ways to improve the motivation of extension worker as the activities that result of technical training is shown in visible way.

◆Example of Local NGO Implementing the Agricultural Project◆

①The NGO "Organisasaun Haburas Moris" as mentioned above is executing the spreadding of silos (drum for grain preservation) of maize and supporting in operating irrigation facilities, agribusiness and community bank in and around Maliana sub-district.

②The NGO "Movimento Cooperativa Economica – Agricola" who is supported by the Oxfam, disseminates the SRI to rice farmers and supports the coffee farmers. They have dispatched an engineer to disseminate the SRI in Maliana sub-district of Bobonaro district and Uatorali sub-district of Viqueque district. As the ativity results, it is reported that yield record so far is 8 ton/ha. The NGO purchases the rice produced through the contract farming with farmers group and packs them in the office of Dili, and sells the packed one to a supermarket and the public institution.

(2) Programme for the agricultural mechanization

MAF also focuses on promoting agricultural mechanisation to respond to insufficient labour force in agricultural sector. While MAF used to provide small hand tractors to farmers' group directory before, MAF currently establishes the mechanization centres in districts to deploy large tractors to lease to farmers for free of charge. MAF also provides fuel to district offices to operate those large tractors. MAF plans to establish the mechanization centres in 10 districts. Out of 10 districts, mechanization centres have already established in 8 districts, namely Lautem, Baucau, Viqueque, Manatuto, Bobonalo, Covalima, Manufahi and Oecusse.

However, it is concerned that such large tractors are not suitable for the nature of the land in Timor-Leste because most of its land is mountain terrain. So, many tractors in the mechanization centre are not being used. Beside, workshops which can maintain those large tractors are not seen in the regional areas but only in Dili. It is also concerned that leasing large tractors to farmers for free of charge does not contribute to growing farmers' ownership of the agricultural machine. Therefore, it can be suggested that MAF should provide supports, such as an interest subsidy and s credit guarantee, to farmers to purchase hand tractor which can be maintain by farmers themselves, instead of providing fuel for large tractors to the district offices. Also, it can be suggested to invite workshops from outside of the district and to conduct a training session for technical improvement.

3-9-2 Agricultural Cooperatives

MCIE (Ministry of Commercial, Industry, and Environment) promotes establishment of cooperatives. In order to be recognised as a cooperative by MCIE, more than 15 members are required in principle. Besides, a cooperative which proves to have more than US$1,000 as a saving can be registered as a business entity by the Ministry of Justice. MCIE provides training of organisation management training to cooperatives in order to support them to be registered be the Ministry of Justice. As of September 2013, there are 110 cooperatives recognized by MCIE in Timor-Leste. Out of them, there are 9 agricultural cooperatives. There are also some cooperatives which are conducting agricultural activities in multi-sectorial cooperatives. The detail information of cooperatives in Timor-Leste is shown in Table 3-9-2 and Table 3-9-3.

Table 3-9-2 Type of Cooperatives in Timor-Leste

Type of Cooperatives	No. of Members	Saving Amount（US$）
1. Credit	59	2,382,549.21
2. Multi-sectorial	19	293,026.83
3. Fishery	12	20,230.42
4. Agriculture	9	24,606.09
5. Coffee	3	8,144.50
6. Others	8	33,838.00
Total	110	2,762,395.05

Source：MCIE

Table 3-9-3 Detail Information of Agricultural Cooperatives

District	Sub-Dist.	Suco	Cooperative Name	No. of Mem.	Male	Female	Saving Amount (US$)
Baucau	Venilale	Wailaha	Tane Ita Moris	-	-	-	-
Covalima	Zumalai	Zulo	Kop. Haburas Produsaun Zumalai	14	13	1	450.00
Dili	Dom Aleixo	Futuhada	Kop. Haburas Mikro Economia Agrikultura	30	24	6	-
Dili	Cristo Rei	Balibar	Coop. Agricula Balibar	18	6	12	1678.00
Ermera	Hatulia	Mauubu	Coop. Café Erhatubu	30	27	3	2845.00
Manatuto	Baripue	Aubeon	Kop. Klatamuna	27	27	0	723.00
Manufahi	Fatuberliu	Caicasa	Kop. FTA Lusconi	14	12	2	4448.34
Manufahi	Fatuberliu	Clacoc	Coop. Produsaun Agrikultura Kbi'it	32	30	2	14052.75
Manufahi	Same	Daisua	Kop. Agrikultura Kadalak Sulimutu	48	46	2	409.00

Source：MCIE

Successes and Failures of Cooperative Activities Identified through the Study

Success Stories of Cooperative Activities

- Throug the SOL experience of organizing seed farmers, it is identified that leadership in the group, a certain amount of cooperative budget, and products can be sold are important factor for farmers' organization to continue to grow.
- There are active cooperatives and inactive cooperatives amoung the agricultural cooperatives. The reason to be an active cooperative is that marketing channel is ensured, or not.
- Since temperament of famers likely expects the government to do something for them, farmers' counsiousnes of self help is seemed to be low. However, it is also seen that many credit cooperatives succeed comparing with other cooperatives. The reason of their success can be saied strong leasership, well maintain of saving by themselves, and strong responsibility of each member.

Failure case of union activities

- MAF and doners formulated farmers groups and provided agricultural materials such as tractors, seeds, and nuesary. However, farmers' group became dormant since there was not follow up activity to the farmers' group.
- SoL organized seed grower farmers. However activity of the farmers stopped since the irrigation facility was broken and they could not produce seeds.
- Because farming activity is conducted seasonaly, farmers' organization sometimes stops their activity when rain season prevent their activity long time.

MCIE and MAF cooperate to support cooperatives. MAF is in charge of Agricultural technology and MCIE is in charge of organization strengthening and financial management. NGOs also assist cooperatives which are registered in 2014. Considering success and failure of cooperative mentioned in the above table, it can be said that 1) well understanding of cooperative's needs and clear objectives of support, 2) favorable external conditions such as

market availability and agricultural environment, 3) appropriate support plan which suites for cooperative organization level, 4) high qualification of cooperative such as leadership and motivation of members, and 5) ownership for the facility if it is provided, are important.

3-10 AGRICULTURAL EDUCATION INSTITUTIONS IN TIMOR-LESTE

3-10-1 Technical Agriculture School

For commitment to agricultural education by the government of Timor-Leste, currently, 4 agricultural high schools are operated by the Ministry of Education and Ministry of Agriculture and Fisheries. Three of these schools are public schools. The other school is a private school that is run by Christian organizations. The curriculum has been updated from the 2014 fiscal year. There are two major courses which are 1) Agriculture and Livestock, and 2) Fishery. Currently, 637 students are studying at the agricultural high schools. 83 of teachers have been assigned. It means that one teacher is responsible for approximately 7.8 students in average. The agriculture high school in Lautem, which is a private school, has suspended the acceptance of new students from two years ago, because theyare planning to change their organization as an education institution to university level. Detailed information for each agricultural school is shown in the table below.

Table 3-10-1 The Number of Student in Each Technical Agriculture School (2014)

School Location	1st Year	2nd Year	3rd Year	Total	No. of Teachers Assis. Teachers
Natabora	84	83	80	247 (Male 185, Female 62)	32
Maliana	72	72	89	233 (Male 153, Female 80)	26
Oecusi	50	39	14	103 (Male 53, Female 50)	13
Lautem	0	0	59	59 (Male 36, Female 23)	12
Total	206	194	242	642 (Male 427, Female 215)	83

Source: NDEAT-MAF

Table 3-10-2 The Number of Graduates of Technical Agriculture Schools by Year

Year	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2011	2012	2013	Total
No. of Graduates	147	174	161	210	285	348	294	251	1,870

Source: NDEAT-MAF

Table 3-10-3 Curriculum of Technical Agriculture School (Agriculture and Livestock Course)

Subject	Lecture Hours			
	1st Year	2nd Year	3rd Year	Total
1) Social and Cultural Field	595	595	320	1,510
2) Science Field	310	330	120	760
3) Speciality Field				
Agricultural Management	100	100	0	200
Agricultural Machinery	100	100	100	300
Agricultural Production	200	200	0	400
Post-harvest	100	100	130	330
On the Job Training			500	500
Total				1,730
Ground Total				4,000

Source: NDEAT-MAF

Although, there is no detailed numerical data for the path of the graduates, according to NDAE in MAF, 30% are engaged in agriculture, 30% are entering higher level education, 40% are employed by government as agricultural extension staffs, or NGOs. Therefore, most of the agricultural extension workers is a graduate of the agricultural high schools. However,

employment of the government from graduates of technical agriculture school is reducing due to lacking of budget in recent years.

3-10-2 Agriculture Education Institutions of University Level

In addition to the agricultural high school described above, there is UNTL (Universidade Nacional Timor Lorosa'e) as an agricultural educational institution of higher level. The Department of Agriculture of UNTL contains of three bachelor degree courses, namely Agronomy, Agricultural Socio-economics, and Livestock for four years. There is also a diploma cause of Veterinarian for three years. Around 50 freshmen are entering UNTL every year. As an example of the courses of the Department of Agriculture, the curriculum of Agricultural Socio-economics is shown in the table below.

Table 3-10-4 The Curriculum of Agricultural Socio-economics of UNTIL

1st Year		2nd Year	
1st Semester	2nd Semester	3rd Semester	4th Semster
1) Portuguese 2) Tetun 3) English 4) Basic Mathematics 5) Biology 6) Cropping system in Timor-Leste	1) Portuguese 2) Tetun 3) English 4) Civics, Moral and Ethics 5) Chemistry 6) Introduction to Agribusiness	1) Statistics and Experimental Design 2) Agricultural Economics and Policy 3) Continuous agribusiness 4) Basic Agronomy 5) Comparative Analysis of the Cultivation System 6) Economics and Human Resource Management and Natural	1) Dynamic Rural Development 2) Value Chain 3) Physiology of Plants 4) Agricultural Product Marketing 5) Agricultural Extension 6) Environmental Impact Analysis / GIS
3rd Year		4th Year	
5th Semester	6th Semester	7th Semester	8th Semester
1) Cultivation of Science 2) Analysis of Risk Management 3) Micro Economics 4) Social Change 5) Socio Economic Research Method 6) Post Harvest and processing of agricultural products	1) Dynamic Rural Development 2) Value Chain 3) Physiology of Plants 4) Agricultural Product Marketing 5) Agricultural Extension 6) Environmental Impact Analysis / GIS	1) Econometrics 2) Evaluation of Agricultural Project 3) Service and Practice in the Field 4) Accounting 5) International Trade 6) Gender and Development	1) Agricultural Demography 2) Social Work Internship 3) Seminar 4) Thesis

In addition to the UNTL described above, as an educational institution of the agricultural sector in Timor-Leste, course of post-harvest technology in Universidade da Paz (UNPAZ) and course of agribusiness in Dili Institute of Technology (DIT).

3-10-3 Agricultural Research Organization

National Directorate for Research of MAF has responsible for research about agricultural techniques. Some research centers were repaired with the budget of SoL. There are six research centers in Timor Leste as shown in Table 3-10-5. TriLoka Research Center which doesn't have the resident staff is used coopertaively by NDR and NDAH. Corluli Research Center is belonged to the NDAH, however, Bobonaro district agrictuture directorate actually manages it.

Research activity occupied 75% of NDR budget is incorporated into the SoL. In each center, trial cultivation including in selecting varieties, multiplication of seed and introducting and selling new varieties (including the taste test) to surrounding farmers are carried out. Especially in Loes Research Center and Betano Research Center, trial cultivation of maize, sweet potato and other vegetables are conducted. These research activities are supported by ACIAR (the

Australian Centre for International Agricultural Research), CIMMIYT (The International Maize and Wheat Improvement Center) and IRRI (International Rice Research Institute). Moreover, some staffs have been trained at Bogor Agricultural University in Indonesia.

Table 3-10-5 The Research Center of NDR and NDAH

	Name of center	District / Sub-district	No. of MAF Staff	No. of Temporary Staff	Target Crop
1	Loes Research Center	Liquica / Maubara	8	13	Maize, Cassava, Sweet potato, Wing bean, etc.,
2	Betano Research Center	Manufahi / Same	7	17	Rice, Maize, Cassava, Sweet potato, Peanut
3	Darasula Research Center	Baucau / Venilale	7	5	Rice, Maize, Cassava, Sweet potato, Peanut
4	Qintal Portugal Research Station	Aileu / Aileu	4	3	Maize, Cassava, Sweet potato, Peanut
5	Raimaten Research Station	Bobonaro / Maliana	3	3	Rice
6	Urulefa Research Station	Ainaro / Maubisse	1	3	Maize, Sweet potato, Beans
7	TriLoka Research Center	Baucau / Baucau	—	—	—
8	Corluli Research Center	Bobonaro / Maliana	2	14	Maize, Peanut, Cassava

Source: NDR,MAF

3-11 SUPPORTING PROJECTS BY RELATED DONORS

(1) SoL

SoL is a program within the MAF with funding provided by the Ministry and Aus AID and the Australian Centre for International Agricultural Research (ACIAR). The SoL started testing new varieties of food crops in 2000. The program is guided by the work on variety selection and started in 2000 (SoL I). The second phase, SoL II, which was extended in a second phase with seed production and distribution that commenced in late 2005 and ended up working in seven of the 13 districts. Subsequently, SoL started its phase Three (SoL III) in 2011. Its implementation period is planned from 2011 to 2016. Overall program is designed in Table 3-11-1.

Table 3-11-1 Summary of SoL Phase III

Goal	Improved food security through increased productivity of major food crops
Objectives	65,000 farmers (50 % of Timor-Leste's farmers) have access to and are routinely using improved food crop varieties.
Crops (Variety)	Maize (Sele, Noi Mution), Peanut (Utumua), Sweet Potato (Hohrae 1, Hohrae 2, Hohrae 3), Rice (Nakroma), Cassava (Ailuka 1, Ailuka 2)

SoL III builds on the scientific results and technical capacity built in MAF during SoL I and SoL II. SoL III aims to establish a National Seed System for Released Varieties (NSSRV) that will enable at least 65,000 farmers (50% of all farmers in Timor-Leste) to regularly access and plant improved varieties of staple crops and achieve greater food production. The NSSRV is a service developed to provide the farming families of Timor-Leste with secure access to good quality seed at planting time. By using quality seed of the superior varieties, farmers can benefit from the increased production of their major food crops. The NSSRV consists of four components shown in Table 3-11-2. Target crops are maize, rice and peanut.

Table 3-11-2 Activity Components of NSSRV

Component	Contents
1) Research and development	MAF identifies, selects and develops the superior varieties for official release, and produces breeder and foundation seed under highly controlled conditions.
2) Certificate seeds production	Contract growers multiply foundation seed of released varieties under close MAF supervision to produce high-quality certified seed.
3) Commercial seed production	Registered seed producers multiply certified seed according to Mad's quality assurance guidelines to produce large quantities of branded and truthfully labeled commercial seed that farmers and others can purchase with confidence.
4) Community seed production	Farmer groups use commercial seed to locally produce unlabeled community seed, which is properly stored and available for farming families to use next season for their food production.

(2) RDP IV

GIZ has contributed significantly to the agro-processing and agricultural production in the regional development program (RDP II, RDP III). The programmes conducted in Covalima, Bobonalo, Manyufahi districts. Major activities are 1) agricultural extension policy, 2) ICM technology, 3) study at each step in the value system of main agricultural products (value chain research), 4) capacity development, 5) participatory forest management, and 6) Small-scale local road rehabilitation.

Based on the results so far, RDP IV is carried out in all districts in Timor-Leste for the purpose of dissemination of agricultural technology under the framework shown in Table 3-11-3. The project implementation period is from March 2012 to December 2016.

Table 3-11-3 Summary of RDP IV

Approach	The EU has delegated the implementation of the program to GIZ and Comôes (Portuguese cooperation agency). The joint management team comprises the National Directorate for Agricultural Community Development, the National Directorate for Agricultural Education, GIZ and Camôes. The implementation is taking place in all Districts. The main focus is capacity building of Extension and technical staff, strengthening the Agricultural Extension Management System, assisting in the execurion of agricultural campaigns as well as rehabilitation, provision of equipment and curricula improvements of agricultural secondary schools.
Overall Objective	Rural communities have adequate food, either directly from agricultural production, or through other employment and entrepreneurial activities. Income generating oppurtunities and access to public infrastructure and services allows rural communities a basic quality of life and prospects for further improving livelihood.
Specific Objective	To contribute towards sustainable increases in nutrition and food security for farm households and rural communities through strengthening of the extension services.
Component	Strengthening Public Agricultural Extension Services
Output	1) Agricultural education system is improved towards demand- and practice orientation and improved professionalism. 2) Slills of Axtensionists (AEs) and Subject-Matter-Specialists (SMS) increased and continuous skill training system is established. 3) Effective agricultural extension management systems established. 4) Extension campaigns efficiently executed.

(3) Timor-Leste maize storage project (TLMSP, Bidon Halót Batar Project in Titon)

This project is conducted by IFAD and MAF. The goal of the project is to improve food security for maize growing households in Timor-Leste. Its development objective is to reduce the losses

of maize stored on-farm. Phase 1 were started in 2012 and conducted for three years. The project will initially target the economically active poor (households which produce about 150kg of maize per year) in Aileu, Manufahi, Manatuto, Ainaro and Viqueque Districts. These districts have been targeted because 67% of households live below the 2008 poverty line. The project is expected to be directly 23,000 benefitial households. The project has been implemented under following framework.

Table 3-11-4 The Framework of TLMSP

Approach	The project concept has been endorsed by GoTL and all potential parners, particularly MAF, and district governments and local community networks – the latter will be used as the drum distribution network. TLMSP will build on important NGO partnerships and complement the country's largest development initiative for food production.
Goal	Improved food security for maize growing households in Timo-Leste.
Development objective	Reduced losses of maize stored on-farm.
Geographic Area of Intervention	Five Districts (Aileu, Manufahi, Manatuto, Ainaro and Viqueque) have been targeted because 67% of households live below the 2008 poverty line. The project is expected to directly benefit about 60-65% of rural households in these districts (or 23,000 households).
Target Groups	・The target group is poor by any standard and most are food-deficient for about three months of the year. ・Yield of maize is as low as 0.5t/ha. ・Their cash transaction is between US$100 and US$200.
Outcome	1) New 200 liters maize storage drums procured and/or manufactured locally. 2) Maize storage drums distributed and used effectively. 3) Efficient Project management and coordination.

(4) Supporting activities by other related donors

1) WFP

WFP began an emergency operation in Timor-Leste in 1999. Subsequently, WFP has implemented Supplementary Feeding Programmes in all 13 districts since 2011. Outline of the activities is as follows.

i) Mother-and- Child Health and Nutrition (MCHN)

The current focus of WFP is building the capacity of the Government in managing Targeted Supplementary Feeding Programme (TSFP) via the Ministry of Health's Mother-and-Child Health and Nutrition (MCHN) programe.

ii) School Meals Programme

The programme supports the Ministry of Education, in cooperation with SIPI, espousing free education for all children, including a free school meal. Annual budget is around US$26 million.

iii) Future prospect of WFP activities.

WFP development approach is generally divided into the three stages; emergency, recovery and development. Timor-Leste is moving from the emergency and recovery stages focused on the goods supply to development stage.

iv) Food for Assets (FFA)

FFA activities contribute to increased agricultural potential and food security by employing

food-insecure people from poor communities during the agricultural lean season. Under the current operation, related many men and women form the most food-insecure districts have participated in FFA activities, focusing on enhancing agricultural production in rural areas. FFA was conducted last year with ILO, DFAT and EU, focusing on the rehabilitation of irrigation canals, construction or rehabilitation of feeder roads using locally available materials.

v) Conditional Cash Transfer

As for related-agriculture development project, Timor-Leste is one of the countries where a WFP assisted conditional cash transfer project is being introduced and tested under a trust fund. The project targets the vulnerable rural households exposed to natural disasters and food insecurity. The project will contribute to community asset-building and disaster mitigation. All households in selected communities will participate and receive cash day worked in line with government programmes and policies.

vi) Others

Timor-Leste government has a plan to decrease import and increase local produced goods. Three years plan was established to do so and in 2013, water and noodles were targeted.

2) World Bank

The Bank has been supporting the Agriculture Rehabilitation Projects I, II and III in order to improve crop productivity through irrigation rehabilitation and supporting crop extension. According to the ratings for projects, outcomes were moderately unsatisfactory. Lessons learned included: i) a proper monitoring and evaluation (M&E) system should be designed and instituted at the earliest, ii) activities related to crop production should have been included under the project, iii) it is important to focus on irrigation system maintenance and management rather than new construction givern current capacity constraints. iv) the difficulties in obtaining reliable information and constantly changing environment make is difficult to conduct supervision in a traditional way .

After the projects, the WB has been providing technical assistance to the Ministry of Agriculture and Fisheries in the preparation of the SDP, MTOP and MTIP.

The Bank now supports the capacity development of CPPM by IDF (Institutional Development Fund) and facillitae assistance with preparation, appraisal and supervision of the SAPIP, funded by GAFSP (Global Agriculture Food Security Program).

3) FAO

FAO is supporting MAF's activities in various development fields. Operation of KONSSANTIL is one of the supporting activities by FAO. FAO plans to prepare the agricultural census.

4) China

China is supplying the seed of "hybrid rice"(reffered to the 3-5-1 Present Situation of the Agriculture Production). Related to this support, China plans to provide rice mill machine in 2015. Targeted districts are Bobonaro, Manatuto and Viqueque.

5) DFAT

DFAT has provided rice mill machine for ACELDA to strengthen rice market. ACELDA is doing business for processing and trading of agricultural products in Baucau wide area.

CHAPTER 4 IMPACT OF AGRICULTURAL POLICY ON RICE PRODUCTION

4-1 DEMAND OF RICE

4-1-1 Food Demand Estimation by MAF

MAF estimates food demand at national level quarterly, taking consideration into 1) amount of consumption per capita (106kg/year/capita and 67kg/year/capita for rice and maize, respectively), 2) demand as feeding stuff and seeds, and 3) Strategic Grain Reserve (SGR) mentioned hereinafter. Food supply is estimated based on expected production and food stock from previous year. Difference between demand and supply is regarded as imported amount. Basically, those data are collected from relevant departments of MAF except for amount food stock, which is gained from MCIE. Certain amount of SGR is irregularly released at the market, and it is difficult to estimate the amount at the end of quarter term. Therefore, the amount of SGR is estimated as zero for food demand estimation. Estimated food demand since April 2013 to March 2014 is as follows:

Table 4-1-1 Food Demand Estimation (from April 2013 to March 2014)

No.	Item	Rice (mt)	Maize (mt)
I.	**Total availability from domestic sources**	**70,299**	**100,789**
A.	Opening stocks 1/	17,900	0
B.	Final Production Estimate from main season 2/	46,210	91,360
C.	Final Production Estimate from second season	6,189	9,429
II.	**Total utilization**	**132,460**	**115,072**
A.	Food use 3/	121,411	76,741
B.	Seed requirement 4/	570	2,174
C.	Feed use 5/	0	16,000
D.	Post-harvest losses 6/	10,480	20,158
E.	Targeted closing stocks 7/	0	0
III.	**Deficit/Surplus**	**- 62,161**	**- 14,283**
IV.	**Required imports/to be covered by other crops/food**	**62,161**	**14,283**

Source: Timor-Leste Food Security Bulletin, Issue No. 5, July to September 2013

a) Only government stocks as of March 2013

b) 2/Milling rate of paddy to rice is estimated at 60 percent.

c) Based on 106 kg/year/person of rice consumption and 67 kg/year/person of maize and a population of 1,145,383 in 2013.

d) According to the NDAH of MAF standard use of seed for: rice 25 - 35 kg/ha, maize 40-50 kg/ha.

e) There is no information available on the use of grains to feed animals. However, it is known that the 60% extraction rate of rice already takes into account and 6% that remains in the husk is given to animals. Maize, in turn is extensively used as feeding. Only chicken feeding is used for this calculation, based on MAF's standard consumption rate.

f) NDAH/MAF estimates 15 - 20% post harvest losses in both rice and maize.

g) It may include contingency stocks.

Table 4-1-1 is based on estimation and algorithms, and as a consequence, should be regarded as only a general approximation. According to the estimation above, amount of food deficit from April 2013 to March 2014 is 76,444 tons in total, and rice deficit and maize deficit are 62,161 tons (81%), 14,283 tons (19%), respectively. Consumed amounts of rice and maize for food and seed are 132,460 tons and 115,072 tons, respectively, which means the total amount is 247,532 tons.

"Seeds of Life" (SoL) reviews the estimated amount of food demand and supply by MAF considering real situations and modifies the amount[1]. According to SoL, amount of rice consumption per capita

[1] "Impact of Rice Imports on Rice Production in Timor-Leste", Seeds of Life, January 2013, p.4 - 12.

(106kg/year) and quantity of grain reserve by the government are doubtful. Especially, estimated rice production is more than actual one by 40%.

It is expected that rice demand will be increased remarkably by population increase and shifting of people's preference from maize or cassava to rice. According to the estimation by SoL, rice demand will be 193,507 tons in 2030, which is 140% of that in 2012. SoL also expects that even though rice cultivation area is increased, amount of deficit is not changed. Rice deficit in 2012 is estimated 78,757 tons according to SoL's estimation, which is more than estimated amount by MAF by 25%. It is thought that this deficit level will be sustained until 2030.

4-1-2 Management of Demand and Supply of Food by KONSSANTIL

The estimation of demand and supply of food is reported from NDPP, MAF to (KONSSANTIL[2] : National Council on Food Security, Sovereignty and Nutrition in Timor-Leste). KONSSANTIL is cross-cutting organization regarding food security and it was established in November 2012, whose antecedent was IFNSTF (Inter Ministerial Food and Nutrition Security Task Force) established by prime minister's initiatives in 2010. KONSSANTIL is chaired by Minister of MAF chairs, consisting of various ministries such as MCIE, Ministry of Education, Ministry of Social and Solidarity, Ministry of Finance constitute the council. Roles and responsibilities of those ministries are as shown below:

Table 4-1-2 Roles and Responsibilities of Constituting Ministries at KONSSANTIL

Ministry	Responsibility
Ministry of Agriculture and Fisheries	Responsible to increase (in quality and quantity) food production and productivity
Ministry of Health	Responsible for health and nutrition of children, pregnant and lactating mothers
Ministry of Social and Solidarity	Responsible for vulnerable population on food insecurity and victims of natural disasters
Ministry of Education	Responsible for implementation of the School Feeding Program
Ministry of Commerce, Industry and Environment	Responsible to ensure food availability in markets and provide opportunity for farmers to market local produce
Ministry of Finance	Responsible to reduce poverty level, control importation and food prices
Ministry of State and Administration	Responsible for community development and coordination at the district and sub-district levels

Source: MAF-CPPM

KONSSANTIL does not decide the amount of rice to be imported based on the demand and supply of food mentioned above to balance demand and supply. MCIE imports rice every year within the budget, which is irrelevant to the food supply and demand. This is because that there is a time lag between estimation of demand and supply of food and budget allocation. National budget planning begins with draft plan preparation at each ministry in May, the compiling of budget plan is started by Parliament Committee D in October, final budget plan is approved at the parliament in December, while demand and supply of food is estimated quarterly based on production. In other words, budget allocation against the food deficit is taken in next year, even though necessary budget for food import is examined considering expected production in May. It is the reality that demand and supply of food based on estimation is not managed.

[2] Under KONSSANTIL, the Permanent Technical Secretariat and the Inter-Ministerial Food and Nutrition Security Working Group are organized at central level and ministerial working level, respectively. Moreover, the District Food Security, Sovereignty Nutrition and Disaster Management Committee is organized at local level, which District Director of MAF plays as the Vice Coordinator.

4-1-3 Strategic Grain Reserve

SGR is controlled by MCIE for the purpose of price stabilization. The stored food is allocated for market intervention, humanitarian support, school-provided lunch and so on. Amount of the SGR is estimated considering food reservation for 30% of whole population for three months[3].

There is a statistic data describing demand of SGR (rice) is 30,000 tons, however, estimated amounts of SGR (rice) for 2014 and 2020 by the government are 15,200 tons and 17,600 tons, respectively, as shown below:

Table 4-1-3 Amount of Strategic Grain Reserve (Rice)

Category	Unit	Year						
		2014	2015	2016	2017	2018	2019	2020
Population (a	'000's	1,173	1,201	1,230	1,260	1,290	1,321	1,353
Population at Risk (b	000's	352	360	369	378	387	396	406
Cereal Requirement (c	Kg	43.25	43.25	43.25	43.25	43.25	43.25	43.25
Strategic Grain Reserve	Mt	15,220	15,586	15,962	16,347	16,741	17,144	17,557

Note: a) Annual population growth rate is estimated at 2.41%
b) 30% of population
c) 3 months need at a rate of 173 kg/year (106 kg rice; 67 kg maize)

Storages for SGR (rice) are constructed in major cities, Dili (capacity: 15,000 tons), Maliana (ditto 1,000 tons), Maubise (ditto 500 tons), Manatuto (ditto 1,000 tons), Oecusse and so on. Imported rice by the government at Dili port is transported into Tibar storage, which is located on 13km away from Dili. The Tibar storage was constructed in 2010 and it is composed of three buildings, which have 5,000 tons capacity, each. The storage is operated by 32 staff and 300 labours maximally, by using two folk lifts.

As mentioned before, MICE has storages with enough capacity for grain reserve, however, sufficient food is not secured due to budgetary shortage. As of January 2014, one of buildings of Tibar storage has not been used and other two buildings have kept only 3,000 tons and 2,000 tons of imported rice for each. Targeted closing stocks shown in Table 4-1-1 have to describe amount of SGR (rice) in 2014 (e.g. 15,200 tons), however, the amount is written as zero. Originally, target closing stock, which is food reserve for next year, shall be described in the table of demand and supply of food. It can give an indication of amount of rice import for next year.

4-2 CURRENT RICE IMPORT

4-2-1 Imported Rice by the Government and Private Sector

Distribution amount of domestically produced rice in 2013 is around 50,000 tons, while that of imported rice is estimated at 80,000 tons, which is 1.6 times of domestically produced rice. For rice import, there are two routes, namely, by the government and private sector for commercial purpose. Quantities imported by means of former and latter routes are 15,000 tons (19%) and 65,000 tons (81%) of rice, respectively.

Amounts of imported rice for past five years are described in the following table. Ministry of Finance and the custom office publicized statistic data related amount of imported rice, respectively, however, the amounts of both are not consistent. The quantities in the following table are referred to data issued

[3] Inter-Ministerial Food and Nutritional Security Task Force, Quarter IV 2012 Situation Assessment Report, February 2013, p. 11.

by Ministry of Finance while the amount of imported rice is calculated by MCIE based on domestic rice production, which has been fluctuated depending on year.

Table 4-2-1 Amount of Imported Rice

Category	Year				
	2009	2010	2011	2012	2013*
Imports	86,745	59,516	30,508	98,189	80,337

Source: Ministry of Finance, Directorate General of Statistics; with Consultant estimate for 4th Quarter 2013.
* estimated volume based on actual figure from January to October 2013.

According to the statistic data of Ministry of Finance, amount of imported rice from January to October 2013 is 68,900 tons. Total amount of imported rice in 2013 can be estimated at 80,000 tons under the condition that the same rate for other months is applied.

Main rice exporting countries to Timor-Leste are Vietnam, Indonesia, Thailand, China and Singapore, and the amount of import from Vietnam accounts for more than 90% of total one for these five years. This data are not gained from imported countries but from Country of Origin, namely, Timor-Leste. It is noted that amount of imported rice from Myanmar has been increased in these five years, while that from Indonesia has been decreasing.

Table 4-2-2 Rice Importing Countries (Top Three)

	Year				
	2009	2010	2011	2012	2013
Top 1	Vietnam (93%)	Vietnam (98%)	Vietnam (87%)	Vietnam (95%)	Vietnam (99%)
Top 2	Australia (2.3%)	Indonesia (0.5%)	Singapore (13%)	Myanmar (2.7%)	Thailand (0.2%)
Top 3	Indonesia (2.2%)	Thailand (0.5%)	Thailand (1.8%)	Singapore (1.6%)	China (0.2%)

Source: Ministry of Finance, Directorate General of Statistics
Note: Percentage in parenthesis is ratio of the country's rice in total rice import of Timor-Leste.

4-2-2 Price of Imported Rice

Prices of imported rice are various depending on quality, quantity, varieties, place to be sold. In urban areas such as Dili, high class aromatic rice from Thailand or Indonesia is sold, which means that there is a big difference of prices among rice varieties. Commercial imported rice, which has normal fragmentation rate, namely, around 15%, is sold at \$0.60/kg to \$0.80/kg. According to statistic data of MAF, prices of imported rice are various depending on the places, there is a tendency that prices can be higher in remote areas. In statistic data in 2013, retail prices in Baucau and Maliana were at \$0.61/kg to \$0.62/kg, while those are sold at \$0.72/kg and \$0.93/kg in Manufahi and Oecusse, respectively.

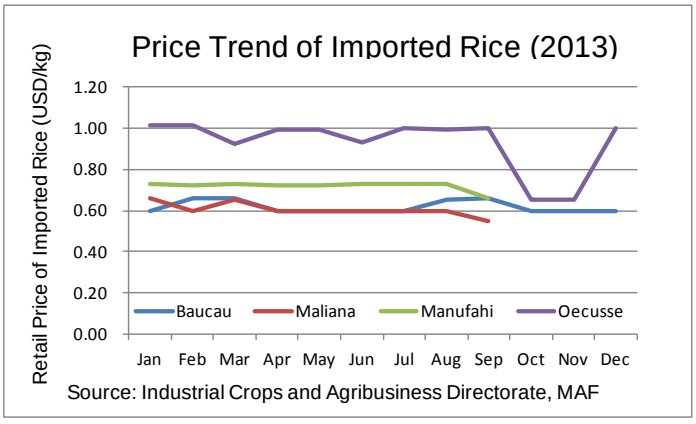


Figure 4-2-1 Trend of Price of Imported Rice by Region

Only rice traders who have licenses can sell governmentally imported rice, and the number is limited. The price of imported rice by the government in 2013 was uniformly \$550t (=\$0.55/kg). According to MCIE, for acquisition of license, it is needed to satisfy the standard, which requires verification of company organization, tax payment certification, submission of balance account. As of 2013, licenses have been issued to 49 companies, and rice import is entrusted to those companies based on contracts

that are exchanged quarterly. Imported rice by the government is packed with a white bag with the printed governmental logo mark, and one package is uniformly 25kg. According to MCIE, milled rice is packed with bag of MCIE in the importing countries and it is separated from other imported rice for distribution after arrival in Dili port.

Import of rice is liberalized in Timor-Leste, however, tariff duty and sales tax are set at 2.5% and 2.5%, respectively, 5% in total is charged as tax. Price setting of imported rice is generally based on the taxes. However, average price of imported rice is very low according to the custom office, and prices in 2012 and 2013 were $314/tons and $260/tons, respectively. The values are lower than CIF price at Dili port in the same duration by 40%. According to the custom office, price of imported cargo through self-declaration by private import companies is estimated based on FOB price, while the custom office adds insurance (5%) and transport (10%) and charges tariff by exchanging into CIF price. However, there is still difference between actual price and declared one.

Relevancy of estimated price is confirmed by the Tariff Custom Valuation (TCV). The TCV examines quality of imported rice, prices described in invoices, and difference of price among fellow-traders, and if the staff find any violation, they imposes fine on the offenders. The system regarding relevance confirmation in Timor-Leste is different from Japanese one, which requires to check contracts of imported cargo, invoice inward and other documents related to trade and book keeping, and to examine relevance of tax return.

4-3 PROCUREMENT SYSTEM FOR DOMESTIC RICE BY THE GOVERNMENT

Productivity improvement of staple food in Timor-Leste is implemented through irrigation system establish, technical supports, seed provision and so on. However, in addition to production improvement, process for distribution and consumption is important to bring about good impacts on the food security. Farmers in Timor-Leste put high priority on food production for subsistence more than that for sale. When they produce surplus rice, they sell it to relatives and friends or they exchange and batter. Amount of commercial distribution through market is relatively small. Under the circumstance, the government procurement system for domestic rice is functioned as a complement measure of under developed distribution system in Timor-Leste.

4-3-1 Budget for Purchase of Domestically Produced Rice

The government has implemented the procurement policy of rice, maize, mung bean, ground nut (Povu Kuda, Governo Sosa) for the purpose of production increase and marketing since 2008 through MCIE. MCIE procures those crops through registered companies. The amount to be procured is decided based on budget of MCIE.

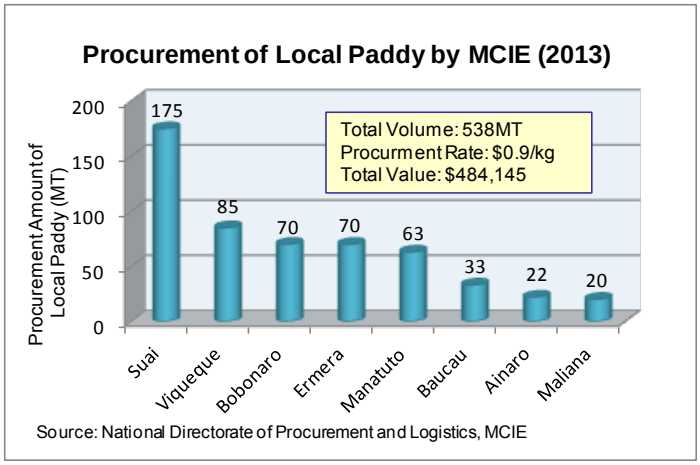


Figure 4-3-1 Procurement of Domestically Produced Rice by MCIE

Budget of MCIE for procurement in 2013 was $1,110,000. However, only $824,000 was spent for procurement of (1) 538 tons rice in Baucau, Viqueque, Maliana and Manatuto, (2) 93 tons maize in Viqueque, Baucau and Liquiça, and (3) 4 tons beans in Maubise. The procured amount accounted for only 1% of total one in case of rice.

In 2013, MCIE improved the procurement system and started its operation. Before the change of system, there was no appointment of rice traders from farmers, after the improvement, 1 to 2

cooperatives appointed by districts have purchased rough rice from rice production farmers. If there is no proper cooperative, MCIE appoints some distribution traders. Such cooperatives and traders have to satisfy the qualification standard e.g., management basis, financial base, work experiences and so on, which is specified by MCIE. Selected cooperatives in each district procure rice from production farmers.

The rice procurement is implemented in Dili and Maliana. Rice traders from Suai, Ainaro, Baucau, Manatuto and Viqueque get together in Dili, while those from Bobonaro, Ermela, Maliana do in Maliana. According to statistic data of MCIE, it was Suai which the biggest amount of rice was procured in 2013 and it accounted for 33% of total one, followed by Viqueque (16%), Bobonaro (13%), Ermera (13%), Manatuto (12%).

The amount of procurement by the government is too small compared with expectation of farmers and rice traders, which causes various problems. For instance, MAF staff in Bobonaro had a plan to procure 755 tons of rice from five traders from July to August in 2013 based on announcement by MCIE, however, actual procured amount by MCIE was only 70 tons. In such condition, MAF staff, farmers and traders have a mistrust of the procurement system. Payment to the traders are done through banking institutions, however, there were cases of bankruptcy of traders due to delay of payment from MCIE to traders, although the traders procured rough rice by their own funds.

Budget of MCIE for rice procurement in 2014 is $3,000,000. $2,000,000 out of the budget is spent for procurement of rice, maize, mung bean, and remaining $1,000,000 is spent for cost of milling of rough rice stored in storehouses of MCIE. After rice milling, the rice is supplied at $0.48/kg as subsidized rice by the government to consumers. As well as 2013, it is expected that amount of procurement will be very limited, however, impact of publicized price by MCIE on farmers is very big, which seemingly fluctuates expected sale price of farmers.

4-3-2 Procurement Price of Domestic Rice

Procurement price by the government is fixed by MCIE and publicized in the document. Following table describes trend of prices by annual.

Table 4-3-1 Procured Price of Local Rice by MCIE

	2010	2011	2012	2013
Procured Price from Farmers	$0.40/kg	$0.45/kg	$0.50/kg	$0.75/kg
Procured Price from Traders	$0.50/kg	$0.70/kg	$0.75/kg	$0.90/kg

Source: MCIE

In 2013, procured price from farmers by traders and ones¥ from traders by MCIE were $0.75/kg and $0.90/kg, respectively. The difference between them, namely, $0.15/kg is regarded as margin for the traders. There is no classification of rice based on quality for procurement. In general, quality of procured rice is low, since such rice has high percentage of fragmentation and impurity.

Compared with margin in 2012, namely, $0.25/kg (=0.75-0.50), the margin in 2013, namely, $0.15/kg was disadvantage for the rice traders. This situation has decreased of traders' incentives, consequently, many traders do not procure rice. In February 2014, it was observed that rice traders purchased rice at $0.50/kg from farmers and delivered at $0.75/kg to the storage of MCIE in Maliana.

4-4 SALE OF RICE BY MCIE

Sale of rice by MCIE (subsidized rice) is implemented based on amounts of 1) governmental imported rice, 2) rice reserve and 3) procurement of domestically produced rice. MCIE sold 8,176 tons of rice from January to September 2013. The subsidized rice is provided to all the districts. MCIE had a plan

to sell 16,000 tons of rice in total in 2013, the breakdown of rice was as follows, school lunch by MOE, humanitarian support by MSS are 11,000 tons, 4,000 tons and 1,000 tons, respectively.

According to the interview to MCIE staff on 23rd January 2014, MCIE sold imported rice at $0.28 to 0.36/kg ($7~9/25 kg) to distributors. In such cases, maximum price of rice by the distributors was set at $0.48/kg ($12.00/kg) by MCIE. The price was around 60% of cost for rice import.

According to the SLMS report, prices of subsidized rice are depending on regions, the average is $0.59/kg, which is higher than the maximum price. Probably, it is because that the distributors sell the rice to other distributors. There is no structure in MCIE to monitor the process regarding sale of subsidized rice due to limitation of financial and human resource, as a result, distributors can enjoy benefit more than consumers in the current system. MCIE has a plan to re-examine the sale system in 2014 to make secure that targets can receive the rice sufficiently.

4-5 MARKET OF RICE PRICE

Price of imported rice is lower than that of domestically produced rice. NDA studies retail price of rice in four markets, namely, Baucau, Maliana, Manufahi, and Oecusse. According to the survey result, mean retail prices of imported rice in 2013 in Maliana, Baucau, Manufahi and Oecusse were $0.61/kg, $0.62/kg, $0.72/kg and $0.93/kg[4]. On the other hand, ones of domestically produced rice were higher than imported ones by 5 to 20%, and prices in Maliana, Baucau, Manufahi and Oecusse were $0.66/kg, $0.62/kg, $0.72/kg and $0.97/kg.

Such trend was observed through the site survey by the Project Team. Figure 4-5-1 illustrates correlation between rice price and distance from Dili by regression analysis using least square method. Though number of sample is small, the trend mentioned above can be observed. Price of imported rice is lower than that of domestically produced rice, and price of subsidized rice is lower than that of imported one. Consequently, rice production farmers cannot sell rice even though they want to do, which results in reduction of their motivation for rice production.

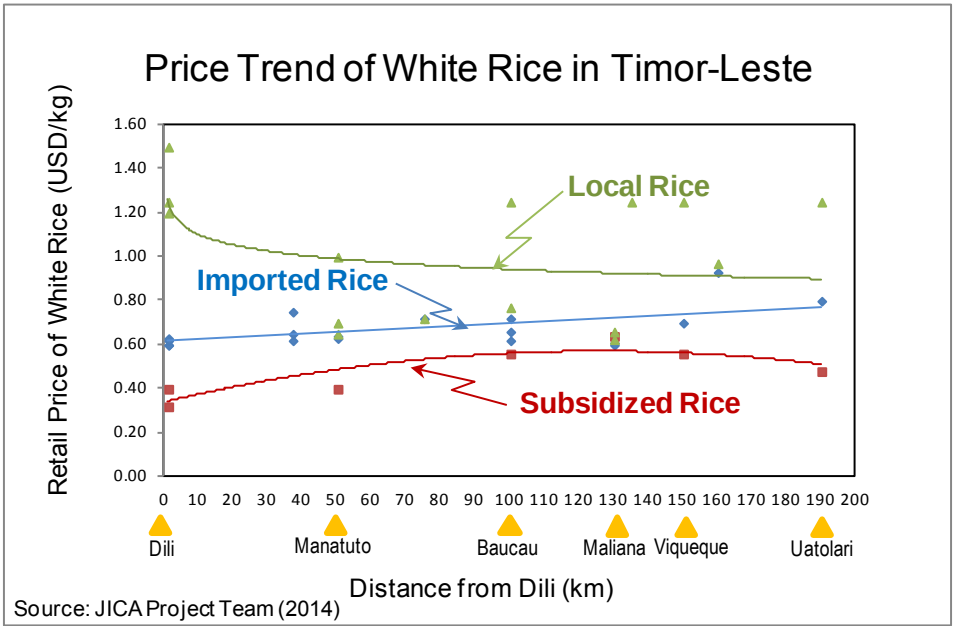


Figure 4-5-1 Price Trend of Domestically Produced Rice, Imported Rice and Subsidized Rice

[4] NDA, MAF.

In general, the further from Dili, the higher rice price is because of transportation cost, however, there is no price difference between imported rice and domestic one in Uotolari, Viqueque according to the site survey in February 2014.

Membremo variety, which is domestically produced and aromatic rice, is popular compared with other domestically produced rice varieties. However, there is no difference of price between Membremo and others, which means that cultivation of Membremo is not beneficial for the farmers except that it is sold out at the market very soon. According to the survey in November 2013, it was confirmed that rice in Baucau is sold at $2.00/kg at the supermarkets in Dili and that some rich people purchase high-priced local rice.

Not only white rice but also black rice and red rice are sold at the markets, however, only black rice is sold at higher price than usual one in Dili, and there is no differentiation of rice prices in Baucau and Viqueque, even Uotolari, which is a famous production area (Figure 4-5-2). It means that there is a possibility that differentiation of rice by variety or production area will be caused, as the local rice market is matured in the future.

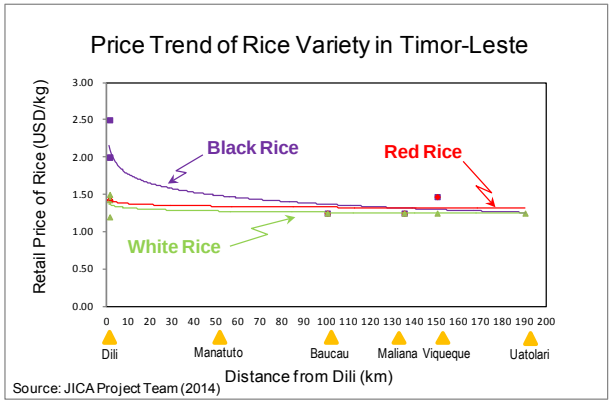


Figure 4-5-2 Trend of Rice Price by Variety

Following figure illustrates a flow chart of rice distribution in Timor-Leste. Imported rice is distributed from Dili to other regions in the country, and the further destination from Dili is, the higher transportation cost is. On the other hand, local rice is distributed from Maliana, Baucau, Viqueque and so on to Dili, the amount is small, though. Red rice and black rice at the markets in Dili are almost from Uotolari in Viqueque. Such situation shows that Uotolari has a high potential as a rice production center of red rice and black rice.

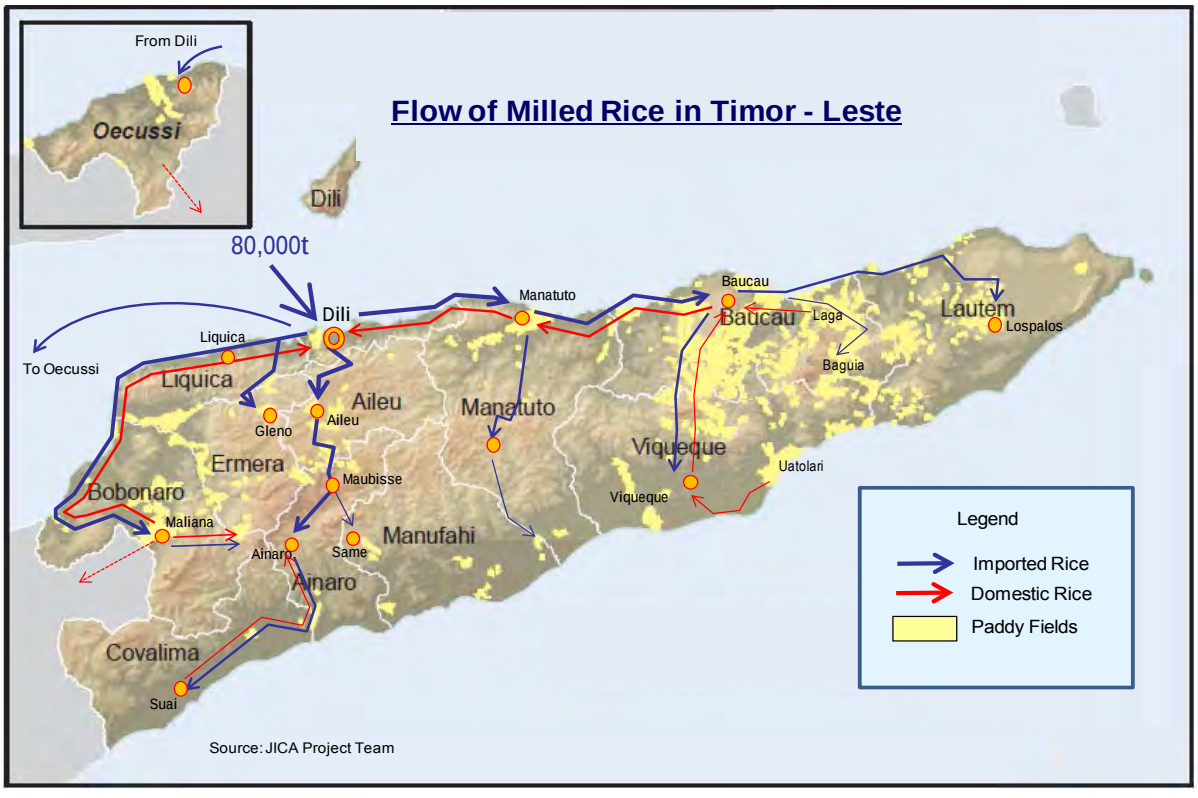


Figure 4-5-3 Distribution Flow of Imported Rice and Domestically Produced Rice

4-6 ANTICIPATED IMPACTS BY ASEAN AFFILIATION

The government of Timor-Leste prepares for affiliation with the ASEAN in near future (it is planned to be done in 2015). It is planned that ASEAN Economic Community (AEC) will be established in 2015 and tariff duty will be discontinued within the AEC area. Therefore, some policies, which go against the trend of ASEAN such as protectionist policy including protection rice production farmers, are likely to be avoided in Timor-Leste.

Rice is protected in the ASEAN countries, since it is a sensitive crop, therefore, liberalization of rice and sugar will be difficult even after establishment of AEC. Moreover, the ASEAN counties are much diversified in terms of scale of population and economy, ethnology, language and religion. Regarding development level, Singapore, Malaysia and Thailand are industrialized to some extent, while Cambodia, Laos, Myanmar, Vietnam are still developing. Therefore, following sub-chapter compares economic indicators of ASEAN countries and Timor-Leste to overview of agricultural policies in the main counties of ASEAN and discusses anticipated impacts on Timor-Leste.

4-6-1 Comparison of Main Economic Indicators between ASEAN Countries and Timor-Leste

Main economic indicators of ASEAN countries and Timor-Leste are examined in Table 4-6-1. ASEAN countries have more than 600 million population and a giant market which is 5 times more than that of Japan, while it has 2,400 billion dollars nominal GDP, which is around 40% of that of Japan[5]. Indonesia has the biggest population, 250 million, followed by Philippines that has around 100 million, while Brunei has the smallest one, 410 thousands. If Timor-Leste affiliates ASEAN, it is the second smallest country in ASEAN countries (Figure 4-6-1).

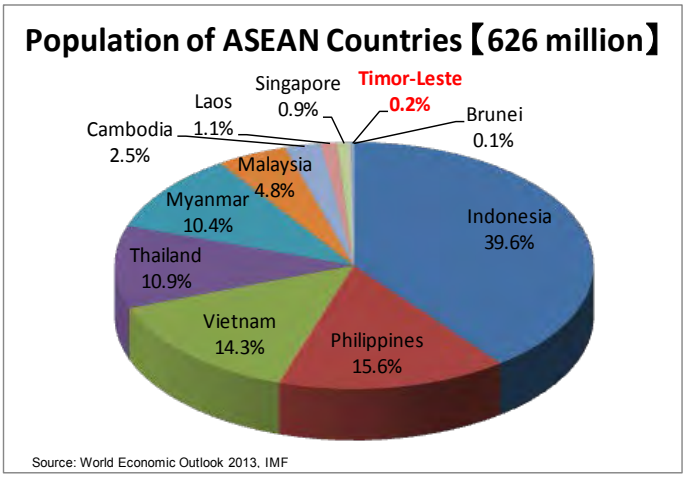


Figure 4-6-1 Comparison of Population of the ASEAN Countries and Timor-Leste

In terms of economic scale by means of nominal GDP (2013), Timor-Leste is the smaller than any of the ASEAN countries. Indonesia is the biggest, US$870 billion, followed by Thailand, Malaysia, Singapore and Philippines, their nominal GDP are US$400 billion, US$310 billion, US$280 billion, US$270 billion, respectively. The smallest country in terms of nominal GDP is Laos which has US$10 billion and Timor-Leste has around 60% of that.

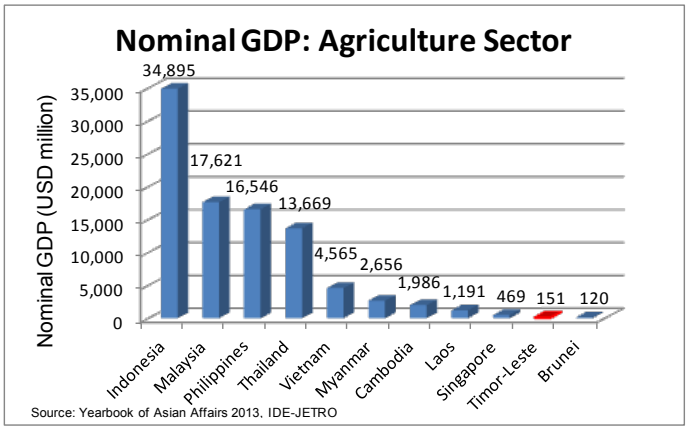


Figure 4-6-2 Comparison of Economic Scale in Agricultural Sector

In terms of scale of agricultural sector, also, Timor-Leste is a small country (Figure 4-6-2). The ASEAN countries can be classified into three groups by means of the categorization mentioned above. The big-scale group has US$13 billion to US$35 billion of GDP in agricultural

[5] World Economic Outlook 2013 (IMF)

sector and the group is constituted by Indonesia, Malaysia, Philippines and Thailand. Middle scale countries have US$1.2 billion to US$4.5 billion of nominal GDP in the sector and they are Vietnam, Myanmar, Cambodia and Laos. Small scale group which has US$ 0.1 billion to US$ 0.5 billion of nominal GDP includes Singapore and Brunei. The nominal GDP of Timor-Leste is US$ 0.15 billion, which is the same level of those of Singapore and Brunei.

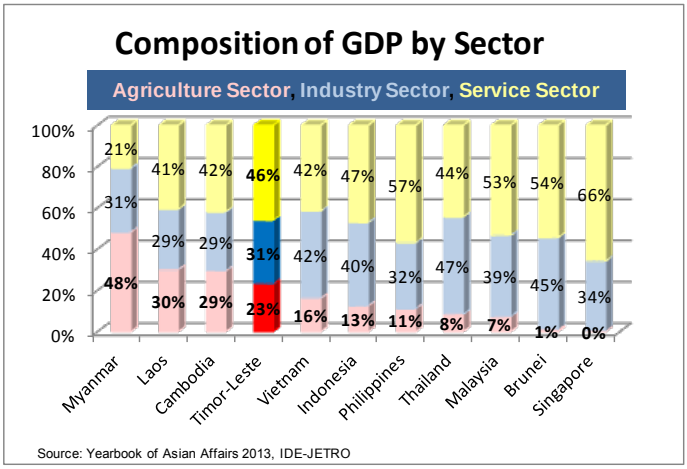


Figure 4-6-3 Comparison of GDP Composition by Sector

Timor-Leste mainly depends on the primary industry, especially agricultural sector compared with the ASEAN countries. In terms of importance of agricultural sector in the national economy by means of GDP composition, Myanmar has the biggest percentage (48%) followed by Laos (30%), Cambodia (29%) and Timor-Leste (23%) (Figure 4-6-3). Concerning composition of labour in agricultural sector, Laos is ranked at 1st, followed by Cambodia and Timor-Leste and percentage of them are 82%, 77% and 66%, respectively. It means that agriculture is important industry for employment maintenance in Timor-Leste (Figure 4-6-4).

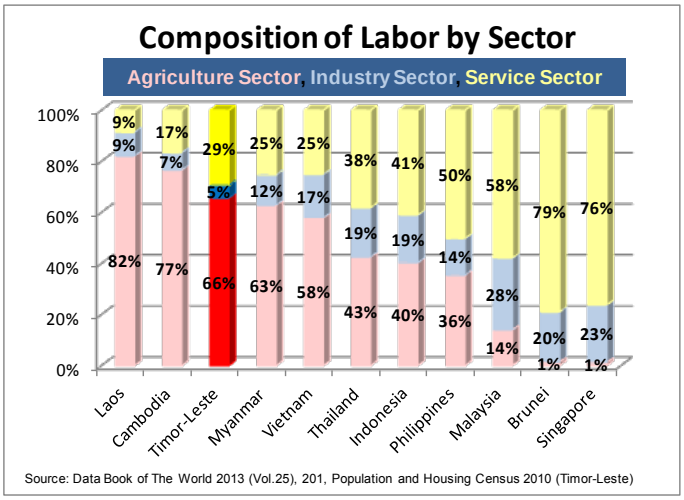


Figure 4-6-4 Comparison of Employed Population by Sector

Productivities of agricultural sector in terms of land productivity (US$/ha) and labour productivity (USD/person) are examined. They are US$444/ha and US$420/person in Timor-Leste, which is ranked at 8th in the ASEAN countries, it is low level, though. These values are much lower compared with those in Malaysia, Philippines, Thailand and Indonesia, however, they are higher than those of Cambodia, Vietnam and Myanmar while they are almost same level of those of Laos.

The result, however, probably shows high commodity prices in the Timor-Leste rather than effect of management effort. It is noted that land productivity and labour productivity are very high in Singapore and Brunei, which liberalize trade of agricultural products. Both countries promote high-valued agricultural, livestock and aquatic products, for instance, Agro-technology Park (ATP) is introduced in Singapore.

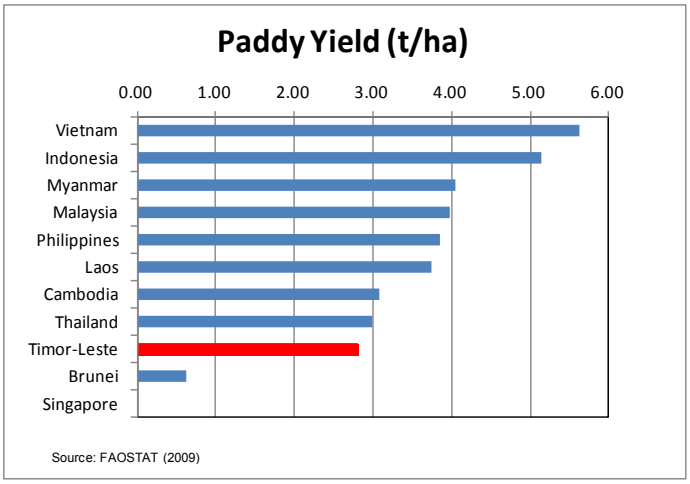


Figure 4-6-5 Comparison of Paddy Yield

Cultivated acreage per household in Timor-Leste is 1.1ha/household and it is almost same level as the ASEAN countries except Malaysia that plantation agriculture has been developed and has achieved 4.8ha/household (see Figure 4-6-5). Land productivity (yield of paddy) of Timor-Leste is grouped into lower countries.

One of the main reasons for such situation is low input of fertilizer. According to the FAOSTAT (2011), the input of fertilizer per unit area (kg/ha) is almost same as that in Laos, which is ranked at lowest in the ASEAN countries (see Table 4-6-1).

Rice production scale in Timor-Leste is remarkably low compared with that in the ASEAN countries. Rice cultivated acreage and amount of production in Timor-Leste is 37 thousand ha and 100 thousand tons, respectively, while those are 3 million to 13 million ha and 10 million to 70 million tons, respectively in main rice production countries[6]. On the other hand, farm price of rice was $370/t on average in 2011 according to the NDA, MAF (see Figure 4-6-6). The price is high and same level as those in Thailand and Philippines. It means that rice production in Timor-Leste faces severe conditions in terms of price competition also.

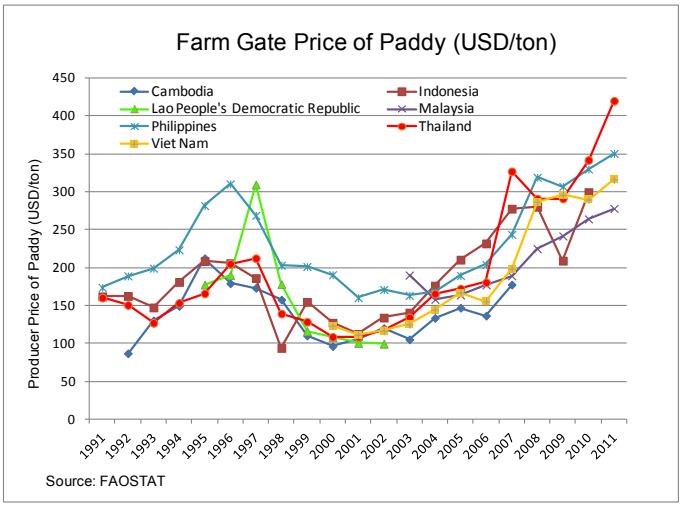


Figure 4-6-6 Farm Gate Prices of Rice in the ASEAN Countries

[6] FAOSTAT 2009

Table 4-6-1 The Comparison of Timor-Leste with ASEAN countries

Indicators	Malaysia	Thailand	Indonesia	Philippines	Singapore	Brunei	Cambodia	Laos	Myanmar	Vietnam	Timor-Leste
Basic Indicators											
Population (million) /a	29.96	68.20	247.95	97.48	5.43	0.41	15.41	6.78	64.95	89.69	1.19
Area (km^2) /a	329,847	513,120	1,900,000	300,000	697	5,765	181,035	236,800	676,578	331,210	14,874
Population Density (person/km^2)	91	133	131	325	7,792	70	85	29	96	271	80
Literacy Rate /a	89%	94%	90%	95%	93%	98%	74%	73%	93%	93%	59%
Economic Indicators											
Nominal GDP ($ billion) /a	312.4	400.9	867.5	272.2	287.4	16.6	15.6	10.1	59.4	170.0	6.1
GDP per Capita (Nominal, $) /a	10,429	5,879	3,499	2,792	52,918	40,804	1,015	1,490	915	1,896	5,162
GDP per Capita (PPP, $) /a	17,526	9,888	5,182	4,660	62,428	54,809	2,573	3,066	1,711	4,001	21,396
Agricultural Indicators											
GDP of Agricultural Sector (USD million) /b	17,621	13,669	34,895	16,546	469	120	1,986	1,191	2,656	4,565	151
Share of Agricultural Sector in GDP /b	7.3%	8.4%	12.5%	11.1%	0.0%	0.7%	29.4%	30.0%	48.2%	16.1%	23.1%
Share of Agriculture Sector in Labor Force (%) /c	14.0%	42.5%	40.3%	35.5%	1.2%	1.4%	76.6%	82.2%	62.8%	57.9%	65.6%
Number of Agricultural Labor (million) /c	1.64	19.49	49.51	13.34	0.002	0.001	4.90	2.31	18.61	29.30	0.34
Fertilizer Use (1000t) /d	2,980	5,136	12,500	1,827	7	0	126	0	296	3,297	0
Agricultural Land (1000ha) /d	7,870	21,060	54,500	12,100	1	11	5,655	2,378	12,558	10,842	360
Total area equipped for irrigation (1000ha) /d	365	6,415	6,722	1,567	0	1	354	310	2,292	4,600	35
% of area equipped for irrigation	5%	30%	12%	13%	0%	9%	6%	13%	18%	42%	10%
Capital Stock (Machinery/ Equipment) (USD million) /e	515	1,768	9,450	726	N.A.	1	232	77	1,363	10,777	12
Labor Productivity (USD/labor)	10,745	701	705	1,240	234,503	119,644	405	516	143	156	444
Land Productivity (USD/ha)	2,239	649	640	1,367	642,475	10,495	351	501	212	421	420
Land Holding Size (ha/farmer) /c	4.8	1.0	1.1	0.9	0.4	11.4	1.1	1.0	0.7	0.4	1.1
Fertilizer Use per Agricultural Land (kg/ha)	379	244	229	151	9,419	0	22	0	24	304	0
Capital stock of machinery/ equipment per agri-labor (USD/labor)	314	91	191	54	N.A.	790	47	33	73	368	36
Paddy											
Share of Rice in Cropped Area (%) /f	10.2%	57.8%	32.9%	32.8%	0.0%	12.4%	74.7%	61.3%	44.7%	55.6%	16.1%
Area Harvested (1000ha) /g	692	12,600	13,443	4,690	0	2	3,008	934	8,150	7,753	37
Yield (t/ha) /g	3.97	3.00	5.14	3.84	0.00	0.63	3.09	3.74	4.05	5.63	2.81
Production (1000t) /g	2,750	37,800	69,045	18,032	0	1	9,291	3,489	33,000	43,662	104
Rice											
Food Supply (kg/capita/year) /g, h	74	133	127	123	81	77	160	166	141	141	67
Import of Rice (1000t) /g, h	26	97	259	1,858	375	39	8	46	26	1	4
Export of Rice (1000t)	31	8,806	9	0	0	0	4	0	512	6,010	0
Self-sufficiency Rate (%) /i	76%	165%	102%	89%	0%	2%	105%	112%	102%	130%	35%

Source:
a/ World Economic Outlook 2013, IMF
b/ Yearbook of Asian Affairs 2013, IDE-JETRO. Agricultural sector includes livestock, fisheries, and forestries. GDP of Myanmar is quoted from Myanmar Statistical Year Book.
c/ Data Book of The World 2013 (Vol.25), 2014, Ninomiya Shoten. Labor force of Timor-Leste is quoted from Population and Housing Census 2010 of Timor-Leste.
d/ FAOSTAT (2011)
e/ FAOSTAT (2007), using constant 2005 prices as the base year. The concept includes tractors (with accessories), harvesters and thrashers, milking machines and hand tools.
f/ FAOSTAT (2012)
g/ FAOSTAT (2009), except food supply and import figures of Singapore.
h/ Food consumption and import volume of Singapore are obtained from MAFF-Japan data (2008). http://www.maff.go.jp/j/soushoku/boueki/kome_yusyutu
i/ Self-sufficiency rate is estimated based on FAOSTAT (2009), except Timor-Leste which is estimated by JICA Project Team.

4-6-2 Rice Policies in the ASEAN Countries

Main rice export countries in the ASEAN are Thailand, Vietnam, Myanmar and Cambodia (see Figure 4-6-7). Especially, Thailand, and Vietnam were the largest and the second largest rice export country, respectively, in 2011. On the other hand, net import countries of rice are Philippines, Singapore, Brunei and so on (see Figure 4-6-8). Indonesia exported rice in 2007-08 due to high production while it imported rice in 2010 and 2011 to compensate for the deficit.

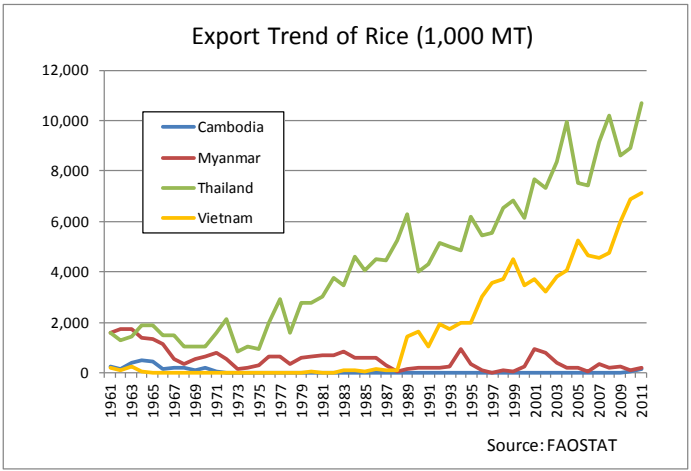


Figure 4-6-7 Trend of Amount of Exported Rice by Country

Rice is staple food and sensitive for the ASEAN countries. The countries take some countermeasures for rice self-sufficiency. Singapore and Brunei depend rice on import while Indonesia and Philippines try to achieve the self-sufficiency. In Indonesia, "One Day No Rice" policy is implemented every week to reduce demand of rice. In Thailand, Vietnam, Myanmar and Cambodia, which have already achieved self-sufficiency, have established an export oriented production system. Laos mainly focuses on small-scale and self-sufficiency rice production in the mountainous areas.

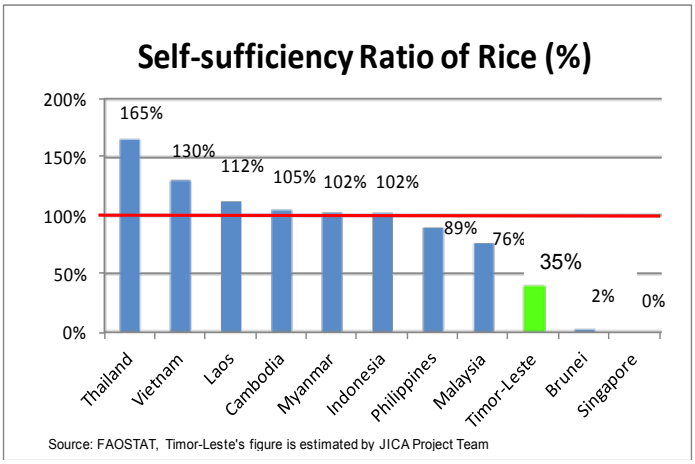


Figure 4-6-8 Self-Sufficiency Ratio of Rice in the ASEAN Countries

Recently, Thailand, Indonesia and so on, which are ranked at middle level in the ASEAN countries, take protectionist agricultural policies. It is because that agricultural income in such countries has been relatively declining while those countries have achieved economic development at more than 5% on average per year and have increased national income. For instance, the guarantee fund system was restarted in Thailand in November 2011. Following the system, farmers can access to loan on security of products and amount of fund is 15,000 Bahts/t, which is 1.8 times of market price. It is more beneficial for farmers to get fund on security of rice and pawn their rice than to sell rice. The system functions as a rice procurement system.

Government of Indonesia has increased the imported rice price to Rp430/kg in 2000, which was charged at 30% of tariff, for the purpose of protection of domestic rice production farmers. Moreover, it has set a prohibition period of import, from one month before of and two months after of harvest period of domestically produced rice, since January 2004. The ban was lifted during off-crop season, but Red Lane inspection[7] is required. Consequently, it is said that price of imported rice has been

[7] Three categories, including Red lane, Yellow lane, Green lane, are existed in Indonesian's import clearance procedure, and newly established company is required the Red lane procedure, which takes one to one and half month for the clearance. However, the necessary date for clearance is not sure and not clear.

increased by 40 to 50% from 2000 to 2004[8]. This policy was suspended in 2011, however, price of rice was increased again to Rp450/kg in April 2011 to control rice import. Furthermore, the policy to purchase domestically produced rice at high price and to provide the rice at low price has been continuously implemented. It was planned to purchase 3.62 million tons of rice from farmers in 2012-2013 and to do 3.85 million tons of rice in 2013- 2014[9].

In addition to those policies mentioned above, the ASEAN countries try to protect rice production farmers and consumers by taking tariff, non-tariff measures and so on. Following table shows rice protection policies which are taken by main ASEAN agricultural production countries.

Table 4-6-2 Rice Protective Policies Taken by the ASEAN Main Agricultural Production Countries

Policy	Thailand	Vietnam	Indonesia	Philippines	Malaysia
Tariff on Rice/ a (Basically, Zero tariff among AFTA)	2.75THB/kg - WTO: In-quota: 30%, Out-quota: 52% - AFTA (CEPT): 5% /g (+ Sales tax: 7%)	40% (ASEAN-ATIGA: 5%) (+ Sales tax: 5%)	450IDR/kg (30%) (+ Sales tax: - %) * Rice is in GEL of AFTA	In-quota: 40%, Out-quota: 50% (+ Sales tax: 12%) * Rice is in GEL of AFTA (ATIGA: 40%)	- AFTA (CEPT): 20%, - AoA of WTO: 40% /f
Import Monopoly	Non (License holder can import)	VFA handle 80% of exporting rice /b	BULOG + Private (but private can import only high quality and waxy rice)	National Food Authority (NFA)	BERNAS monopolize rice import till 2021
Lowest-price Guarantee System	Rice Loan is a sort of guaranteed lowest-price system	Lowest-price ensure 30% of farmers' profit	Gov. decides purchasing price of rice	NFA buy rice from farmers at floor price	Gov. instructs BERNAS for price support at GMP
Local Purchasing Scheme	Rice Loan Program (Then, Gov. distribute to international market)	Gov. instruct VFA to buy rice for reserve purpose	BULOG buy from farmers at higher price and distribute at cheaper price to the poor /d	NFA buy rice from farmers at floor price and distribute through licensed traders at subsidized price	BERNAS procure local rice for strategic reserve and distribute subsidized rice /e
Input Subsidy		Fertilizers, pesticides, seeds, irrigation / c	Fertilizers, seeds, credit support, etc.	Seeds, Fertilizers, etc.	Fertilizers, pesticides, mill, machinery services
Import Restriction	Import Quota, for lower import duty, is limited to WTO members & Laos /g	No import quota for rice	Seasonal quota (import ban for 7 months: before 1 month and after 2 months of harvest season) /d	Minimum Access: 350 thousand ton	License is required for rice import
Population under the Poverty Line (% of Poverty in Rural Areas) /h, i	8,788 thousand (16.7%)	15,269 thousand (22.1%)	28,485 thousand (14.3%)	24,370 thousand (N.A.)	497 thousand (3.4%)

Source: a/ Tariff rates are quoted from World Tariff Account Information (FedEX), sales taxes are quoted from Duty Calculator (http://www.dutycalculator.com/hs-lookup/42028/hs-tariff-code-for-rice/)
b/「Country Report in 2011: Thailand, Vietnam」(2012.3)(Policy Research Institute, Ministry of Agriculture, Forestry and Fisheries)
c/ http://www.tnc-online.net/pic/20150207122130757.pdf#search='Vietnam%2C+rice%2C+subsidy%2C+inputs
d/「Studies on the world wide mid- and long-term forecasting of food supply and demand in 2010」(Policy Research Institute, Ministry of Agriculture, Forestry and Fisheries)
e/http://www.bernas.com.my/index.php?option=com_content&view=article&id=74:background&catid=34&Itemid=58
f/ "MALAYSIAN RICE TRADE AND GOVERNMENT INTERVENTIONS" by Deviga Vengedasalam, Michael Harris and Gordon MacAulay
g/ For WTO members, Cambodia and Laos ad valorem duty of 30% is applied for the import in quota while off-quota ad valorem duty rate is 52%. For AFTA members, under CEPT scheme, specific duty rate is Baht2.75/kg while the ad

[8] An Assessment of the Impact of Rice Tariff Policy in Indonesia, A Multi-Market Model Approach, May 2007, ESA Working Paper No. 07-18, FAO

[9] http://www.oryza.com/reports/monthly-review/oryza-january-2014-rice-market-review

valorem duty rate is 5%.
(http://www.fao.org/docrep/013/al668e/al668e04.pdf#search='Thailand%2C+Rice%2C+tariff%2C+52%25')
h/ population under the poverty line is estimated based on data from the World Development Indicators, The World Bank. The data are compiled from official government sources or are computed by World Bank staff using national (i.e. country–specific) poverty lines.
i/ % of rural population below national poverty line (percentage) between parentheses is quoted from data base of The Millennium Development Goals Indicators (http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=583).

Remarks：ATIGA (ASEAN Trade in Goods Agreement), GEL (general exceptional list), AFTA (ASEAN Free Trade Area), CEPT (Common Effective Preferential Tariff Agreement), AoA (Agreement of Agriculture), WTO (World Trade organization), BULOG (The National Logistics Agency, Indonesia), BERNAS (Padiberas Nasional Berhad, Malaysia), GMP (Guaranteed Minimum Price), VFA (Vietnam Food Association: Hiep Hoi Luong Thuc Viet Nam)

As mentioned before, rice is a politically sensitive crop for the ASEAN countries and some measures to protect rice production farmers have been taken. Based on ASEAN Free Trade Area (AFTA), tariffs of most of imported commodities were abolished among the ASEAN 6 countries (Brunei, Indonesia, Malaysia, Philippines, Singapore and Thailand) in 2010. However, in the name of national security, rice is specified as General Exemption List (GEL) in Indonesia and Philippines[10].

In addition to tariff, sales tax for rice is set in Philippines, Indonesia and Thailand, those percentages are 12%, 10% and 7%, respectively. Tariff and sales tax in Timor-Leste are 2.5%, which are remarkably low compared with ones in the ASEAN countries. In Indonesia and Thailand, per-unit tax is applied. It is said that per-unit tax system makes it possible to control fluctuation of import price compared to ad duty system.

4-6-3 Anticipated Impacts by ASEAN Affiliation

Due to AEC inauguration, the trade systems including tariff reduction in the ASEAN countries will be unified and the unified system will bring about trade which has comparative advantage[11]. As the market is expanded, some industries with comparative advantage can enjoy benefits resulting from merit of scale and reduce production cost. Consequently, this situation leads to improvement of international competitiveness and increase of export to other countries. On the other hand, amount of production in ineffective industries will be decreased, goods which are produced in more effective way are imported. As a result, general consumers can purchase such products at cheaper price than before. Foreign Direct Investment (FDI) to the signatory states will be increased, which can improve competiveness of existing industries and promote new industry development. This is a general expectation.

It is not necessary such expected situation can be observed in the developing countries[12]. In general, merit of scale is demonstrated in some industries which have high fixed charge such as vehicle production or appliance industry that are fund intensive and technical intensive. However, such situation will be rarely caused in developing countries such as Timor-Leste, which depends mainly on agricultural sector.

It is needed to establish investment environment and basic infrastructure and to provide skilled labours and cheap unskilled labours for increase of FDI. Timor-Leste has some characteristics: 1) Investment environment and infrastructure are under development, 2) It is located on the remote area in the

[10] According to the Tariff Commission in Philippines, it is planned to reduce rice tariff from current 40% to 35% in 2015 in the ASEAN Trade in Goods Agreement (ATIGA). (http://finder.tariffcommission.gov.ph/)。

[11] “Economic Integration in East Asia and Agricultural Problem”, M. Honma, Chapter 6 of “The Theoretical Background and East Asian Integration”, Edited by I. Kuroiwa, 2012

[12] “East Asian Economic Community and Developing Countries”, Tran Van Tho, Chapter 9 of “Prospects for Economic Community”, Volume 2 of “Building an East Asian Community”, Edited by S. Urata, Y. Fukagawa, 2007

ASEAN countries, 3) Labour cost is relatively high, and 4) Population of English speaking worker is small. Under this condition, it is difficult to promote FDI. It is pointed out that establish of economic community will fix current comparative advantage of developing countries, which prevent industrial development of those counties in the future.

Table 4-6-3 Anticipated Impacts by ASEAN Affiliation

	Theoretical Result	Possible Result in TL
1	Trade promotion effect comes out	Initial impact will be small, since tariff rate is already low
2	Shift from the inefficient industry to the efficient industry	Production of inefficient sector including rice production decreases, but rural area has no other alternative job opportunities, which in turn result in increase of unemployment rate in rural area
3	Economics of scale takes place, then production cost decreases and competitiveness increases, in turn volume of export increase	Economics of scale usually comes out more to the capital-intensive or high technology industries
4	Foreign direct investment (FDI) increases	Not easy, due to high labor cost, remoteness, and language barrier

Some advantage will be brought about for the agricultural sector in Timor-Leste by affiliation of ASEAN, for instance, (1) Cheap seeds, fertilizers, chemical, agricultural machines and their spare parts will be available, (2) Price competitiveness will be increased due to decrease of production cost, (3) General consumers can purchase cheaper rice and imported foods, and (4) International boundary area can export rice to west Timor.

According to the interview to some distributors, domestically produced rice in Maliana and Oecusse are exported to foreign cities such as Atambua in Indonesia without official authorization. Retail price of rice as of December 2013 in Atambua was Rp9,000～Rp13,000/kg ($0.77 to $1.11/kg) and it was higher than mean price of domestically produced rice in Maliana, namely, $0.66/kg, which means that export can be feasible. Therefore, there are some distributors who try to secure certain amount of rice for export through farmer's groups establish and mechanization of agricultural for production increase. It is needed to get approval for export from Timor-Leste to Indonesia from both governments. Many distributors export rice without official permission, which makes it difficult for MCIE to grasp the actual conditions. In addition, the border office cannot grasp the trade since the exported rice does not pass the border.

Agriculture in Timor-Leste faces some problems: 1) Merit of scale is very limited due to small farmlands, 2) Farming cost e.g. agricultural inputs and labour cost is high, 3) Cost effectiveness of irrigation project is low due to many steep areas and unmanageable rivers, and 4) Transportation cost is high due to poor road conditions. As a whole, the country has low comparative advantage.

Some negative impacts by the ASEAN affiliation on agricultural sector are expected. Firstly, low international competitive agricultural products will be withdrawn from the market. Especially, most of crops cultivated by small-scale farmers do not have comparative advantage and they are not competitive at the international markets. Rice can be one of such crops, therefore, it is thought that most of rice production farmers have to choose small-sized subsistent rice production or shift to other crop production. General consumers can purchase imported rice at low price, however, they can be affected directly by price fluctuation of rice.

4-6-4 The Situation of Entry to ASEAN

It is March 4, 2011 that Timor-Leste applied to ASEAN secretariat (Jakarta) to join ASEAN. ASEAN discussed about entry of Timor-Leste in 2011 and basically showed the will of the welcome. They made working group in ACC (ASEAN Coordinating Council) and examine about preparations situation of Timor-Leste. Currently Timor-Leste is still waiting for a response of ASEAN.

There is the secretariat of Timor-Leste about procedure of entry to ASEAM in Ministry of Foreign Affairs and it adjusts the view of each ministry having various interests. ASEAN has three communities (ASEAN Economic Community, ASEAN Political-Security Community, and ASEAN Socio-Cultural Community) and activities of AEC are supported from ADB and JICA. Timor-Leste has aimed to entry to ASEAN in 2015, however preparation is not enough and the outlook of joining to ASEAN is bleak.

Timor-Leste make working group consisted by representative of each affair and prepare to entry to ASEAN from 2011. The focal points of working group are few person of Director General or Director of each affair, and they meet to discuss and have training on a regular basis. However, because Ministries suffer low organizational capacity, the discussion is not been proceeded substantially and it is the fact that the preparations run into difficulties.

The focal points of MAF are Director General and Director of CPPM. According to Director of CPPM, the current priority issue of MAF is to adapt various standards such as Sanitary and Phytosanitary Measures to ASEAN standard. According to the strategic action plan of AEC, some priority items of agricultural sector include to establish operation system of ASEAN GAP and HACCP, adjust procedure of quarantine or inspection, establish the system of Sanitary and Physosanitary Measures and manage of animals' sanitation for food safety. It is very difficult to do these action plans. These items are matters about reliability of the ASEAN economy and they are necessary at the very beginning when trade is liberalized. Protection measures of the important crops such as the rice are future problems.

4-7 POLICY OPTIONS

There are no predictions of joining to the ASEAN, however Agricultural master plan is necessary to be based on the movement about entry to the ASEAN. After joining the ASEAN, if attaining self-sufficiency in rice production is maintained as a national goal then farmers will need to be provided with technical support in the fields of irrigation, rice farming and processing/ marketing as well as market incentives.

Possible policy interventions related to the incentive of farmers include the following: (i) tariff imposition (including appropriateness of tax levy); (ii) above market rate crop purchase schemes, (iii) provision of subsidized inputs and (IV) introduction of tenant system. The policy option about rice marketing is summarized in Table 4-7-1.

Table 4-7-1 Policy Option of Rice Market

Policy	Description	Advantage	Disadvantage	Remarks
1. Increase Tariff Rate on Rice	Increase tariff rate on imported rice to increase market price of rice	・Price competitiveness of local rice increases ・Farmers encouraged to produce more rice ・More Government revenue ・Technically easy to implement	・Price of rice increases, impacting negatively on vulnerable groups ・Requires political will ・Promote underreport at the entry by the private company ・Possibility of illegal import ・In the long run, farmers lose competitive power	・Each 1% tariff generate +/- $0.25 million ・Support for vulnerable groups is needed ・Subsidized rice distribution reduces impact of the tariff policy depending on the price level. ・Subject to abuse on tariff ・ASEAN will remove tariff by 2015's AEC inauguration
2. Introduce Zero Tariff on Rice (ASEAN Option)	The free trade system are intensified because the tariff are abolished by participation of AEC.	・Farmers can buy cheaper imported inputs. ・Exports to west Timor could be stimulated increasing investments and production ・Consumers can enjoy cheaper price of rice and other goods	・Products without competitive advantage (e.g., small rice farmer output) may have to withdraw from the market ・Rice farmers have to shift to more competitive value crops ・Higher import prices could cause disruptions ・Government has to increase financial expenditure to meet self sufficiency goal	・For food security purpose, need to consider non-tariff measures to protect and encourage rice farmers ・Supporting agriculture sector to enhance international competitiveness is necessary (infrastructure, technical extension, information service, etc.) ・Protection to farmers cultivating crops which do not have the comparative advantage is necessary
3. Government Imported Rice Purchasing Scheme	MCIE buys imported rice at market rates and distributes at proper rates depending on purposes	・Socially and economically vulnerable groups can buy cheaper rice bettering nutrition ・Pressure to reduce the market price of domestic and imported rice benefits consumers ・Provide support for specialized needs (shortages, school feeding, emergencies, vulnerable groups) ・Easy to transport, store and distribute ・If the Government gain margin profit, they can use it to farmers and consumers	・Local farmers lose incentive because cannot compete with cheaper imported rice ・Imported rice not always sold at subsidized prices.（Potential for abuse） ・Significantly reduces private trader opportunities ・Government intervention distorts domestic markets	・MCIE's rice distribution should be limited to specialized needs (food shortage period, school feeding, emergencies, vulnerable groups, etc.) ・Strict monitoring of rice distribution is required ・Subject to abuse
4. Local Purchasing Scheme (Domestic Paddy)	MCIE buys local rice at rates to gain necessary amount of rice and	・If sufficient resources available, protects farmers livelihoods	・Government has to establish capable organization in terms of technical, managerial and financial capacity	・Improving of operation such as secure the budged and introduction of effective monitoring system is necessary

Policy	Description	Advantage	Disadvantage	Remarks
	distributes at proper rates depending on purposes	・If sufficient scale, stimulates farmer's incentive to increase rice production and farmers income ・Provide support to specialized groups. ・Higher price results in shifting rice demand to other crops ・The Balance can be black ink, if the government procures rice at cheaper price after harvesting and sell at higher price when market price increases ・Contribute to quality increase when the government set prices based on quality	・Operation cost increases if the government procures at higher rate than market prices and supply at lower rates (loss is +/-$1.32/kg of paddy purchased) ・Traders and farmers do not have confidence in system due to disappointing past performance, namely the amount of purchasing is limited. ・Farmer expectations are unrealistically raised ・Purchase without grading incentivizes low quality production ・Government intervention distorts domestic markets ・Possible cross border leakage	・MCIE's rice distributions should be limited to specialized targets (Gov' officials, military, etc., as a part of salary) ・Costs about $2,800/ha to operate
5. Input Subsidy	Distribute farm inputs (seeds, fertilizer, pesticides, equipment use) at subsidized (or free) rates	・Relatively inexpensive to implement ・Decreases farmer's out of pocket paddy production cost ・ Increased paddy yields and production volume because most farmers do not use fertilizer and agricultural chemical under the circumstances ・Growth of production contributes to reduce the farming cost, sell at the lower price and improve income. ・Integration with MAF extension system	・MAF currently lacks institutional capability and financial resources to implement such a program ・Private input suppliers meet difficulty in selling their products ・Reduces efficiency since the long run, farmers do not make efforts to reduce production costs ・Potential for abuse from re-sale of inputs ・Potential for conflict if inequitable distribution of support ・Only able to reach limited numbers of farmers ・No system to increase production volume of supported farmers ・Not effective to increase production more than necessary volume	・Optimally private input suppliers should be included in the scheme ・Careful operation to avoid social conflict is needed ・Costs about $440/ha to operate

4-7-1 Continuation of Current Policy

The basic features of the current rice sector include:

- unrestricted commercial rice imports at a 2.5% tariff rate
- distribution of imported rice
- limited input (seed, fertilizer, tractors) availability
- limited access to extension services
- high farm labor costs; and
- lack of an effective market.

Given these circumstances, even when irrigation water is available, it is most likely farmers will basically only aim to produce sufficient paddy for self-consumption. If irrigated paddy land is added, total production will increase by that needed for self-consumption. The excess production will not be produced specifically to sell but only be the result of extra self-consumption targeted production. It serves no purpose to produce paddy where no market is available. Currently many farmers purchase the rice to compensate shortage of self-consumption[13], additionally the price of rice is controlled low because the cheap MCIE subsidized or the commercial imported rice is in circulation. Under this situation, local rice doesn't have price competitiveness, and distributor cannot have incentive to purchase local rice.

MCIE has purchased local rice at a high price than market price to rise of farmers encouraged to produce more rice. Because the purchasing amount of MCIE is overwhelmingly small contrary to expectation of farmers and distributor, so that bankruptcy of distributor and suspicion or disappointment of farmers are incurred. Also with only limited public input and extension support, all production costs must be shouldered by the farmers. Confronted with the need to directly pay for all inputs including high rural labor costs, the profit margin is slim and the actual cash income per hectare is very limited. Table 4-7-2 presents a per-hector financial profile of rice farmer operating under current conditions. Even with paddy purchase at $0.50/kg, his cash income per hector is only $384/crop.

[13] According to the baseline survey of Seeds of Life (October 2012), most of the farmers (99.6%) purchase rice of the mean 39kg/month. The amount of purchase is 70kg/man and the consumption per year is 106kg/man, so that they purchase 66% of the amount of consumption.

Table 4-7-2 The Cost of Rice Production

Current 2013 Conditions
Irrigated Paddy Production Costs
(Maliana - Owner/Operator)

Category	Measure	Units (1)	$/Unit (2)	Total $ (1)*(2)
I. Production				
A. Cash Sales - Paddy (a	kg	2,132	0.50	1,066
B. Household Use				
1. Consumption (b	kg	1,118	0.50	559
2. Retained Seed	kg	40	0.50	20
3. Paddy Losses (c	kg	210	0.00	0
Sub-total Household Use	kg and $	1,368		579
Total Production Value (I.A+ I.B)	kg and $	3,500		**1,645**
II. Input Value				
A. Direct Costs				
1. Rent (d	NA	0	0	0
2. Purchased Seeds	kg	0	0.50	0
3. Fertilizer				
i. Urea	50 kg bag	3	27.00	81
ii. TSP	50 kg bag	2	30.00	60
iii. KCL	50 kg bag	1	30.00	30
Total Fertilizer				171
4. Pesticide (Sevin)	kg	1	10.00	10
5. Pesticide (Dharma Bas)	1 liter	1	12.00	12
6. Hired Labor (e	days	43	6.28	270
7. Irrigation Water Fee	lump sum	0	20.00	0
8. Ploughing Cost f)	session	2	40.00	80
9. Packing Materials	50 kg bag	66	0.50	33
10. Threshing Costs	kg	200	0.50	100
11. String	rolls/ha	1	6.00	6
Sub-total Direct Costs (II.A)				682
B. Non Purchased Inputs				
1. Family Labor (g	days	100	0.00	0
2. Own Produced Seed	kg	35	0.50	18
Sub-total Non Purchased (II.B)				18
Total Input Value (II.A+II.B)				**699**
III. Income				
A. Imputed Income (=1,645-448) (h				946
B. Cash Income (1,066-431) (i				**384**
C. Household Cash Need (=635/1,100) (j				35%
IV. Production Cost/kg (448/3,500)(k	$/kg			**0.20**

(a 2013 MCIE purchase price.
(b Household size 5.8 people; paddy use 193 kg/yr (i.e., rice 106kg/yr)
(c Loss estimated at 6% comprised of 5% on all production plus an additional 5% for household consumption.
(d Assumes producers owns the land and no property taxes apply.
(e Maliana interviews 40days at wage rates $5 -$10/day depending on tasks.
(f MAF standard 100 family work days/crop and prevailing agricultural wage rate
(g Total Production Value ($) less Input Value
(h Cash Sales less Total Direct Costs
(i Based on an anuual cash need of $2,200/year ($1,100/ crop)
(j Total Input Value divided by Total Production Value (kg)

4-7-2 Tariff Policy

In 2013 rice imports appear to be at least 60% more than domestic rice production. As such, the price of rice imports exerts a significant impact on domestic rice prices. High tariff rates would boost paddy prices thereby raising farmer's incomes, encouraging production and generating Government revenues. However, it would also raise consumer prices and negatively impact on vulnerable groups. Imposition of a tariff in a country where malnutrition is rampant and nearly 50% children are stunted due to lack of food would no doubt be a political challenge.[14] However, tariff administration is technically relatively easy to implement and with careful justification and judicious use of generated revenues, use of a moderate tariff rate might be possible. Proceeds from the tariff could be applied for good use to boost paddy production.

In 2013 the tariff duty on rice imports was 2.5% of receipted value plus there was an additional 2.5% sales tax. However, from 2002 to 2007, there was a 6% tariff duty and a 6% sales tax levied on rice imports. With this fact, there are some well-informed persons judging that the imposition of tariff is possible to a standard at the time of the independence. In 2012 the average price of imported rice, the basis for duty and tax collections, was only $314/ton. Such a low price is about 40% below an estimated CIF market price at Dili port. Tax is imposed on the basis of evaluation self-reported by the importers in the custom, there is an equal effective to raise the price of imported rice if the tax of custom are closed to a market price. If the evaluation price (FOB base price) are corrected to an adequate market price in the case that it is 40% lower than actual CIF price, the effect appear same as innovation of tariff of 33%[15].

Obviously, the imposition of a tariff impacts directly on commercial import prices. However, it is not clear that this would be translated into the expected farmers' paddy production decisions. It is crucial to note that continuation of the MCIE subsidized rice distribution scheme could reduce the impact of any tariff application on farmer production decisions. The target of disposal of MCIE subsidized rice should be limited to humanitarian support, school-provided lunch, disaster victims and the part of salary of public servants, etc.

The tariff rate is standard of from24% from 8%, if the price of domestic rice and that of imported rice is equal on the base of market statistics of MAF. In addition, the whole country mean was 40% when price of domestic rice and price of imported rice (the price exclusive of tax) calculated a rate to become the same amount as a test based on the result of the regression analysis of 4-7-4. In Dili, the tariff rate is 110%. The standard of tariff rate is 55% from 27% in the case for the purpose of raising the price competitiveness in the production area.. It is necessary to limit varieties and increase the number of samples for implementing correct analysis.

Table 4-7-3 The Estimation of Tariff Rate

Item	Dili	Manatuto	Baucau	Viqueque	Uotolari	Average
Distance (km)	1	50	100	150	190	95
Local Rice (USD/kg)	1.26	0.99	0.94	0.91	0.89	0.94
Imported Rice (USD/kg)	0.60	0.64	0.68	0.72	0.75	0.67
Tariff Rate (%)	105%	51%	36%	25%	17%	40%

Note: a/ Prices of imported rice are excluded 2.5% of tariff.

[14] There are different percentages of the stunted children in Timor-Leste under the inaccurate condition of statistics, e.g. 47% by Oxfam (Homepage as of March 2015) and 54% by UNICEF (The State of the World's Children 2011).

[15] Taxable value (CIF price) is calculated by adding the shipping (10%) and insurance (5%) to FOB price

4-7-3 Upgrading and Expansion of Procurement of Domestic Rice

Under the conditions cheaper imported rice is prevailing in the market of Timor-Leste, rice production farmers have low incentives for production increase due to lack of price competitiveness. Therefore, most of those farmers cultivate rice for house consumption only and sell surplus, which is equivalent to quarter of total amount, little by little after milling to exchange cash to purchase essential commodities. To remedy the situation, MCIE has set up a procurement scheme. The scheme intends to purchase domestically produced rice at high price to give incentive farmers for production increase. However, MCIE has faced challenges stemming from lack of budget and human and physical resources, consequently, intended effects have not been observed so far.

Implementation of the system has brought about complicated result and moreover, it is costly. In Maliana in 2013, MCIE traders purchased paddy from farmers at $0.50/kg and received $0.75/kg for paddy sales at MCIE warehouses. The rice selling prices are set at $0.48/kg as upper limit after the rice milling. However, food loss rate is high in this process due to resale to other distributors and improper rice management in the storages.

Following table shows a profile of local rice procurement system of MCIE in 2014. Assuming 85% of purchases can be sold, difference between purchased price and sold one is $0.85/kg. Assuming that all of surplus rice 2,132 kg/ha (balance of production of 3,500 kg/ha and self-consumption 1,368 kg/ha) is purchased, total cost is estimated at $1,812/ha. It is necessary to secure enough budgets for enhancement of effectiveness of the system.

Table 4-7-4 Local Rice Procurement Profile of MCIE

No.	Category	Unit	Amount
1.	Paddy Purchase Price	$/kg	0.75
2.	Convert to Rice	55%	1.36
3.	Operating Expenses	15%	1.57
4.	Amount Not Sold	15%	0.24
5.	Price Adjusted for Not Sold	$/kg	1.33
6.	Less: Sales Income	$/kg	0.48
7.	Total Procurement Price	$/kg	0.85
8.	Purchases Per Ha (a	kg	2,132
9.	Cost per Ha	$	**1,812**
10.	Ha Covered (a	ha	3,900
11.	Purchases Per Ha (b	kg/ha	2,132
12.	Total Production	mt	8,315
13.	Total Procurement Cost	$ million	7

Notes: (a Target area is 3,900ha, 30% of total Rice Bowl area (13,000ha)
(b Production 3,500 kg/ha less household use of consumption 1,118 kg,-seeds 40 kg and loss 210 kg.

It is proposed to operate the system mentioned above within only the proposed Rice Bowl area and to target motivated farmers for effective implementation. Assuming that the government purchases surplus rice from 30% of rice production farmers in the Rice Bowl areas (=3,900ha), necessary cost is estimated at US$7 million as mentioned in the table above. The system can enhance farmers' motivation to cultivate more rice, however, it is difficult to reflect quality difference on the price in the current system, and the percentage of low quality rice will be increased. Both improvement of rice quality and proper distribution management are important for the system operation.

4-7-4 Other Policies

(1) Subsidization for Agricultural Input

At this moment, the government implements a program that provides improved seeds, fertilizers, herbicides, other chemicals to farmers who follow the ICM or SRI extension guidelines free of charge.

Moreover, there is another program to provide hand tractors free of charge, which contributes to farming cost reduction and income increase of farmers.

The government faces many challenges for the program implementation. Due to budget limitations, only about 300 farmer groups have accessed the service so far. The beneficiaries represent only a small portion of paddy farmers, which has resulted in social tensions between those who receive free goods and those left out of the scheme. It also gave negative impacts on private input suppliers, who face difficulty marketing their products since this program can be competitor for the suppliers. Furthermore, at present, MAF does not have sufficient institutional capacity and financial resources to expand the subsidized inputs program in the large-scale.

Table 4-7-5 shows a financial model of normal rice production farmers who are subsidized for farming input purchase. This model is prepared under the condition that farmers receive improved seeds, fertilizers and chemicals and that they can access to hand tractors. Farmers shoulder cost of fuel for ploughing. It clearly shows that the impact of the subsidization is very big, namely, direct cost is decreased by 35% and cash income is increased by 65% compared to those in the conventional way. In addition to that, the farmers receive a cash income of $635, which is equivalent to half of cost of living.

Table 4-7-6 estimates the cost of subsidization for farming input per unit area at $407/ha per one crop, assuming that target farming inputs of subsidization are improved seeds, fertilizers, chemicals and use of agricultural machines. If they are installed by the subsidization in the farming plots where no fertilizer has been applied, the production volume can be doubled theoretically. For instance, cost for subsidization is estimated at US$ 3.17 million (=$407/ha*3,900ha) in total assuming that 20% of farmers in the Rice Bowl area can receive the subsidization and they harvest crops twice per year. Production increase through subsidization of farming inputs is enough expected with careful operation of the subsidization program.

Table 4-7-5 Sample Financial Model of a Rice Farming Household with Receiving Subsidized Inputs

Category	Measure	Units (1)	$/Unit (2)	Total $ (1)*(2)
I. Production				
A. Cash Sales - Paddy (a	kg	2,132	0.50	1,066
B. Household Use				
1. Consumption (b	kg	1,118	0.50	559
2. Retained Seed	kg	40	0.50	20
3. Paddy Losses (c	kg	210	0.00	0
Sub-total Household Use	kg and $	1,368		579
Total Production Value (I.A+ I.B)	kg and $	3,500		**1,645**
II. Input Value				
A. Direct Costs				
1. Rent (d	NA	0	0	0
2. Purchased Seeds	kg	0	0.50	0
3. Fertilizer				
i. Urea	50 kg bag	3	0.00	0
ii. TSP	50 kg bag	2	0.00	0
iii. KCL	50 kg bag	1	0.00	0
Total Fertilizer				0
4. Pesticide (Sevin)	kg	1	0.00	0
5. Pesticide (Dharma Bas)	1 liter	1	0.00	0
6. Hired Labor (e	days	43	6.28	270
7. Irrigation Water Fee	lump sum	0	20.00	0
8. Ploughing Cost (f	session	20	1.10	22
9. Packing Materials	50 kg bag	66	0.50	33
10. Threshing Costs	kg	200	0.50	100
11. String	rolls/ha	1	6.00	6
Sub-total Direct Costs (II.A)				431
B. Non Purchased Inputs				
1. Family Labor (g	days	100	0.00	0
2. Own Produced Seed	kg	35	0.50	18
Sub-total Non-Purchased (II.B)				18
Total Input Value (II.A+II.B)				**448**
III. Income				
A. Imputed Income (=1,645-448) (h				1,197
B. Cash Income (1,066-431) (i				**635**
C. Household Cash Need (=635/1,100) (j				58%
IV. Production Cost/kg (=448/3,500)(k	$/kg			**0.13**

(a 2013 MCIE purchase price.
(b Household size 5.8 people; paddy use 193 kg/yr (i.e., rice 106kg/yr)
(c Loss estimated at 6% comprised of 5% on all production plus an additional 5% for household consumption.
(d Assumes producers owns the land and no property taxes apply.
(e Maliana interviews 40days at wage rates $5 -$10/day depending on tasks.
(f Fuel cost only 20 liters diesel/ha at$1.10/liter
(g MAF standard 100 family work days/crop and prevailing agricultural wage rate
(h Total Production Value ($) less Input Value
(i Cash Sales less Total Direct Costs
(j Based on annual cash need of $2,200/year/($1,100/crop)
(k Total Input Value divided by Total Production Value (kg)

Table 4-7-6 Cost per ha to Provide Subsidized Inputs

Category	Measure	Units (1)	$/Unit (2)	Total $ (1)*(2)
I. Production				
1. Subsided seeds	kg	40	0.50	20
2. Fertilizer				
i. Urea	50kg bag	3	27.00	81
ii. TSP	50kg bag	2	30.00	60
iii. KCL	50kg bag	1	30.00	30
Total Fertilizer				171
3. Pesticide (Sevin)	kg	1	10.00	10
4. Pesticide (Dharma Bas)	1 liter	1	12.00	12
5. Contract Ploughing	rental fee	1	58.00	58
Total subsidized inputs (sum of 1-5)	$/ha			**271**
II. Distribution Cost	50%			**136**
Total Subsidized Costs (I+II)	$/ha			**407**
III. Ha covered	3,900			
IV. Crop/Year	2			
V. Subsidy Cost	$ million			**317**
VI. Tariff Revenue Generation	$ million/1%			**0.25**
VII. Tariff Rate Required	%			**13%**

(2) Introduction of Fixed-rent Tenancy System with Fixed Amount

Fluctuation of tenant fee directly gives impacts on the motivation of farmers. In general, land owners and tenant farmers share the products half and half in Timor-Leste. It was confirmed that tenant rate is set at 50% of products in Maliana, Manatuto and so on in many cases, however, other conditions are applied in some areas. In Oecusse, there are some cases that tenant farmers and land owners get two-thirds and one-third of products, respectively. However, if land owner subsidizes agricultural machines and fuel to the tenant farmers, the share rate becomes half and half. In Buluto, it is reported that land owners, provider of farming inputs (water bull, seeds and fertilizers) and tenant farmers share products evenly. It means that farmers who are provided with farming materials can get only one-third of products.

Contracts of farming tenant are generally prepared considering balance between transaction cost and risk sharing[16]. Land owners, who cannot watch tenant farmers all the times, tend to fix amount of tenant rent to reduce the transaction cost. On the other hand, sharing of products between land owners and tenant farmers is done in the regions where farming risk is high due to unstable climate conditions and fluctuation of production volume[17]. Moreover, if tenant farmers do not have enough capacity to pay tenant rate due to poverty and they are partly supported with seeds, fertilizers, agricultural machines, fuel and so on by land owners, benefit sharing tenant system is applied in many cases.

In general, benefit sharing tenant system is applied in Timor-Leste, even in Manatuto where there are many absentee landowners. Under this system, tenant farmers tend to declare underestimated amount of products to the land owners[18]. Against this situation, absentee landowners take countermeasure by

[16] "Theory and demonstration, study on sharing benefit tenant system" (K. Otsuka, "Economic Research", 1985, 36(1), p75-p84

[17] Benefit sharing system is applied in some areas of Malaysia and China where amount of products fluctuate drastically. On the other hand, in India benefit sharing system and fixed tenant rate system are applied during dry season characterized by drastic fluctuation of production volume and rainy season characterized by stable of production volume. (Otsuka, 1985)

[18] "Traditional water user's organizations and land ownership" (K. Nozawa)

strict monitoring, increase of tenant rate, shift to fixed tenant rate system and so on. It is thought that due to various reasons, e.g., risk sharing against unstable climate, low capacity of tenant farmers, support by land owners for delivery cost, the benefit sharing tenant system is generally applied in Timor-Leste. The sharing rate, namely, half-and-half is a big burden for some farmers.

In Philippines, there is a successful case for giving incentives to farmers by means of improvement of the conventional tenant system. Due to the Agricultural Land Reform started in 1972, official confirmation of tenant rights, stabilization of tenant rights, shift to fixed tenant rate system from benefit sharing system, freeze of tenant rent as of 1972 and so on were implemented, consequently, these measures resulted in enhancement of farmers' incentives for production increase[19]. Although this fact is a result of the land tenancy system improvement, Timor-Leste could obtain the same sort of result if we took measures to mitigate risks from unstable weather condition, and to mitigate farmer's uncertainty over the fixed tenant rate system. It will be possible to increase the motivation of farmers in Timor-Leste also by introduction of fixed tenant rate system and freeze of tenant rate as of the introduced year, especially, in the areas where stable irrigation water through the project is available.

4-7-5 Economic Analysis for Strategic Options

In this chapter, surplus analysis of rice is conducted in order to quantitatively evaluate the benefits of the policy options. There are three assumptions in terms of tariff policy for import rice, and two assumptions in terms of purchasing policy of domestic rice by the government. Based on these assumptions, the impacts of the social surplus and the contribution to improvement of the self-sufficiency are examined. Following chapters summarises that condition of analysis, result of analysis, sensitivity analysis, and policy implication.

(1) Precondition of Analysis

As a precondition of the surplus analysis, the demand curve and the supply curve of rice production in Timor-Leste are estimated by referring to Indonesian cases. The data of price and quantity of rice is referred to the forecast of food supply and demand surveyed by MAF in 2013. In addition, the supply curve and the demand curve are assumed to be a linear function.

Generally speaking, the price elasticity of demand (PED) of agricultural products is likely to be higher than that of industrial products. Also, low-income countries have relatively higher PED of agricultural products than high-income countries[20]. For example, PED of rice fluctuates from -0.1 to -2.8 in Japan[21], from -0.35 to -0.46 in Malysia[22], and from -0.42 to -0.62 in Indonesia[23]. For the surplus analysis in this chapter, -0.424 of the Indonesia's PED, estimation condition of which is clearly stated in the literature, will be applied because of consideration which Indonesia is geographically close to Timor-Leste and has similar agriculture and nature environment.

On the other hand, the price elasticity of supply (PES) tends to be effected by fixed production factors such as lands and capital resources in a long-term perspective. Therefore, the supply curve is likely to

[19] "Rural communities in Philippines, the structure and change" (H. Umezawa)

[20] "Agricultural Economics New Edition" (Y. Sakomizu, Y.Goudo), 2002, P23,P54

[21] "Simulation Analysis of the Food Security of Japan in Consideration of the Export Restrictions and Productivity Shock of Rice" (T. Tanaka, N. Hosoe), 2009.

[22] "A Model for the Rice and Wheat Economy in Malaysia, Empirical Assessment of Alternative Specifications", AHMAD ZUBAIDI BAHARUMSHAH, Department of Economics, Faculty of Economics and Management, Universiti Pertanian Malaysia (1991)

[23] "Price Elasticities from Survey Data, Extensions and Indonesian Results", Angus Deaton, Princeton University, 1989

be a horizontal shape[24]. However, it is considered that labour force in Timor-Leste is illiquid because industry other than agriculture is underdeveloped. Therefore, if the situation of Timor-Leste is considered, PES in a shorter period should be applied in the surplus survey. There are some data of PES in other countries to be refereed, for example, from 0.4 to 0.45 in Japan[25] and from 0.11 to 0.45[26] in Indonesia. In this analysis, 0.11 of PES will be applied referring to the Indonesian case. However, the PES will be subjected in sensitive analysis in the later chapter since it is often fluctuated even in Indonesian cases.

With consideration of the precondition mentioned above, the demand function and the supply function are estimated as below.

$$D = - 81396\ P + 188623$$

$$S = 8353\ P + 46635$$

Also, the inverse demand function and the inverse supply function are shown in the right figure.

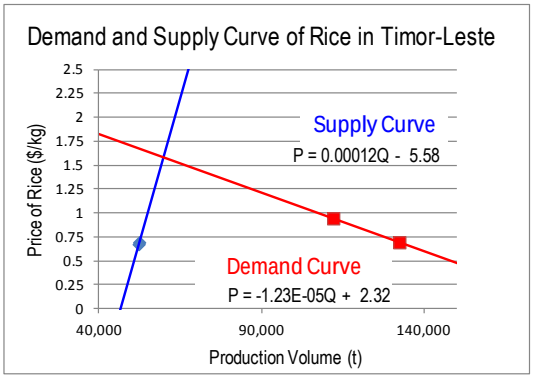


Figure 4-7-1 Demand and Supply Curve of Rice in Timor-Leste-1

The demand curve is likely to be horizontal since the elasticity is high, while the supply curve is likely to be vertical since the elasticity is low. This indicates that changing price of rice will affect to the rice demand more than the rice supply. It can be predicted that the fluctuation of the market price of rice in Timor-Leste does not significantly affect the rice production in a short term because most of the farmers in Timor-Leste are producing rice for self-consumption, rather than selling to markets.

Maize is also considered as a staple crop. It can be seen that rice and maize are alternative relationship. While rice is consumed in 106kg/person annually, maize is consumed in 67kg/person. There is a possibility if the price of rice increases, people tends to purchase maize instead of rice. Considering this background, the shape of demand curve and the supply curve above can be understandable.

(2) Result of the Analysis

a) Tariff Policy

The simulation of the tariff policy is shown in the table below. In the base case, 2.5% of tariff rate is considered as a current situation. In addition to the base case, there are three cases to be analysed according to the tariff rate, namely 1) the case of eliminating tariff (0%), 2) the case of increasing tariff (24%) so that the rice produced in Baucau and Maliana can complete with imported rice, and 3) the case of increasing tariff (40%) so that the price of import rice should be same as average market price of domestic rice in Timor-Leste.

Table 4-7-7 Result of Simulation according to the Tariff Policy

	Base Case (Tariff: 2.5%)	Tariff: 0%	Difference	Tariff: 24%	Difference	Tariff: 40%	Difference
Price after Tariff	$0.69/kg	$0.67/kg		$0.83/kg		$0.94/kg	
Demand (t)	132,725	134,088	1,363	120,999	-11,725	112,274	-20,451

[24] "Agricultural Economics New Edition"(Y. Sakomizu, Y.Goudo), 2002, P34
[25] "Tariff Reduction and Domestic Liberalization of Rice and Changes in Agricultural Trade System", Y. Fujiki, 1998
[26] "Food Policy and Poverty in Indonesia: A General Wquilibrium Analysis", Peter Warr, Australian National University

	Base Case (Tariff: 2.5%)	Tariff: 0%	Difference	Tariff: 24%	Difference	Tariff: 40%	Difference
Production (t)	52,372	52,232	-140	53,575	1,203	54,471	2,099
Import (t)	80.353	81,856	1,503	67,424	-12,928	57,803	-22,549
Consumer Surplus ($1,000)	108,211	110,445	2,235	89,936	-18,274	77,433	-30,778
Producer Surplus ($1,000)	33,997	33,120	-876	41,627	7,631	47,419	13,422
Government Revenue ($1,000)	1,346	0	-1,346	10,842	9,496	15,491	14,145
Social Surplus ($1,000)	143,553	143,566	13	142,406	-1,148	140,343	-3,210

The result of the simulation above seems to be consistent with the theory of economics. In the case of the elimination of tariff, the tariff revenue and producer surplus are reduced, while the consumer surplus is increased. Eventually, the social surplus increases as a whole through eliminating tariff. If tariff rate is increased, tariff revenue and producer surplus are increase, while the consumer surplus is reduced.

Under the current tariff rate (2.5%), the amount of import rice estimated about 80,000 tons. By eliminating tariff, it can be predict that the amount of import rice will increase up to 82,000 tons. Besides, the amount of import rice is predicted to decrease to 67,000 tons by imposing 24% of tariff, and 58,000 ton with 40% tariff. The revenue of tariff will be $10,840,000 with 24% tariff and $ 15,500,000.

b) Government Purchasing Programme of Domestic Rice

To analyse the government purchasing programme of domestic rice, there are two assumptions of purchasing prices, which are $0.83/kg and $0.94/kg, to be considered in order to compare the result of the simulation of tariff policy above. The price of $0.83 is equivalents to the price of the imported rice with 24% tariff. The price of $ 0.94 is equivalent to the price of imported rice with 40% tariff.

Under the purchasing system, the demand does not change, but the production volume increases and it contributes to increase producer's surplus. According to the simulation, if the purchasing price is $0.83/kg, the amount of rice production will increase from 52,000 ton to 53,600 ton. If the purchasing price is $0.94/kg, the amount of rice production will increase until 54,500 ton. On the other hand, the amount of import rice will decrease by increasing domestic rice production, since the total demand does not change under the government purchasing programme.

Table 4-7-8 Result of Simulation for Government Purchasingg Programme

	Base Case	Case 1 @$0.83/kg	Difference	Case 2 @$0.94/kg	Difference
Subsidized Price	0	0.83		0.94	
Demand (t)	132,460	132,460	0	132,460	0
Production (t)	52,399	53,568	1,169	54,487	2,088
Import (t)	80,061	78,892	-1,169	77,973	-2,088
Consumer Surplus ($1,000)	107,780	107,780	0	107,780	0
Producer Surplus ($1,000)	34,167	41,584	7,418	47,528	13,361
Government Expenditure ($1,000)	0	-7,500	-7,500	-13,622	-13,622
Social Surplus ($1,000)	141,947	141,865	-82	141,686	-261

Expenditure to buy rice under the implementation of the purchasing programme is estimated at $7,500,000 with the buying price of $0.83/kg, and $13,620,000 with the buying price of $0.94/kg. However, the government sells the purchased rice to domestic market at the price of $0.48/kg which is much cheaper than the average market price. Considering this, the net expenditure will become at $18,500,000 with the price of $0.83/kg, and $25,060,000 with price $0.94/kg. This price is equivalent to about 74% of MAF's budget of 2013.

c) Contribution to the Self-sufficiency of Rice

Based on the result of surplus analysis, the contribution to improvement of self-sufficiency rate is examined. According to the result of the analysis, the elimination of tariff does not affect the rice production and self-sufficiency rate. However, if the tariff rate becomes 24%, the self-sufficiency rate of rice increases from 53% to 59%. Likewise, if the tariff rate is 40%, the self-sufficiency rate of rice increases until 64%. This is because the production of rice will increase while the demands for the imported rice decrease due to increase of price with high tariff rate.

On the other hand, under implementation of the purchase programme, the price of the imported rice is fixed at low level. It does not positively affect the demand for domestic rice. Besides, the self-sufficiency rate is as low as 54% at $0.83/kg of the purchase price, and 55% at $0.94/kg of the purchase price. It is confirmed that the decline of social surplus under the purchasing programme is smaller than under the policy to increase tariff rate of import rice. However, the purchase programme does not contribute to improve the self-sufficiency rate of rice significantly like the increase of tariff does.

Table 4-7-9 Estimations of Surplus Analysis (PES=0.11)

	Base Case (Tariff: 2.5%)	Tariff Policy 0%	Tariff Policy 24%	Tariff Policy 40%	Procurement @$0.83/kg	Procurement @$0.94/kg
Rice Price	$0.69/kg	$0.67/kg	$0.83/kg	$0.94/kg	$0.83/kg	$0.94/kg
Production (t)	52,372	52,232	53,575	54,471	53,568	54,487
Self-sufficiency Rate (%)	53%	52%	59%	64%	54%	55%
		(difference)	(difference)	(difference)	(difference)	(difference)
Consumer Surplus ($1,000)	108,211	2,235	-18,274	-30,778	0	0
Producer Surplus ($1,000)	33,997	-876	7,631	13,422	7,418	13,361
Government Revenue ($1,000)	1,346	-1,346	9,496	14,145	0	0
Government Expenditure ($1,000)	0	0	0	0	-7,500	-13,622
Social Surplus ($1,000)	143,553	13	-1,148	-3,210	-82	-261
B/C	-	1.01	0.94	0.90	0.99	0.98

(3) Sensitivity Analysis

As mentioned above, 0.11 of the price elasticity of supply (PES) in a short period, which is applied to the surplus analysis, is referred to the case of Java in Indonesia. Java is located near to the Timor-Leste at almost same latitude. So, it can be assumed the agricultural environment in Java is similar to in Timor-Leste. The other cases show that PES in short term period is 0.45 in Sulawesi, 0.12 in Sumatra, and 0.02 in Kalimantan. As of PES in a long period, it is 0.13 in Java, 1.25 in Sulawesi, 0.52 in Sumatra, and 0.21 in Kalimantan. Therefore, it is observed that PES is fluctuated so much even within Indonesia.

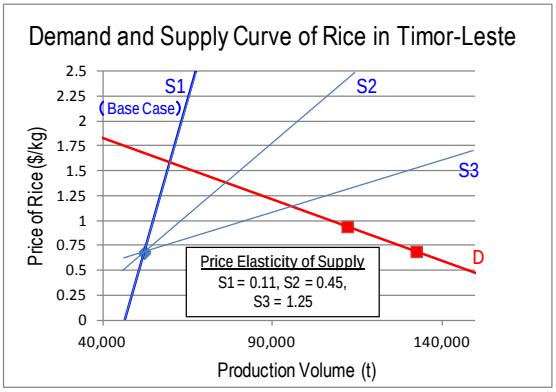


Figure 4-7-2 Demand and Supply Curve of Rice in Timor-Leste-2

So, the sensitive analysis is conducted to see effect of fluctuation of PES. In the sensitive analysis, 0.45 (Slawesi, short period) and 1.25 (Slawesi, long period) are applied as PES. The analysis says that larger PES is given, higher the self-sufficiency rate tends to be, and then effects of the government policy are likely to appear. The result of sensitive analysis is shown below.

Table 4-7-10 The Result of Sensitive Analysis

	Base Case (Tariff: 2.5%)	Tariff Policy 0%	Tariff Policy 24%	Tariff Policy 40%	Procurement @$0.83/kg	Procurement @$0.94/kg
PES=0.11	53%	52%	59%	64%	53%	54%
PES=0.45	53%	52%	62%	70%	57%	60%
PES=1.25	53%	51%	69%	84%	63%	71%

(4) Policy Implication

So far, MAF has made efforts to conduct a variety of agricultural supports to achieve food self-sufficiency in Timor-Leste. However, while the cheaper imported rice has swept the market, it is a harsh environment for farmers to pursue commercial production. In order to enhance the effect of agricultural supports in future, it is necessary to create a competitive environment which should be suitable for domestic rice market. It is also seen as an effective to control importing rice on the border. It was confirmed by the analysis that increasing tariff rate can contribute to improve the self-sufficiency rate. On calculation, the self-sufficiency rate is improved from 53% to 60% by increasing tariff rate from 2.5% to 40%. It was also confirmed that the tariff policy contributes to improve the self-sufficiency rate more significantly than the government rice purchasing policy.

However, it can be said that the tariff policy imposes burden to consumers. If 40% of tariff is applied, the market price of rice will rise from $0.69/kg to $0.94/kg, namely $0.25 higher than before per kg. It means that one household has to pay $160 extra in average for purchasing rice per a year[27]. In total, $1,445,000 has to be additionally paid by the people of entire Timor-Leste. Moreover, $160 is equivalent to a salary for one month of a MAF extension officer in Covalima district. This cost burden will be serious especially for poor people in rural are, who are living with less than one dollar in a day. To avoid the cost burden, consumers reduces consumption of rice and increases maize and cassava consumption.

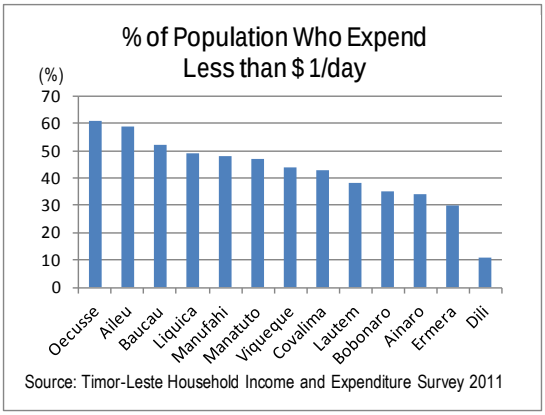


Figure 4-7-3 Percentage of Who Expend Less Than US$1/day

It is obvious that to increase price of rice by 40% is a serious problem for most of the people in Timor-Leste and it can lead to social unrest. In January 2014, the price of rice in Dili rose from $0.6/kg to $1.0/kg. This is because Vietnam rice was shipped to Philippine on a priority basis as an emergency assistance for the damage of typhoon happened on 8th November 2013, and shipping rice to Timor-Leste had been significantly decreased in November and December 2013. As a result, the Minster of MCIE is accused on the budget committee for the countermeasure of this problem[28]. This incident explains how rice issue is sensitive in Timor-Leste and it can be imagine that increasing tariff on rice may cause political unrest.

The result of the surplus analysis also shows that increase of tariff rate will bring decrease of rice consumption, rather than increase of rice production. In fact, there are a lot of subsistence rice farmers in Timor-Leste who are not likely to be affected by the change of market price on their production. On calculation, if tariff is increased up to 40%, the rice production will increase only 4%, which is from 52,000 ton to 54,000 ton, while the rice consumption will decrease 15%, which is from 133,000 ton to

[27] It is calculated as 6 people per household with106kg of annual rice consumption per capita.
[28] Nacional Newspaper; timoroman.com, Edition, January 27 – February 2, 2014

112,000 ton. It looks that the self-sufficiency rate is improved. However, it is not because the rice production is increased, but the rice consumption is decreased due to the higher market price.

The purchasing policy of domestic rice by the government can contributes to improvement of self-sufficiency more than the tariff policy. This policy directly motivates rice producers to increase production. However, the policy does not influence rice consumers, and the demand of rice remains same level as before. So, it can be said that social and political resistance to the purchasing policy is relatively small because it does not influence consumer price. However, if the budget for the purchasing policy is not enough, it may cause complaint of producers. MCIE plans to continue the rice purchasing policy, and rice cooperatives will be the target of the policy in future. It can be suggested to future operation that domestic rice should be purchased from commercial rice promotion area, such as rice bowl, discriminatory price of rice in accordance with the quality should be introduced, and monitoring systems and transparency in distribution should be strengthened.

The reasons of deceasing rice production must be several factors such as lacking water supply and labour force, less incentive for production due to generous pension programme. The following table explains the priority of problems regarding issues on production and marketing of domestic rice, identified in the problem analysis workshop.

Table 4-7-11 Priority of the Problem Identified in the Problem Analysis W/S

	1st	2nd	3rd	4th	5th
Baucau	Irrigation water shortage (59)	Low profitability (13)	Low quality (10)	Difficulty to access to market (7)	Low farming technology (1)
Viqueque	Low profitability (52)	Difficulty to access to market (28)	Not enough extension service (10)	Low farming technology (8)	Low incentive to production (1)
Covalima	Low profitability (54)	Difficulty to access to market (20)	Low farming technology (3)	Low quality of seeds (3)	Others (3)
Bobonaro	Low profitability (43)	Difficulty to access to market (26)	Difficult to access to credit (16)	Low farming technology (13)	Not functioning of WUA (－)
Oecusse	Irrigation Facility (39)	Improved Seeds (27)	Pesticide Control (24)	Fertilizers (10)	Water Resources/ International River (5)

Note: The number of votes by participants expresses in the parentheses

It was observed that the most serious problem identified in the workshop is shortage of irrigation water. The access to market was the second problem. This includes the situation of no buyer, no market, and bad road conditions. It was also identified as the problem of buyers that the purchasing policy is not currently functioning. Therefore, the assistance of improving rice production in Timor-Leste has to be a comprehensive approach which includes irrigation water supply, market access, farming technology, financial service, and so on.

CHAPTER 5 CURRENT PROGRESS FOR ACHIEVEMENT OF THE AGRICULTURE MASTER PLAN

5-1 SIGNIFICANCE OF THE MASTER PLAN IN THE NATIONAL DEVELOPMENT PLAN

5-1-1 Development Potential and Development Need of the Agricultural Sector

(1) Development potential of agricultural sector

1) The structure of agricultural sector

Agriculture of Timor-Leste has diversity, and its farming forms are classified as follows.

(i) Minimum and self-subsistent agricultural production with rainfed - Food crops cultivation in high lands (Maize, Cassava and etc.)

(ii) Crop production with irrigation (Lowland rice)

(iii) Horticultural agriculture (Coffee, Coconut, Candlenut, Cashew nuts, Vanilla and etc.)

(iv) Livestock rearing (Cow, Buffalo, Pig, Sheep, Goat and Poultry)

The average cultivated area per farm household is 1.2ha. The productivity is low because of the small size of the field. However, farmers cultivate various crops as subsistent food crops combining farming and livestock rearing. They produce many varieties of food crops or vegetables under the traditional farming style, to avoid the risk of food shortage when crop failure.

2) Labor force of agricultural sector[1]

70% or more of the nation's labor force is engaging in agriculture in Timor-Leste. It is necessary for agriculture to become the main driving engine to bring the economic development of the country. The large amount of labor force has a potential to lead such development. Agricultural sector can supply much employment opportunities especially in rural area. Considering that the increase rate of the population is high at 2.4%, the labor force will increase because the age structure of the population is the pyramid form.

3) Effect of agricultural development on the related industries

Agriculture development can give multiply effect on an agricultural related industry in the urban and rural areas by making a marketing chain of agricultural input materials and output farm products. Only agriculture is the main industry. There is no any production industry except the agriculture and the oil sector in Timor-Leste. Agricultural sector should be the main power for development of the national economy.

(2) Development needs of agricultural sector

1) Poverty Reduction

The economy of Timor-Leste is gradually developing nevertheless many farmers still remain poor level in the rural area. Although the current agricultural situation is regarded as the "minimum production agriculture or subsistent agriculture", the actual production does not reach even a minimum level. The most effective way to reduce poverty is to increase of crop production for self-sufficiency.

[1] This "agricultural sector" include cultivation crop, livestock and fishery.

2) Food and Nutrition Security

In Timor-Leste, the balance between food supply and food demand is kept by importing food products. However, there is no guarantee for continuing to purchase necessary food with the proper price in the near future. For example, the price of imported rice is rising suddenly over January from November. At that time, the government distributes the imported rice to the market at subsidized cheap price, dealing amount is small, though.

Domestic production of the staple foods is unstable. For example, the maize production in 2011 fell to only 21% of the last year because of the following reasons, a) too much rainfall because rainy season was extended longer than that in the normal season, b) the government and NGO regulated reclamation by burning, and c) farmers couldn't plow the fields because of the shortage of tractors and input materials.

In addition to such unstable food supply, climate change might give a much influence on the agricultural production and the farm products market fields for mid and long term. Therefore, KONSSANTIL works to supplement the lack of the staple foods by importing them through reinforcement of the NIEWS. Basic state policy is to increase the domestic production of the staple foods.

3) Creation of the labor opportunity in rural area

Although the population is more concentrated to Dili, it is also dispersed widely in the country. Most of rural population considers the agricultural activity as the main living means. Only agriculture sector can create the labor opportunity in rural area, which is considered to be the actual way to conduct sustainable development.

4) Social stability

In order to realize sustainable social stability, most important problem is to fulfill "the food" of the nation. If an agriculture sector can supply the food of all nations at an appropriate price, it can lead to social stability.

5-1-2 Development Objectives Shown at the Country's Agriculture Related Superior Plan

SDP and Program of the 5th Constitutional Government are regarded as the country's superior plan of agriculture. Related to the plans, MAF has prepared the MAF-Strategic Plan (MAFSP), Medium Term Operational Plan (2014-2018) (MTOP), and Medium Term Investment Plan (2014-2018) (MTIP), and Annual Action Plan (AAP) is formulated annually. Proposed agriculture master plan in this project is expected to supplement these existing plans. The master plan aims to examine and suggest realistic measures to accomplish the goals of these plans.

Figure 5-1-1 The Placement of Master Plan

It is aimed to achieve the goal of food self-sufficient in 2020 in SDP. Therefore, SDP plans to reduce on-farm losses from 25% to 15%, to extend irrigated rice fields from 50,000ha to 70,000ha and to improve crop production system by 2020. Target of the SDP is shown in Table 5-1-1.

Table 5-1-1 The Target Amount of SDP to Achieve Food Self-sufficient.

Year		2010	2015	2020	2025	2030
Annual Losses (% of total production)		25%	20%	15%	10%	5%
Basic Food Production	Rice (ha)	50,000	63,815	70,000	70,000	70,000
	Rice Yield (t/ha) (grain)	1.00	1.20	1.43	1.70	2.02
	Rice Production (t) (adjusted for losses)	37,500	61,262	85,085	107,100	134,330
	Maize (ha) /a	76,500	80,494	83,169	85,625	87,080
	Maize Yield (t/ha) (grain)	1.25	1.54	1.89	2.33	2.50
	Maize Production (t) (adjusted for losses)	71,719	99,169	133,611	179,556	206,815
	Toots/ Tubers (ha)	8,499	8,943	9,240	9,513	9,675
	Toots/ Tubers Yield (t/ha) (grain)	7.50	8.35	9.29	19.33	11.49
	Toots/ Tubers Production (t) (adjusted for losses)	47,807	59,739	72,964	165,498	105,607
Basic Food Balance	Rice (t) (grain)	-76,317	-59,608	-49,959	-27,340	-5,868
	Maize (t)	-438	23,127	54,759	98,524	124,408
	Total Grain (t)	-76,755	-36,481	4,800	71,184	118,540
	Root/ Tubers (t)	-7,306	1,509	12,118	25,422	40,840
	Basic Food Balance (t)	-84,061	-34,972	16,918	96,606	159,380
	Basic Food for Livestock Production (t)	0	0	0	75,000	125,000
	Adjusted Basic Food Balance	-84,061	-34,972	16,918	21,606	34,380

Source: Timor-Leste Strategic Development Plan 2011-2030

Note) a/ Area planted grows at rate of rural population growth due to labor constraints for maize weeding

5-1-3 Annual Action Plan and Development Objectives of the SDP

Four objectives are picked up from the SDP for this Project, which is shown in Table 5-1-2. In addition, the objectives of MTOP correspond to the SDP are described in the same table. Description of "rice" is excluded in the objective on food self-sufficient of the MTOP, considering the supply of rice depends on rice import. Importance of rice in staple food production is becoming higher steadily since the demand is increasing recently. On the other hand, self-sufficiency ratio of rice is declined because of the decrease of the planted area. We could find the rice target of self-sufficiency was not realistic; hence, MTOP excludes rice from the self-sufficiency target. The targets of four major crops about production, planted area, and yield are described in MTOP.

However, as the target of rice production, cultivated area and yield are mentioned. The increasing target of the size of irrigated rice fields is set on the MTOP. Although the target yield of maize is set at lower level of 2.0 MT/ha, target year is set two years earlier than the SDP. The target of harvest losses is set at 40 % in MTOP, although that is 75 % in SDP and the target year of the MTOP is 12 years earlier than the SDP.

Table 5-1-2 The Objectives Picked from the SDP (MP) and MTOP

SDP (MP)	MTOP	Description on the MTOP
The food supply will have exceeded demand (By 2020)	Total staple food supply exceeds except for rice (by 2018)	Annex 4 Results framework - Development Objectives - Improved household food and nutrition security and reduced hunger - Target for 2018
The area of irrigated rice will have increased from 50,000ha to 70,000ha (by 2020)	Area under irrigated rice will have increase by 40% (by 2018)	Annex 4 Results framework - Sub Program 1.4 Sustainable water supply to agriculture and enhanced water use efficiency - Target for 2018
Average maize yields will have increased to 2.5t/ha (by 2020)	Average maize yield will have increased to 2.0t/ha (2018)	Annex 4 Results framework - Sub Program 1.6 Accelerated production of selected enterprises - Component 1 Increased production and productivity of food and horticultural crops - Target for 2018
On-farm rice storage losses will have reduced from 20% to about 5% (by 2030)	Pre and post-harvest losses reduced by at least 40 percent (by 2018)	Annex 4 Results framework - Sub Program 1.3 Reduced field and post-harvest losses - Target for 2018

MAF has sorted the objectives of the SDP (2017) to the 29 items (A-1 to A-29), and then they has set the annual target from 2013 to 2017 of each item. The AAP has been made by each national directorate and each district. For example, the annual goal of the A-6 “Increased production and productivity of food and horticultural crops (rice, maize, soya bean, mung bean, ground nuts, vegetables, tubers, potatoes, etc.)”, and the AAP provided by NDAH in 2014 are shown in Table 5-1-3.

Generally, about 20 to 50 actions are planned in each AAP. For example, the objective specification of the AAP provided by NDAH in 2014 is to increase the production and the productivity of rice, corn, vegetables, tuber/roots and horticulture crops. In this line, 47 activities are planned in the AAP. These activities are listed as follows.

- National workshop for the orientation of the food program of production intensification
- Capacity building to the technicians to improve the technology of cultivation and post-harvest treating
- Seminars and conferences of vegetables
- Capacity building to the extensions about the operation and maintenance of hand tractors / the method of multiplication of seeds
- Capacity building to farmers about farming machines
- Provision of seeds/sticks/seedlings, organic fertilizer, pesticides, equipment, fuel and maintenance cost for machines
- Developing certificated seeds and multiplication
- Monitoring and evaluation of the programs, projects and implemented activities
- Training and seminar in foreign countries
- Supporting ceremonial activities related to projects and activities of women’s groups
- Supporting programs of hybrid seeds, crop harvesting and Membramo (rice) production

The AAP provided by each national directorate and each district prepared to aim the annual objective of the SDP. However, in the AAP, actual situation is reflected by every year. It is prepared by accumulating individual activity and development needs of each field or the target area. However, the relation between the activities and the goals is not clear. It is necessary to verify whether the planned activities are sufficient to achieve the goal.

It is important to analyze the situation and result of the activities by year, and reflect the analysis on the next year plan to improve effectiveness and efficiency of each activity. Although the monitoring and evaluation activities have been planned in AAP, the indicator of the AAP activities is superficial. It is considered that monitoring and evaluation activities planned in the MAF annual objectives are only described as formal work.

Table 5-1-3 Examples of Goals and Annual Action Plans of SDP

Sub-Sector No.	SDP 2017 Goals	Performance Indicator	Annual Action Plan				Responsible Entity		Planning Source*			
			SDP 2013 Goals	SDP 2014 Goals	SDP 2015 Goals	SDP 2016 Goals	GoTL	DP	SDP	PG	MDG	ND
A-6	**Increased production and productivity of food and horticultural crops (rice, maize, soya bean, mung bean, ground nuts, vegetables, tubers, potatoes etc.)**											
	Tonnage of paddy production increased:	Tonnage of paddy production increased at least up to 167,000 mt	1) 292 tons of rice seeds purchased; 2) areas of 11,680 ha planted ; 2) produced of 141,683 mt rice	1) Production of rice increased to 157,000 mt; ; 2)Average rice yield 3.49 mt/ha	1) Production of rice increased to 175,000 mt; 2)Average rice yield 3.57 mt/ha	1) Production of rice increased to 186,660 mt; 3) Average rice yield 3.66 mt/ha	MAF	RDP IV	MAF-SP & MTOP			
	Increased areas under rice	Area under rice increased up to 57,000 ha	1) Areas of 30,267 hectares of rice field adopted good agriculture practices; 2) Areas about 40,902 ha cultivated	1) Areas cultivated 45,000 ha	2) Areas cultivated 49,000 ha;	2) Areas cultivated 51,000 ha;	MAF	RDP IV	MAF-SP & MTOP			
	Increased maize yield up to 2.5 mt/ha	Average maize yield increased to 2.5 mt/ha	1) Area 75,804 ha cultivated; 2) 152,366 mt maize produced; 3) 22,741 ha of maize are cultivated under good agricultural practices	1) Production of maize increased to 173,840 mt; 2) Area cultivated increased to 82,000 ha; 3) Average maize yield increased to 2.12 mt/ha	1) Production of maize increased to 192,270 mt; 2) Area cultivated increased to 87,000 ha; 3) Average maize yield increased to 2.21 mt/ha	1) Production of maize increased to 223,440 mt; 2) Area cultivated increased to 98,000 ha; 3) Average maize yield increased to 2.28 mt/ha	MAF	RDP IV	MAF-SP & MTOP			
	Cassava production increased up to 50,000 mt	Cassava production increased up to 50,000 mt	1) Production of cassava increased to 18,000 mt; area cultivated 5,000 ha; average yield 3.6 mt/ha	1) Production of cassava increased to 24,000 mt; area cultivated 6,000 ha; average yield 4 mt/ha	1) Production of cassava increased to 30,000 mt; area cultivated 7,000 ha; average yield 4.2 mt/ha	1) Production of cassava increased to 33,000 mt; area cultivated 7,500 ha; average yield 4.4 mt/ha	MAF		MAF-SP & MTOP			
	Sweet potato production increased up to 15,000 mt	Sweet potato production increased up to 15,000 mt	Production of sweet potato increased to 8,000 mt; area cultivated 2,500 ha; average yield 3.2 mt/ha	Production of sweet potato increased to 10,800 mt; area cultivated 3,000 ha; average yield 3.6 mt/ha	Production of sweet potato increased to 19,000 mt; area cultivated 4,750 ha; average yield 4 mt/ha	Production of sweet potato increased to 28,600 mt; area cultivated 6,500 ha; average yield 4.4 mt/ha	MAF		MAF-SP & MTOP			
	Production of soya beans, green gram, peanuts and mung beans increased by 75%; 63%; 80% and 78% respectively	Production of soya beans, green gram, peanuts and mung beans increased by 75%; 63%; 80% and 78% respectively	1) Production of soya bean 2,100 mt, areas cultivated 1,500 ha, yield 1.4 mt/ha; 2) Production of peanut 4,800 mt, areas cultivated 4,000 ha, yield 1.2 mt/ha.	1) Production of soya bean 3,825 mt, areas cultivated 2,550 ha, yield 1.5 mt/ha; 2) Production of peanut 8,775 mt, areas cultivated 6,750 ha, yield 1.3 mt/ha.	1) Production of soya bean 5,120 mt, areas cultivated 3,200 ha, yield 1.6 mt/ha; 2) Production of peanut 13,300 mt, areas cultivated 9,500 ha, yield 1.4 mt/ha.	1) Production of soya bean 17,763 mt, areas cultivated 12,250 ha, yield 1.45 mt/ha; 2) Production of peanut 13,300 mt, areas cultivated 9,500 ha, yield 1.4 mt/ha.	MAF		MAF-SP & MTOP			
	Increased production of onion/garlic; fruits, leafy vegetables and other vegetable to 8,000 mt; 53,000 mt; 30,000 mt and 21,000 mt respectively	Onion/garlic; fruits, leafy vegetables and other vegetable production increased to 8,000 mt; 53,000 mt; 30,000 mt and 21,000 mt respectively	1) Production of onion/garlic 3,000 mt, areas cultivated of 800 ha, yield of 3.0 mt/ha; 2) Production of fruits 21,000 mt, areas cultivated 2,300 ha, yield 9.1 mt/ha.	1) Production of onion/garlic 3,485 mt, areas cultivated of 1,025 ha, yield of 3.4 mt/ha; 2) Production of fruits 26,125 mt, areas cultivated 2,750 ha, yield 9.5 mt/ha.	1) Production of onion/garlic 4,860 mt, areas cultivated of 1,350 ha, yield of 3.6 mt/ha; 2) Production of fruits 35,000 mt, areas cultivated 3,500 ha, yield 10 mt/ha.	1) Production of onion/garlic 6,365 mt, areas cultivated of 1,675 ha, yield of 3.8 mt/ha; 2) Production of fruits 43,775 mt, areas cultivated 4,250 ha, yield 10.30 mt/ha.	MAF		MAF-SP & MTOP			

EXAMPLE OF ANNUAL ACTION PLAN IN 2014 PROVIDED BY NDAH

GENERAL OBJECTIVE: To increase the production and productivity, assure quality of the food security, and create field work

Objective Specification	Activities	Expected Result	Indicator of Activity	Estimated Cost (USD)	Implementation Area	to March 31	to June 30	to September 30	to December 31
1. To increase the production and the productivity of rice, corn, vegetables, tuber/roots and horticulture crops	1.1 National workshop for the orientation of the food program of production Intensification	20 technicians of MAF participate in the workshop and the national orientation on the program of ICM, SRI and hybrid including the cultivation technique	The 20 technicians' knowledge, the partner development on the program of ICM, SRI and hybrid, and cultivation technique to raise production	1,200.00	Dili and Agriculture Extension Centers			20 technicians of MAP participate in the workshop and national orientation on the program of ICM, SRI and hybrid including the cultivation technique	

5-2 POTENTIAL AREA, IRRIGATION POTENTIAL, AND THE DIFFERENCE BETWEEN PRODUCTION AND DEMAND

5-2-1 Potential Area and the Difference between Production and Demand of Rice

Figure 5-2-1 shows trend of potential area, planted area and harvested area. The biggest rice planted area was the 46 thousand hectare in 2008. Even in the biggest planted year, the ratio of the planted area is only 62 percent of the potential area. At first glance, it seems there are plenty of paddy fields for the expansion of rice cultivation. However, it is considered a lot of potential area needs big amount of cost to restore the field to paddy field, considering that the area of paddy field in 2014 is large, about 34 thousand hectare according to the Inventory Survey. The trend of the planted area is decreasing after 2008. It fell into 37 thousand hectare in 2012.

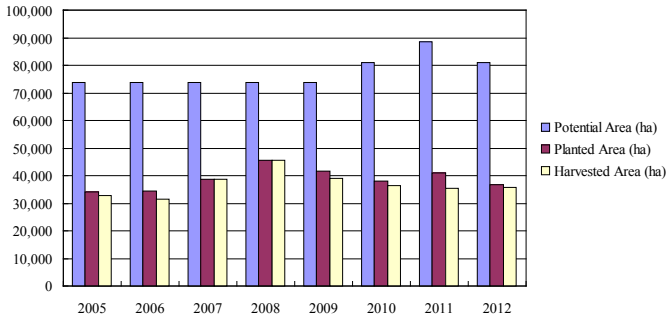


Figure 5-2-1 Rice Potential, Planted, and Harvested Area in the Whole Country

The main reason of the decrease of planted area is considered that the incentive of the rice production grew weak relatively. As the reason, farmers have come to be able to get working opportunities and income resources other than agriculture. To be concrete, 1) Daily wages; road construction is implemented widely including rural areas, which provides wages of $5 a day, 2) Veteran pension; the veterans' pension scheme pays the beneficiaries $250 a month, 3) Old-age pension; the national pension system started to pay $30 a month to all Timorese of 60 years and up[2]. It is considered that "shifting from rice cultivation to other crops cultivation" is reaching an advanced stage in accordance with the decline of farmers' motivation for working in agriculture production.

1) Daily wages: In recent years, infrastructure improvement was conducted rapidly such as electricity, waterworks, housing, etc. other than road repairing. Situation that cannot gather neighboring farmers with low wages for transplanting or harvesting like before is expanding because working opportunities, which provide better wages than farm work, are increased even in rural areas. The situation causes decrease of planted area due to the shortage of labors in short term. In midterm, it causes reduction of rice production, which needs a lot of labors, because of the jump of the production cost.

2) Veteran pension: The recipient of the veteran pension is limited. Number of the beneficiaries is small[3] even if their families and relatives are considered. However, most recipients of peasants will quit their jobs, and if they are owners of paddy fields, they may finish rice production because they receive big money. The recipients will decrease in long term but there is a possibility that the designation standard of the veteran will be widened.

3) Old-age pension: This pension system influences the farmers' motivation for rice production extensively since the receiving money is small but the number of the recipients is huge[4] contrary to the veteran pension. The working incentive of rice farmers who are over sixty and can work will be reduced certainly. The pension system is going to continue in the future by long term though the system will be reviewed.

[2] Veteran pension and old-age pension were started in 2006 and 2008, respectively.
[3] The number of persons who are qualified as recipient was around 38,000 from 2008 to 2012.
[4] The number of persons who are qualified as recipient was around 88,000 in 2010.

The ratio of the planted area was declined to 46 % of the potential area; moreover the ratio of the harvested area was remarkably low of 87 % of the planted area in 2011, when bad weather influenced the agriculture production.

Figure 5-2-2 shows the difference between the rice production and the demand, which was calculated, deducting estimated rice demand from domestic rice production. The rice production was calculated, considering the secureness of seed of 35 kg/ha for the next season, the post-harvest loss of 17.5 %, and the milling ratio of 60 %. The demand was estimated by the estimated population, which was calculated based on the population in 2010 and the annual increase ratio of 2.41 %, and the annual rice consumption of 106 kg/person. As the result of this trial calculation, the difference between the production and the demand decreased until 51 thousand MT in 2009 though it was 76 thousand MT in 2007. The difference shifted from decrease to increase in 2010 and it grew to 68 thousand MT in 2011. The difference was 60 thousand MT in 2012 on a little decrease. The ratio of the production in this year was 49 %, about a half of the estimated demand.

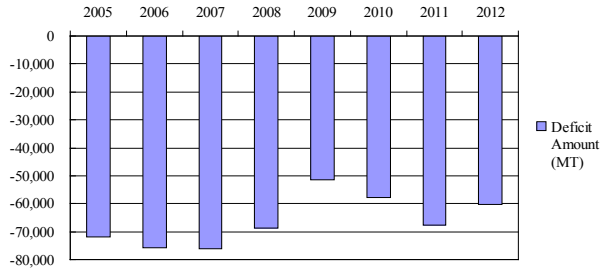


Figure 5-2-2 Difference between Rice Production and Demand in the Whole Country

Next, we shall look into the change of the rice production in each district. (See Figure 5-2-3) The increase of the production from 2009 onward in Baucau is worthy of mention. The production amount grew four times in the four years of 2008 - 2012. Within the same years, the planted area and the yield in the District increased about double. NDAH thinks the great progress of the District was caused by the improvement of cultivation technique, which caused the increase of yield and the extension of land preparation by tractors, which caused the increase of planted area, which was remarkable in comparison with other districts. Projects of EU (GIZ) and technical extension activities of NGO contributed much to the improvement.

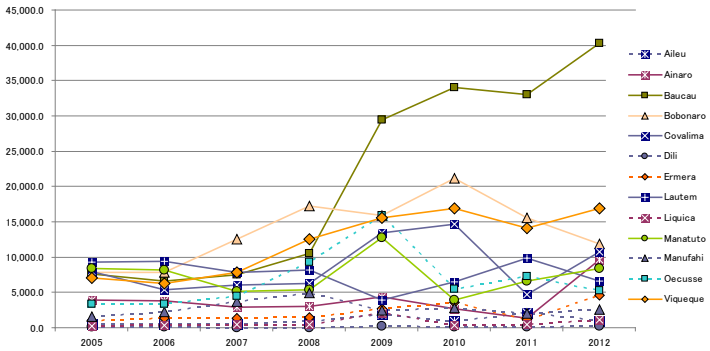


Figure 5-2-3 Paddy Production in Each District (MT)

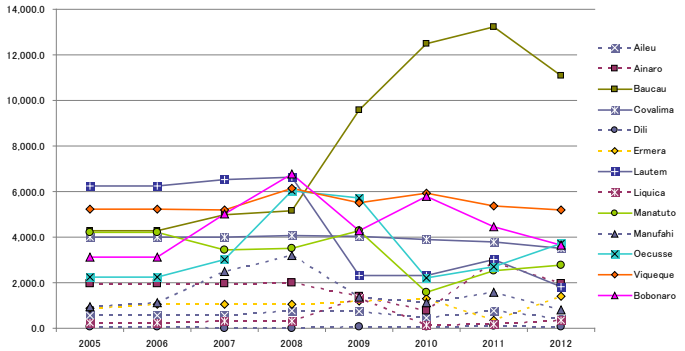


Figure 5-2-4 Rice Planted Area in Each District (ha)

As effective activities to expand cultivation technique, 1) introduction of bikes to the extension service, 2) organizing farmers' groups, and 3) implementation of technical training are raised. It seems that basic cultivation technique was extended by modern manners effectively and practiced in wide area. As the background of this phenomenon, it is considered that Baucau is located in a wide plain, and the potential of rice cultivation is high. Baucau has the demand of

the second biggest town and of Dili, which is linked by the National Route 1[5]. It is also considered that before the civil war, rice production was doing well in Baucau and the restoration of the production base was conducted rapidly; the extension of the technique and farming machines became the start of the restoration.

The following figure shows the change of imported rice price in Timor-Leste. The price, which was stable at 300 US$/MT until 1998, shifted between 200 and 400 US$/MT in 1999 - 2006. After that, it soared to 725 US$/MT in 2010. We can understand the increase of the production in Baucau after 2009 was caused in accordance with the rise of the rice price.

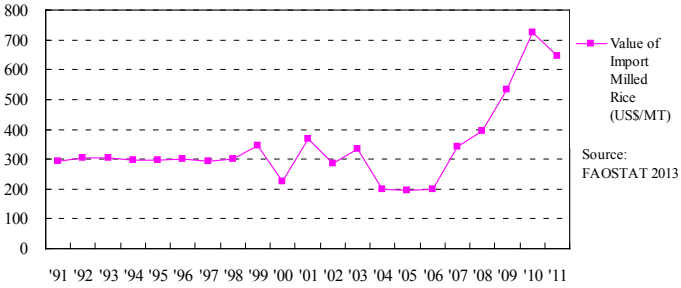


Figure 5-2-5 Change of Imported Rice Price (US$/MT)

Districts which have the largest production after Baucau are Viqueque, Bobonaro, and Covalima. EU (GIZ) and other development partners also have conducted supporting projects for agriculture production in those districts as well as Baucau.

On the other hand, the production in Oecusse and Manatuto was expanded until 2009 but it changed to decrease in 2010 due to the bad weather mentioned above. The planted area was decreased about 40 % and the yield was decreased about 80% in the both districts, compared to them in 2009. Shortage of irrigation water, and flood damage were occurred in Oecusse due to the unstable rain.

It is expected that the decrease of the production due to bad weather will occur in Baucau, too in the near future, whose planted area changed to decrease in 2012. In the current situation of low preparation level of irrigation and riparian work, especially, the change of rainfall affects the production seriously. The case of small rainfall causes shortage of irrigation water. The case of heavy rain and local downpour easily causes bad drainage, damage of irrigation facilities, furthermore, mudslides and floods.

Also, it is considered that landowners' move to Dili makes further progress, which causes increase of abandoned fields and decrease of the production by tenant farmers.

We shall look on planted areas in each district. Districts which have the largest planted area after Baucau are Viqueque, Bobonaro and Covalima as well as the production amount. The planted areas in Oecusse and Manatuto decreased widely in 2010 as well as the production. In terms of the planted area, there is a big decrease of Lautem. Though Lautem had the largest planted area until 2008, it was decreased to a scale of one third in 2009, and remained at the same level after that. It is considered the situation of the production in Lautem has returned to

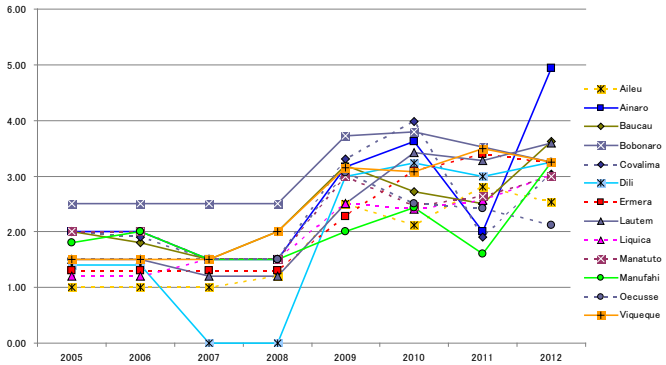


Figure 5-2-6 Paddy Yield in Each District (MT/ha)

[5] It is considered that the evacuation of emigrants from Baucau to Dili due to the disturbance in Dili, both of the rice demand in Baucau and the manpower of the rice producer were increased in 2008.

the original situation as Lautem has been maize-producing area not rice-producing for a long time.

Districts which had big yield in 2012 were Ainaro, Baucau, and Lautem. The yield of 4.9 ton/ha in Ainaro stand out only in 2012, which is 2.5 times growth of 2.0 ton/ha in 2011. The value of the yield in the district contributes a lot to the national average of 3.4 ton/ha in 2012, which is the highest record in the past. It is considered that the increase trend of the yield in recent years is caused by the effect of the introduction of chemical fertilizer and the extension of cultivation technique though the data in the district is doubtful.

Let us now look at the transition of the yield in each district. Bobonaro kept higher yield than other districts until 2011. Viqueque keeps higher rank from 2008 onwards. To the contrary, districts whose yield is low in 2012 are Oecusse, Aileu and Manatuto. Also, Manufahi in 2009-2011 and Liquica from 2009 onwards remain in a low yield level.

Following figure shows the difference between the potential area and the planted area in each district, which indicates non-planted area. In Manatuto, which has a lot of non-planted area from the past, the planted area decreased about 2,700 ha in 2009-2010 and the non-planted area exceeded 11,000 ha. The potential area of 9,900 ha was not planted in 2012.

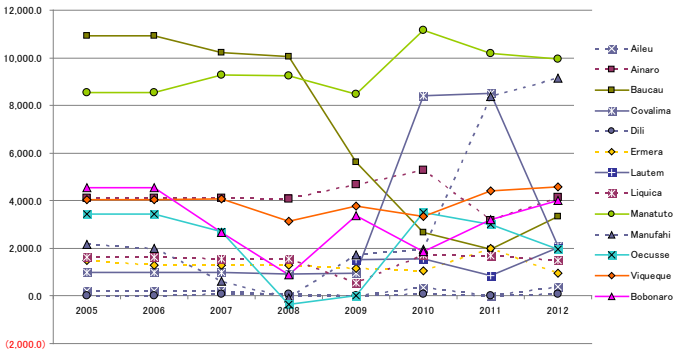


Figure 5-2-7 Non Planted Area in the Potential Area (ha)

On the other hand, the non-planted area in Baucau was bigger than Manatuto until 2008 but the planted area increased remarkably after 2009 onwards, as mentioned above, and it became about 3,300 ha in 2012. In contrast to Baucau, Manufahi, whose non-planted area was small from the past, increased rapidly the non-planted area in 2011 because the potential area increased three times in the year but the increase of the planted area remained about 1.4 times. Covalima also increased rapidly the non-planted area in 2009-2010 because the potential area increased 2.5 times but the increase of the planted area remained small. It is considered that the increase/ decrease of the potential area are mainly caused by the results of rehabilitation on irrigation facility or the damage of floods. It can be gathered that the increase of the potential area does not lead to the expansion of the planted area, immediately owing to the damage risk of facility or the change of agricultural surroundings.

Let us take a general view of the difference between the rice production and the estimated demand in each district. The district which stays in the plus of the balance is only Baucau in contrast to Dili, which stands out in the minus of the balance. Excluding Ermera, whose minus is about 11 thousand MT, the scale of minus in the remaining ten

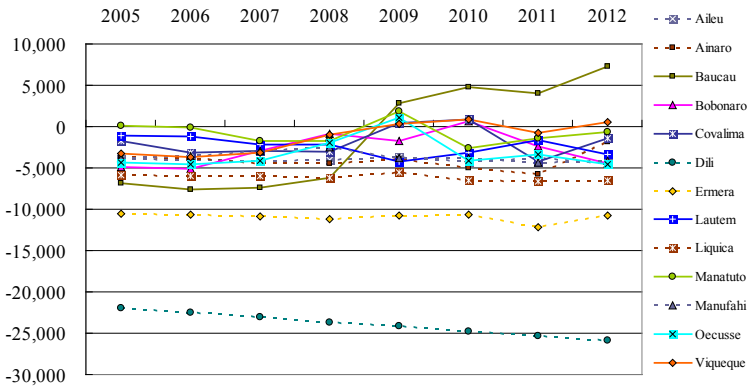


Figure 5-2-8 Difference between Rice Production and Demand (MT)

districts was about 0 - 7 thousand MT.

The difference between the production and the demand in Dili District has constantly increased in accordance with the trend of the population growth has been steady. The difference in Ermera and Liquica has been flat movement. Districts whose difference between the production and the demand is the least after Baucau are Viqueque, Manatuto, Covalima, and Ainaro.

We can say the development needs to increase domestic rice production or needs to import rice is big, considering the shift of the difference between the rice production and the estimated demand in each district. Promotion of rice production leads to the national interests because agriculture is a key industry and provides most of working opportunities. On the other hand, the ratio of the net planted area to the potential area is various among districts. It can be gathered that if we regard the size of the potential area as the size of development potential, the big development potential does not directly lead to the expansion of the planted area.

5-2-2 Potential Area and the Difference between Production and Demand of Maize

The production and the yield in 2005-2012 are shown in Figure 5-2-9. The peak of the production was about 150 thousand MT in 2010. The peak of the yield was 2.1 MT/ha in 2010, too. The production fell down sharply in 2011 and 2012 due to the long rain. NDAH recognizes farmers could not plant seeds since they had not been able to prepare their fields. In the background of this problem, two conditions happened to occur at the same season; 1) shortage of tractors for land preparation, 2) land preparation work concentrated on the limited days of fine weather. In addition to the problem, it is estimated that landslide damage in some areas because of heavy rainfall and regulation on slash-and-burn method by MAF/ NGO influenced the rice cultivation in 2011 and 2012.

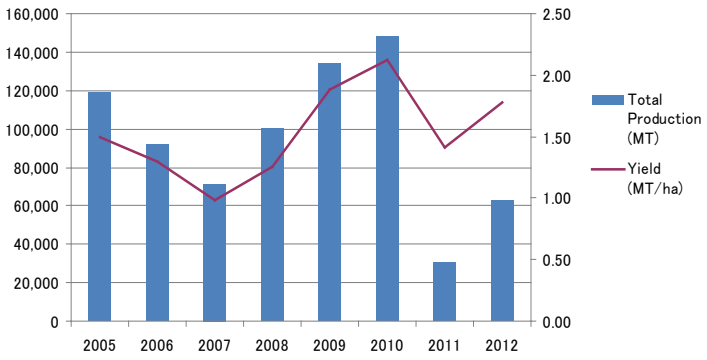


Figure 5-2-9 Production and Yield of Maize in the Whole Country

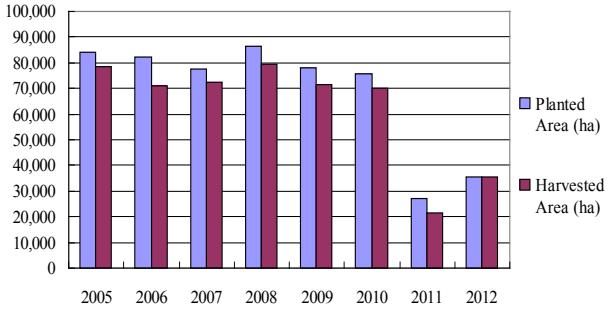


Figure 5-2-10 Planted and Harvested Area of Maize in the Whole Country

Next figure shows the planted area and the harvested area. The peak of the planted area of maize was 87 thousand ha in 2008. After that, the planted area decreased to 27 thousand ha in 2011 and to 35 thousand ha in 2012 as mentioned above. Especially in 2011, the ratio of the harvested area 21,699 ha to the planted area 26,928 ha was remarkably low of 81 % because of the bad weather.

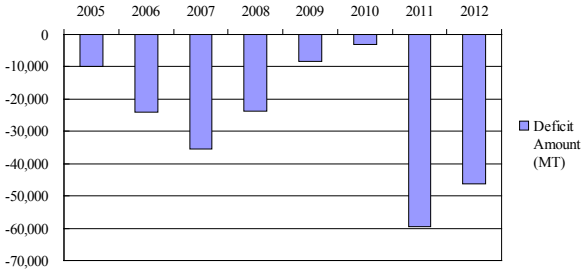


Figure 5-2-11 Difference between Production and Demand of Maize

The potential area in non-paddy fields

of the whole country is about 215 thousand ha. Although the potential areas are not arranged in each year, it is considered there are enough fields to expand the planted area because the ratio of the planted area in 2008, which is the largest in the past, was about 40 % of the potential area.

Following figure (right) shows difference between maize production and estimated demand. The production was calculated, assuming the threshing ratio of 70 %, deducting the secureness of seed of 50 kg/ha for the next season, the post-harvest loss of 17.5 %, and the feed for livestock of 14 %. The demand was estimated by the estimated population, which was calculated based on the population in 2010 and the annual increase ratio of 2.41 %, and the annual maize consumption of 67 kg/person. As the result of this trial calculation, the difference between the production and the demand decreased until 3 thousand MT in 2010 from 35 thousand MT in 2007, which means the production almost reached the estimated demand. However, the difference fell down to - 60 thousand MT, whose production ratio was 19 % of the estimated demand, in 2011 because of bad weather. Though the difference shifted from increase to decrease in 2012, it still remained at - 46 thousand MT, whose self-sufficiency ratio was 38 % of the estimated demand.

We can say the development potential to increase maize production is big, considering the relationship between the potential area and the planted area. Although the production achieved the demand level in 2010, the fluctuation of production is huge. Therefore, development needs to stabilize the production is high. It is continuously necessary to stably provide excellent seeds and make extension of cultivating technique.

5-2-3 Potential Area and the Difference between Production and Demand of Cassava

Production and yield in 2010 - 12 are shown in the right figure. The biggest production is about 28 thousand MT in 2010, and the biggest yield is 4.6 MT/ha also in 2010. Next figure shows cultivated area and harvested area. The biggest cultivated area is 69 hundred ha in 2010. The potential area of cassava in 2010 is 61 thousand ha; hence, the ratio of cultivated area is about 11 %, which means there is enough room for the expansion of the cultivated area in the future.

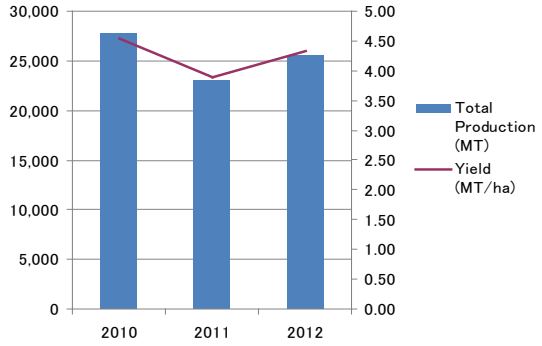


Figure 5-2-12 Production and Yield of Cassava

Next figure shows the difference between the production and the estimated demand of cassava. The production was calculated on the net production, which was 90 % of the raw production, deducted the post-harvest loss of 5 % and the animal feed of 5 %. The demand was calculated, multiplying the estimated population and the annual consumption that was assumed 32 kg/person. The result of this test calculation showed the difference in 2010 was minus 12 thousand MT, whose self-sufficiency was 66 % and the difference in 2011 was minus 16 thousand MT, whose self-sufficiency was 54 % (see Figure 5-2-14).

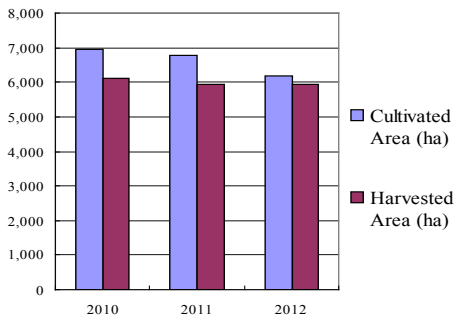


Figure 5-2-13 Cultivated and Harvested Area of Cassava

The potential of production expansion of cassava is high, considering the relationship between the potential area and the cultivated area. Under the present state, the expansion of rice

production cannot attain the demand; it is required to continue to increase cassava production through the stable supply of excellent seed and the extension of cultivation technique because the role, which complements the staple food, will increase in the future.

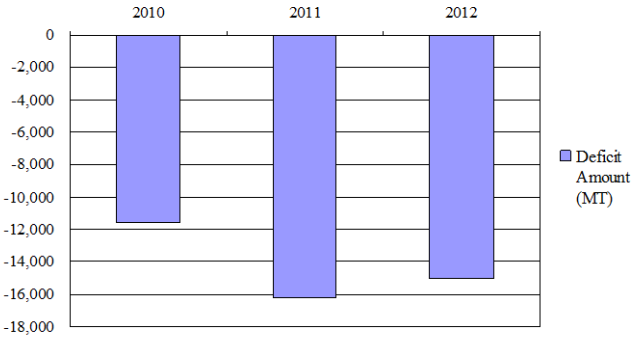


Figure 5-2-14 Difference between Production and Demand

5-2-4 Irrigation Potential

In Timor-Leste, feasibility studies, planning and designing of some irrigation schemes have been conducted on assumption of double cropping of rice at whole the farm lands. However, double cropping of rice has not been done as expected after construction of schemes as actual. In this sub-chapter, although there may be some reasons, irrigation potential from the view of water resources, in this case potential for double cropping, is roughly assessed.

(1) Target watersheds

31 rivers having river discharge data including estimated data by simulation model are selected as targets for assessment. Basically each watershed of target river is divided into 3 - 5 areas and potential is assessed by area.

Target watersheds

1. Loes	16. Tuco (Wetuai)
2. Comoro	17. Luca
3. Laclo	18. Dilor
4. Laleia	19. Sahen
5. Vemasse	20. Clere
6. Seical	21. Laclo do Sul
7. Uaimuhi	22. Caraulun
8. Laivai	23. Belulic
9. Raumoco	24. Mola
10. Malailada	25. Loumea
11. -	26. Raiquita
12. Namaruto	27. Tafara
13. Irabere	28. Tono
14. Bebui	29. Bessi
15. Cuha	

Loes river is divided into 4 branch rivers and No.11 is missing number. So total target watersheds are 31.

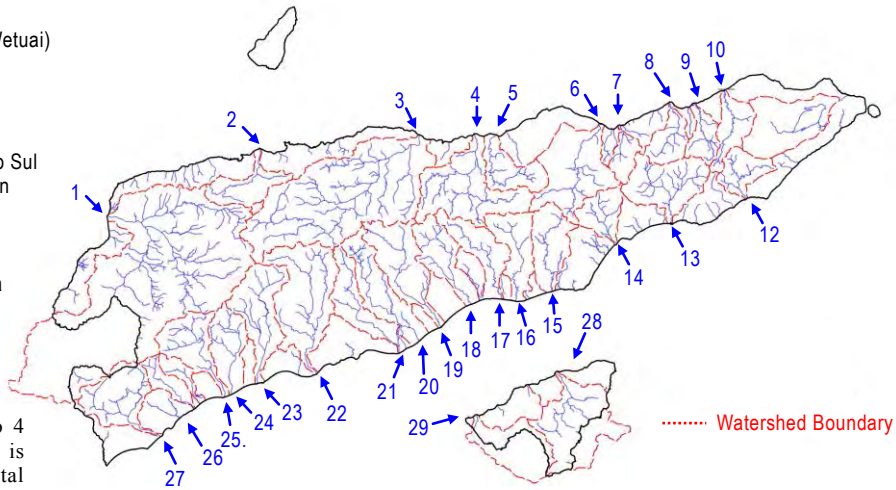
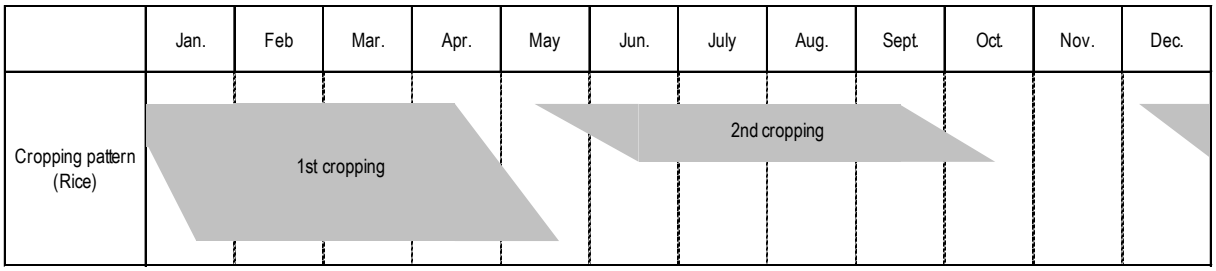


Figure 5-2-15 Target Watersheds for Irrigation Potential Assessment

(2) Applied cropping pattern, data and coefficient

Applied cropping pattern of rice, data and coefficient are shown in Table 5-2-1. In this assessment, population, number of livestock, rainfall and river discharge are estimated by area considering its location or natural condition but same cropping pattern and coefficient are applied to all the areas.

Table 5-2-1 Assessment Criteria



	Items	Amount / Coefficient	Unit	Remarks
Area	Farmland	*1	ha	Calculated by area
Number	Human being	*2	person/km2	Calculated by district
	Livestock	*2	head/km2	
Water supply	Rainfall	*3	mm/month	*4, *5
	River discharge	*3	MCM/month	
Water demand (Drinking Water)	Human being	50	litter/person/day	
	Livestock	50	litter/person/head	
Intake effiiency (The ratio of intakable water to river discharge)		30	%	Downstream and middlestream area
		40	%	Upstream area
Irrigation Water Requirement	Percoration	3	mm/day	
	Standing and puddling water	300	mm	
	Irrigation efficiency	0.55		

River discharge = Area x Unit discharge
Water demand = Σ(Unit amount x Area of district within target small-watershed)

*1: Result of inventory survey
*2: Data in "Population and Housing Census of Timor-Leste, 2011, National Statistics Directorate (NSD), Timor-Leste"
*3: Data in "Assessment of Water Availability and Water Demand in Timor-Leste at River Basin Level, 2004, ADB"
*4: Rainfall data are selected from a station located within or nearby target small-watershed considering the elevation.
*5: Effective rainfall: 80% of Rainfall data but maximum 250mm/month

(3) Condition of assessment

Irrigation potential is assessed under the following conditions.

1) Target of assessment is second (dry season) cropping.

2) All the farmlands are utilized for rice cultivation.

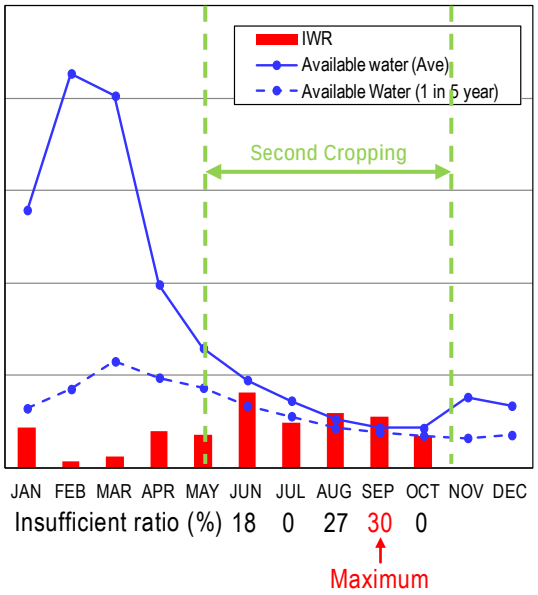
3) 1 in 5 years probable drought discharge is adopted as river discharge.

4) Farmland areas within Indonesia are not counted.

5) Insufficient ratio (= (Irrigation water requirement - Available water volume) / Irrigation water requirement) is calculated by month and maximum ratio is selected.

6) Irrigation potential for second cropping is assessed shown as below according to the maximum insufficient ratio.

High Potential: Insufficient ratio 0%, Middle potential-2: Insufficient ratio 0% - 30%, Middle potential-1: Insufficient ratio 30% - 60%, Low potential: Insufficient ratio 60% - 100%



*Available water
= (Inflow from upstream area + Inflow from its own area)
x Intake efficiency
- Water demand

Figure 5-2-16 Estimation of Maximum Insufficient Ratio

(4) Results and consideration

Assessed results with cropping ratio 110%, 130% and 200% are shown as below. Areas without any farmlands within its area are assessed as high potential.

1) Cropping ratio 110%

Areas having middle or low potential are located within the watershed of Comoro, Seical, Laivai, Tafara, Loumea and Sahen river. These areas are classified into 2 groups based on the reason of insufficient.

i) River discharge in dry season is almost 0.

Areas in Comoro, Tafara, Loumea and Sahen river watershed

ii) River discharge is available even in dry season but area of command area is wide.

Areas in Seical and Laivai river watershed

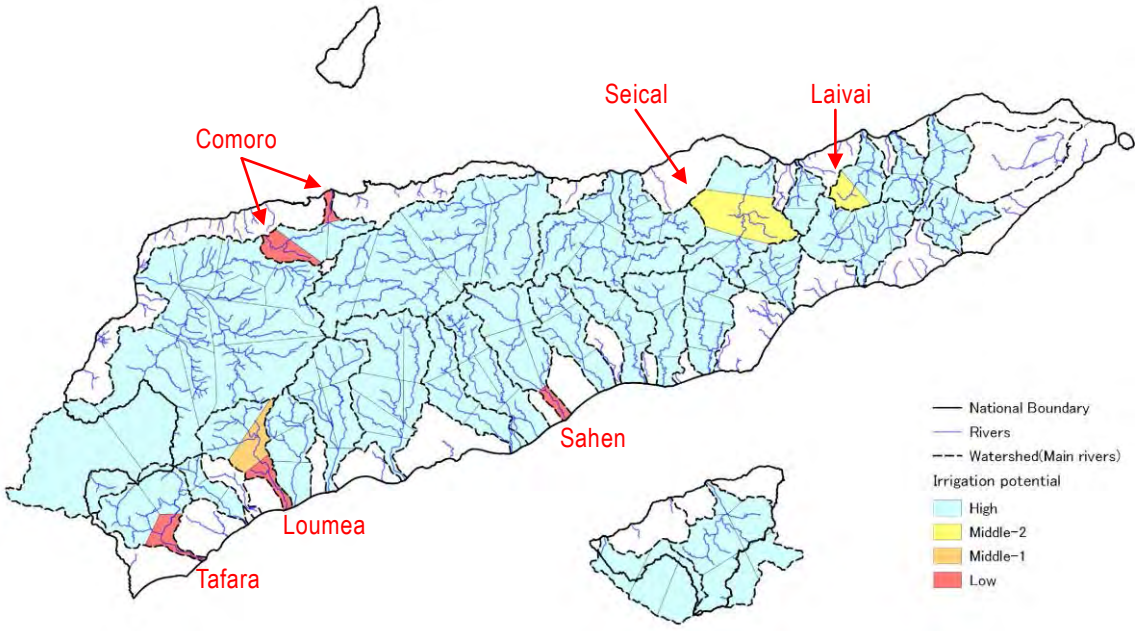


Figure 5-2-17 Irrigation Potential (Cropping Ratio 110%)

2) Cropping ratio 130%

In addition to the case of 110%, areas in Bebai, Vemasse, Uaimuhi, Raumoco, Belulic, Cuha and Bebui River become insufficient condition. Comparing with the case of 110%, insufficient areas in southern part are almost same however those in northern part, especially north-east part from Baucau district to Lautem district, expanded particularly.

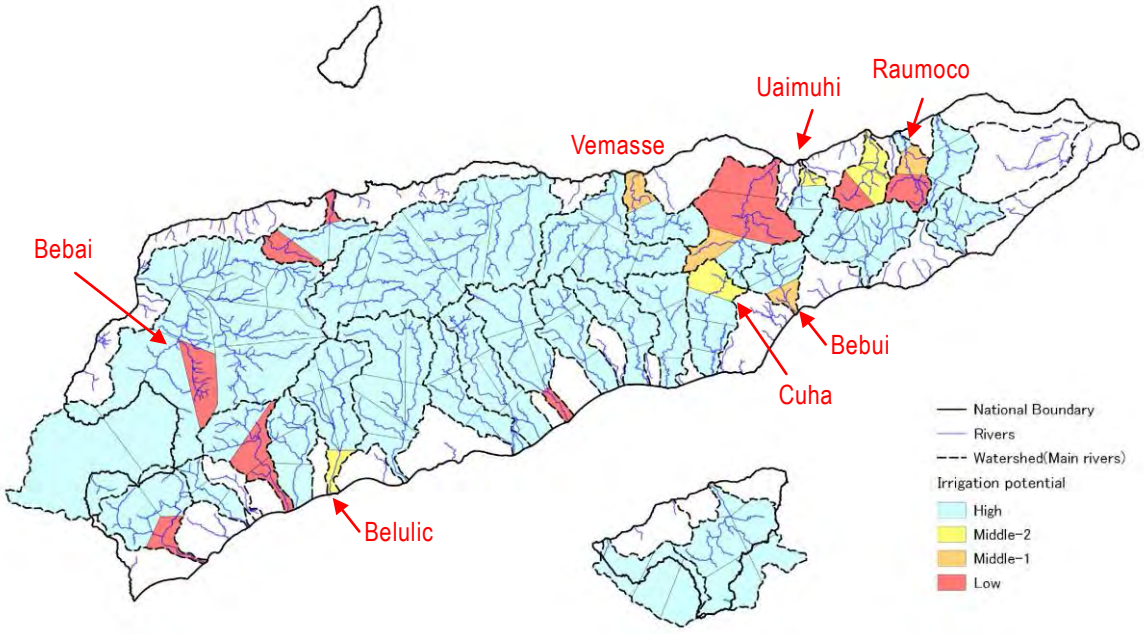


Figure 5-2-18 Irrigation Potential (Cropping Ratio 130%)

3) Cropping ratio 200%

Irrigation potential map is shown in Figure 5-2-19 and Irrigation potential map excepting areas

without any farmlands in its area from high potential is show in Figure 5-2-19. From Figure 5-2-20, many areas located at downstream side are under insufficient condition.

Implemented, on-going and planned stage irrigation schemes are mentioned in Figure 5-2-20 as well. Almost all the areas in which these irrigation schemes are located are under insufficient condition. As a result, only 1 scheme, Raibere scheme at Belulic River, is possible for cropping ratio 200%.

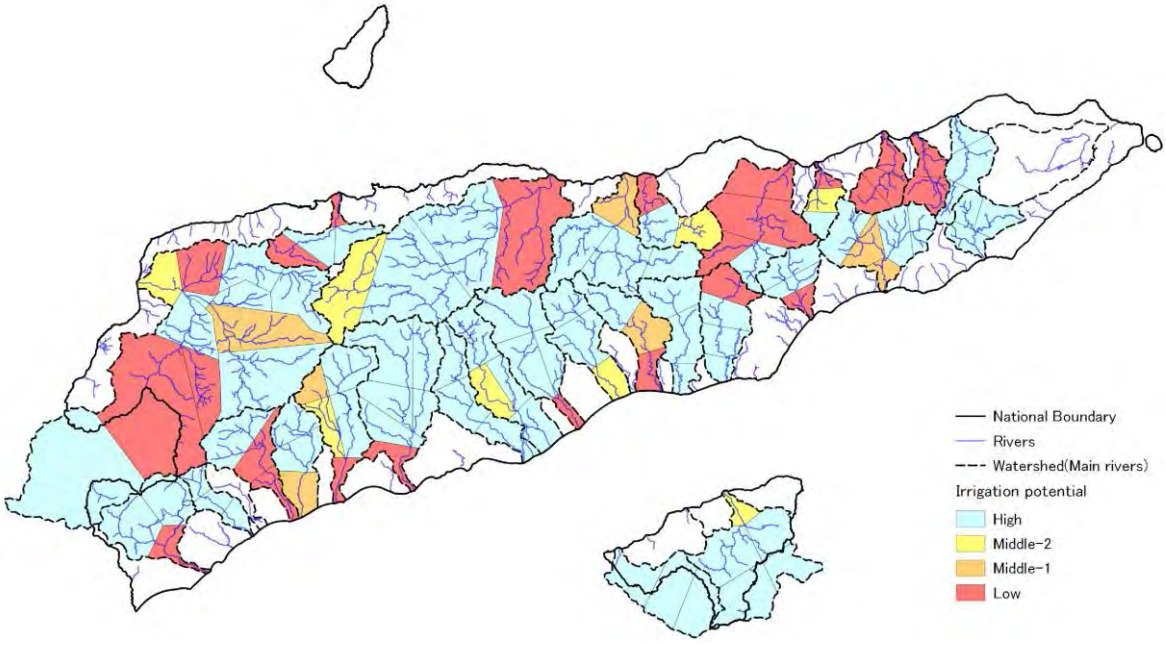


Figure 5-2-19 Irrigation Potential (Cropping Ratio 200%)

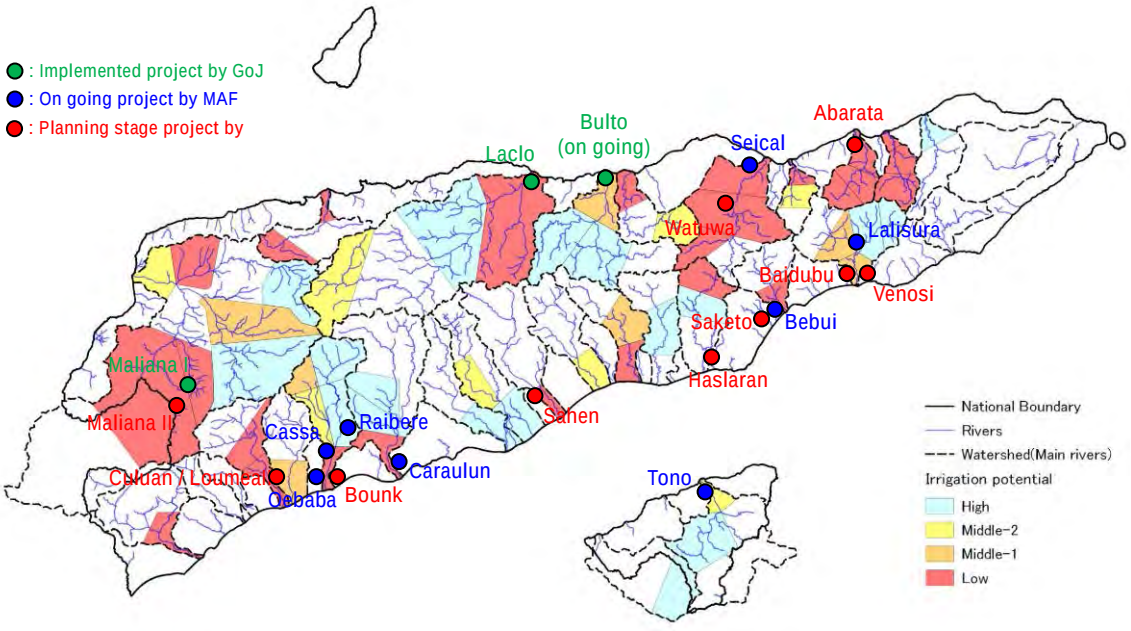


Figure 5-2-20 Irrigation Potential (Cropping Ratio 200%) with Location of Implemented, Ongoing and Planned Stage Irrigation Schemes

***Except areas without any farmland within its area**

It is required to provide stable water source for double cropping. As a new water source, it is

ground water and storage pond and regulating pond. In order to realize development of those water resources, it is necessary to take long term development process for studying, planning and designing. It is also required to provide input resource.

5-3 REVIEW OF INDICATOR AND ACHIEVEMENT ON AGRICULTURAL MASTER PLAN

The agricultural master plan is reviewed about targeted indicators and achievement. It is shown on as following section.

Targeted Indicators	Section
Rice filed is increased from 50,000 ha to 70,000 ha (target year in 2020)	5-3-1 Increase of irrigated rice filed
Demand of food is higher than supply (target year in 2020)	5-3-2 Expectation of balance for rice demand and supply 5-3-3 Expectation of balance for maize demand and supply
Ration of harvested loss is diminished from 20% to 5% (target year in 2030)	5-3-4 Diminishment of harvested loss
Average yield of maize is increased to 2.5 ton/ha (target year in 2020)	5-3-5 Increase of average yield of maize

5-3-1 Increasing of Irrigated Rice Field

(1) Target of irrigated rice filed in SDP and MTOP

On target of irrigated rice filed, it is shown as following;

- SDP: “Rice filed is increased from 50,000 ha to 70,000 ha (target year in 2020)”

- MTOP: “Rice filed is increased by 40% (target year in 2018)”

Each of plan target the increasing of rice area against the existing irrigated rice filed.

According to the past inventory survey (2002), total planned area (Potential area) of irrigation schemes in Timor-Leste was 71,155 ha (the 2013 inventory survey shows the potential area; 66,500 ha). Hence, When the SDP was prepared, 70,000 ha of targeted rice area in SDP sum up the planned area of each irrigation scheme.

On the other hand, as for the existing irrigation rice area, the actual irrigation area was reported 35,434 ha in 2002. That area is almost same as a result of inventory survey in 2013, of which totaled areas is 34,359 ha. In addition, DNAH reports the average cropped area of rice for three (3) years from 2010 to 2012 (refer to Table 3-5-3), is 38,624 ha.

The definitions of between "irrigation area" and "cropped area" are difference in a strict sense. In addition, since these surveys were conducted through the interview and/or aerial photograph, accuracy of collected data might be low. However, even taking these disparity into consideration, present irrigation area in Timor-Leste is assumed to be 35,000 ha ~ 40,000 ha.

(2) Increase expectation of irrigated rice field by on-going project in MAF

MAF is under planning and implementing of the large improvement and rehabilitation project for irrigation (refer to "3-7-3 On-going irrigation project by MAF"). Considering the project progress and the project which secure the budget so far, increasing of irrigation rice filed by project until 2020 is expected to as following Table 5-3-1.

Table 5-3-1 Increase Expectation of Irrigation Rice Filed by Project for Improvement of Existing Major Irrigation Facility

Irrigation scheme	Expected / assumed implementation plan	Irrigation area (ha)	Expectation of yearly increase of Irrigation area (Single cropping)						
			2014	2015	2016	2017	2018	2019	2020
Completed									
Maliana I		840	840	840	840	840	840	840	840
Laclo		507	507	507	507	507	507	507	507
Under implementation									
Bulto	2014-2015	780			780	780	780	780	780
Caraulun	2012-2015	812		812	812	812	812	812	812
Raibere	2012-2015	180		180	180	180	180	180	180
Oebaba	2012-2015	1,890		1,890	1,890	1,890	1,890	1,890	1,890
Cassa	2012-2014	320		320	320	320	320	320	320
Larisula	2014-2015	278			278	278	278	278	278
Secial	2013-2014	640		640	640	640	640	640	640
Bebui	2014-2015	872			872	872	872	872	872
Tono	2014-2015	1,374			1,374	1,374	1,374	1,374	1,374
Under designing									
Watuwa	2015-2018	1,576					1,576	1,576	1,576
Sahen	2015-2017	536				536	536	536	536
Bonuk	2015-2017	448				448	448	448	448
Abarata	2015-2017	296				296	296	296	296
Venosi	2015-2017	96				96	96	96	96
Baidubu	2017-2018	336						336	336
Haslaran	2017-2018	260						260	260
Saketo	2017-2018	337						337	337
Culuan/Lomea II	2017-2018	256						256	256
Maliana II	2015-2018	1,200					1,200	1,200	1,200
Area Total		13,833	1,347	5,189	8,493	9,869	12,645	13,834	13,834

Source：Based on Table 3-7-5 of major irrigation project area by MAF

According SDP, it aims that irrigation rice filed should expand by 20,000 ha until 2020 for the present irrigation rice field of 50,000 ha which show on SDP. Due to the lack of area for existing irrigation rice filed for each project, estimation of increase rice area is difficult to analyze accurately. Planed irrigation area in each project total approximately 13,800 ha, instead of expectation of increase rice. Accordingly, entire irrigation rice field until 2020 is assumed to be 13,800 ha which is subject to completion of under construction project and proceeding well without obstructions.

On the other hand, according to the 2002 inventory survey, actual cropping area (irrigated area) is half of planned area. In addition, the 2013 inventory survey shows 34,359 ha of actual irrigated area and 66,501 ha of planned area. In other word, planned area in 2013 is half of actual irrigated area, as well as in 2002 survey (Refer to Table 5-3-1).

As a premise of fact that actual irrigated area is half of assumed irrigation area, actual expected irrigation area by implemented project of MAF is assumed to be 6,900 ha which is half of 13,800 ha by project expected irrigation area. Therefore, considering these prospects, it is difficult to achieve target of increasing by 20,000 ha. In order to reach 20,000 ha up for 13,800 ha of irrigation area, cropped ratio should be 150% approximately. However, according to the analysis of “irrigation potential” shown in the section 7-2-4, realization of double cropping of rice is not practical way. To achieve target area, securing of stable irrigation water like a technical issue, balance of import rice, shortage of work force and other social issue should be taken the measure and solved.

From the viewpoints as mentioned above, the target of increasing area by 20,000 ha in SDP and by 40% in MTOP until 2020, are assumed to be difficult.

5-3-2 Prediction of the Balance between the Rice Production and the Demand

Let us now verify the achieved situation of the established target, "Food supply exceeds demand in 2020." through the prediction of the balance between the rice production and the demand. In this sub-chapter, the established data of the cultivation area and the unit yield, which are basic data for the prediction of the production and the demand, is based on the data of MTOP and NDAH. The targets of cultivation area, yield, and production are established by MTOP and NDAH, respectively. All targets of NDAH are set higher than those of MTOP.

NDAH makes the production targets of rice and maize, based on the actual results, which are applied for the entire of MAF as the production targets. Table 5-3-2 shows the increase rate of the cultivation area, which were used for setting rice production targets, and yield targets in 2013 -2018. The targets of the cultivation area were calculated in each district, considering the planted area in 2010 and the increase rates. The average increase of the cultivation area in the whole country is expected about 13 % a year. However, the target of rice cultivation area, which is more than 10 % increase in every year, is considered to be remarkably difficult to realize since the planted areas were decreased in 2009, 2010 and 2012 though it shifted to increase in 2011 as mentioned in 5-2-1 above.

Table 5-3-2 Increasing Ratio of Target Cultivation Area and Target Yield of Rice

	2013	2014	2015	2016	2017	2018
Target Cultivation Area / Harvested Area in 2010 (%)	115	126	138	143	155	175
Target Paddy Productivity of NDAH (ton/ha)	3.46	3.49	3.57	3.66	3.73	3.91

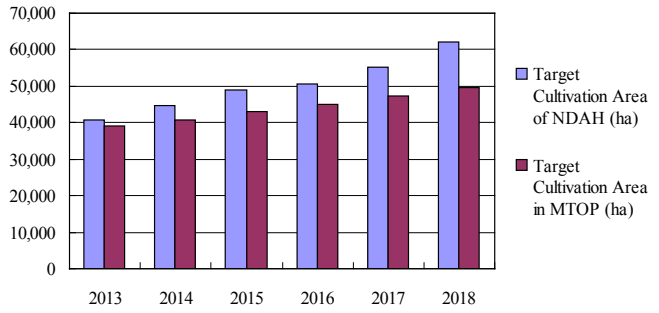


Figure 5-3-1 Target Cultivation Area of NDAH and MTOP

NDAH has set the target yield of 3.46 MT/ha for 2013, which seems to be achieved at first sight since the actual result in 2012 was 3.35 MT/ha. But the yield in 2012 was thought to be caused by an abundant year, considering the results of 2.97-3.09 MT/ha in 2009-2011 and 1.56-1.80 in 2005-2008. Therefore, the targets that are expected about 0.1 MT/ha growth every year from 2013 onwards based on the result in 2012 is remarkably challenging. The NDAH's yield target is very difficult to achieve.

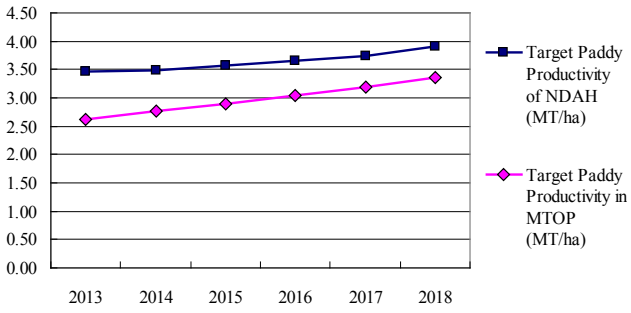


Figure 5-3-2 Target Yield of NDAH and MTOP

As for the cultivated area, the MTOP's target in 2018 is 49.7 thousand ha and the NDAH's target is 62.3 thousand ha, which is 125 % of the MTOP's target. The target cultivation area of NDAH in 2018 is 77 % of the potential area in 2012. As mentioned in "5-2-1 Development Potential and Development Needs in Rice Production", the potential area is big but non-planted area is increasing. The target

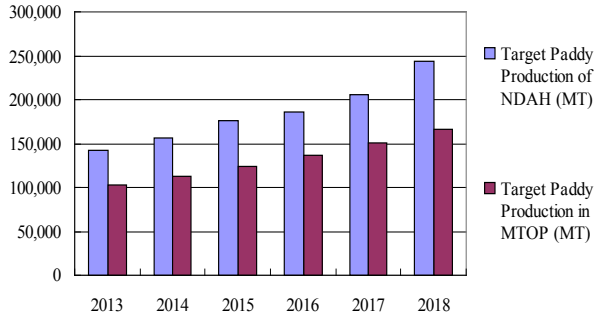


Figure 5-3-3 Target Production of NDAH and MTOP

production of MTOP in 2018 is about 167 thousand MT. On the other hand, the target production of NDAH in 2018 is 243 thousand MT, which is 146 % of the MTOP's target.

Figure 5-3-4 shows the difference between the production and the demand on the supposition that the target of NDAH is achieved. The conditions of the loss and the milling ratio other than the production are the same as the clause 5-2-1. As the result of this trial, the difference in 2013 is minus 52 thousand MT and the production ratio is 57 % of the demand. In 2018, five years later, the difference becomes minus 17 thousand MT and the production rate increases to 87 %.

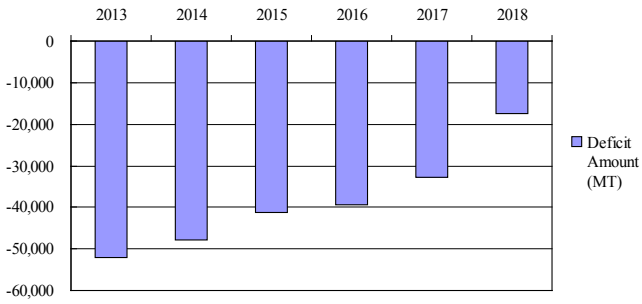


Figure 5-3-4 Difference between Target Production and Demand

The results of the balance prediction between the production and the demand in each district are shown in Figure 5-3-5. Let us look at the districts in minus. The minus quantity in Dili increases constantly and reaches to minus 30 thousand MT in 2018. Then, Ermera, which is located in a mountainous region, exceeds minus 10 thousand MT. Flat movement of minus 7 thousand MT and minus 4 thousand MT is also estimated in the neighboring districts of Liquica and Aileu, respectively.

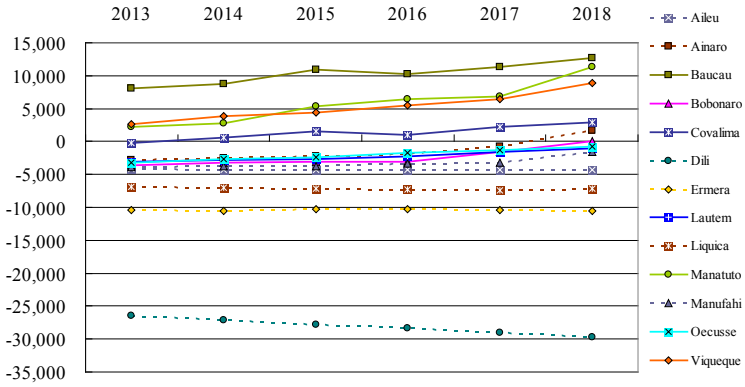


Figure 5-3-5 Difference between Target Production and Demand in Each District (MT)

Districts whose rice production exceeds the demand are Baucau, Manatuto, and Viqueque. The production ratios of the demand in 2018 are 189 %, 306 % and 200 %, respectively. The trend of the difference between the production and the demand in the three districts is increasing. In Covalima and Ainaro also, the production exceeds the demand in a few thousands. The production ratios in 2018 are estimated 137 % and 123 %, respectively.

MAF reviews the targets of the production plan since the current targets are unreasonable as mentioned above though it is not impossible to achieve the self-sufficiency in rice until 2020 for example if the current annual targets of NDAH can be achieved every year till 2018.

5-3-3 Prediction of the Balance between the Maize Production and the Demand

Table 5-3-3 shows the increase ratio of the cultivation area and the target yield of Maize production, which were applied for the targets setting of NDAH for 2013-2018. The target cultivation area in 2013 is decided in each district, considering the potential area and the planted area in 2012. The total target area in 2013 is the same value as the planted area in 2010. From 2014 onward, the increase rates based on the target area in 2013, shown in the Table, are applied uniformly to each district. As we

Table 5-3-3 Increasing Ratio of Target Cultivation Area and Target Yield of Maize

	2013	2014	2015	2016	2017	2018
Target Cultivation Area / Cultivated Area in 2010 (%)	100	108	115	130	138	145
Target Cob Productivity of NDAH (ton/ha)	2.01	2.12	2.21	2.28	2.35	2.43

studied in "5-2-2 Potential Area and the Difference between Production and Demand of Maize", the planted areas in six years of 2005 - 2010 are stable. The plan of NDAH, whose standard is the planted area in 2010, seems to be appropriate, considering the planted areas in 2011 and 2012 were caused by bad weather.

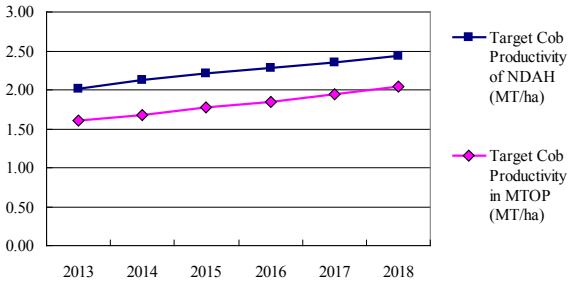


Figure 5-3-6 Target Yield of NDAH and MTOP

In terms of the yield, the target of 2.12 MT/ha in 2014 seems to be achievable since the actual yield in 2012 was the same value. The question is whether the yield increase which accumulates 0.08 MT/ha every year linearly after 2015 onward is possible or not. If the NDAH's targets of the yield and the cultivation area are achieved, the actual planted area, the yield, and the production will exceed the targets of MTOP (See Figures from 5-3-6 to 5-3-7 and 5-3-8). Figure 5-3-9 shows the prediction of the balance between the production and the demand in case of the achievement of the targets of NDAH. The conditions of the calculation excluding the production are same as those of the calculation of the production and the estimated demand in the previous clause, "5-2-2 Potential Area and the Difference between Production and Demand of Maize". The result of the trial in 2013 is minus 7 thousand, whose production ratio is 91 % of the demand. The balance becomes plus 37 thousand, whose production ratio is 143 % of the demand in 2018, five years later.

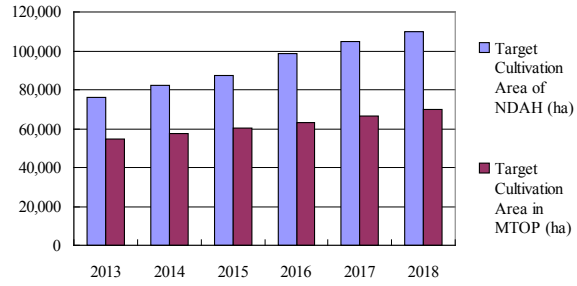


Figure 5-3-7 Target Cultivation Area of NDAH and MTOP

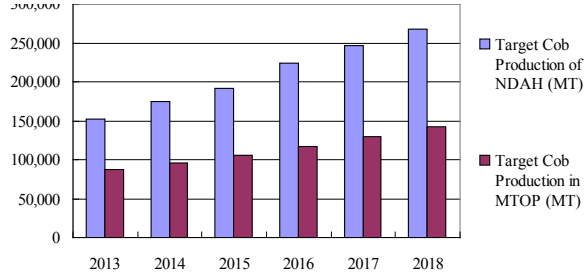


Figure 5-3-8 Maize Target Production of NDAH and MTOP

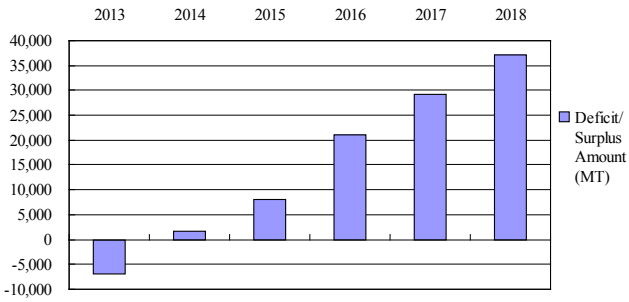


Figure 5-3-9 Difference between Target Production and Estimated Demand of Maize

It is considered that the maize production has enough potential to recover the production amount from the fall in 2011-2012 because of the actual production in 2010, which almost achieved the level of the demand. Also, if it recovers promptly until the level in 2010, the targets set by NDAH will become a realistic goal because the quantity of fertilizer input is restricted low so far. A target of SDP, "the average yield of maize will increase to 2.5 MT/ha, whose target year is 2020." also will be able to become a realistic target. However, study on the reasons of the decrease of the production from the view point of medium-range is necessary, considering poor harvest continues in two years or the climate change.

5-3-4 Prediction of the Balance between the Cassava Production and the Demand

Though NDAH has no detailed cassava production plan like a maize, until 2018, the production expansion of 45 % of the cultivated area in 2010, which is the same level as the maize

production plan of NDAH, is judged to be possible because there is no big change in the cultivated areas in the three years of 2010 - 2012, and there is enough potential area to expand, which are checked in "5-2-3 Potential Area and the Difference between Production and Demand of Cassava".

As for the yield, until 2018, the yield increase of 15 % of the yield in 2010, which is the same level as the maize production plan of NDAH, is judged to be possible because there is no big change in the yields in the three years of 2010 - 2012, and the extension of high-yield varieties is continued.

Figure 5-3-10 shows the projection of the balance between the production and the demand in the case of the achievement of the increase of the cultivated area and the yield mentioned above. The conditions of the calculation excluding the production are same as those of the calculation of the production and the estimated demand in the previous clause, "5-2-3 Potential Area and the Difference between Production and Demand of Cassava". The result of the trial in 2013 is minus 12 thousand, whose self-sufficiency ratio is 66 % of the demand. The balance will reach the self-sufficiency level after 4 - 5 years though it is not so rapid as well as the shift of maize production.

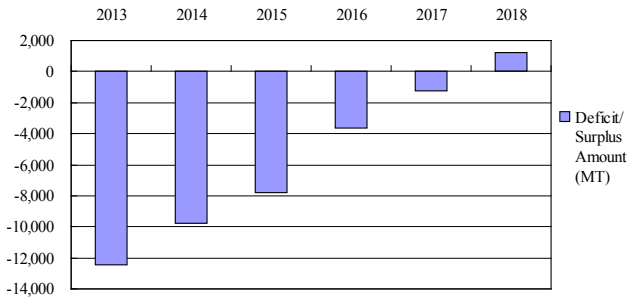


Figure 5-3-10 Difference between Production Target and Demand

5-3-5 Reduction of Post-Harvest Losses

SDP indicates that the target of the 'on-farm storage losses' of major grains has been set to reduce from 20% to 5%. The figure (20%) of the losses was premised on the 'postharvest losses' estimated by KONSSANTIL, and taken from the maximum loss at 15-20%, from collection of paddies and maize ears at farm gate to consumption. For the demand/supply balance sheet, KONSSANTIL used the average losses at 17.5%. The target of the master plan should be considered the following factors:

i) The postharvest losses should be separated by rice and maize. The losses of shelled maize are generally higher than paddy due to current packaging methods; easy contacting with air, insects and fungi.

ii) The losses should be clarified from harvesting or on-farm storing. The current yield surveys are not considered on the losses harvesting, threshing and drying before collection.

The target in SDP is emphasized on improvement of storing methods, however, the reduction of losses should be considered not only quantitative losses but also qualitative losses.

(1) Rice

The reduction of postharvest losses has not been implemented by sufficient measures by MAF. Farmers apply traditional measures using local materials as much as possible. Among the working procedures, the losses during harvesting, storing and milling are cooperatively higher. The losses at 1-5% during harvesting are occurred by drops of dead, damaged or immature grains. For storing losses at 5% or less, farmers exercise their ingenuity using high floor stores, secondhand fertilizer sacks and nipper leaves bins.

The milling losses are estimated at 5-10% for self-consumption rice and 5% or less for

commercial rice. The losses are caused by ununiformed grain shapes, over drying (broken or crashed) and wet paddy in rain season harvesting. They make the lower milling recovery at 50-55%.

For reduction of the postharvest losses, both of improvement on all procedure of working in postharvest and quality improvement in pre-harvest should be noticed. The production technologies, starting from seed regeneration and preventing from dead/immature/damaged rice by good practice of pest-control, conduct to reduction of quantitative and qualitative losses and better milling recovery.

The postharvest losses starting from harvesting are estimates at 9-22% for self-consumption rice and 9-12% for commercial rice. The on-farm storage losses starting from storage are 5-15% for self-consumption rice and 5.5-6.5% for commercial rice.

The compassable target of the postharvest losses is assumed at 10-15%. In addition, reduction of qualitative losses will be more important by means of promotion of high quality rice production. For example, the establishment of local paddy reserve center under MAF paddy purchasing system can be one of drives to improve rice quality, participating with farmers' groups and private sector.

(2) Maize

The postharvest losses are occurred mainly during storage. The locally-fixed varieties and Sele variety are comparatively protective from fungi damages, but the storage loss is estimated at 14-17% in conventional storing methods. In order to cope with reduction of the storage loss is implemented by IFAD and other institutions to extend drum cans (mini-silo), focused on reduction of damages by rats and fungi without chemical preservatives. As trials, the project achieves the storage loss at 5.2%. The techniques before storage will be also conducted to achieve lesser losses.

5-3-6 Increase of Yield of Maize

Regarding the production and the yield of maize, the actual results in 2005 - 2012 and targets of NDAH in 2013 - 2018 are shown in Figure 5-3-11. We can see the production after 2007 continued to increase. The highest yield in the past of 2.12 MT/ha was recorded in 2010; however, the production in 2011 and 2012 were decreased drastically due to bad weather and climate change.

Figure 5-3-11 Actual Result and Target of Production and Yield of Maize (2005 – 2018)

According to the annual report of SoL in 2012, the yields without fertilizer of Sele, Suwan5 and Noi Mutin, which are recommended varieties of MAF and SoL, are 2.54, 2.87, 2.15 MT/ha, respectively. Now, those seeds are cultivated by contracted farmers and distributed to ordinary farmers. As mentioned in "3-5 Present Situation of the Agriculture Production", extension activities related to cultivation technique of maize, which includes planting method, mixed cultivation with beans, etc., are conducted in RDPIV. Also, NDR researches variety selection suited to natural conditions in Timor-Leste and cultivation technique with fertilizer, including chemical. Therefore, the target of 2.43 MT/ha in 2018 and the target of 2.5 Mt/ha in 2020 are able to be expected if quality seeds produced by seed farmers are distributed and cultivation technique is extended to ordinary farmers more widely in the near future.

5-3-7 Necessity of Realizable Target on Increase of Rice Supply

Table 5-3-4 is a review of the target values within realizable range at the current step. First, it is considered the projection of increase of 75 % in 2018 is difficult to realize because the actual results in 2009, 2010 and 2012 were about 90 % of the previous years, respectively. If the existing policy is assumed not to change and to continue, the increase of 25 % of 2010 is set in 2018, and the annual increase of 4 % is estimated, which the incremental ratio was equally divided into the six years of 2013 - 2018. Distribution of agricultural inputs such as provision of seed and utilization of tractors by MAF and NGOs supporting directly affects the continuation and the expansion of the planted area. Also, ICM and SRI are spread by the strengthening of agriculture extension activities. In RDPIV, change of thinking way of the extension officers and results of the extension activities are confirmed. Farmers who really felt the improvement of cultivation technique have increase the planted area. Therefore, the annual 4 % increase of planted is assumed to be expected if securing irrigation water and provision of agricultural inputs are continued to be conducted in future as in the past.

Table 5-3-4 Review of Target Planted Area, Yield and Post Harvest Loss

	2013	2014	2015	2016	2017	2018
Target Cultivation Area / Harvested Area in 2010 (%)	104	108	113	117	121	125
Target Paddy Productivity in the Agriculture Master Plan (ton/ha)	3.38	3.40	3.43	3.45	3.48	3.50
Target Post Harvest Losses in the Agriculture Master Plan (%)	16.3	15.0	13.8	12.5	11.3	10.0

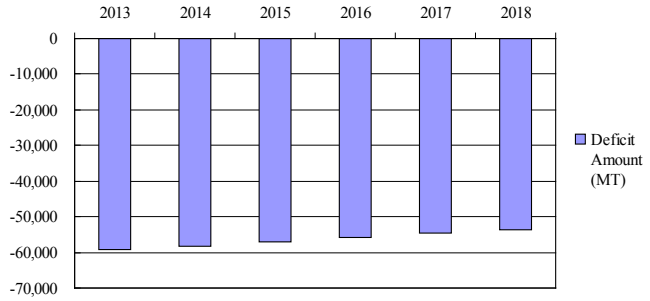


Figure 5-3-12 Review of the Difference between Rice Production and Demand

Considering the change of yield in the past, the actual result of 3.35 MT/ha in 2012 is considered to be pretty high. Hence, in the case of comprehensive material investment, concentrated into the rice bowl, about 4 MT/ha in the area is considered to be realizable. In the national average case, about 3.5 Mt/ha in 2018, whose annual increment is about 0.03 MT/ha, is considered to be appropriate.

Figure 5-3-12 shows the review of the difference between the projected production and the estimated demand. The calculation conditions are the yield and the planted area mentioned above, the post-harvest loss of annual 1.25 % decrease, whose target in 2018 is 10 %, and the milling ratio of 60 %.

The difference of the production and the demand in 2018 is minus 54 thousand MT, whose self-sufficiency ratio is 61 %. Namely, the achievement of self-sufficient of rice is not a realistic target at least until 2020 even if counter measures are added on the existing production and supporting activities. It is necessary for solving the condition that is obstructing the increase of the production to achieve the self-sufficiency. It is required to set a realizable target of the supply and demand through the review of the existing targets as well as the consideration of concrete measures for the solving.

5-3-8 Results of the Verification on the Targets of the Agriculture Master Plan

We have verified the production condition and targets of the staple foods, rice, maize, and cassava. The demand of rice is increasing but the production has failed to rise. The achievement of the existing target is not realizable because of the difficult situation for the expansion of the production. Hence, the target of the supply and demand is required to be radically reviewed as

soon as possible.

The achievement of the future production plan of maize and cassava by NDAH is realizable because the validity of the plans on the cultivated areas and the yields is confirmed respectively. If abnormal weather/ matters are not occurred, the self-sufficiency will be achieved through the continuation of the supporting policy of MTOP.

The wide range of the staple foods supply today relies on the rice import. During the independence time, the shortage of food was supplemented by inexpensive imported rice, which has increased the degree of rice-based diet gradually. The demand shift from maize (cassava) to rice will be advanced further more in the economic development, which will increase the role of rice as the first staple food.

On the other hand, under the influx of inexpensive imported rice, the demand of maize and cassava is limited low. However, the role of those crops as the staple foods in hilly and mountainous area will not be changed in the near future. Also, maize and cassava, which is comparatively easy to expand cultivated area, are important crops as a risk management of food security such as a measure to soaring in imported rice price. Therefore, it is necessary for continuing with supporting policies for the production of MTOP.

CHAPTER 6 FRAMEWORK OF AGRICULTURE MASTER PLAN

6-1 OVERALL DEVELOPMENT GOAL FOR AGRICULTURE MASTER PLAN

Systematic relationship among the four targets set for this Project as picked for the SDP is shown as the Figure 6-1-1.

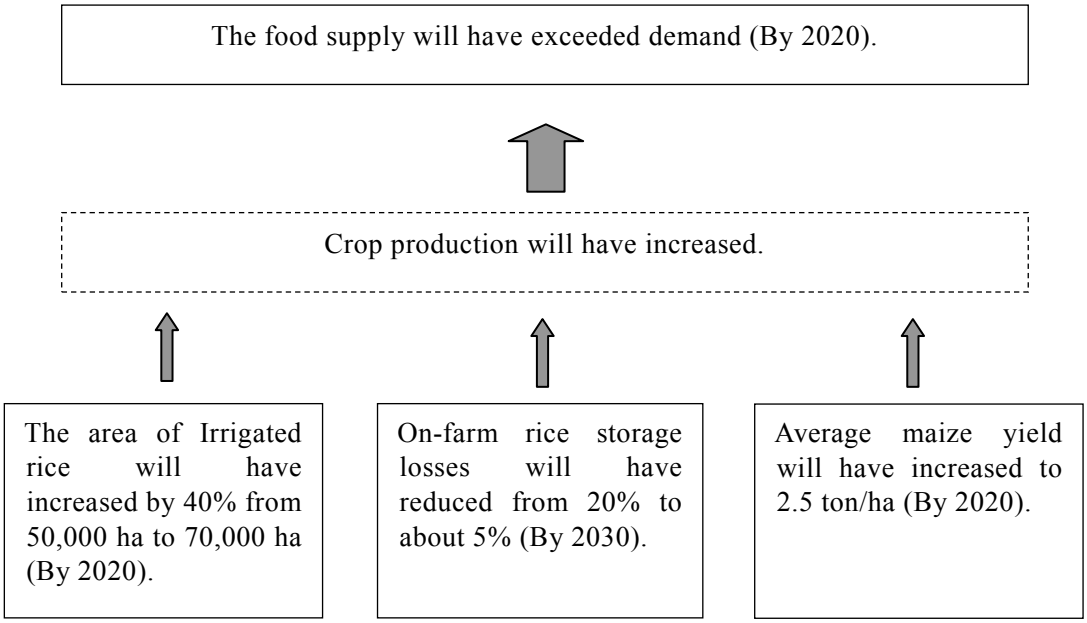


Figure 6-1-1 Systematic Flow of the Four Development Targets

Four targets of this master plan is logically composed: the overall target "the food supply will have exceeded demand" will be reached through "the food production (rice, maize and cassava) will be increased" which will be reached "the increase of irrigated rice", "the reduction of on-farm rice storage losses" and "the increase of average maize yield". (Cassava is the supplemental crop and its target is not set in the MTOP.)

On the other hand, judging the achieving progress for those targets, it is considered to be difficult to achieve the target "the food supply will have exceeded demand" as mentioned in the Chapter 5-3. Looking at the achievement progress of each food crop, related with the rice, its self-sufficiency is hard. Deficit between supply and demand is met with import rice. Related with maize, target of self-sufficiency will be able to reach under the continuation of MTOP (supported by SoL) although it is influenced by unpredictable climate change. Related to the cassava, production target will be achievable. However, looking at the current production, in the achievement process of both crops, supply deficit might be arisen. In order to meet overall national food security, it will be maintained to rely on import rice as substitute food crops for maize and cassava. Recent national trend for food crop is shifting from maize to rice since import rice is easily gotten in the market and people's taste is changing to rice. Importance of rice is increased to ensure overall food security.

For setting the target for food supply, supply of rice should be focused. Basic policy for ensuring food security in this country should be put on the rice supply. To make rice supply stable in importing rice, rice policy should be provided to increase the local rice production and reduce the import rice as possible much as possible.

Under such consideration, for setting overall goal for this master plan, increase of rice production should be the main target. The target "**Rice production is increased**" is set as the

target for the master plan, aiming to improve rice self-sufficiency for the national food security.

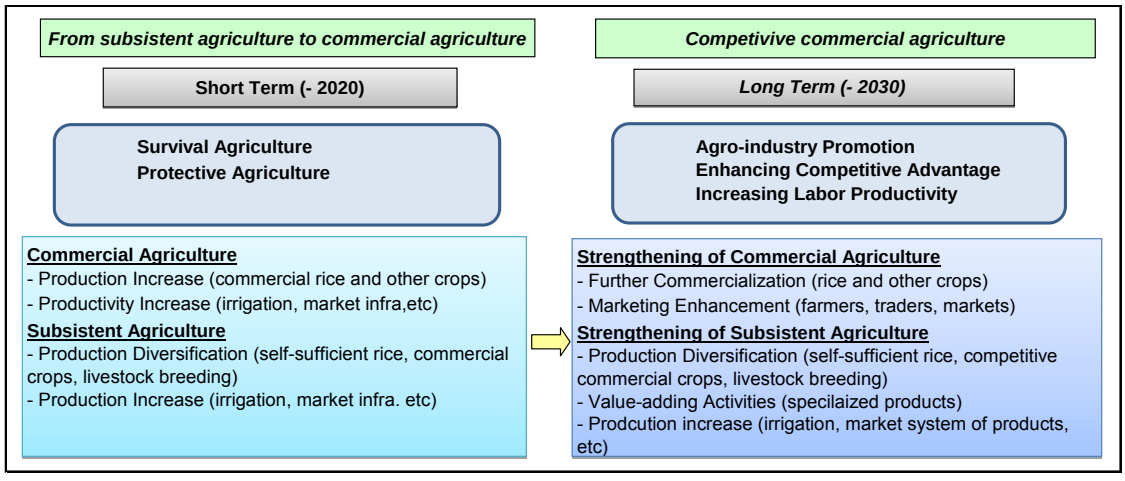
6-2 FORMULATION OF AGRICULTURE MASTER PLAN

6-2-1 Future Agricultural Development Prospect with Joining to ASEAN

Joining to ASEAN is the governmental consensus in Timor-Leste. Aiming at this, preparatory works are presently done in each ministry level. Although whether preferential steps as the Cambodia, Laos, Myanmar and Vietnam (CLMV) would be applied or not is still uncertain, joining to ASEAN will be realized sooner or later. It is expected after joining, that exchange among ASEAN countries in various sectors such as culture, human, service and capital is activated and products is traded among ASEAN countries on the competitive advantage.

In Timor-Leste, as considering future prospect for joining to ASEAN, the government addresses that agriculture will be shifted from the current conventional subsistent agriculture to market-oriented agriculture. MAF recognizes the current state is in the transition stage directed to the commercial agriculture. In this transition stage, it is required to take the policies so that these can promote to change from the current conventional farming still settled in rural area to the commercial based farming with competitive advantage. Present stage is considered to being nurtured commercial agricultural sense to farmers. In the past, government purchasing system by MTCI (present MCIE) had been conducted as the policy to create commercial sense on farmers. In line with the same direction policy, MAF is planning to change the present distribution of the input materials from gratis basis to commercial one.

It is required to take different approach in the between the transition stage including aiming to join to the AEC and the competitive stage after joining. If the timeframe of those transition and competitive stages would be considered to be overlapped with the SDP's target year, it would be considered that the transition stage might be set as the short term until the year 2020 and the competitive stage, long term, the target year 2030. The short term is implied to include the preparatory period that may be given to Timor-Leste as the CLMV.



Source: prepared by the project team

Figure 6-2-1 Future Agricultural Development Direction with Joining to ASEAN

(1) Agricultural development direction in transition stage

Improvement of food self-sufficiency rate is the national development target as indicated in the SDP. Aiming for the improvement, future prospect of population increase and staple food demand is incorporated into the master plan study. In the study, population growth is projected

at 2.9%[1] for 2010-2015. Based on this growth, the rice demand 121,000 ton in 2013, is expected to rise to 143,000 ton in 2020. On the other hand, it is predicted that worldwide crop demand is steadily increased with population growth, but, increase of food supply is limited and food shortage becomes more strained. Considering such worldwide future prospect, it should be required to provide the country's food production environment for ensuring national food security. To do so, provision of production infrastructure and improvement of crop productivity should be promoted in this transition stage.

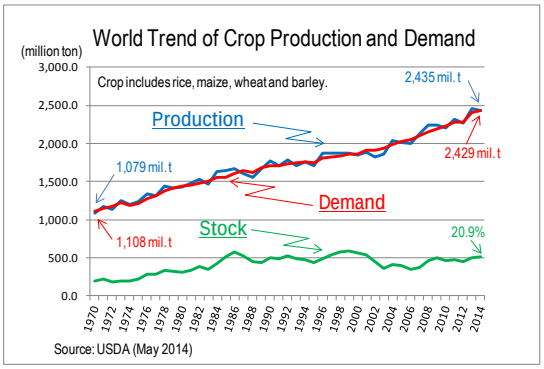


Figure 6-2-2 World Trend of Crop Production and Demand

In Timor-Leste, climate change such as large rainfall fluctuation including seasonal rainfall in wet and dray seasons and its intensity, and raising the sea-surface by annual 9 mm are forecasted[2]. This implies to appear the frequent severe flood and drought, cropping injury and change of paddy cultivation farmland suitable so far. Predicting such future change, it is important to provide irrigation system for effective irrigation water intake and introduce watershed management.

Agricultural policy to survive competitive environment after joining to ASEAN should be provided in this transition stage as soon as possible. Out of the ten countries joined to ASEAN, the countries as CLMV, is given to take the preferential step which allows in getting behind in meeting with various criteria to join to AEC. The CLMV is allowed to enable to be behind in making decision as the tariff policy. The project, named as the Initiative for ASEAN Integration (IAI) aiming to abolish the differentials developing among the ASEAN countries, is provided for developing countries. The IAI generally covers the various development fields such as technology transfer on agricultural and forestry sectors, education on English and related to the Information Technology (IT) and support in providing suitable projects and operating/ managing them. The CLMV is struggling to abolish the differentials by applying the IAI. Timor-Leste will probably be recognized as the IAI's country, and then, is required to make effective use of this transition period as taking this preferential step.

Timor-Leste is required to provide making necessary budget to struggle differentials in various fields as mentioned above. Especially, owing to survive future competitive environment after joining to ASEAN, it is required to improve the economic sector, especially agricultural sector regarded as the basic industries. Commercial based agriculture should be nurtured in this country. In future, agriculture should be promoted on the competitive advantage. To approach future commercial agriculture, it is required for rice farmers to support in increasing their household income. Expansion of both commercial rice production and subsistent rice production are required to meet this requirement. Agriculture with crop diversification should be also promoted to improve farm household income. Crop cultivation should be practiced on suitable farmlands for suitable crops.

On the other hand, the commercial agriculture should be gradually promoted depending on the

[1] World Statistics Pocketbook, United Nations Statistic Division

[2] Climate Change in the Pacific: Scientific Assessment and New Research, Volume 2: Country Reports (Pacific Climate Change Science Program, International Climate Change Adaption Initiative, Australian Government, AusAID, 2011)

individual farmland condition to survive competitive agriculture. Ensuring national food security is crucial for this country. In order to ensure food security and maintain sustainable and stable development for rural area, protective agriculture may be promoted in parallel with the commercial agriculture, which includes the policy improvement to control current unlimited inflow of import rice to the market.

(2) Agricultural development direction under the competitive environment

After joining to ASEAN, Timor-Leste is expected to make strong linkage with giant market of total 600 million of population. In the market, there are various actors and diversified demand in agribusiness fields in the developed countries. For future development of Timor-Leste, small scale market of the own country is the bottleneck. After joining-to ASEAN, however, market development and diversification of industry may be changed to be expanded. Considering the country's geographical environment, impact with free trade will be infiltrated slowly and steadily into the nation's socio economy. To survive the country's agriculture, competitive agriculture with competitive advantage should be realized.

Money economy will be infiltrated into the rural area through joining to ASEAN. Even in this situation, rural eclectic service is expanding rapidly in the rural area, so that rural people can come in touch with Indonesian consumptive life through the TV. As cash demand would be expanded, moment to accumulate capital would be brought more and more. It is certainly required to introduce profitable crops in addition to paddy, and to develop a value adding process covered with processing/ market development.

6-2-2 Significance of the Agriculture Master Plan Formulation

- Government is executing the "National Food and Nutrition Security Policy" to ensure the nation's food and nutrition security. MAF chairs the "National Council on Food Security, Sovereignty and Nutrition in Timor-Leste (KONSSANTIL)" in line with the national food security policy as the responsible agency. The policy aims to ensure the diversified food requirement covered crops, fish and meat for the nationals. Priority approach to realize this policy is put on the promotion plans such as increase of irrigated farmland and reduction of cereal import. Development target, increase of the food crop (rice) production put on this agriculture master plan contributes to the nation's food and nutrition security policy.
- Agriculture sector is the leading sector for economic growth and employ from 70 to 80% of the nation's work force in the 12 districts except Dili district. There is no major industry except agriculture in rural society in Timor-Leste. Generating employment opportunity in the agriculture sector is crucial for the country. In order to maintain subsistent farming and lead sustainable rural development, food production activity in rural area is the most concrete and realizable way. Expansion of food crop (rice) production contributes to the stability of rural society through ensuring the self-sufficient food and employment opportunity.
- This master plan is formulated aiming to supplement and strengthen the programs, projects and subprojects formulated in the MAF Strategic Plan (MAFSP), MTOP and AAP, as mentioned in the previous Chapter 5-1.

6-2-3 Analysis of Development Constraints and Preparation of Master Plan Framework

MAF is tackling to realize the increase of food[3] production along on-going MAFSP, MTOP, MTIP and AAP. Development constraints are analyzed related with those on-going plans. Analyzing process is itemized as follows.

i) Current "Problems" are picked up from the present related food crop production activities.

ii) "Current actions taken by MAF for the problems" to cope with the "Problems" are analyzed based on the actual situations arisen from on-going activities which are put on the MAFSP, MTOP and AAP.

iii) Subjects to be reinforced in the master plan are formulated as the "Plan of approach to cope with the problems", analyzing the above "Current actions taken by MAF for the problems".

iv) "Measures to be taken in the MP" are formulated based on the "Plan of approach to cope with the problems".

Related with the item i), namely, current "Problems" arises from wide range of food crop production fields. Those are extended over the comprehensive technical/ social and political fields. In this analysis, those fields are categorized into the following fields. "Problems" are picked from the those fields based on the on-going activities and findings in site survey

1. Problems caused from natural conditions
2. Problems caused from farming practice
3. Problems caused from post-harvest processing
4. Problems caused from current rice policy
5. Problems caused from MAF organization capacity
6. Problems caused from surrounding socio-economic environment

Analysis of development constraints was conducted along the above processes (see Table 6-2-1)

[3] Note: Although food crop is rice, maize and cassava, rice is referred as a food crop since this chapter.

Table 6-2-1 Analysis of Development Constraints

Relevant program in the MAF Strategic Plan/ Medium Term Operation Plan	Problems	Current actions taken by MAF for the problems	Plan of approach to cope with the problems	Measures to be taken in the MP
	1. Problems caused from natural conditions			
1.4 Water resources of agricultural production 3.3 Agricultural statistics and data bases 3.4 Climate information and analysis 3.6 Infrastructure requirement 4.2 Strengthening MAF's capacity 4.3 M&E Strategy	1.1 Paddy production area is limited on the topographic conditions. Topographic condition is formed by central mountain range. Most of farmland is located in the sloped topography. Suitable lands for paddy production are limited into the low-lying land along the north and south coastal areas.	Necessity of zoning for paddy production is described in the SDP. Based on the SDP, MAFSP and MTOP describe to make zoning for paddy production area. According to this concept, some large scale irrigation rehabilitation projects are planned and implementing in the technical & semi technical irrigation schemes area such as Oebaba, Raibere, Caraulun and Bulto to increase paddy cropping area. Detail design study is also conducted by MAF in the 10 irrigation areas. Action Plan 2014 budgeted for implementation for two (2) areas (Larisula and Tono). Irrigation inventory survey planning in the MTOP is under going by this JICA project team. Surveyed inventory data will be filed in ALGIS	1.1.1 Zoning of agricultural area Zoning is planned based on the topographic, social condition and water resources potentiality, as follows. i) Rice bowl area: Possible local commercial rice production area where are suited for paddy production. The areas are generally grouped into the irrigation scheme areas located in the low lying area. ii) Subsistent farming strengthening area: Conventional farming area where are generally located in the sloped land as traditional irrigation scheme and rainfed. Conventional farming system is strengthened through diversification of crop cultivation and livestock raising. On-going rehabilitation project areas as listed are regarded as the rice bowl area. Agriculture development is required in the both zoning areas from food security viewpoint. In the MP, development plan is formulated for both, putting stress on the rice bowl area. 1.1.2 Establishment of updating organization of irrigation system inventory data For making the zoning, irrigation inventory is useful. The zoning is preliminary made by the project team. It may be changed since agricultural conditions and irrigation situations are varied. Updating of the inventory data is required to reflect the change of condition into the zoning works. The data should be updated regularly by NDIWM. Updating work should be done in corporation with extension workers. Organization system to update it should be established. Organization capacity of NDIWM to update the data and make zoning for agricultural development is low, so that it is required to develop the capacity of the staff. Capacity development program of NDIWM should be incorporated into the MP as mentioned in the MAFSP.	Zoning of agricultural area and formulation of agricultural development plan in each zone. - Rice bowl area - Subsistent farming strengthening area Establishment of organization to update irrigation system inventory data Capacity development of NDIWM staff dealing in irrigation system inventory
	1.2 Irrigation water supply is unstable and shortage owing to unstable water source and intake. River water is the water source. In general, river flow and water level are fluctuating due to the sloped river. Intake from river is unstable. It becomes hard to intake timely on the cropping plan in case of no intake facility. It is reported in the SLMS (The Suco Level Food Security Monitoring System)	Pilot project of reservoir and groundwater development is proposed in the SDP. Besides these, regulating reservoir is proposed to construct at the suitable site along the main canal between diversion or intake site and targeted irrigation area, capacity around 10,000 to 30,000m^3. Related with groundwater development, it is proposed to conduct pilot project to construct 20 tube wells in potential area in low lying and semi- sloped area, in order to get basic data for promoting future groundwater irrigation development. Based on the proposal of SDP, MAF	1.2.1 Water resources development based on the development potentiality. To ensure double cropping, stable water source such as dam and groundwater is required. For dam construction, reconnaissance is on-going. Technical/ social steps should be taken to seek construction possibility. It is also required to cooperate with MPW who is responsible for river administration. Long term will be needed to realize it. Regulating reservoir should be studied on the individual irrigation development with water resource development. Detail survey whether or not suitable site exists is required to realize its construction. Related with groundwater development, it is studied that high potentiality may exist in coastal low-lying zone. In general, tube well development to irrigate paddy is said to be unfeasible owing to higher operation cost and its sharing, operation and necessity of strong maintenance organization. Tube well irrigation system should be limited into the supplemental irrigation for paddy and less water consumptive crops such as vegetable and horticulture crops. Construction of small scale tube well, water storage tank and pond are useful to	Water resource development plan based on the potentiality - Diversion water (intake from river) - Regulating reservoir - Tube well - Small storage tank - Small scale pond

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	under the food security policy that shortage of irrigation water and unstable intake is the main subject to increase paddy production.	is studying possibility of dam construction in the 15 river basins. In addition, it is proposed to construct water storage tank and reservoir for smallholders to ensure supplement irrigation water and living water (NDIWM is planned in the district of Bobonaro, Oecussi and Ainaro). On the other hand, MAF, NDIWM does not have a plan to construct tube wells although SDP proposed.	supply supplemental irrigation water and livestock water for smallholders in traditional irrigation scheme. These contribute to food production and supporting smallholders' livelihood in subsistent farming strengthening area. Spring water is also used In traditional irrigation schemes. Past water resource development planning focused on intake form river water. In future irrigation development planning, diversification of water source should be studied based on the water resource conditions and its potentiality. For master plan formulation, diversified water source as mentioned in the MTOP should be provided for irrigation development, considering future agricultural practice in the targeted irrigation area.	
	1.3 Soil sedimentation in the irrigation facilities prevents suitable and timely intake from river. Soil distributed in the river basin is apt to be eroded. Eroded soil flows out into river and intake site and irrigation canals. To maintain irrigation agriculture with intake from river, removal of deposited soil in and around irrigation facilities should be critical subject. Irrigation agriculture might be abandoned, unless the soil could be removed.	Maintenance works were shared conventionally so far between the administration and water use group (beneficial farmers). In the area less deposited soil, removal is doing by them. On the other hand, for heavy soil deposition area like Laclo irrigation scheme, removal work as over their technical and financial capacities is regularly needed. In the Indonesian time, almost the maintenance works including removal of deposited soil were covered by the government. Accordingly, cost sharing and maintenance sense of water use group's or beneficial farmers' is low. Furthermore, past irrigation development projects were put on large scale facility construction. MAF did not pay attention on budgeting into maintenance works. MTOP mentions to provide a plan to establish effective maintenance system for provided irrigation facilities. In the Action Plan 2014, necessary budget for maintenance works at 10 irrigation sites and heavy machine was provided.	1.3.1 Establishment of maintenance organization to remove deposited soil. According to the MAF's policy related with operation and management of irrigation system, operation and management (O&M) shall be transferred to WUA since 11 years after rehabilitated. Judging from the current O&M progress, it may be uneasy to realize it as the policy. Especially, it is hard for WUA to remove deposited soil with heavy civil machine. It is desirable to do so under technical/ financial supports from MAF. MAF recognize necessity of such O&M work. For leading an effective O&M work of irrigation scheme, it is necessary that MAF (or district agriculture office) and WUA fully understand the range of O&M works shared between them. (In the basic policy, intake and main canal should be managed by MAF and branch canals by WUA.) O&M activities should be conducted on farmers' participation to create ownership sense for beneficial farmers. Those concepts should be incorporated into M/P formulation and MTOP. It is proposed to materialize those in the proposed irrigation development projects. 1.3.2 Farmers participatory irrigation development plan There are some irrigation schemes that operation and management by beneficial farmers is being doing well. To maintain function of irrigation facilities, it is important for beneficial farmers to create ownership sense to their irrigation system through participation, and support and intervention from district office and MAF is done timely. In the irrigation development projects proposed in the M/P, related facilities should be constructed on a participatory basis. To do so, stakeholders' participation should be the basic condition from beginning stage of the project. In the project, construction of irrigation canal and access roads to irrigation areas should be planned and constructed under farmers' participation. 1.3.3 Promotion of organizing Water Users Association (WUA) and strengthening operation capacity of the WUA To maintain irrigation agriculture, water management should be worked well by collection of water fee and water distribution by traditional water management person called as "Marino" and "Kauboegate". It is indispensable to organize Water Use Group (WUG) or Water Users Association (WUA) and make it	Establishment of O/M organization - Removal of deposited soil - Technical/ financial supports from MAF - Establishment of work sharing of O/M Awareness of ownership sense through participatory irrigation facility development process (construction of irrigation canal and access roads to irrigation areas) Promotion of organizing Water Users Association (WUA) and strengthening

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			workable. Providing O/M organization structure and organizing WUA (or WUG) should be proceeded Integra rally. Learning from the irrigation projects in Maliana and Laclo, it is essential for maintaining benefit generating from irrigation agriculture to collect water fee and maintain canal and facilities. To provide such situation, providing awareness process so that beneficial farmers can become aware of necessity of water fee and O/M activities to improve their livelihood should be incorporated as strengthening WUA (or WUG)'s capacity into the development plan of MTOP and M/P. Strengthening it should be planned and realized in the M/P. Especially, for developing rice bowl area, strengthening WUA's capacity should be indispensable when irrigation facilities are constructed.	operation capacity of the WUA - Introduction of awareness process of livelihood improvement sense
	1.4 Debris flow often damages irrigation facilities, farmland and river embankment. Incorporation with countermeasures to prevent such situations to the irrigation project is one of factors to induce to estimate higher construction cost. SLMS reports that harvest loss often occurs in steep river since river flow with stone and soil often intrudes into farm land and irrigation facilities.	MAF is implementing irrigation facility rehabilitation projects at three sites which are designed by Indonesian consultant entrusted by MAF. In one of the sites, one structure on the construction was washed out by debris flow. MAF proposes in the MTOP to construct check dams and river control to protect agricultural land. Based on this, MAF is promoting river control project in Tono and Larisula. For Caraulun area where no irrigation water could intake and flow into the canal due to soil sedimentation after the weir was removed, new intake weir was re-planned/ designed and now it is constructing. Poor study/ design and supervision lead to higher irrigation project cost. River control work is planned at three sites in the Action Plan 2014.	1.4.1 River control works River control structures such as revetment, debris barrier and training levee are required to protect intake facility and make intake water stable. Although irrigation project with such structure construction lead to high cost requirement and low cost-benefit, those are necessary structures to ensure irrigation system. Irrigation development project planning in the M/p, river structure works as mentioned above should be planned. 1.4.2 Capacity development of NDIWM staff In irrigation rehabilitation project, it is required to conduct careful planning/ designing and implementation/ supervision based on the runoff characteristic of the river. Judging from progressing of the rehabilitation project in the three rivers, it is not considered that necessary measures in designing and implementation/ supervision working process are taken suitably for the river characteristic. To lead appropriate irrigation development plan and facility design in Timor-Leste, first requirement is to standardize the studying, planning and designing processes under the various Timorese natural/ physical conditions such as river runoff characteristic and fluctuation of river water. In this project, technical guideline for planning and designing is prepared as the first approach. Subsequently to this, NDIWM is required to revise it aiming to provide standardization of these processes. Standardizing working process from planning, designing to supervising in irrigation development is proposed to incorporate into M/P. But, NDIWM's engineering capacity is limited. It is planned to support NDIWM staff so that they can tackle with this work.	Introduction of river control works - Revetment - Debris barrier - Embankment - Training levee Capacity development of NDIWM staff in engineering fields covered with studying, planning, and designing and supervising processes. - Standardization of irrigation development process from study to implementation supervision - Capacity development of NDIWN to cope with standardization
	2. Problems caused from farming practice			
1.1 Agricultural research 1.2 Decentralized extension services 1.3 Improved pest control 1.5 Mechanization 1.6 Accelerated production of selected enterprises based on specialization	2.1 Improvement of productivity is limited since there is a limit of obtainable input materials in quality and quantity. (1) Hard to obtain quality seed. Since quality of seed	Variety which government distributes free of charge is Nakroma、IR64, Ciherang for paddy, Sele, Nai, Noi Mutin and Bisma for maize (2012/2013). For root crops, 100,000 cutting of sweet potato of variety, Hohrae 1, 2 and 3 were distributed to farmers and seed producers.	2.1.1 Obtaining and renewal of seed Almost all the farmers prioritize to sow the seed distributed from government. Share of farmers who can get it, however, is small. According to the SoL, percentage of those farmers to whole sampling farmers is 11% in paddy; Nakroma and 13 % in maize. If increase of the yield would be observed in the fields where the distributed seeds planted and ICM and/or SRI farming applied, these seeds would be disseminated widely with those cultivation methods. MAF with the SoL has a plan so that MAF entrusts seed producing farmers to	Improvement of input materials (seeds) - Continuation of SoL program - Strengthening on producing, renewal and obtaining of seeds - Technical training on self

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and agro-zoning 2.2 Promotion of quality inputs 3.3 Agricultural statistics and data bases 4.2 Strengthening MAF's capacity	obtained from self seed collection is gradually deteriorated, it is hard to improve the yield. According to the SoL and SLMS, almost all the farmers use self collection seed in paddy planting. Current self seed collection method of which it is collected after harvested all planted is not appropriate. Mating with other varieties and weeds are easily grown. Self collected seed is gradually deteriorated collected. Seed is normally stored simple basket and cloth made sack. It is subject be damaged by rat and high humidity. Drum project to store seed of maize is being progressing by IFAD.	Seed of paddy and maize is obtained from abroad, and after cultivation test for 2-3 years, it is distributed to farmers. There is a case different seeds are distributed by years. Variety, Ciherang, imported from Indonesia, was distributed in 2013. Cultivation method on the variety is not disseminated, so that it is not expected to get yield planned on the varieties. There is no research on crop breeding for paddy. However, Improvement of maize variety is planned by NDR in the test plot at the Loes where cultivation comparison between the imported variety; Sele and Noi Mutin and the local variety is tested.	produce seeds and distributes them to farmers. MAF plans seed distribution should be gradually shifted on a commercial basis. At this time, however, concrete way to do so is not planned yet. During the period of MTOP, on-going sees distribution method will be continued. As for renewal of seed, it is necessary to improve the frequency of its renewal and self seed collection method how to make intervals to the other variety in planting, select suitable one and conserve it by using local resources. It should be proposed to incorporate the renewal of seed and self seed collection method as mentioned above to MTOP and MP, and materialize in proposed project. 2.1.2 Crop breeding for improved variety Although it is needed to find suitable seeds for natural condition of Timor to increase crop yield, MAF does not research on breeding of variety and introduces them from neighboring countries. So, it is important for MAF to breed improved variety suitable for the agricultural ecological conditions based on making zoning of cropping area. There are many local varieties in Timor. Local people prefer to the taste of local ones. It is important to breed improved ones so as to meet the demand of people's taste and resist the diseases and harmful insects, and expect to be high yield. To increase yield, it is firstly required to promote cropping technology of ICM, SRI and IRCS by the existing seed. Breeding improved variety as mentioned above is the important subject in the long term. It should be incorporated into MAFSP and MTOP. To provide this situation, support to NDR in researching on breeding is required.	seed collection method - Support in researching crop breeding of improved variety
	(2) There is a lack of labor force in the busy farming season. The labor shortage for rice farming takes place in the plowing, transplanting and harvesting seasons. In those seasons, it becomes hard to get labor. Consequently, at present, agricultural labor cost tends to rise. The system of lending tractors and fuel distribution has been established. But, it cannot meet quantitatively with whole farming.	MAF has distributed the tractors and distributes fuel to district offices. The district offices are supposed to distribute these on the request from farmers groups, but, cannot accept whole request. NDAH has a plan to establish the mechanization centers of 10 sites in the MTOP, out of them, has established at 8 sites so far. No concrete plan is scheduled in the Action Plan 2014. In this plan, training programs to learn operation and maintenance method of the agricultural machines like hand tractor.	In Timor-Leste, size of farm plots is small in sloped lands in which large type tractor is not workable. Unusable distributed large tractors are left in the rural area. Under such condition, private workshops to repair and maintain the tractors and other farm machines have not been provided in rural areas. On the other hand, system of lending tractors operated by government prevents farmers from creating their ownership sense to the machines. Paddy production is expected to become active more and more in rice bowl area. As the paddy cropping expanded, using tractors would be increased. It is expected that highly incentive farmers for cropping paddy grow to provide machine on their own initiative. Considering these, the followings are proposed in the M/P formulation. (1) Support in increasing use of small type tractor It is necessary to promote to use a small type tractor (hand tractor) which is suitable for agricultural production activities in Timor and farmers can maintain on their own initiative. To approach to providing this situation, it is proposed to introduce loan supporting system such as subsidy for interest and credit loan for farmers/ farmers groups and cooperatives who intend to purchase agricultural machine like tractor. (2) Raising private tractor mechanics and mechanical workshops It is supported financially and technically to open private repair shop of	Improvement of input materials (labor force) - Introduction of credit system for highly motivated farmers for mechanization (subsidy to compensate interest and guarantee on credit) - Holding a mechanical workshop for private mechanic in rural area

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			tractor. Business model to operate and maintain agricultural machine workshop is provided in rural area.	
	(3) It is hard for framers to obtain enough input materials such as pesticides and fertilizers Input materials distributed from government and NGOs are limited. Chemical fertilizers and pesticides are expensive for framers.	MAF distributes pesticides and fertilizers free of charge to farmers as subsidy policy. Because of budget limitation, distributing amount and target farmers are limited. MAF intends to entrust distributing work of input materials to private economic activity as an agri-business promotion. NDAH researches organic and microbiological materials. (not reaches to the practical level in the fields.) NDR plans to test the application of organic fertilizers, Raboek and Bio-M Rhizobium imported from Indonesia to the paddy and maize cultivation.	2.1.4 Promotion of local resource circulative agriculture To maintain agricultural production activity under the obtaining limitation of chemical fertilizers and pesticides, it is effective to use local resources available in the rural area. It includes development of organic and microbial improving materials and making manure by using excreta of livestock. Using such cheap local resource without use of higher cost chemical fertilizers and pesticides bring environmental conservation in rural area and reduction of production cost. For maintaining local resource circulate agriculture, soil improvement is important to maintain crop production. Feed crops and green manure crops are proposed to do this condition. In Maliana, one of NGO has manufactured the materials as mentioned above manufactured and disseminated them to farmers under the cooperation with MAF. Such activities should be supported. It is supported to develop the local resource based materials, guide its skill and disseminate it to the related areas. It is planned in the MP to support NDAH in finding local available resource to manufacture compost and promoting its technique and application method.	Promotion of local resource circulative agriculture - Environmental conservation - Introduction of feed crop and green manure crops - Soil improvement by using organic and microbial improving materials
	(4) Farmers have not enough purchasing power to get necessary input materials. Input materials distributed from government and NGOs are limited. To sustain crop production, highly incentive farmers for increasing production replenish self made input materials from available local resources.	MAF distributes seeds and fertilizers free of charge to farmers as subsidy policy. Because of budget limitation, distributing amount and target farmers are limited. MAF intends to entrust distributing work of input materials to private economic activity as an agri-business promotion. On agricultural credit, cooperative is functioned. Related to agricultural finance system, business of the Timor-Leste Micro-finance Institute had been transferred to the National Commercial Bank. Credit business of them has not enough frameworks to cover for highly crop cultivation motivated farmers and small scale entrepreneur in rural area.	2.1.4 Support in improving financial access In general, it is hard for most farmers to obtain necessary input materials on their own money in advance before planting, since they get income by selling their harvested products. It is also difficult to borrow money from commercial banks since they cannot provide the security under the condition which land tenure system is not provided yet. In addition, MAF's input material distribution grant prevents private company from participating in commercial activities. It is expected to activate rice production activities in the proposed rice bowl area. Along with this, it will be increased to obtain input materials such as fertilizers and pesticides on farmers own initiative commercial activities. To make this situation, the followings are proposed in the M/P. (1) Establishment of financial system in obtaining input materials Financial system is established so that farmers can borrow necessary funds to obtain input materials. Idea of interest subsidy is incorporated into this system. MAF provides credit guarantee for farmers who can not provide security. (2) Promotion of obtaining input materials from market. It is supported in making a purchase of packaged input materials from market and a matching opportunity with private traders and farmers groups to activate agri-business in rural area.	Improvement of obtaining method of input materials (pesticide and fertilizer) - Introduction of credit system for highly motivated farmers for purchasing input materials related with crop production (interest subsidy and credit guarantee) - Support in dealing connection between framers and traders (purchase of packaged input materials and provision of matching opportunity)
	2.2 Yield is not increased since cropping method is not fully disseminated to on-farm. <u>Paddy</u> MAF is promoting the GAP	<u>Paddy</u> Main measure to improve the yield is taken so that farmers can realize an increase effect by means of applying quality fertilizers and seeds and	2.2.1 Dissemination of cropping technology. Extension staff is trained as planned in the Action Plan so that they improve their capacity, update the cropping manual by their target area and disseminate the cropping method suited to their area. By continued current activities, data on ICM, SRI and Hybrid, such as cropping	Dissemination of cropping technology - Farming method of ICM and SRI - Dissemination of IRCS

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	classified into ICM, SRI and Hybrid in the country. Roughly ICM is in the eastern region, SRI in the western region, Hybrid in limited area. Although the yield is grown in the fields with ICM and SRI, it is still low compared with neighboring countries. （ Timor-Leste: 2.8t/ha, Indonecia: 5.1t/ha, Malaysia: 4.0t/ha (FAOSTAT)） <u>Damage caused by diseases and harmful insects and wild animals</u> Although damage by pest is observed, no any pesticides are applied. In addition, crop damage to paddy caused by wild animal like rat is reported (SLMS). <u>Maize</u> No Input such as fertilizer and organic is done. Yield is around 1.9 ton/ha (2010-2012). Compared with that of neighboring countries, it is low, 1.3 t/ha in Timor-Leste, 4.9 t/ha in Indonesia and 5.5 t/ha in Malaysia (FAOSTAT)).	obtain them surely. Technical manual of ICM and SRI has been prepared. Training for extension worker and practice in the fields are conducted. But, actual data related with the field size applied and the yields are not accumulated. In these farming methods, skills on collection, threshing and drying are not covered. Guidance is not done by extension workers. Promotion area of GAP (ICM, SRI and Hybrid) farming is set 93 % in 2018, while 1.4 % in 2008. Yield target is set 3.9 ton/ha in 2018. <u>Maize</u> SoL leads to expand cultivation area and disseminate cropping skills. Yield target in 2018 is set 2.43 ton/ ha.	area, yield and input materials is collected and accumulated so that it can be analyzed and applied for future dissemination activities. Related with Hybrid rice, there are development constraints, judging from the past activities and outputs. IRCS (Improved Rice Cropping System) should be incorporated into the M/P, besides the ICM, SRI and Hybrid. IRSC is the cropping system of which main component consists of picking up seeds, field leveling, grid planting and weeding, restricting the input of fertilizers and pesticides. It is incorporated to apply the “rarooning”, simple weed machine and manual threshing machine. This cropping is applicable for the rice fields where irrigation water limited, fertilizers and pesticides restricted. To reduce losses occurred from collection, threshing (not only direct loss at threshing, but also on-farm loss due to lack of threshing machine) and drying, it is required to train in finding suitable harvesting time, prompting threshing machine, disseminate suitable drying method. 2.2.2 Research and establishment for pest control method It is important to research, establish and disseminate the pest control method in which organic and microbiological pesticides are made from local available resources. Training opportunity to learn how to make organic and microbiological pesticides, predict outbreak of pest, prevent it and disseminate those is planned in the M/P. It may be planned to train in the qualified organizations and/ or agencies. 2.2.3 Dissemination of crop management method for maize No fertilizers and compost are widely applied in maize cultivation. Mixed cropping with bean crop is observed in the limited lands. It is required to guide and promote to apply organic and microbial improving materials and introduce mix cropping with bean crops to promote maize production. Terrace farming is an effective method in slash and burn land and sloped land. Actions aiming at the above are planned in the M/P.	for low input paddy fields - Dissemination of skills on reduction of losses in collection, threshing and drying processes. Establishment of pest control method - Technical support to research and establish pest control method - Technical support for prediction of outbreak of pest and prevention method Dissemination of crop management method for maize
	2.3 Owing to lack of manure management skill, mutual relation between input and output yield is not found. Appropriate manure management skill to increase yield cannot be disseminated to farmers.	Necessity of manure management concept is not understood. Input data of distributed chemical fertilizer and output production data after its application are not collected and analyzed to reflect establishment of manure management technique.	2.3.1 Establishment and dissemination of manure management technique Application effect of fertilizers distributed should be analyzed by collecting related data. Importance of manure management should be disseminated. On the other hand, considering present situation that application of such chemical fertilizers is very limited. It is required to establish the skill to manufacture compost from local available resource and disseminate it widely. Taking account of future commercial based marketing, establishment of manure management technique is required. Establishment of manure management technique including chemical fertilizer and compost, and its dissemination should be incorporated in Action Plan in NDAH.	Establishment and dissemination of manure management technique - Establishment of manure management technique including chemical fertilizer and compost
	2.4 Dissemination system is not provided properly. ICM and SRI is promoted	NDAH executes regular training program to extension worker based on the Action Plan. In the Action Plan	2.4.1 Capacity development of extension workers and provision of dissemination system Capacity development for extension workers and farmers group is planned by	Capacity development of extension workers and provision of dissemination

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	through training to extension workers, but, not disseminated widely on farm level.	2014, training on ICM, SRI and Hybrid rice is planned for 20 extension workers. Participation in the field training conducted by RDPIV and SoL is effective. Materials for dissemination are provided through the projects by USAID and GIZ, etc.	target crops in connection with the donor's projects in the NDAH Action Plan. According to the baseline survey by SoL, cognition rate of extension works is 43% in farm household and 74 % of them is satisfied with their extension works. Judging from this survey, extension works have certain effect on farm level. It is necessary to take long term to train extension workers in which on farm training and systematic training programs are incorporated. MAF should continue the present training activities. Materials to disseminate proper cropping technique are not provided sufficiently in quality and quantity. Updating of present technical manual for extension works, provision of extension materials and capacity development of them are incorporated in MP.	system -Updating of present technical manual for extension works -Provision of extension materials -Capacity development of extension workers and provision of extension system
	2.5 Traditional farming with diversified crops planting and livestock breeding is practiced. Irrigation paddy cropping in dry season is not spread as planned, with other constraints. Animal such as buffalo, pig, sheep and chicken is the income source for farm household. Free breeding causes the crop eating damage on the dry paddy.	MAF is promoting to provide irrigation projects to increase rice production. But, irrigation area is not expanded as planned in the projects, since various constraints such as insufficient irrigation water, crop damage by animal, shortage of labor force and cheap import rice on the market are linked with each other. MAF has no plan of fence and house to prevent animals from intruding into cropping fields. Disease prevention measures for animal are not taken. In recent year, demand of vegetables is increasing. Vegetable cropping is active around the city.	2.5.1 Strengthening of integrated farming with livestock breeding Considering the current agricultural environment, it is important to encourage farmers to diversify crops to strengthen farm management practice. Strengthening of integrated farming with traditional livestock breeding is required. SoL has prepared a cropping calendar of various crops for 8 districts and 32 suco. In the future, cropping based on this should be disseminated. For unconditional paddy cropping areas, it is effective to cultivate the animal feed crops and green manure crops, improve the soil fertility by using livestock animals' excrement. It is required to generate income source by vegetable cropping. Farming practice plan is planned based on the natural condition of the area. MP supports in providing an infrastructure like irrigation facility and training to realize its farming.	Strengthening of integrated farming with livestock breeding -Strengthening integrated farming with vegetables/ cash crops and livestock breeding -Provision of small scale irrigation facilities for strengthening integrated farming
	3. Problems caused from post-harvest processing			
1.6 Accelerated production of selected enterprises based on specialization and agro processing 2.1 Safety standards and quality control 2.3 Promotion of diversification and value addition 2.6 Promotion of private sector engagement 4.2 Strengthening MAF's capacity	3.1 Marketing system of local rice is not formed. Farm gate price of local rice is hovered at competitive price with import rice. Lower price causes negative incentive to rice production. Local rice market is distorted because of unsustainable intervention to rice market in which government paddy purchasing system had been collapsed and inflow of import rice is put on the market. There is no commercial rice	MAF does not involve in trade price policy. In Timor-Leste, Marketing system of local rice based on the standardization of quality and weight is not established. Consumers purchase rice judged by appearance. Local rice is traded conventionally at the farm gate of individual farmers. Owing to the price competition with import rice, farm gate price of local rice is not set to deal with production cost. Government paddy purchasing system in 2014 plans to purchase about 500 ton, 1% of production, not to cause serious impact on rice	3.1.1 Nurturing commercial rice farmers group Under the condition that MCIE's operating paddy purchasing system is not functioned widely, it is important for rice farmers to aware of commercially oriented market sense, in order to generate local rice market to cope with import rice. It is required for them to find and produce marketable variety rice and sell it under the market oriented sense. Judging from consumers' taste, variety, Membramo and Nakroma, is favored ones. Selecting marketable variety should be decided by farmers groups on the social and physical conditions. MP provides learning opportunity how to commercialize their produced rice for commercial rice farmers group. 3.1.2 Value-chain analysis by rice farmers and traders Value chain analysis is required to learn about present rice market. Learning opportunity on this should be provided so that farmers group and related traders can learn a value chain process on selection of marketable rice variety, demanded quality, production cost, farm gate price, selling and market price, find problems in the process, and seek proper solutions. They can analyze their competition power and market needs with import rice and, develop their	Nurturing commercial rice farmers group Value-chain analysis by rice farmers and traders (finding problems in the analyzing process from market needs to production, collection, processing and selling,

Relevant program in the MAF Strategic Plan/ Medium Term Operation Plan	Problems	Current actions taken by MAF for the problems	Plan of approach to cope with the problems	Measures to be taken in the MP
	processed product, so that no rice market linked with processing industry is developed.	market. NDA is promoting to find local special products through SIPI and a campaign "local products and local consumption". NDA has presently no plan to promote to find any rice products processed.	analyzing and marketing capacities in the learning process. Project incorporated the value chain concept is proposed to provide appropriate learning opportunity for farmers and rerated traders, as well as the 3.1.1 in the MP. 3.1.3 Establishment of marketing system of local commercial rice There is a demand of local rice such as smell rice, red and black rice, although small amount of them. For developing market channel, it is planned to restrict intervention of middle traders. Remote areas from Dili have competitive advantage in price with import rice on transportation cost. Market system for the commercial rice production area is established based on the value-chain analysis. Rice production is increased steadily through ensuring market channel. MP provides input resource for learning and training opportunities aiming to realize the above situation. Necessity of financial support for middleman, traders and groups might be arisen in the value chain analysis process. 3.1.4 Promotion for making rice processed products Expanding consumption of local rice stimulates rice farmers to increase rice production. It is important to promote rice processing industry in the rice production area, aside from developing rice market to the outside area. As the SIPI, finding processed rice products and selling them give rice farmers much incentive to rice production. Considering such situation, it is important to nurture rice processing groups and support them in processing rice. Supports in organizing rice processing groups, finding rice products and developing market channel are incorporated in the MP.	seeking solutions for the problems) Price analysis of marketing rice Developing local commercial rice market channel -Financial support for traders and marketing groups Promotion for making rice processed products
	3.2 Much impurities are contained in the milling process. It causes quality and quantity loss of milled rice, which is the competitive disadvantage with import rice Post-harvest loss is estimated from 15 to 20%. For rice, it causes from deterioration before harvesting and milling stage. That of maize occurs in storage stage. MCIE's paddy purchasing prevents rural private milling business from updating their machine and enlarging business.	MAF promotes to use small size of silo and waterproof sheet to reserve agricultural products. For maize reservation, using drum and tin plate is promoting with the assistance of IFAD and USAID. At present, simple elevated warehouse and cage made from coconut leaf and cloth bag are used to reserve grains of paddy and maize. Loss in the milling stage is low around 50% and quality is also worse, compared with import rice. Milling stage is largely dependent on private millers' technique. Assessment system of rice quality is not provided.	3.2.1 Improvement of commercial rice farming Low quality compared with import rice bring from: i) broken rice in the milling stage caused by over drying ii) mixed unequal size of rice caused by un-nutritional growing stage and hybridization, iii) mixed un ripened rice caused by disease and harmful insects, iv) mixed with sand in the preliminary selection process in the milling stage. Technical guidance to improve quality as mentioned above is incorporated into the MP. 3.2.2 Improvement of milling stage Local rice such as white rice, black rice and red rice is sold based on the extent of milling on the market. Sale of them is done by observing the appearance. Although there is a market that broken rice is favorable, homogeneous rice without impurities is generally required on the market in competition with import rice. Improvement of milling stage is important to produce competitive rice. MP proposes to support in improving milling process of commercial rice farmers groups and private millers. 3.2.3 Introduction of rice grading system and issue of quality certificate In order to expand local commercial rice market against import rice labeled its quality, it is required to introduce dealing method on a quality basis. To do so, it should be considered to examine the water content, standardize to grade rice, introduce grading system, issue quality certificate and introduce the weights and measures.	Improvement of commercial rice farming -Local rice quality improvement (control of broken rice, prevention of over drying, mixed with inhomogeneous rice and sand before milling) Improvement of milling stage Standardization of rice grade, introduction of grading system, issue of quality certification, dealing on a water content basis and weights and measures

Relevant program in the MAF Strategic Plan/ Medium Term Operation Plan	Problems	Current actions taken by MAF for the problems	Plan of approach to cope with the problems	Measures to be taken in the MP
			Necessity of the grading system and certification may be discussed in the value chain analysis process as mentioned in the 3.1.2. In the MP, input plan to realize the above situation is planned. This plan is not included in the MTOP. It is required to provide necessary supports to MAF.	
	3.3 Local commercial rice farmers who will be able to maintain stable supply in quality and quantity to seller are not organized. A few of local rice is in the market. Most of all produced rice is traded conventionally at individual farm gate. For expanding local rice market, it is required to strengthen from production to marketing processes and organize rice farmers so that they can supply quality and quantity supply to the market.	Aiming to realize MTOP's target "shift from subsistence farming to market oriented farming", NDA is executing 'SIPI' of which target is to commercialize local agricultural products. Related with rice, NDA has an idea that produced specialized rice is put on the market as branded rice. As an approach to this, NDA plans in the Action Plan to support in organizing the market oriented rice farmers' organization in Maliana. National directorate of cooperative, MCIE, tackles to organize cooperative in various industry including agriculture, fishery and livestock. Total 147 cooperatives have been established so far. There is no cooperative handling local rice.	3.3.1 Organizing local commercial rice farmers group MCIE's Cooperative Directorate deals with the i) training to organize groups, ii) management support for the established cooperative such as providing rule for the cooperative, making mutual consensus and accounting, etc. It is not covered to provide technical/ financial supports such as financial support to obtain necessary equipment and machine for production, processing and marketing activities, and technical guidance for them. Advantage of the cooperative organized and registered as an official organization in the Ministry of Justice is to be recognized as a social entity that can smoothly negotiate with an outside organization. Direct effect is to make the labeling and branding of their produced rice easy to promote its sales. Furthermore, the registered cooperative can afford to communicate with MAF and MCIE, and deliver the voice of them and actual problems to the government aiming to bring the policy. Action directed to organize the rice farmers group is taken by NDA in the project. In the MP, supporting actions are planned based on the NDA's capacity. 3.3.2 MAF's supporting activities for organizing rice farmers group Activities aiming for organization are taken in the rice bowl area. NDA is the supporting agency to support such activities administratively in cooperation with MCIE's cooperative department. In the actual activities, it is suggested to make use of NGOs who are acting in grass root level. In the proposed project, supporting organization with NGOs is established.	Organizing local commercial rice farmers group -Nurturing local commercial rice farmers groups for cooperative (packing, labeling and branding of produced rice, improving communication capacity with outside organizations) Support in managing (providing rule, making consensus)
	4. Problems caused from current rice policy			
3.1 Policy framework and capacity for policy analysis 3.2 Program coordination 4.1 Support for MAF's organization and transformation 4.2 Strengthening MAF's capacity 4.3 M&E Strategy 4.4 Support to develop complementary strategies	4.1 Cheap import rice on the market prevents rice farmers from expanding commercial oriented rice production. Rice is imported to meet with national food demand. It always is put on the market. Such situation gives rice farmers negative impact on rice production. They don't move into surplus rice production more than home consumption production.	MAF chairs the operation of the "National Council on Food Security, Sovereignty and Nutrition in Timor-Leste (KONSSATIL) under the "National Food and Nutrition Security Policy". Government imports rice to meet demand, aiming to increase local food production. MCIE is the responsible for importing and marketing rice.	4.1.1 Introduction of border control policy It is required for rice farmers to have much incentive to increase rice production. To do so, intervention to the current rice importation policy from the viewpoint of their incentive is necessary. It is needed to provide rice policy to manage and control import rice. It includes border control policy such as erecting tariff barrier, import ban and import quota. It is proposed to provide such policies. But, to realize these, it is required to analyze social and economic impact on nation. Although the project will make recommendation on this policy, the policy should be made by policy makers.	Introduction of border control policy - Tariff - Import quota
	4.2 Since government products purchasing system had collapsed, there is no incentive to produce surplus rice for rice farmers.	MCIE resume that purchasing system in 2013. One to two cooperatives or traders qualified based on operational and financial base by its district are planned to purchase the products. As	4.2.1 Improvement of government purchasing system Present purchasing system should be improved to deal with the operational problems. Related with the idea for rice sales which would be managed by the cooperative through MCIE, future prospect of it is unclear. One of problems on the MCIE's purchasing system is that purchased rice is not	Improvement of government purchasing system - training of human resources, sustainable

Relevant program in the MAF Strategic Plan/ Medium Term Operation Plan	Problems	Current actions taken by MAF for the problems	Plan of approach to cope with the problems	Measures to be taken in the MP
	MTCI (present MCIE) introduced the products purchasing system in 2009. The system was suspended since 2012 because of operational problems (delay of payment to traders due to the delay of budgeting). Purchasing at fixed price brought a certain incentive for farmers.	for paddy, MCIE plans to manage purchase and sales at fixed price. Although this system is resumed from a few amount purchase from learning from the past failure experience, it is not infiltrated widely into rice farmers. On the other hand, MCIE have an idea to register the cooperatives dealing with marketing and entrust them to sell the purchased rice.	asked the quality of paddy, which brings negative effect on the motivated farmers who intend to produce favorable high quality rice for consumers. Government intervention to the rice market prevent from growing soundly. By contraries, for the farmers who have no market channel of their produced paddy, it is effective to maintain and increase local rice production. It is required to improve the operational problems found in the cause of the past operation process. Operation and management system including budgeting should be well designed. Easy intervention by purchasing without such improvement would distorts rice market involved rice farmers. MA participation in the purchasing system is an alternative development plan. Based on the past experience and lessons learned from MCIE purchasing system, MAF participates in purchasing system. In this system, standard of rice quality is introduced. Rice variety recommended by MAF is recommended for purchasing system and standard of paddy quality is provided to stimulate rice farmers for expanding rice production.	budgeting and system design, improvement of operation and management method - MAF participation in paddy purchasing systemF
	5. Problems caused from MAF organization capacity			
4.1 Support for MAF's reorganization and transformation 4.2 Strengthening MAF's capacity 4.3 M&E Strategy	5.1 Human resources development is needed for promoting agriculture development. Shortage of human resource prevent from developing an agriculture field and operating related projects and generating development effect.	MAF reported in the MTOP that there was a shortage of human resources in the past agriculture development projects and it is needed to nurture talent for development. MAF plans the human resource development in the MTOP. It is practically effective to participate into training activities of the related donor's projects for improvement of human capacity development. NGOs are the active actors in the actual project sites of the donor's projects.	5.1.1 Capacity development of MAF staff. To nurture human resources, systematic training program including field trainings is required. Training programs already incorporated into the MTOP should be executed. In the MP, capacity development of MAF staff is planned by each development field of the proposed programs/ projects. 5.1.2 Making use of NGOs in the project implementation. Under the insufficient MAF's capacity, facilitators who act as an interface among MAF, district agricultural office and extension workers should be allocated in the development fields of irrigation, farming and processing/ marketing. NGOs are acting in grass root level, aiming to improve the farming practice and livelihood of local people. NGOs have established close relationship with them in the working process. Considering such situation, it is proposed to make use of NGOs as facilitator for project implementation.	Capacity development of MAF's staff Making use of NGOs for project implementation
	5.2 Implementation organization which will be able to take integrated approach from production to processing and marketing is not established. Development activities and implementation process of the past projects were largely dependent on donor's projects. Those were conducted as a spot in the vertical administration division.	Past development projects were led by related donor's commitment. For provision of infrastructure, it is brought from the infrastructure fund established as a top priority. Irrigation facility rehabilitation projects are under going by MAF under this system. In the MTOP, NDPP is supposed to monitor and evaluate the working progress of the MAFSP and MTOP.	5.2.1 Integrated project implementation Past irrigation related projects tended toward the design and construct irrigation structure such as weir and canal. As the result, related subjects with farming are remained. In the proposed projects in the MP, it is required to take integrated approach. Development activities such as dissemination of cropping system and marketing of commercial rice in the irrigation sites should be linked and monitored after the construction of irrigation structures. Proposed projects should be developed as an integrated approach. Those are implemented in cooperation with MAF's related directorates. 5.2.2 Establishment of M&E system M&E system so that inputs and outcomes can be monitored and evaluated to reflect those into the project implementation would be established in the proposed projects of the MP. According to the MTOP, M&E system is established under the leadership of NDPP. Capacity development of NDPP to do so is supported in the MP.	Provision of project implementation organization in the MAF to take integrated implementation approach - Support in strengthening MAF's capacity Establishment of M&E system of the projects

Relevant program in the MAF Strategic Plan/ Medium Term Operation Plan	Problems	Current actions taken by MAF for the problems	Plan of approach to cope with the problems	Measures to be taken in the MP
	6. Problems caused from surrounding socio-economic environment			
	6.1 Paddy cultivation farmlands are decreasing. (1) Increase of abandoned farm land due to leaving paddy cultivation. The number of cereal production farmers in each district is decreasing, according to the statistic data (2004-2010), except for Oecusse. In recent year, public construction works for infrastructure in rural area are increasing. Consequently, cash income opportunity for farmers is increased. In addition, minimum wage is set at $5/day. Those cash income works are more attractive than the agricultural income. Furthermore, pension system for nation and veteran has established. As cash income opportunity is increased, farmers abandoned agriculture is increasing in rural area.	Immigration from rural area to city/ town and cash income opportunity is increasing in rural area. Consequently, lack of agricultural labor force is becoming serious. Although MAF recognizes that abandoned farm is increasing and consequently, uncultivated area is growing, but, it is hard to provide appropriate measures to cope with those situations. MAF recognizes that land tenure system and agricultural finance system is closely related with shifting to commercially oriented agriculture and making effective use of uncultivated area. Related land tenure system, in order to improve it, preparation of land registration process is taken, for urban land, but, for rural area, not launched yet. MAF is planning a model project in the southern region in which Indonesian company cultivates paddy and produce rice (produced rice is planned to purchase by government).	6.1.1 Establishment of rice production service It is important for national food security to maintain food production activity in uncultivated land. To do so, it is necessary to provide rice production service which can lead rice production in abandoned farm land. As a measure to cope with such situation, it is planned to establish agricultural production service groups/ enterprisers so that they can produce rice in the abandoned farm land. It is the precondition that produced rice is purchased by government. (1) Nurturing agricultural production service groups and support in cultivating paddy (2) Support in cultivating paddy by enterprisers 6.1.2 Necessity of measures against devastating national land Devastating national land would be escalated, increasing abandoned farmlands. In the abandoned farmland, water conservation capacity becomes low and runoff of surface soil is escalated. It is required to support in cultivating farmlands and encouraging upland crop cultivation in order to prevent from devastating.	Establishment of rice production service - Nurturing rice production service groups and support in cultivation - Supporting in cultivating by enterprisers
	(2) Production incentive of tenant farmers is hindered due to conventional tenant farming system. In a part of farmlands in Manatsuto, conventional tenant farming is made between tenant farmers and absent landowners who are not living in Manatsuto. Sharing of burden and profit such as provision of input materials and distribution of benefit is conventionally made on the fixed rate.	MAF does not grasp actual tenant farming. According to the hearing survey in other districts. Actual situation are not clear.	6.1.3 Reform of current conventional tenant farming Sharing method of burden to provide input materials and distribution method of harvested paddy are conventionally made on the fixed rate of the cultivation area between tenant and landowner. To give further motivation to tenant farmers, sharing by the fixed amount method is suitable than the present fixed rate.	Reform of current conventional tenant farming

6-2-4 Framework of Supporting Policy Based on the Problems/ Measures

Problems and measures are grouped and summarized as shown in Table 6-2-2. Improvement approach is summarized into two supporting policies based on the grouping of problems and measures. Those are i) "Productivity improvement supporting policy" to improve rice productivity and ii) "Production incentive stimulating policy" so that rice farmers have high incentive to expand rice production, and iii) "Supporting for Strengthening MAF implementation Organization" to improve implementation capacity of MAF.

Table 6-2-2 Grouping of Problems and Measures

Problems	Improvement approach (Supporting policy)
Paddy production area is limited on the topographic conditions. Irrigation water supply is unstable and shortage owing to unstable water source and intake. Soil sedimentation in the irrigation facilities prevents suitable and timely intake from river. Debris flow often damages irrigation facilities, farmland and river embankment.	Productivity is improved. (Productivity Improvement Supporting Policy) - Irrigation system is improved.
Improvement of productivity is limited since there is a limit of obtainable input materials as seed, labor force, fertilizer/ pesticides and capital, in quality and quantity. Yield is not increased since cropping method is not fully disseminated to on farm. Owing to lack of manure management skill, mutual relation between input and output yield is not found. Dissemination system is not provided properly. Traditional farming with diversified crops planting and livestock breeding is practiced.	- Crop productivity is improved.
Marketing system of local rice is not formed. Many impurities are contained in the milling process. It causes quality and quantity loss of milled rice, which is the competitive disadvantage with import rice. Local commercial rice farmers who will be able to maintain stable supply in quality and quantity to seller are not organized.	- Processing and marketing process of local rice is improved.
Cheap import rice on the market prevents rice farmers from expanding commercial oriented rice production. Since government products purchasing system had collapsed, there is no incentive to produce surplus rice for rice farmers. Paddy cultivation farmlands are decreasing.	Rice farmers have high incentive to expand rice production. (Production Incentive Stimulating Policy) - Inflow of import rice on the market is controlled. - Selling of local rice is ensured.
Human resources development is needed for promoting agriculture development. Implementation organization which will be able to take integrated approach from production to processing and marketing is not established.	Implementation capacity is improved. (Supporting for Strengthening MAF implementation Organization)

6-2-5 Putting the Measures and Supporting Policy on Preparing the Framework

The measures shown in Table 6-2-1 are categorized into the necessary development fields. Categorized measures are grouped and put on the framework, as shown in Table 6-2-3. Programs and Projects are framed from the grouping of the measures.

Table 6-2-3 Grouping of the Measures and Putting on the Framework of the Master Plan

Grouping of the Measures (from Table 6-2-1)	Putting framework of the MP
1. Measures to cope with the problems caused from natural conditions	
Zoning of agricultural area and formulation of agricultural development plan in each zone. - Rice bowl area - Subsistent farming strengthening area	Basic concept of MP framework Zoning of agriculture area and formulation of agricultural development plan in each zone (Rice bowl area, Subsistent farming strengthening area)
Water resource development plan based on the potentiality - Diversion water (intake from river) - Regulating reservoir - Tube well - Small storage tank - Small scale pond	<Productivity Improvement Supporting Policy> Intake weir construction project Tube well construction project Regulating pond construction project Small irrigation water storage pond/ tank construction project for smallholders
Establishment of O/M organization - Removal of deposited soil	

Grouping of the Measures (from Table 6-2-1)	Putting framework of the MP
- Technical/ financial supports from MAF - Establishment of work sharing of O/M	Strengthening program for operation and management system of irrigation scheme
Promotion of organizing Water Users Association (WUA) and strengthening operation capacity of the WUA - Introduction of awareness process of livelihood improvement sense	
Awareness of ownership sense through participatory irrigation facility development process (construction of irrigation canal and access roads to irrigation areas)	Farmers participation irrigation related facilities construction project
Introduction of river control works - Revetment - Debris barrier - Embankment - Training levee	River control facility construction project for pretention of irrigation system and farmland
Capacity development of NDIWM staff in engineering fields covered with studying, planning, and designing and supervising processes - Standardization of irrigation development process from study to implementation supervision - Capacity development of NDIWN to cope with standardization - Establishment of organization to update irrigation system inventory data - Capacity development of NDIWM staff dealing in irrigation system inventory	Capacity development program of NDIWM for leading irrigation development project
2. Measures to cope with the problems caused from farming practice	
Improvement of input materials (seeds) - Continuation of SoL program - Strengthening on producing, renewal and obtaining of seeds - Technical training on self seed collection method - Support in researching crop breeding of improved variety	Program for obtaining quality seed and improved variety seed breeding
Improvement of input materials (labor force) - Holding a mechanical workshop for private mechanic in rural area	Promotion program for private mechanization (Linked with supporting policy: establishment of agricultural fund system)
Promotion of local resource circulative agriculture - Environmental conservation - Introduction of feed crop and green manure crops - Soil improvement by using organic and microbial improving materials	Local resource circulative agriculture promotion project
Improvement of input materials (labor force) - Introduction of credit system for highly motivated farmers for mechanization (interest subsidy and credit guarantee) Improvement of obtaining method of input materials (pesticide and fertilizer) - Introduction of credit system for highly motivated farmers for purchasing input materials related with crop production (interest subsidy and credit guarantee) - Support in dealing connection between framers and traders (purchase of packaged input materials and provision of matching opportunity)	Establishment of agricultural fund system (Interest subsidy and/ or credit guarantee)
cropping technology - Farming method of ICM and SRI - Dissemination of IRCS for low input paddy fields - Dissemination of skills on reduction of losses in collection, threshing and drying processes. Capacity development of extension workers and provision of dissemination system -Updating of present technical manual for extension works -Provision of extension materials -Capacity development of extension workers and provision of extension system	Dissemination Program of cultivation techniques
Establishment of pest control method - Technical support to research and establish pest control method - Technical support for prediction of outbreak of pest and prevention method	Strengthening program for pest and disease control
Establishment and dissemination of manure management technique - Dissemination of crop management method for maize - Dissemination of soil improvement method using organic and microbial improving materials -Manufacturing compost by using local resource and its application method	Establishment and dissemination program of manure management technique
Strengthening of integrated farming with livestock breeding -Strengthening integrated farming with vegetables/ cash crops and livestock breeding -Provision of small scale irrigation facilities for strengthening integrated	Strengthening program of integrated farming with livestock breeding

Grouping of the Measures (from Table 6-2-1)	Putting framework of the MP
farming	
3. Measures to cope with problems caused from post-harvest processing	
Nurturing commercial rice farmers group Organizing local commercial rice farmers group -Nurturing local commercial rice farmers groups for cooperative (packing, labeling and branding of produced rice, improving communication capacity with outside organizations) Support in managing (providing rule, making consensus)	Training for farmer groups in market-oriented rice farming
Value-chain analysis by rice farmers and traders (finding problems in the analyzing processes from market needs to production, collection, processing and selling and seeking solutions for the problems) Price analysis of marketing rice Developing local commercial rice market channel -Financial support for traders and marketing groups - Developing local commercial rice market channel - Promotion for making rice processed products	Rice value chain establishment project in rice production area
Improvement of commercial rice farming -Local rice quality improvement (control of broken rice, prevention of over drying, mixed with inhomogeneous rice and sand before milling) Improvement of milling stage Standardization of rice grade, introduction of grading system, issue of quality certification, dealing on a water content basis and weights and measures	Post-harvest processing improvement project of local rice
4. Measures to cope with the problems caused from current rice policy	
Introduction of border control policy - Price control for import rice Improvement of government purchasing system - training of human resources, sustainable budgeting and system design, improvement of operation and management method - MAF participation in the purchasing system	<Production Incentive Stimulating Policy> - Border control policy (Control of import rice price by tariff and import band, import quota) - Non- border control policy (Improvement of MCIE purchasing system, MAF participation in the purchasing system)
5. Measures to cope with the problems caused from MAF organization capacity	
Capacity development of MAF's staff	Put on the related programs/ projects
Provision of project implementation organization in the MAF to take integrated implementation Making use of NGOs for project implementation	Put on the project implementation organization
Support in strengthening MAF's capacity Establishment of M&E system of the projects	Put on the project implementation framework
6. Measures to cope with the problems caused from surrounding socio-economic environment	
Establishment of rice production service - Nurturing rice production service groups and support in cultivation - Supporting in cultivating by enterprisers - Reform of current conventional tenant farming	< Production Incentive Stimulating Policy> Non-border control policy (Supporting policy of rice production service) (Reform of conventional tenant farming)

6-2-6 Zoning of Agricultural Production Area

(1) Basic Concept for Zoning

Almost all farmers are practicing the conventional farming in which food crop production is prioritized to ensure home consumption. The farming is characterized as the subsistent farming where various crops are cultivated and livestock are raised, in order to avoid shortage of food throughout the year, mono-crop failure and drought and flooding. Almost farmers cannot produce enough rice to ensure their home consumption. Even rice farmers purchase the import rice for the food shortage season. Under such conditions, in order to increase rice production in the country, it is required to provide the situations: i) farmers can produce home consumption rice, ii) farmers can produce surplus rice over and above home consumption as the commercial rice, and can ship them to the market.

As mentioned in the previous section 6-2-5, zoning of the agricultural area is made from the viewpoint of rice farming prospect. Making two zoning area is formed; i) Rice bowl area: farming area where development potential for irrigated rice farming is relatively high and expected to produce the surplus rice as the commercial rice, ii) Subsistent farming strengthening area: farming area where development potential is relatively lower than the rice bowl area and home consumption rice production is prioritized. Measures as proposed

programs/ projects in the master plan are applied on the zoning area. Development concept of the classified zone and its development direction are outlined as follows.

Table 6-2-4 Zoning of Agricultural Production Area

Zone	Potential	Development direction, etc.
i) Rice bowl area	Rice farming potentiality is relatively high, where enabling to produce local rice as the commercial rice (Relatively mass production is possible because of larger size of farm plots and easy mechanization and easy access to the market. Irrigation areas are mainly located in low-lying area) Estimated total area = 20,749 ha (based on the inventory survey)	Aiming to commercialize the local produced rice. Programs/ projects proposed in the master plan to increase and improve local rice production in quantity and quality are applied. Rice production is expected to increase, as the market of local produced rice is expanding.
ii) Subsistent farming strengthening area	Rice farming potentiality is relatively low, where producing home consumption rice is prioritized. (Surplus cannot be produced since it is difficult to expand irrigation area under topographic constraints. Difficult access to market place. Irrigation areas are mainly located in hill and sloped areas.) Estimated total area = 13,610 ha (based on the inventory survey)	Aiming to ensure food security in household level. Proposed programs/ projects to produce home consumption rice and lead to crop diversification with livestock breeding are prioritized. By strengthening farming practice, higher purchasing power can be provided for farm household in the area.

(2) Zoning of the Rice Bowl Area

Zoning of the rice bowl area is planned on the present rice production of each district, irrigation scheme inventory survey, future road network improvement plan, etc. Zoning process is taken as follows.

1) Zoning based on the ranking of the district's supply and demand balance

District's rice production was ranked based on the production data (2012) as shown in Table 6-2-5. As well, district's surplus rice production based on the rice supply and demand balance was also ranked as shown in Table 6-2-6. According to those rankings, districts of Ainaro, Baucau, Bobonaro and Viqueque, are regarded as an active rice production district, so that, paddy cropping area of those districts is delineated as the zone of the rice bowl area. Besides those districts, Oecusse is also defined as the rice bowl area since the detached territory is needed to reach rice self-sufficiency in district level independently.

Table 6-2-5 District Ranking of Paddy Production in 2012

No.	District	2005	2006	2007	2008	2009	2010	2011	2012	Rank
1	Aileu	576.0	574.0	561.0	900.0	1,862.5	930.0	2,114.0	1,033.8	12
2	Ainaro	3,916.0	3,848.0	2,937.0	2,937.0	4,419.0	2,651.9	1,378.0	9,623.1	5
3	Baucau	7,658.0	6,588.0	7,456.5	10,192.7	29,440.0	34,024.2	33,020.8	40,285.7	1
4	Bobonaro	7,800.0	7,800.0	12,510.0	16,662.5	15,922.6	21,127.6	15,556.6	11,856.0	3
5	Covalima	7,900.0	5,411.2	6,022.5	6,022.5	13,405.5	14,642.4	4,670.2	10,719.0	4
6	Dili	93.8	93.8	0.0	0.0	201.0	110.2	162.0	260.0	13
7	Ermera	1,012.7	1,371.5	1,371.5	1,371.5	2,704.9	3,586.7	1,135.6	4,534.9	9
8	Lautem	9,337.5	9,375.0	7,845.6	7,845.6	3,951.9	6,504.0	9,892.8	6,609.6	7
9	Liquica	236.4	289.2	465.0	465.0	2,175.0	306.7	411.2	1,082.7	11
10	Manatuto	8,400.0	8,182.0	5,175.0	5,175.0	12,795.0	3,883.7	6,654.4	8,367.5	6
11	Manufahi	1,575.0	2,190.0	3,750.0	4,740.0	2,436.6	2,765.3	1,976.0	2,613.0	10
12	Oecusse	3,378.0	3,378.0	4,522.5	8,992.6	15,856.9	5,500.0	7,237.9	5,280.9	8
13	Viqueque	7,008.0	6,313.5	7,807.5	12,114.0	15,603.8	16,892.9	14,087.5	16,900.0	2
14	Other*	-	-	-	2,838.2	-	-	-	-	
	Total:	**58,891.4**	**55,414.2**	**60,424.1**	**80,256.6**	**120,774.8**	**112,925.4**	**98,297.1**	**119,166.3**	

Note:* Production by ICM and SRI, which was compiled as other only in 2008.

Table 6-2-6 District Ranking of Surplus Rice Production

District	Paddy Production 2012 (ton)	Planted Area 2012 (ha)	Seed Requirement 35kg/ha (ton)	Paddy excluding Seed (ton)	Post harvest Losses 17.5% (ton)	Paddy excluding Losses (ton)	Milled Rice 60% (ton)	Estimated Population 2012 (persons)	Food Use 106kg/person 2012 (ton)	Deficit/ Surplus 2012 (ton)	Supply/ Demand Ratio (%)	Rank of Surplus 2012	Rank of Surplus Ratio 2012
Aileu	**1,034**	**407**	**14**	**1,020**	**178**	**841**	**505**	**46,487**	**4,928**	**-4,423**	**10.2**	**8**	**11**
Ainaro	9,623	1,948	68	9,555	1,672	7,883	4,730	62,062	6,579	-1,849	71.9	5	5
Baucau	40,286	11,098	388	39,897	6,982	32,915	19,749	117,143	12,417	7,332	159.0	1	1
Bobonaro	**11,856**	**3,648**	**128**	**11,728**	**2,052**	**9,676**	**5,806**	**96,539**	**10,233**	**-4,428**	**56.7**	**9**	**6**
Covalima	10,719	3,526	123	10,596	1,854	8,741	5,245	62,355	6,610	-1,365	79.4	4	4
Dili	**260**	**80**	**3**	**257**	**45**	**212**	**127**	**245,442**	**26,017**	**-25,890**	**0.5**	**13**	**13**
Ermera	**4,535**	**1,404**	**49**	**4,486**	**785**	**3,701**	**2,220**	**122,774**	**13,014**	**-10,794**	**17.1**	**12**	**10**
Laulem	**6,610**	**1,836**	**64**	**6,545**	**1,145**	**5,400**	**3,240**	**62,703**	**6,647**	**-3,407**	**48.7**	**6**	**7**
Liquica	**1,083**	**359**	**13**	**1,070**	**187**	**883**	**530**	**66,496**	**7,049**	**-6,519**	**7.5**	**11**	**12**
Manatuto	8,368	2,789	98	8,270	1,447	6,823	4,094	44,827	4,752	-658	86.2	3	3
Manufahi	**2,613**	**804**	**28**	**2,585**	**452**	**2,133**	**1,280**	**51,000**	**5,406**	**-4,127**	**23.7**	**7**	**9**
Oecusse	**5,281**	**2,491**	**87**	**5,194**	**909**	**4,285**	**2,571**	**67,148**	**7,118**	**-4,547**	**36.1**	**10**	**8**
Viqueque	16,900	5,200	182	16,718	2,926	13,792	8,275	73,452	7,786	489	106.3	2	2
Total	**119,166**	**35,590**	**1,246**	**117,921**	**20,636**	**97,285**	**58,371**	**1,118,429**	**118,554**	**-60,183**	**49.2**	-	-

Note: 17.5% of Post-harvest Losses and 60% of Milled Rice are based on the MAF's standard.

2) Zoning based on the market potentiality

Poor road network in the country raises the price of agricultural products and agricultural input materials by adding transportation cost. Under such situations, the Government has prioritized the road improvement as national priority program in 2010. SDP also put high priority on the six roads based on the concept of Regional Development Corridors of the National Planning Framework as mentioned in the section 2-2-4 (referred to Figure 6-2-3).

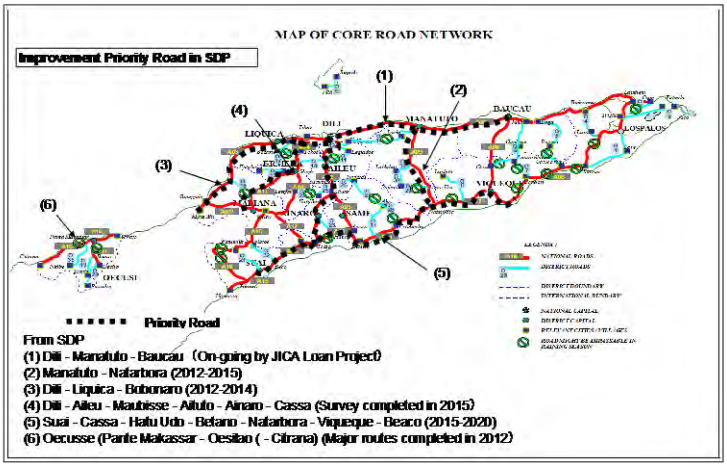


Figure 6-2-3 Improvement Priority Road in SDP

As mentioned above, improvement of the road network is indispensable to realize effectively transportation of surplus rice produced in rice bowl area to the related marketplaces. It is significant to develop the area along with those priority roads planned in the SDP. Rice production would be easily expanded in such areas as the transportation system is improved. For the zoning, it should be considered the condition whether or not the zoning area is adjacent to the priority roads. By overlapping with the district basis zoning as formed in the section (1) and the road improvement and corridors development concept, the zoning is examined.

3) Putting on going MAF's irrigation facility rehabilitation projects on the zoning process

MAF is promoting some large scale irrigation facility rehabilitation projects as shown in the section 3-7. In the projects, paddy cultivation is expected to become active in the project areas. Those areas should be located as the commercial rice production area and be involved in the zoning process.

Based on the above study (1), (2) and (3), making five (5) rice bowl area is delineated. Location of the 5 zones with the MAF's rehabilitation projects are shown in Figure 6-2-5.

4) Rice bowl area from making the batch of the irritation schemes on the inventory survey

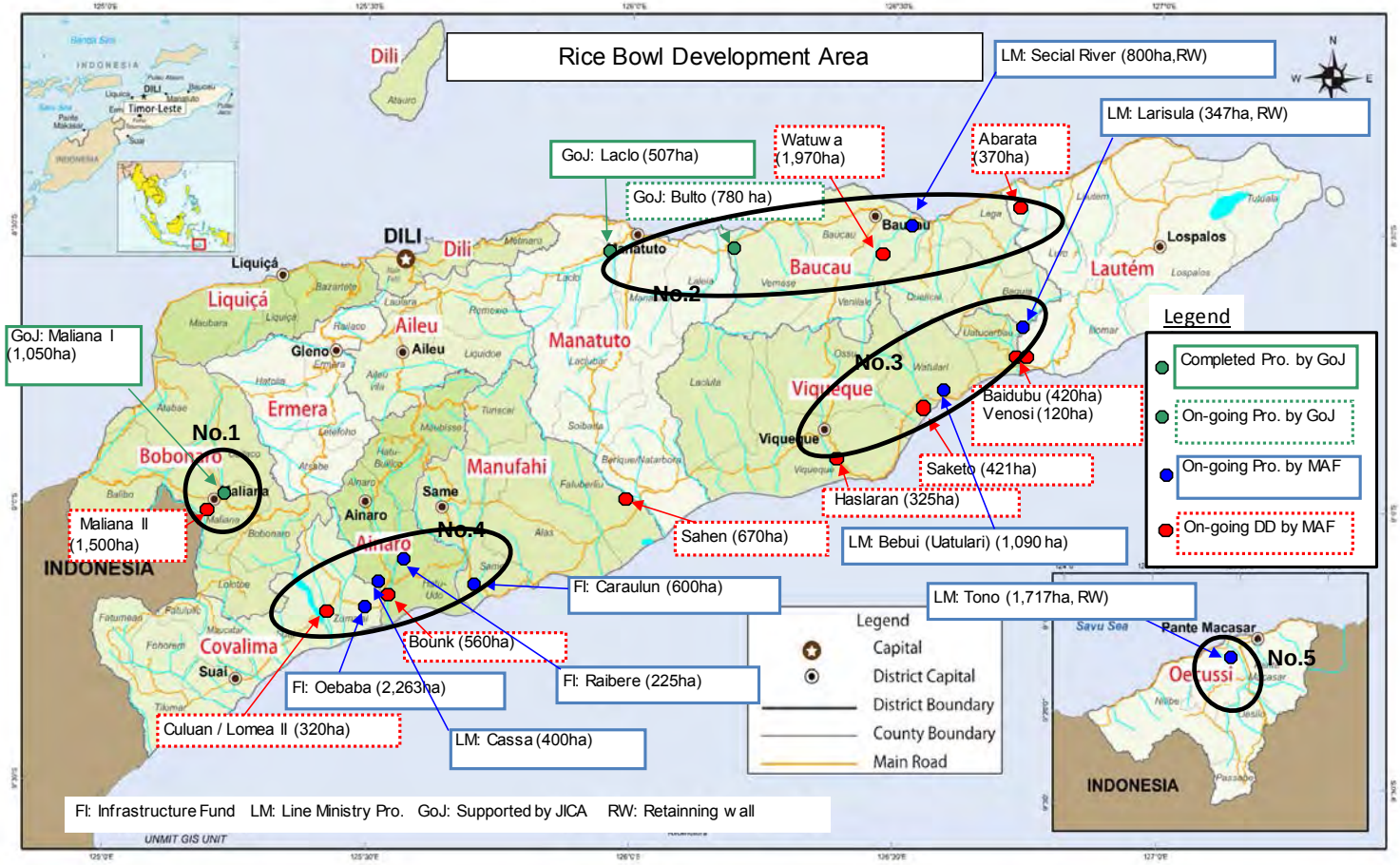
According to the inventory survey, there are 425 irrigation schemes in the country, total irritation area 34,360 ha. These irrigation schemes are overlapped with the rice bowl area. By

overlapping, making batch of the irrigation schemes is delineated as the rice bowl areas. Delineated total irrigation area of the schemes is accounted 20,749 ha. Area size of the 5 zones is shown in Table 6-2-7 and Figure 6-2-4.

Table 6-2-7 Irrigation Area by 5 Rice Bowl Areas

No.	Zone	Irrigation area (ha)
1.	Maliana	4,123
2.	Baucau & Manatuto	7,448
3.	Viqueque	3,824
4.	Covalima & Ainaro	4,520
5.	Oecusse	834
	Total	20,749

Source: Estimated by the JICA study team based on the inventory survey.



Rice bowl area	Expected Irrigation area (ha)*	Rice bowl area	Expected Irrigation area (ha)*
No.1 Maliana area	2,000	No.4 Ainaro&Covalima area	3,900
No.2 Baucau area	3,800	No.5 Oecussi area	1,300
No.3 Viqueque area	2,100	Total	13,100

* Expected irrigation area is estimated based on the completed and on-going major projects. It should be planned on the inventory survey data.

Figure 6-2-4 Zoning of the Rice Bowl Areas

6-2-7 Preparation of Framework for Master Plan

(1) Preparation of Framework for Master Plan

As mentioned in the previous section 6-2-6, in order to achieve the expansion of food supply, i.e., increase of rice production, social, political and engineering development constraints should be solved.

Considering the development direction to cope with the constraints, development target to prepare the framework of master plan is tentatively set as the "Local food production is increased through enhancing farmers' production incentive by improving enabling environment." Rice is the target for local food.

From the analysis in the previous section, in order to achieve the expansion of food supply, i.e., increase of rice production, both of the production incentive stimulating policy to encourage rice farmers to expand rice production is required together with the productivity improvement supporting policy to improve rice productivity including irrigation, farming skill and processing/ marketing.

Considering the necessity of the both policies, to reach the setting target, the framework is made logically in the line of "Development strategy", "Subjects", "Countermeasure" and "Program/ Project/ Policy/ Institution" (see Table 6-2-8).

Table 6-2-8 Framework of the Master Plan

Development strategy	Subjects	Countermeasure	Program/ Project/ Policy/ Institution
<Productivity Improvement Supporting Policy>]			
Irrigation system is improved.	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
	Removal of deposited sediment	Establishment of WUA and strengthening of operation and management Strengthening WUA capacity	5. Strengthening program for operation and management system of irrigation system
		Creation of farmers' ownership sense	6. Farmer 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
		Provision of river control works	8. Capacity development program of NDWIM for leading irrigation development project
Crop productivity is improved.	Lack of input materials	Obtaining of quality seeds	9. Program for obtaining quality seed and improved variety seed breeding
		Promotion of farm mechanization	10. Promotion program for private mechanization
		Provision of credit to obtain input materials	11. Establishment of agricultural fund system (Institution)
		Making use of local resources	12. Local resource circulative agriculture promotion project
	Low cultivation techniques	Dissemination of cultivation techniques	13. Dissemination program for cultivation technique
		Establishment of pest and diseases control method	14. Strengthening program for pest and disease control
		Establishment of manure management techniques	15. Establishment and dissemination program of manure management technique
	Weak farm management basis	Strengthening of integrated farming	16. Strengthening program of integrated farming with livestock breeding
Processing and marketing process is improved.	Non commercially oriented rice farmer organization	Training of local commercial rice farmers group	17. Training or farmer groups in market- oriented rice farming

Development strategy	Subjects	Countermeasure	Program/ Project/ Policy/ Institution
	Not developing local commercial rice market	Establishment of local rice value chain system	18. Rice value chain establishment project in rice production area
	Low local rice quality	Improvement of post-harvest processing process of local rice	19. Post-harvest processing improvement project of local rice
<Production Incentive Stimulating Policy>			
Rice farmers have high incentive to expand rice production	Unlimited inflow of cheap import rice to market	Benefiting from selling local produced rice	20. Policy (Border control policy for import rice)
			21. Policy (Non-border control policy for trading rice)
<Supporting for strengthening MAF implementation organization>			
MAF's capacity is improved.	Low MAF's planning and implementation capacity	Strengthening MAF's operation and management capacity	Support in strengthening of MAF's project operation and management capacity
		Making use of NGOs	Establishment of project implementation organization

(2) Priority of the production incentive stimulating policy and the productivity improvement policy

Different steps, however, are needed to realize these policies. Master plan is designed that development target, increase of rice production, is achieved by both policies of the production incentive stimulating policy how to motivate rice farmers to expand rice cultivation and the productivity improvement policy how to improve productivity of rice. In the master plan, it is planned that increase effect of rice production may be generated by the linkage with both policies. To materialize the policies, however, different approach should be taken.

Related with the production incentive stimulating policy, political step under making consensus in governmental level is needed since it implies the choice of the national policies such as border control policy and/or government products purchasing system. To achieve the target, MAF should prioritize to make consensus to go forward this policy Therefore, it is required to make consensus in the governmental and ministry level. Prior to this, MAF should tackle to make internal consensus of MAF.

Related to the productivity improvement supporting policy, proposed programs/ projects are provided to reinforce the present MTOP and annual action plan. Their development directions can be made taking account of the MAF's own responsibility based on the regulation. MAF can lead the concrete implementation process of them by making linkage with the past related projects.

Both policies are indispensable to generate the increase effect of rice production. To realize this condition, making consensus of the production incentive stimulating policy is a top priority. However, governmental initiative to launch into should be taken. It may be difficult to make governmental consensus for short time. If the production stimulating supporting policy would not be worked, related projects/ programs to increase the rice production would be stagnant. It is required to avoid such situation in order to tackle the increase of rice production. To do so, it is important that MAF should take action to materialize the productivity improvement supporting policy. MAF selects the suitable areas where rice farmers intend to expand paddy cropping, selects necessary programs/ projects based on the development needs and applies them into the selected area. In this case, however, rice production increase effect may be limited into smaller level than the case with both policies.

(3) Application of programs/ projects into the zoning area

The target, increase of rice production, can be achieved by systematically applied the programs/

projects as a package into the irrigation schemes (irrigation areas) in the zoning area, under the production incentive stimulating policy. Through applying these, it is expected to increase rice production and improvement of rice self-sufficiency would be achieved.

For developing the master plan implementation how to apply the programs/ projects into the irrigation areas, the priority is standard given to them for the irrigation areas of the rice bowl area and subsistent farming area based on the objective of each, as shown in Figure 6-2-5. Prioritized programs/ projects are basically applied in the overall project planning stage. However, for designing detail application to concrete irrigation area, the priority given to the programs/ projects should be redesigned on the inherent conditions of each irrigation area, since each area has different input requirement to cope with the inherent subjects. Different countermeasure should be taken. General procedure to make design of the application is planned as follows.

i) Irrigation area is classified into the rice bowl area or subsistent farming area based on the zoning and characteristic of the area. Development direction of the area is studied on the inventory survey and reconnaissance survey, etc.

ii) Based on the application priority set in advance and development direction, applicable programs/ projects are listed.

iii) Preliminary survey is conducted to study the irrigation and crop production development potentiality. Based on the study, development possibility of the area is assessed.

iv) From the above study, the programs/ projects to be applied in the area are selected. Concrete contents of them are designed based on the full scale of survey.

In the agricultural master plan, it is expected that proposed programs/ projects are systematically developed for the targeted irrigation area, according to the general procedure mentioned above. For example, it is proposed to plan/ design and implement as the project named “Promotion Project for Local Commercial Rice Production in Rice Bowl Area” or “Promotion Project for Food Production in Subsistent Farming Strengthening Area”, selecting individual or batched areas (see Figure 6-2-5).

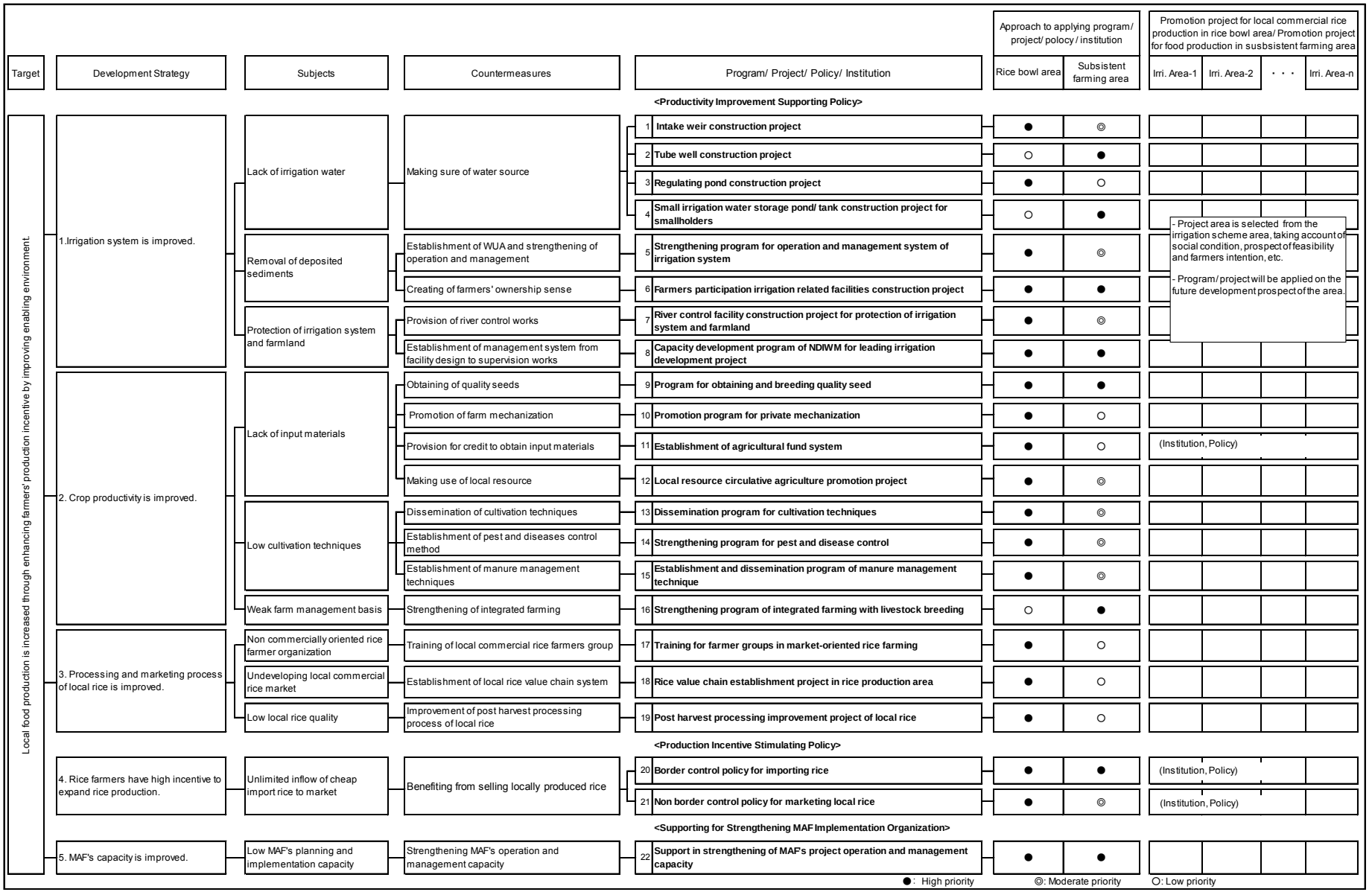


Figure 6-2-5 Framework of the Agriculture Master Plan

(4) Priority of the programs/ projects in the productivity improvement supporting policy

In the workshop conducted in the five districts in the rice bowl area, it was indicated that shortage of irrigation water was the biggest constraints to practice rice farming. Making irrigation water supply stable is the fundamental condition to maintain the paddy cultivation. According to the inventory survey, many irrigation facilities are not functional due to sedimentation and collapse of the facilities. For promoting the productivity improvement supporting policy, related programs/ projects aiming to recover the function of the irrigation facilities should be prioritized. In the input plan to recover the irrigation system, economic validity should be examined.

Related to this policy, as the physical measure to increase rice production, it is effective to improve irrigation facilities to expand the irrigation area and introduce double cropping into such area. However, in order to realize double cropping, much investment is needed to improve the various conditions such as making irrigation water supply more stable and timely, obtaining labor force, prevention of crop damage caused by animal and removal of sediment. It is not easy to realize full scale of double cropping with expansion of irrigation area. Rather than such irrigation infrastructure based approach, it is more actual and realizable to improve the working process in quality and quantity aspects of rice production from planting to marketing.

To generate more rice production, importance is to apply systematically related programs/ projects aiming to recover the irrigation function and improve the processing and marketing process.

(5) MAF's on-going irrigation rehabilitation projects

MAF is promoting the irrigation rehabilitation projects in the existing irrigation sites in the rice bowl area to expand the area of irrigated rice. Current status of these projects is classified into various stages such as under construction, on the budgeting, and under studying/ planning. By observing the implementation progress of them, common problems are picked; i) contents of the projects leans to the design and construction of the irrigation facilities, it is required to review the validity of the projects as included the farming and economic development viewpoints, ii) uniform design standard and excessive crop intensity plan are incorporated without consideration of the river and water resource characteristics in and around the irrigation areas. Prior to the project implementation, these problems as picked should be reviewed, analyzed and solved.

If the production incentive stimulating policy would be promoted, these projects might bring larger rice production effects on the project areas than that of without policy. On the other hand, even if not promoted that policy, it is expected to generate such certain development effects that home consumption rice production becomes stable, irrigation infrastructure for commercial rice production is provided, although quantitative economic effects would be limited to be small.

Validity of these projects should be reviewed from promotion viewpoints of the local commercial rice production in rice bowl area. But, taking account of generating the certain effects as mentioned above, it is desirable to materialize these projects in order.

CHAPTER 7 PREPARATION OF AGRICULTURE MASTER PLAN

7-1 MAKING THE FRAME OF DEVELOPMENT SCENARIOS

7-1-1 Option of the Supporting Policy

As mentioned in the previous chapter, in order to achieve the target "food supply will have exceeded demand" by increasing rice production under the uncontrolled inflow of imported cheap rice to the market, following two political approaches should be taken. i) "Productivity improvement supporting policy" aiming to improve the rice productivity through provision of irrigation system, improvement of crop productivity and processing/ marketing system, and ii) "Production incentive stimulating policy" aiming to stimulate rice farmers into increasing rice production through ensuring market channel. By operating both policies, rice production increase would be possible.

There are some political options of which the content clearly differs, such as tariff policy and government paddy purchasing policy. For making the choice between these options, it is required to take necessary steps to make governmental consensus. For the "Productivity improvement Supporting policy", there are two options, i) present of continuation of the present MTOP and AAP (annual action plan) and ii) propose of introduction of the programs/ projects proposed in the framework of this master plan.

These options are compiled as the following table.

Table 7-1-1 Supporting Policy Options

Supporting Policy	Contents of the policy	
Production incentive stimulating policy (Supporting policy to stimulate farmers' incentive to expand rice production)	Present;	Limited MCIE paddy purchasing, Limited distribution of input materials
	Propose;	Border control policy for rice trade (erecting tariff barrier, import ban and import quota) Non-border control policy (paddy purchasing system, other supporting system)
Productivity improvement supporting policy (Supporting policy to improve rice production process)	Present;	Actions based on the MTOP/ Annual action plan
	Propose;	Application of programs/projects into the rice bowl area and subsistent farming area.

7-1-2 Setting Options of Development Scenarios

Achievement process to increasing rice production is influenced by making choice of the supporting policy. Especially, related with the choice of the "Production incentive stimulating policy", whether the border control policy would be introduced or not is governmental subject. Considering the present social and political situations as joining to ASEAN, choice of the supporting policy should not be concluded easily from the technical viewpoint for increasing rice production.

Options of development scenarios are made from choice of the supporting policy options as mentioned above. Four development scenarios are provided for further consideration as follows.

Table 7-1-2 Setting the Development Scenarios

1) 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.
2) 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 paddy purchasing system as the non-border control policy. Together with this policy, MAF will introduce proposed productivity improvement supporting policy. By applying both policies, MAF aims to expand

	rice production.
3) 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 local produced rice. Together with this policy, MAF will introduce proposed productivity improvement supporting policy. By applying both policies, MAF aims to expand rice production.
4) 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 100% rice self-sufficiency by local rice.

Four development scenarios are prepared for further consideration. Rice production activity and degree of rice self-sufficiency is simulated by the development scenarios.

7-1-3 Setting the Target Year

In order to materialize the production incentive stimulating policy of the development scenarios, it should be required to make governmental consensus and solve the various technical subjects. Long term discussion and preparation are needed to cope with these matters. Considering requirement of such necessary term, it might be hard to set the target year 2020 which is set in the SDP "food supply will have exceeded demand (by 2020)". Then, considering that long term target year of the SDP is the 2030, the year 2025 is set for the simulation of the development scenarios.

7-2 BASIC CONDITIONS OF THE SIMULATION OF THE DEVELOPMENT SCENARIOS

Basic conditions that are common to each development scenarios are arranged in the following table.

Table 7-2-1 Basic Conditions of the Development Scenarios

<table>
<tr><th>Basic Conditions</th><th>Scenario-1</th><th>Scenario-2</th><th>Scenario-3</th></tr>
<tr><td>(1) Demand</td><td colspan="2">Increase under the population projection</td><td>Estimation on price changes</td></tr>
<tr><td>(2) Planted area</td><td rowspan="2">Continuation of same production activities as the existing activities</td><td>Implementation of programs/ projects related to irrigation system improvement on the supporting policy for productivity improvement</td><td></td></tr>
<tr><td>(3) Unit Yield</td><td>Implementation of public purchasing rice and the supporting policy for productivity improvement in the rice bowl</td><td>Setting a tariff wall and conducting supporting policy for productivity improvement through the whole of the country</td></tr>
<tr><td>(4) Exclusion of paddy seed</td><td colspan="3">Exclusion of paddy seed for the next year from paddy production</td></tr>
<tr><td>(5) Storage loss</td><td rowspan="2">Continuation of the current situation</td><td colspan="2" rowspan="2">Implementation of program/ project related to processing and distribution improvement in the support for productivity improvement</td></tr>
<tr><td>(6) Milling ratio</td></tr>
<tr><td>(7) Consumer price</td><td colspan="2">Same as the current situation</td><td>Estimating the changes on tariff</td></tr>
</table>

(1) Demand of Rice

On the demand estimation, the Scenario-1 and 2 were calculated by multiplying the annual consumption and the estimated population together, and the demand in the Scenario-3 was calculated in accordance with the price change of rice. The demand of the Scenarion-1 and 2 were computed by multiplying 106 kg/person[1] of the annual consumption and the estimated population with 2.41 %[2] of increase ratio. According to the calculation results, 1,145 thousand of the population and 121 thousand MT of the demand in 2013 would be 1,524 thousand of the population and 162 thousand MT of the demand in 2025, which became about 1.3 times during the 12 years. In the Scenario-3, demand of rice

[1] 106kg/person of the annual consumption amount is applied in KONSSANTIL.
[2] 2.41% of the increasing ratio of the population is applied in KONSSANTIL.

will decrease because the domestic rice price will be raised by the setting a tariff wall.

(2) Planted Area

Three cases are simulated in the Scenario-1; a pessimistic case, whose planted area is continued to decrease, a moderate case, whose planted area is kept in the level in 2013 and an optimistic case, whose planted area will be recovered until the paddy field area of the country. In the Scenario-2 and 3, planted area of paddy fields whose irrigation facilities would be rehabilitated by irrigation improvement programs/ projects was added to the targets of the planting areas, based on the three cases of the Scenario-1.

(3) Unit Yield

Three cases were studied in the Sceanario-1; a pessimistic case, whose yield will continue to be the average of the latest five years, a moderate case, whose yield will continue to be the value in 2013, and an optimistic case, whose yield will continue to be the highest value in the past. In the Scenario-2, the target is the unit yield which is increased by productivity improvement programs/ projects and public purchase of rice conducted in rice bowls, based on the three cases in the Scenario-1. In the Scenario-3, the target is the unit yield which is increased by the introduction of tariff barrier and productivity improvement programs/ projects conducted in the whole country, based on the Scenario-1.

(4) Excluding Paddy Seed

Paddy seed for the next year is 35 kg/ha[3], which is fixed. The amount of paddy seed is deducted from the production in proportion to the planting areas in the next year. Also, storage loss of the paddy seed is not taken into consideration.

(5) Storage Loss[4]

As for postharvest storage conducted in each farming house, 5.0 % of loss ratio as the current situation in 2013 would continue to be until 2025 in the Scenario-1. In the Scenario-2 and 3, the loss ratio would be reduced until 3.4 % in 2025 by the implementation of processing and distribution improvement programs/ projects.

(6) Milling Ratio[5]

As for the milling ratio, 51.5 % of milling ratio as the current situation in 2013 would continue to be until 2025 in the Scenario-1. In the Scenario-2 and 3, the ratio would be improved until 55.0 % in 2025 by the implementation of processing and distribution improvement programs/ projects.

(7) Consumer Price

Future consumer price of rice is supposed to be similar to the current situation, whose change is not taken into account, in the Scenario-1 and 2. In the Scenario-3, the change of the consumer price owing to the introduction of tariff was considered.

7-3 DEVELOPMENT SCENARIO-1

7-3-1 Contents of the Development Scenario-1

The Development Scenario-1 predicts how future rice production will change, which becomes the base for consideration of rice production in future, on condition that present agriculture surroundings will

[3] 35kg/ha of the paddy seed amount is applied in KONSSANTIL

[4] Current situation, 5.0% and plan, 3.4% of storage loss were set based on the survey results of the Project.

[5] Current situation, 51.5% and plan, 55.0% of milling ratio were set based on survey results of the Project.

not change drastically and existing policies of MAF will continue. Because of the continuation of the same measures conducted so far in similar production activities as well as the present activities, it can be expected the yield will increase slightly. On the other hand, it is considered decrease in the planted area will get worse due to the spread of away from rice production.

Following three cases were set up since the future prediction has big uncertain factors and the results are changeable; 1) Widely decrease of the planted area - Pessimistic Case, 2) Maintaining the status of the planted area - Moderate Case and 3) Recovery of the planted area - Optimistic Case. Simulation of these cases will be conducted with variables of the planted area and the unit yield. Conditions which lead each case are arranged in the following table. If the existing policies continue and the decrease in the planted area is not be improved, the rice production will fall into the Pessimistic Case.

Table 7-3-1 Conditions that Lead Each Case

Case	Conditions of Occurrence
1) Widely decrease of the planted area - Pessimistic Case	- Influence of working opportunities and veteran/ old-age pention, which are considered to cause the decrease in the plnated area, will continue or strengthen. - Price of imported rice will fall drastically. - Large-scale bad weather will occur.
2) Maintaining the status of the planted area - Moderate Case	- Influence of working opportunities and veteran/ old-age pention, which are considered to cause the decrease in the planted area, will be mitigated. - Price of imported rice will not change drastically. - Large-scale bad weather will not occur.
3) Recovery of the planted area - Optimistic Case	- Influence of working opportunities and veteran/ old-age pention, which are considered to cause the decrease in the planted area, will be decreased. - Price of imported rice will soared remarkebly. - Large-scale bad weather will not occur.

(1) Pessimistic Case in the Scenario-1

(a) Planted Area

Right figure shows paddy planted area and unit yield in 2005 - 2013. From the peak of the planted area in 2008, decrease continues for four years except 2011, whose planted area increased compared to the year before. According to the main crops statistics by NDAH, rice planted area in 2013 is 26,403 ha[6], whose ratio to the previous year is 72 %[7].

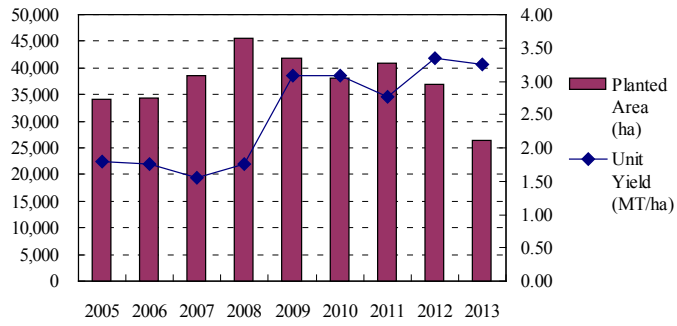


Figure 7-3-1 Change of Paddy Planted Area and Unit Yield

As a pessimistic future projection of planted area in paddy field, it is considered the remarkable decrease will continue. On the other hand, rice production of the minimum level will be kept in the future, considering the increase of rice consumption and the preference to domestic rice. Though linear approximation is good as a simple projection, a curve was applied to the approximation in the Pessimistic Case for decreasing the degree of decrease gradually because it is considered the trend of decrease of the planted area will calm down little by little and the planted area will reach "the stop-line", after that, the planted area of the lowest level will continue.

[6] Provisional value as for Jun 13, 2014

[7] Planted area in 2014 seems to be lower than that in 2013 according to an expert of WB/ AusAID in May 2014.

Figure 7-3-2 shows the result of the exponential approximation, using six years' planted areas in 2008 - 2013. The result of the exponential approximation, which comparatively well fitted those data, was extended until 2025.

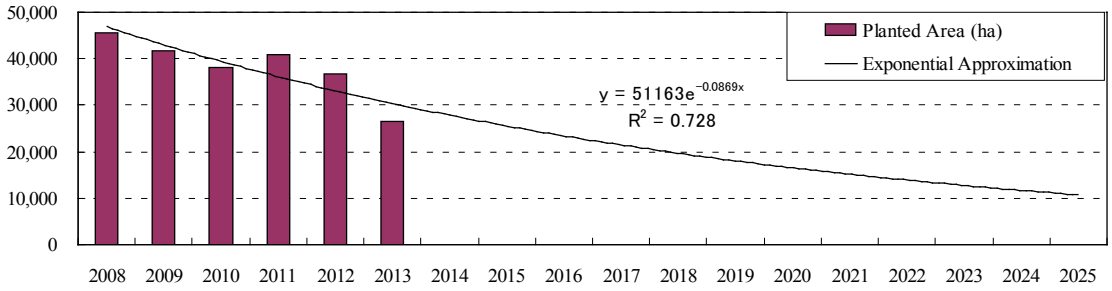


Figure 7-3-2 Estimation of the Planted Area by Exponential Approximation

Figure 7-3-3 shows rice harvested areas from 1981 to 2012. The harvested area in 2000, before the independence, was 17 thousand ha. We can see paddy of about 10 - 20 thousand ha was cultivated even in the civil war days. Though there is a problem of reliability on data before the independence, those paddy fields are considered to have good conditions because the planted area was limited under the civil war, which caused many damage on irrigation facilities, etc. Therefore, it is assumed the paddy cultivation of this level will continue even if the planted area is kept on decreasing in the near future. So, 15 thousand ha, the intermediate between 10 - 20 thousand ha was set as "the stop-line". The exponential approximation, mentioned above, estimated a planted area in 2021 was 15,156 ha and a planted area in 2022 was 13,895 ha. Hence, the exponential curve was applied for the estimation in 2014 - 2021 and planted areas in 2022 -2025 were given at 15,000 ha, which is constant.

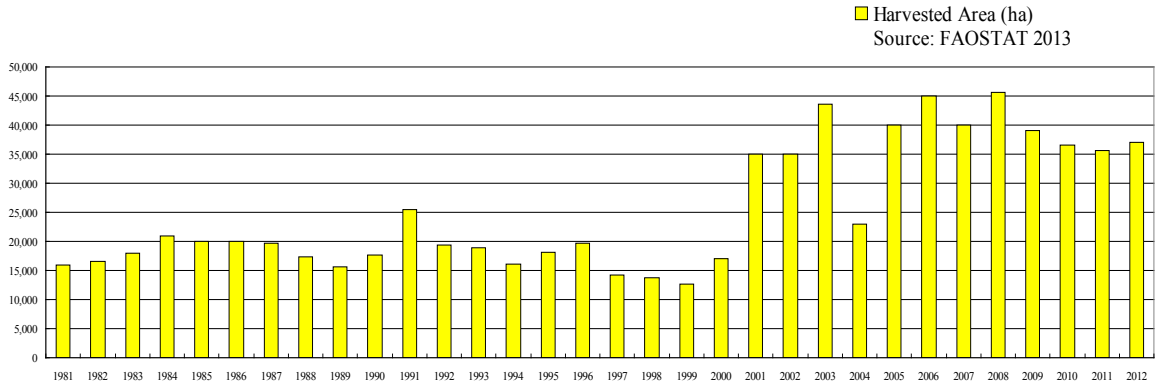


Figure 7-3-3 Change of Harvested Area of Rice

(b) Unit Yield

The yield of rice has increased about 1.8 times between 2008 and 2009 as shown in Figure 7-3-1. Five years after 2009, it shifted between 2.76 - 3.35 MT/ha. The tentative yield in 2013 is 3.25 MT/ha, which is 97 % of that in 2012. The expectation of a steep rise in yield without improvement of agricultural facilities or mass agricultural input in the whole country is difficult even if we consider examples in other countries. In the Pessimistic Case, 3.11 MT/ha of the average of five years, 2009 - 2013, was applied to every year until 2025 based on the understanding that high yield in these years is temporary phenomenon.

(2) Optimistic Case in the Scenario-1

(a) Planted Area

In the Optimistic Case, it is supposed to prevent the decreasing trend of planted area and moreover expect the expansion of the area but the expectation is difficult since the decrease of planted area continues for four years. However, recovery of planted area to 34,359[8] ha of all paddy fields throughout the country was assumed and set for the target of planted area in 2025, based on the supposition that natural and social

(b) Unit Yield

Unless improvement of agricultural facilities or mass agricultural input in the whole country, we cannot expect a steep rise in yield in the near future. However, 3.35 MT/ha, which is the highest yield in the past, was applied for those in 2014 - 2025 in the Optimistic Case because high yield in these years can be understood they were gained as a production standard of today by technical extension service, etc.

(3) Moderate Case in the Scenario-1

(a) Planted Area

In the Pessimistic Case, it is assumed the planted area will decrease until the lowest level of 15,000 ha in 2022, which is 57 % of that in 2013. In the Optimistic Case, it is assumed the planted area will recover until the level in 2012 of 34,359 ha in 2022, which is 130 % of that in 2013. As a middle case of the both cases, it is assumed to maintain the present state in the Moderate Case; the planted area in 2013 of 26,403 ha will continue to 2014 - 2025.

(b) Unit Yield

In the Pessimistic Case, it is assumed the average of the recent five years of 3.11 MT/ha will continue which is 96 % of that in 2013. In the Optimistic Case, it is assumed the highest yield in the past of 3.35 MT/ha will continue, which is 103 % of that in 2013. As a middle case of the both cases, it is assumed to maintain the present state in the Moderate Case; the actual result in 2013 of 3.25 MT/ha will continue to 2014 - 2025.

(4) Confirmation of the Contents of the Scenario-1

The contents of the Scenario-1, described so far, are arranged in the Table 7-3-2.

[8] 34,359ha of paddy field in the whole country is a result of the Inventory Survey of the Project.

Table 7-3-2 Contents of the Scenario-1

Case	Items	Unit	2013	2014	2015 - 2024	2025
Optimistic	Planted Area	ha	26,403	27,066	27,729 - 33,696	34,359
		Remark	Actual result	Constantly increase	Constantly increase	Paddy field area
	Unit Yield	MT/ha	3.25	3.35	3.35	3.35
		Remark	Actual result	Maximum	Equivalence	Maximum
	Storage Loss Ratio	%	5.00	5.00	5.00	5.00
		Remark	Current situation	Current situation	Equivalence	Current situation
	Milling Ratio	%	51.5	51.5	51.5	51.5
		Remark	Current situation	Current situation	Equivalence	Current situation
Moderate	Planted Area	ha	26,403	26,403	26,403	26,403
		Remark	Actual result	Latest result	Equivalence	Latest result
	Unit Yield	MT/ha	3.25	3.25	3.25	3.25
		Remark	Actual result	Latest result	Equivalence	Latest result
	Storage Loss Ratio	%	5.00	5.00	5.00	5.00
		Remark	Current situation	Current situation	Equivalence	Current situation
	Milling Ratio	%	51.5	51.5	51.5	51.5
		Remark	Current situation	Current situation	Equivalence	Current situation
Pessimistic	Planted Area	ha	26,403	27,847	25,529 - 15,000	15,000
		Remark	Actual result	Approximation	Approximation/ Minimum line	Minimum line
	Unit Yield	MT/ha	3.25	3.11	3.11	3.11
		Remark	Actual result	Average in 2009-2013	Equivalence	Average in 2009-2013
	Storage Loss Ratio	%	5.00	5.00	5.00	5.00
		Remark	Current situation	Current situation	Equivalence	Current situation
	Milling Ratio	%	51.5	51.5	51.5	51.5
		Remark	Current situation	Current situation	Equivalence	Current situation

7-3-2 Simulation of the Development Scenario-1

The summary of the simulation results of the Development Scenario-1 is shown in Table 7-3-3.

Table 7-3-3 The Summary of the Simulation Results of the Development Scenario-1

Item	Unit	2013	2014	2016	2018	2020	2022	2024	2025
Demand	MT	121,411	124,337	130,402	136,763	143,434	150,431	157,769	161,572
Case - Optimistic									
Milled Rice	MT	41,519	43,886	46,037	48,187	50,338	52,488	54,639	55,726
Deficit Amount	MT	-79,892	-80,451	-84,365	-88,576	-93,097	-97,943	-103,130	-105,846
Supply/Demand	%	34.2	35.3	35.3	35.2	35.1	34.9	34.6	34.5
Case - Moderate									
Milled Rice	MT	41,530	41,530	41,530	41,530	41,530	41,530	41,530	41,530
Deficit Amount	MT	-79,880	-82,806	-88,872	-95,233	-101,904	-108,901	-116,239	-120,041
Supply/Demand	%	34.2	33.4	31.8	30.4	29.0	27.6	26.3	25.7
Case - Pessimistic									
Milled Rice	MT	41,506	41,934	35,244	29,621	24,895	22,567	22,567	22,567
Deficit Amount	MT	-79,905	-82,403	-95,158	-107,142	-118,539	-127,865	-135,203	-139,005
Supply/Demand	%	34.2	33.7	27.0	21.7	17.4	15.0	14.3	14.0

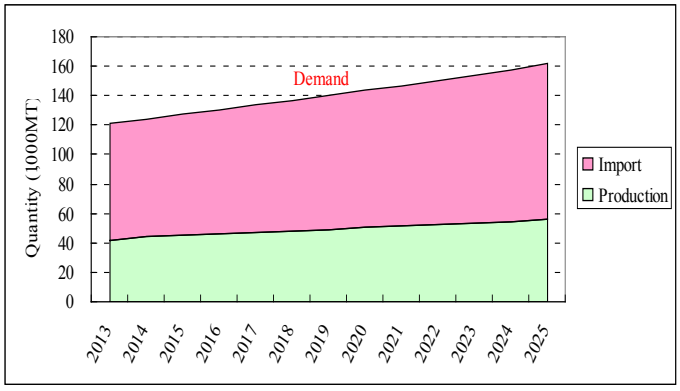


Figure 7-3-4 Optimistic Case of the Development Scenario-1

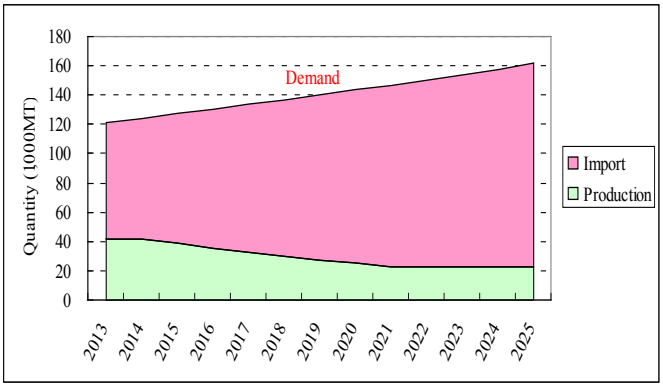


Figure 7-3-5 Pessimistic Case of the Development Scenario-1

In the Pessimistic Case, 42 thousand MT of domestic production of milled rice in 2013 will decrease until 23 thousand MT in 2025, which is 54 % of that in 2013. On the other hand, because of the increase of the demand, the difference between the supply and demand will swell from 80 thousand MT to 139 thousand MT, which is 174 % of that in 2013, and the self-sufficiency ratio will decrease widely from 34 % to 14 %.

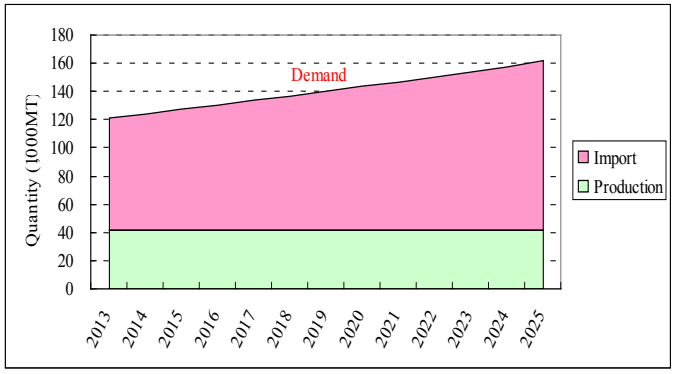


Figure 7-3-6 Moderate Case of the Development Scenario-1

In the Optimistic Case, the production of milled rice will increase to 56 thousand MT in 2025, which is 134 % of that in 2013 but the difference between the supply and the demand will also increase to 106 thousand MT, which is 132 % of that in 2013, and the self-sufficiency ratio of 35 % will be maintained.

In the Moderate Case, the production of milled rice is 42 thousand MT in 2025, which is same amount in 2013 but the difference between the supply and the demand will be 120 thousand MT owing to big increase of the demand, which is 150 % of that in 2013, and the self-sufficiency ratio will decrease to 26 %.

7-4 DEVELOPMENT SCENARIO-2

7-4-1 Contents of the Development Scenario-2

In the Development Scenario-2, a series of supporting activities will be invested until 2025 based on the Scenario-1; purchase of rice (paddy) by government, MCIE/ MAF as a stimulating policy to production incentive, and programs/ projects proposed in the agriculture master plan as supporting policies for productivity improvement. The effects of those supporting policies will be applied to the three cases of pessimistic, optimistic and moderate. The increase amount of rice production in each case will be studied.

In the subsistent farming area, production activities are proceeded, aiming to secure home-consumption rice. On the other hand, rice production whose purpose is to sell is proceeded in the rice bowl. It is assumed rice production will expand in suitable areas for rice cultivation where supporting policies for productivity improvement can increase yield though the trend away from rice production will proceed in areas that cannot increase the competitiveness; costs, quantity and quality.

(1) Purchase of Rice (paddy) by government, MCIE/ MAF

Now, small amount of rice is purchased by MCIE but they have big problems, e.g. delay of the payment, unequal quality of paddy, high price for the purchase, etc. There are opinions that MCIE/ MAF should buy paddy in order to increase farmers' incentive to cultivate rice.

In the Development Scenario-2, the target areas of the purchase of rice (paddy) are to be the rice bowl of 20,749 ha, which accounts for 60 % of the total paddy fields of 34,359 ha, according to the result of the Inventory Survey. Through the implementation of the purchase and programs/ projects related to crop productivity improvement in supporting policies for productivity improvement is attempted.

(2) Supporting Policy for Productivity Improvement

In the supporting policy for productivity improvement, eight programs/ projects will be conducted to increase the yield. It is difficult to set the increments of the yield by separate program/ project

implementation, because they are related with each other intricately. So, as for setting the increments of the yield, it was assumed that the effects of the supporting policy for productivity improvement will occur in the four programs (See Table 7-4-1.) as the representative of the eight programs/ projects. Their effects of the four programs are comparatively easy to study, taking the results of the projects that were conducted so far into account. Target values were set for the four programs, considering the actual results of GAP in Timor-Leste.

Table 7-4-1 Effects of the Supporting Policy for Productivity Improvement

Program/Project	Items		Yield (MT/ha)	2013 Present (%)	2025 Plan (%)	Increment of Country Yield (MT/ha)
Program for obtaining and breeding quality seed	Rice bowl（60%）	Proper obtaining and breeding quality seed	3.60	15	30	
		Improper obtaining and breeding quality seed	3.13	45	30	
		Converted yield to the whole country (MT/ha)		1.95	2.02	0.07
	Subsistent farming area（40%）	Proper obtaining and breeding quality seed	3.60	10	20	
		Improper obtaining and breeding quality seed	3.13	30	20	
		Converted yield to the whole country (MT/ha)		1.30	1.35	0.05
	Yield of the whole country (MT/ha)			3.25	3.37	0.12
Dissemination program for cultivation techniques	Rice bowl（60%）	Intensive farming	4.76	3	24	
		Extensive farming	3.17	57	36	
		Converted yield to the whole country (MT/ha)		1.95	2.28	0.33
	Subsistent farming area（40%）	Intensive farming	4.76	2	8	
		Extensive farming	3.17	38	32	
		Converted yield to the whole country (MT/ha)		1.30	1.40	0.10
	Yield of the whole country (MT/ha)			3.25	3.68	0.43
Strengthening program for pest and disease control	Rice bowl（60%）	Cultivating prevention	4.06	0	15	
		No prevention	3.25	60	45	
		Converted yield to the whole country (MT/ha)		1.95	2.07	0.12
	Subsistent farming area（40%）	Cultivating prevention	4.06	0	4	
		No prevention	3.25	40	36	
		Converted yield to the whole country (MT/ha)		1.30	1.33	0.03
	Yield of the whole country (MT/ha)			3.25	3.40	0.15
Local resource circulative agriculture promotion project	Rice bowl（60%）	Compost making and utilizing	3.58	0	9	
		No compost	3.25	60	51	
		Converted yield to the whole country (MT/ha)		1.95	1.98	0.03
	Subsistent farming area（40%）	Compost making and utilizing	3.58	0	6	
		No compost	3.25	40	34	
		Converted yield to the whole country (MT/ha)		1.30	1.32	0.02
	Yield of the whole country (MT/ha)			3.25	3.30	0.05
Yield of the whole country (MT/ha)	Implementation of program/ project in the rice bowl			3.25	3.80	0.55
	Implementation of program/ project in the subsistent farming area			3.25	3.45	0.20
	Implementation of program/ project in the whole country			3.25	4.00	0.75

As a supporting policy for productivity improvement; the case that the target area of the programs/ projects is only the rice bowl increases the yield of the whole country by 0.55 MT/ha, the case that the target area of the programs/ projects is only the subsistent farming area increases the yield of the whole country by 0.20 MT/ha, the case that the target area of the programs/ projects is whole of the country increases the yield of the whole country by 0.75 MT/ha. Since the target area of the public purchase of rice in the Scenario-2 is the rice bowl as mentioned above, the yield in the Scenario-2 is planned to add 0.55 MT/ha until 2025 based on the yield of the Scenario-1.

(3) Increase of Paddy Field Area by Programs/ Projects Related to Irrigation Facilities

According to the Inventory Survey, now, non-cultivated paddy field due to malfunction of irrigation facilities is about eight thousand ha (7,956 ha). In the Development Scenario-2, the eight thousand ha is the rehabilitation target until 2025 in the programs/ projects related to irrigation facilities of the supporting policy for productivity improvement.

(4) Moderate Case in the Scenario-2

(a) Planted Area

In the Moderate Case of the Scenario-1, maintaining the present state is assumed and 26,403 ha of the planted area in 2013 will continue to 2014 - 2025. In the Moderate Case of the Scenario-2, based on the Moderate Case of the Scenario-1, 34,359 ha (=26,403+7,956) of the target in 2025 was planned to

plant, considering the rehabilitation target above mentioned.

(b) Unit Yield

In the Moderate Case of the Scenario-1, maintaining the present state is assumed and 3.25 MT/ha in 2013 will continue until 2025. In the Moderate Case of the Scenario-2, based on the Moderate Case of the Scenario-1, 3.80 MT/ha (=3.25+0.55) of the target in 2025 was planned to achieve through the implementation of the supporting policy for productivity improvement in the rice bowl.

(5) Pessimistic Case in the Scenario-2

(a) Planted Area

As for the planted area of the Pessimistic Case in the Scenario-2, based on the Pessimistic Case in the Scenario-1, 8,000 ha of planted area caused by the programs/ projects related to irrigation facilities improvement is added on the line of the planted area of the case in the Scenario-1. Also, in the Pessimistic Case in the Scenario-1, 15,000 ha of "the stop-line " was set and the planted areas in and after 2022 were regarded as 15,000 ha but the added planted area of 8,000 ha was conducted on the estimated values by the exponential curve of the Pessimistic Case in the Scenario-1 because the correction to "the stop-line" should be conducted at the final stage of the planted area setting. As the result of the adding, the minimum value of the planted area was 18,662 ha in 2025, which is bigger than 15,000 ha; then, the correction to "the stop-line" is not occurred.

(b) Unit Yield

In the Pessimistic Case of the Scenario-1, the state of 3.11 MT/ha will continue until 2025. In this Case of the Scenario-2, based on the Pessimistic Case of the Scenario-1, 3.66 MT/ha (=3.11+0.55) of the target in 2025 was planned to achieve through the implementation of the supporting policy for productivity improvement in the rice bowl.

(6) Optimistic Case in the Scenario-2

(a) Planted Area

In the Optimistic Case of the Scenario-2, the total paddy field area of 34,359 ha was planned as the target in 2025 as well as the Optimistic Case in Scenario-1.

(b) Unit Yield

In the Optimistic Case of the Scenario-1, the yield of 3.11 MT/ha will continue. In the Optimistic Case of the Scenario-2, based on the Optimistic Case of the Scenario-1 (3.35 MT/ha), 3.90 MT/ha (=3.35+0.55) of the target in 2025 was planned to achieve through the implementation of the supporting policy for productivity improvement in the rice bowl.

(7) Confirmation of the Contents of the Scenario-2

The contents of the Scenario-2, described so far, are arranged in the next table.

Table 7-4-2 Contents of the Scenario-2

Case	Items	Unit	2013	2014	2015 - 2024	2025
Optimistic	Planted Area	ha	26,403	27,066	27,729 - 33,696	34,359
		Remark	Actual result	Constantly increase	Constantly increase	Paddy field area
	Unit Yield	MT/ha	3.25	3.30	3.36 - 3.85	3.35
		Remark	Actual result	Constantly increase	Constantly increase	Scenario-1 + 0.55
	Storage Loss	%	5.00	4.90	4.70 - 3.50	3.40
	Ratio	Remark	Current situation	Constantly decrease	Constantly decrease	Estimated target
	Milling Ratio	%	51.5	51.8	52.1 - 54.7	55.0
		Remark	Current situation	Constantly increase	Constantly increase	Estimated target
Moderate	Planted Area	ha	26,403	27,066	27,729 - 33,696	34,359
		Remark	Actual result	Constantly increase	Constantly increase	Paddy field area
	Unit Yield	MT/ha	3.25	3.30	3.34 - 3.75	3.80
		Remark	Actual result	Constantly increase	Constantly increase	Scenario-1 + 0.55
	Storage Loss	%	5.00	4.90	4.70 - 3.50	3.40
	Ratio	Remark	Current situation	Constantly decrease	Constantly decrease	Estimated target
	Milling Ratio	%	51.5	51.8	52.1 - 54.7	55.0
		Remark	Current situation	Constantly increase	Constantly increase	Estimated target
Pessimistic	Planted Area	ha	26,403	28,510	26,855 - 18,971	18,662
		Remark	Actual result	Approximation+increase	Approximation+increase	Approximation+increase
	Unit Yield	MT/ha	3.25	3.28	3.32 - 3.63	3.66
		Remark	Actual result	Constantly increase	Constantly increase	Scenario-1 + 0.55
	Storage Loss	%	5.00	4.90	4.70 - 3.50	3.40
	Ratio	Remark	Current situation	Constantly decrease	Constantly decrease	Estimated target
	Milling Ratio	%	51.5	51.8	52.1 - 54.7	55.0
		Remark	Current situation	Constantly increase	Constantly increase	Estimated target

7-4-2 Simulation of the Development Scenario-2

The summary of the simulation results of the Development Scenario-2 is shown in the next table. In the Pessimistic Case, 41 thousand MT of domestic production of milled rice in 2013 will decrease until 36 thousand MT in 2025. On the other hand, because of the increase of the demand, the difference between the supply and demand will increase from 80 thousand MT to 126 thousand MT, and the self-sufficiency ratio will decrease from 34 % to 22 %. However, in comparison with the Pessimistic Case in the Scenario-1, the supply amount and the self-sufficiency ratio in 2025 are about 1.6 times of those in the Scenario-1.

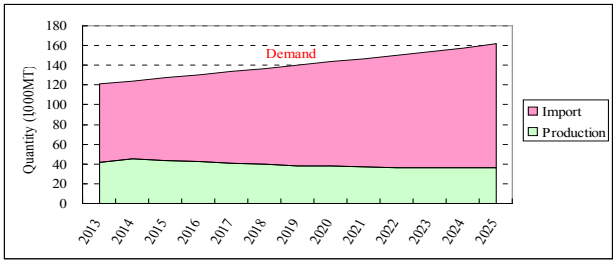


Figure 7-4-1 Pessimistic Case of the Development Scenario-2

Table 7-4-3 The Summary of the Simulation Results of the Development Scenario-2

Item	Unit	2013	2014	2016	2018	2020	2022	2024	2025
Demand	MT	121,411	124,337	130,402	136,763	143,434	150,431	157,769	161,572
Case - Optimistic									
Milled Rice	MT	41,519	43,585	47,903	52,472	57,299	62,392	67,756	70,555
Supply - Demand	MT	-79,892	-80,751	-82,499	-84,291	-86,135	-88,040	-90,013	-91,016
Supply / Demand	%	34.2	35.1	36.7	38.4	39.9	41.5	42.9	43.7
Case - Moderate									
Milled Rice	MT	41,519	43,474	47,548	51,844	56,369	61,128	66,126	68,730
Supply - Demand	MT	-79,892	-80,862	-82,854	-84,919	-87,066	-89,304	-91,643	-92,842
Supply / Demand	%	34.2	35.0	36.5	37.9	39.3	40.6	41.9	42.5
Case - Pessimistic									
Milled Rice	MT	41,494	45,670	42,115	39,446	37,579	36,438	35,957	35,959
Supply - Demand	MT	-79,916	-78,667	-88,287	-97,317	-105,856	-113,994	-121,812	-125,613
Supply / Demand	%	34.2	36.7	32.3	28.8	26.2	24.2	22.8	22.3

In the Moderate Case, the production of milled rice increases to 69 thousand MT in 2025 and the difference between the supply and the demand also increases to 93 thousand MT but the self-sufficiency ratio will improve to 43 % because the incremental of the supply exceeds the incremental of the demand. The simulation result in the Optimistic Case is almost same as the Moderate Case since the increase of the planted area reaches the limit though the amount of milled rice will increase to 71 thousand MT and the self-sufficiency ratio will improve to 44 %.

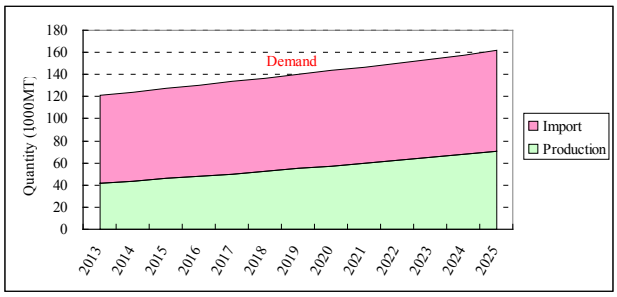


Figure 7-4-2 Moderate Case of the Development Scenario-2

7-4-3 Inputs of the Development Scenario-2

(1) Basic Policy of the Input Plan

As a stimulating policy to production incentive, public purchase of rice by MAF is applied. It is necessary for materializing the purchasing policy by MAF to cooperate with MCIE and prepare implementation body because MCIE operates public purchase of agriculture produce including rice though their dealing amount is small.

On the other hand, considering the existing organization size of MAF, support of experts who have a thorough knowledge of policies is required for realizing the purchase by MAF. Deal with technical problems to be solved as cooperation with MCIE, Preparation of implementation body in MAF, and establishment of purchasing system are able to be achieved only after receiving those supports.

Programs/ projects for expansion of planted area, increase of yield, and commercializing rice production have to be implemented unitedly in irrigation schemes in the supporting policy for productivity improvement. Priority areas of the policy are areas in the rice bowl.

Based on the above consideration, inputs to materialize the both policies are planned in the following fields.

Table 7-4-4 Basic Concept of the Inputs Plan

Policy	Basic Concept of the Inputs Plan
Stimulating policy to production incentive	● Preparation of the Implementation body for the purchasing policy ● Establishment of the rice purchasing system ● Consultation and cooperation on technical problems with MCIE ● Strengthening implementation capacity of MAF implementation body
Supporting policy for productivity improvement	● *Focusing on the rice bowl, which aims to commercialize rice production* ● Cooperation with related directorates in MAF, and establishment of implementation body of MAF ● Preparation of project implementation body and monitoring structure ● Support for implementation of programs/ projects

(2) Input Cost of the Scenario-2

Total input cost of the Scenario-2 is 212 million US$, which is sum of 84 million US$ for the cost of the supporting policy for productivity improvement and 128 million US$ for the cost of the public purchase of rice by MAF in the stimulating policy to production incentive. The following figure shows the annual input plan of the supporting policy for productivity improvement until the target year, 2025. Input cost for the fields of the basic concept of the inputs plan, above mentioned, is not included in the

input cost for the stimulating policy to production incentive.

Supporting Policy / Programs & Projects	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total Input Cost (US$1,000)
＜Prodcution Incentive Stimulating Policy＞(MAF rice purchasing policy)												
Making consensus for the policy												
Establishment of MAF organization structure and operating system												
Operation of the policy												
＜Prodcutivity Improvement Supporting Policy＞												
Establishment of implementation organization												
Programs/ Projects												
Yearly input cost (US$1,000)		118	5,437	5,438	10,526	10,721	13,949	9,662	9,450	9,451	9,330	84,082

Figure 7-4-3 Annual Input Plan for the Supporting Policy for Productivity Improvement

7-4-4 Cost - Benefit Analysis of the Development Scenario-2

As the result of the calculation of cost-benefit ratio of the Moderate Case in the Scenario-2 in the next table, B/C was 0.66. The preparation of programs/ projects was begun in 2016 in accordance with the annual input plan. The cost and benefit until 2025 of the Case were raised. Though projects of the Scenario-2 will finish until 2015, activities in 2025 will continue to 2035 since rice production or rice import will continue after 2025.

Table 7-4-5 Cost - Benefit Ratio of the Moderate Case in the Scenario-2

Unit: $1,000

	Cost						Benefit			Net Benefit	Discount Rate	Present Value	
	Purchasing Cost	Program Cost	Project Cost Total	Cost of Rice Production	Cost of Rice Imported	Total Cost	Value of Rice Production	Sales Revenue	Total Benefit		12.0%	Cost	Benefit
2013				12,032	36,191		28,648						
2014				12,781	37,035		30,432						
2015				13,563	37,896		32,293				1.0000		
2016	299	118	417	14,578	39,770	54,765	34,710	0	34,710	-20,055	0.8800	48,193	30,545
2017	299	5,437	5,736	16,063	42,609	64,408	38,244	0	38,244	-26,164	0.7744	49,878	29,616
2018	4,673	5,438	10,111	17,855	45,601	73,568	42,512	1,792	44,304	-29,263	0.6815	50,134	30,192
2019	8,015	10,526	18,541	19,760	48,837	87,138	47,048	3,713	50,761	-36,378	0.5997	52,256	30,441
2020	11,545	10,721	22,266	21,781	51,891	95,938	51,859	5,766	57,625	-38,313	0.5277	50,630	30,411
2021	15,269	13,949	29,218	23,675	55,284	108,178	56,370	7,955	64,325	-43,853	0.4644	50,238	29,873
2022	19,191	9,662	28,853	25,930	58,851	113,634	61,739	10,283	72,022	-41,613	0.4087	46,440	29,434
2023	23,018	9,450	32,468	28,313	62,327	123,108	67,412	12,753	80,165	-42,943	0.3596	44,274	28,830
2024	22,399	9,451	31,850	29,717	63,875	125,442	70,755	13,172	83,927	-41,515	0.3165	39,700	26,561
2025	23,011	9,330	32,341	31,465	65,361	129,166	74,916	13,600	88,516	-40,651	0.2785	35,973	24,652
2026				31,465	65,918	97,382	74,916		74,916	-22,467	0.2451	23,867	18,360
2027				31,753	66,660	98,414	75,603		75,603	-22,811	0.2157	21,225	16,305
2028				32,042	67,310	99,352	76,290		76,290	-23,062	0.1898	18,856	14,479
2029				32,619	67,960	100,579	77,665		77,665	-22,915	0.1670	16,798	12,971
2030				32,619	68,610	101,229	77,665		77,665	-23,565	0.1470	14,878	11,415
2031				32,908	69,167	102,075	78,352		78,352	-23,723	0.1293	13,202	10,134
2032				33,485	69,910	103,395	79,727		79,727	-23,668	0.1138	11,768	9,074
2033				33,774	70,560	104,334	80,414		80,414	-23,920	0.1002	10,450	8,054
2034				34,063	71,395	105,458	81,101		81,101	-24,357	0.0881	9,295	7,148
2035				34,063	71,860	105,922	81,101		81,101	-24,821	0.0776	8,216	6,290
Total	127,719	84,082	211,801	596,304	1,334,880	1,993,486	1,419,771	69,034	1,397,432	-596,054		616,270	404,786

7-4-5 Other Production Incentive Stimulating Policies in Non-Border Control Policy

(1) Support for Agricultural Inputs

This policy aims to provide a rice-production condition which allows farmers to secure profit even if selling price is low, reducing production cost of domestic rice that is born by farmers, instead of raising rice price by border control or public purchase, distributing agriculture inputs, such as seeds, fertilizer, agricultural chemicals, machine, fuel, etc. by free of charge. Though this is one of the policies that MAF implements even now, beneficially farmers/ area is limited low, considering the

high cost, is pointed out. Also, farmers who have not received those distributions tend to have dissatisfaction since the selection of target farmers of the distribution is not conducted rationally/ strategically.

Therefore, MAF aims to change the distribution to supply of agriculture inputs by private sector at farmers' own expense from the viewpoints of fairness in public services or validity of national policy; however, the development speed of farmers and dealers is slow, and also, MAF has not yet found substitute policy for the distribution. Under such problems, the present situation, which cannot easily reduce the support for agricultural inputs in order to reduce the trend of decreasing planted area, is continued.

In terms of policy cost, the total cost until 2025 is assumed about two hundred million US$ and the annual average is about 20 million US$, considering same level of impact is required as the public purchase of rice. Necessary implementation body and management skill of MAF seem to be comparatively easy since the main activity is distribution of materials without cost, which caused large-scale implementation in the early days after the independence as main policy. However, this rice production policy, which the government provides equipment and material free of charge to rice farmers, cannot be denied losing opportunity to cause ownership for rice cultivation and increasing the degree of dependence on the government.

(2) Income Compensation

Government compensates rice farmers for the income difference between rice production and other working opportunity when the farmers conducted low/ no profit rice production. As for the management cost of the project, it will be lower than public purchase or support for agricultural inputs because the compensation is cash provision without movement of rice or material or equipment. However, farmers who try to apply the policy have to demand the difference with the record after the selling of rice as this system is "compensation". The introduction of this system into Timor-Leste at present is difficult, considering taking time to receive compensation money, including the inspection of the application.

7-5 DEVELOPMENT SCENARIO-3

7-5-1 Outline of Development Scenario-3

Under the Development Scenario-3, the government of Timor-Leste introduces border measures to stimulate farmers' willingness to produce. Main measure of the border policy is tariff increase in imported rice. Under the tariff policy, competitiveness of domestic rice against imported rice increases, and rice production of competitive farmers will expand. At the same time, however, increase in price of imported rice depresses demand of rice. In fact, increase of self-sufficiency of rice is brought out because, while rice production increases, demand of rice decreases. Increase in price of imported rice hit directly consumers' buying inclination, and bring pressure upon inflation. Therefore, it is necessary to protect low income households based on the increased tariff revenue.

The border measures includes tariff policy, import quota system, import restriction of particular quality and season. The tariff policy is a subject of quantitative analysis, whereas other measures are qualitatively introduced in this section.

7-5-2 Tariff Policy

(1) Condition of the Simulation

(a) Tariff Rate

Objective of the tariff policy is to generate competitive environment of domestic rice against imported

rice. In Chapter 4, a simple regression analysis of market prices of rice is conducted to grasp relation between market prices, including domestic rice and imported rice, and distances from Dili. Following table shows price differences between domestic rice and imported rice.

Table 7-5-1 Price Differences between Domestic Rice and Imported Rice

Location	Dili	Manatuto	Baucau	Viqueque	Uotolari	Average
Distance (km)	1	50	100	150	190	95
Local Rice (USD/kg)	1.26	0.99	0.94	0.91	0.89	0.94
Imported Rice (USD/kg) /a	0.60	0.64	0.68	0.72	0.75	0.67
Tariff Rate (%)	**110%**	55%	39%	27%	19%	**40%**

Note: a/ Tariff rate of 2.5% is excluded from prices of imported rice

Result of the analysis indicated that, at least, introduction of 40% of tariff rate is necessary to raise price of imported rice to the level of domestic rice in the major production area including Manatuto and Baucau. Furthermore, to increase price of imported rice to the same level of domestic price in the whole country, introduction of 110% tariff rate is required. Therefore, tariff rate of 40% and 110% are adopted in the simulation.

An inaugural year of the tariff increase is set as 2016, after establishing organizational structure of MAF for the tariff policy in 2015. In addition, gradual increase in the tariff rate is adopted to avoid skyrocket of rice price in the domestic market, and to minimize negative impact on consumers' economy.

(b) Demand Curve and Supply Curve

As a base case of this simulation, the moderate case in the Development Scenario-1 is adopted, and the demand curve (D = -81396P + 188623) and the supply curve (S = 8353P + 46635) discussed in Chapter 4 are applied. Price elasticity of demand and supply of the both curves are -0.424 and 0.11 respectively.

It is expected that the introduction of tariff policy triggers positive investment of both public and private sectors in irrigation agriculture. As a result, production factors including land and capital would have changed during the target years of simulation, from 2016 to 2025, and the price elasticity of supply (PES) would increase from current 0.11 (Java, short term). Therefore, larger PESs including 0.21 (observed in Kalimantan, long term), and 0.52 (in Sumatra, long term) are adopted in the analysis. The reason why these PES are adopted is yield of rice in Kalimantan is 3.5t/ha which is almost same level as that in Timor-Leste, whereas rice yield in Sumatra is 4.2t/ha which is enough possible level if the government implement positive investment in irrigation agriculture after adopting aggressive tariff policy.

(c) Future Price of Imported Rice

Future prospect of international price of rice are needed in the simulation, and the World Bank's data is utilized in the analysis. According to the World Bank's estimation, the international price of rice will decrease from 2014 to 2025. However, if we look at past trend, the prices had increased slowly with repeating erratic fluctuation. Therefore, a tendency equation is estimated from time series data (from 1960 to 2025), and is applied in the trend expectation of the international price of rice. Following figures show the price forecast of grains estimated by the World Bank, and the past price trend of rice with the tendency equation.

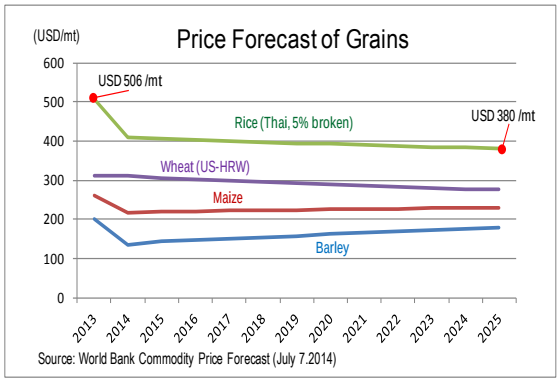


Figure 7-5-1 Price Forecast of Grains

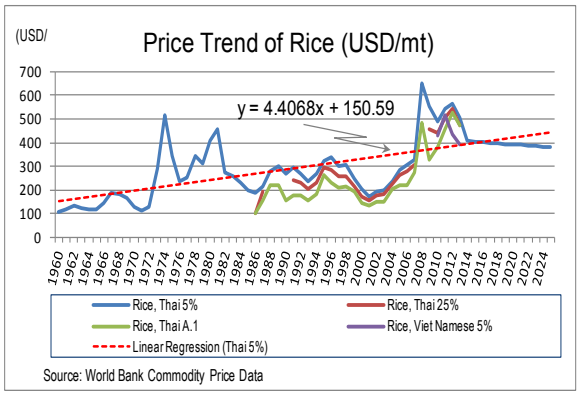


Figure 7-5-2 Price Trend of Rice

(d) Case Study

Based on the above conditions, following 5 cases are simulated. For easy comparison purpose, zero tariff option is also estimated in this simulation as Case-0. Indicators for comparison of the cases are; production volume of rice, total demand of rice, volume of rice import, and self-sufficiency rate.

Case-0 : Tariff rate of rice is 0%

Case-1 : Tariff rate of rice is 40% with PES＝0.21

Case-2 : Tariff rate of rice is 110% with PES＝0.21

Case-3 : Tariff rate of rice is 40% with PES＝0.52

Case-4 : Tariff rate of rice is 110% with PES＝0.52

(2) Simulation Result

Changes in demand and supply of rice after introduction of tariff policy are as follows.

When tariff rate is zero (Case-0), total demand of rice increases by 35% from 2013 to 2025, under the strong influence of population increase. At the same time, total production of domestic rice remains same level since farmer's production incentive keeps low level due to free inflow of cheap imported rice from international market. As a result, import of rice increases by 53% from around 80 thousand ton in 2013 to 122 thousand ton in 2025.

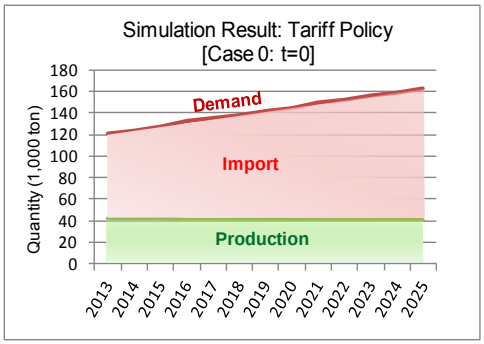


Figure 7-5-3 Demand and Supply (Case-0)

On one hand, after introducing tariff policy, production of domestic rice expands due to increase of farmer's willingness to production. However, under the current subsisting farming condition, increase in domestic rice production remains only 8% in Case-1, and 26% in Case-2. On the other hand, tariff increase causes increase in consumer price of rice in domestic markets, which results in reduction in rice consumption and demand increase in substitutional foods including maize and cassava. As a result, in Case-1, import volume of rice increases from 80 thousand ton in 2013 to 90 thousand ton in 2025, while in Case-2 rice import decreases to 37 thousand ton during the same period.

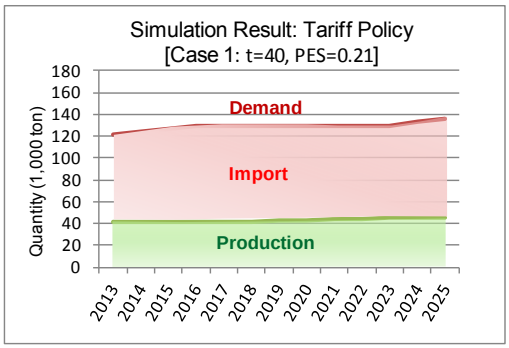


Figure 7-5-4 Demand and Supply (Case-1)

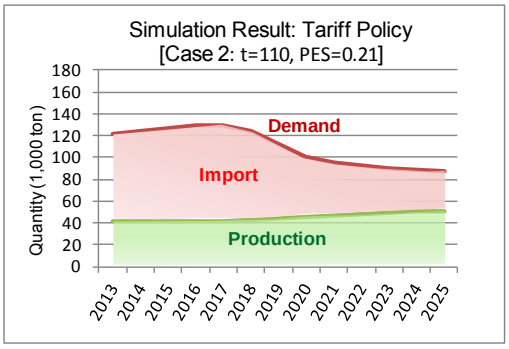


Figure 7-5-5 Demand and Supply (Case-2)

Simulation results of Case-3 and Case-4 indicate that productivity of rice increases due to positive investment in irrigation agriculture under the aggressive tariff policy. Under the condition, it is expected that production of rice has shifted from subsistent farming to commercial farming, and impact of tariff policy would be more visible. While demand of rice remains at the same level of Case-1 and -2, producer's response to price change in imported rice is different, and rice production expands by 20% in Case-3 (t=40%) and by 56% in Case-4 (t=110%). As a result, from 2013 to 2025, import of rice increases to 86 thousand ton in Case-3, whereas that decreases to 23 thousand ton in Case-4.

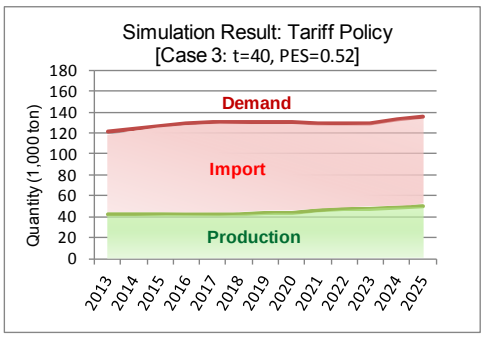


Figure 7-5-6 Demand and Supply (Case-3)

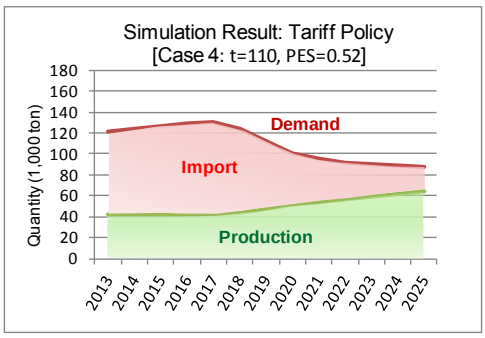


Figure 7-5-7 Demand and Supply (Case-4)

In addition, the simulation result indicates that, as tariff rate increases, self-sufficiency rate also increases, as following figures illustrates. Under the zero tariff condition (Case-0), cheap rice is freely imported and self-sufficiency rate decreases from 34% in 2013 to 25% in 2025. Under the high tariff condition, however, self-sufficiency rate increases up to 33% in Case-1(t=40) and up to 58% in Case-2 (t=110%). Also, under the higher productivity condition with larger PES in Case-3 and -4, self-sufficiency rate becomes 37% under 40% tariff rate condition and 74% under 110% tariff rate condition. The simulation result also shows that 100% of self-sufficiency rate can be materialized when tariff rate is 173% in Case-1 and -2 (PES=0.21), and 153% in Case-3 and -4 (PES=0.52).

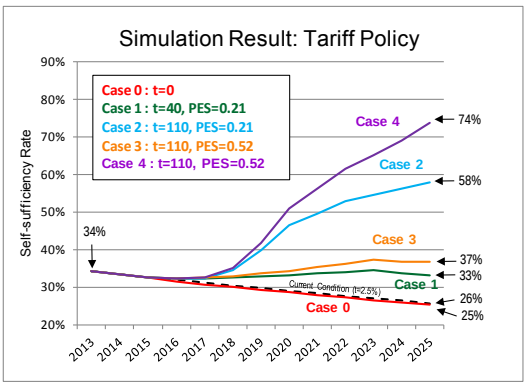


Figure 7-5-8 Simulation Result (Self-sufficiency Rate)

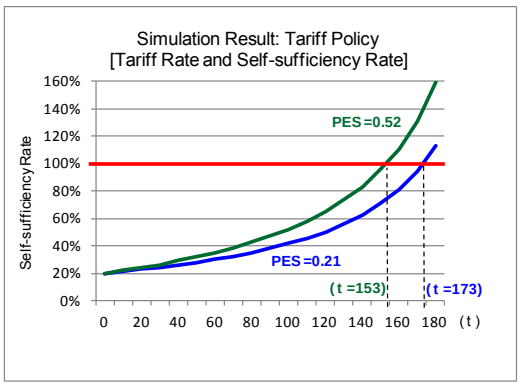


Figure 7-5-9 Tariff Rate and Self-sufficiency Rate

(3) Impact on Consumers

Average consumer price of imported rice in Dili is estimated at $0.69/kg in 2013. By applying future price trend of international rice, simulation results indicate that, in 2025, average imported price will be $0.77/kg at zero tariff rate, whereas $1.09/kg and $1.64/kg at 40% and 110% of tariff rate respectively. If we estimate consumers' future expenditure for rice based on the price changes, household's annual expenditure will increase by $203/HH at t=40% level, and by $553/kg at t=110% level.

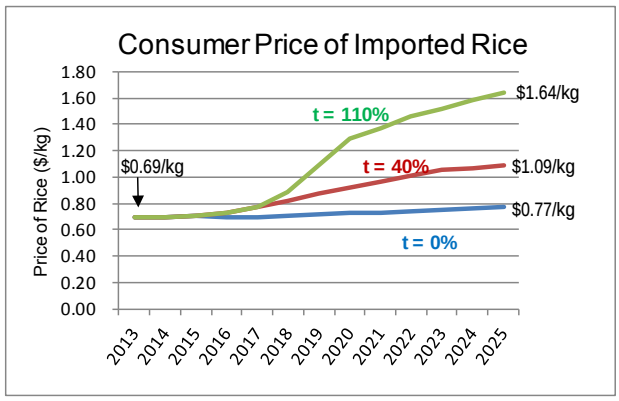


Figure 7-5-10 Consumer Price of Import Rice

When we look at past trend of price index of Timor-Leste and estimate it's future trend, it is possible that consumer price will double from 2013 to 2025. If household income increases up to the same level, share of expenditure for rice in total monthly expenditure decrease from 12% at present to 9% under the 40% tariff rate, while the share will increase to 14% under the 110% tariff rate condition. According to financial section of MAF, however, monthly salary of the government officials has not been changed since the period of UN rule. If the salary level continues, the share of rice expenditure in total household expenditure increases up to 19% and 29% at the tariff rate of 40% and 110% respectively.

(4) Investment Plan

Border measures will be taken under the support policy for production incentive. To make a consensus among the relevant government organizations, MAF have to take initiative by fixing appropriate tariff rate and method of introduction, for example. However, when we look at current manpower of MAF, it would be necessary to input additional senior policy specialists to advise policy making and coordination of relevant government organizations.

At the same time of implementing the support policy for production incentive, as is mentioned in the Development Scenario-2, program or project for crop area recovery, yield increase of rice, shifting toward commercial farming of rice will be integrally implemented. Under the policy implementation, enhancement of rice production will be conducted in both the commercial rice production areas and the subsistence rice production areas. For this purpose, MAF have to establish implementation organization and system to implement projects and programs in both areas, with phase by phase approach. Following table shows outline of the investment plan.

Table 7-5-2 Basic Policy of the Investment Plan

Policy	Basic Policy for Investment plan and Activities
Support policy for production incentive	Assisting establishment of organization to introduce border measures Formulation of Implementation plan of the border measures Discussion and coordination among stakeholders of the border measures Capacity development of implementation organization of MAF
Support policy for production expansion	Establishment of implementation organization Coordination among relevant directorate and department in MAF Establishment of implementing system of project implementation and monitoring Supporting implementation of project or program

Implementation cost of the Development Scenario-3 is estimated at $98 million, and implementation schedule up to 2025 is shown in table below.

Table 7-5-3 Annual Implementation Schedule

Supporting Policy / Programs & Projects	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total Input Cost (US$1,000)
＜Prodcution Incentive Stimulating Policy＞(Border control policy)												
Making consensus for the policy												
Operation of the policy												
＜Prodcutivity Improvement Supporting Policy＞												
Establishment of implementation organization												
Programs/ Projects												
Yearly input cost (US$1,000)		117	6,064	5,904	12,303	11,997	18,728	10,910	10,711	10,728	10,520	97,982

(5) Cost-Benefit Analysis

Cost effectiveness of the Development Scenario-3 is analyzed in terms of financial manner. For this purpose, an analytical method adopted by Center for Agri-food Policy and Agribusiness Studies in Padajdjaran University, Indonesia is applied. Cost and benefit estimated in the analysis are as follows.

- Cost: Project cost for support policy for production expansion, Production cost of rice, Cost of rice imported
- Benefit: Total value of rice production, Tariff revenue

Different point from ordinal economic analysis is tariff revenue and cost of rice imported are included in the above analysis. Tariff revenue is a transfer payment which is not taken into account in the economic analysis, but the center's analysis regards it as benefit because it is additional income of the government, generated by implementation of the tariff policy. Also, the cost of import rice is regarded as a necessary expense to fill domestic demand of rice, and is added to the benefit of the policy implementation. Following table shows result of the analysis. When the tariff rate is set as 110%, B/C exceeds 1.0 and NPV becomes positive.

Table 7-5-4 Cost Effectiveness of Development Scenario-3

	Case 0	Case 1	Case 2	Case 3	Case 4
B/C	0.46	0.72	1.07	0.75	1.20
NPV	-246,693	-141,111	32,415	-124,204	91,936

Simulation result and cost- benefit analysis are shown in Tables 7-5-5 and 7-5-6.

(6) Conclusion

The increase in tariff rate stimulates farmers' production incentive, which results in increase in self-sufficiency rate of rice. Also, as tariff rate increase, its contribution to self-sufficiency rate becomes larger. Therefore, if we target more than 60% of self-sufficiency rate of rice, it is necessary to introduce, at least, 110% of tariff rate which makes price of imported rice to the same price level of domestic rice.

However, under the current production level in Timor-Leste where subsistent farming is dominant, effect of tariff policy on the production expansion of rice is quite limited. Rather, negative impact on consumers' economy is higher, since self-sufficiency rate increases due to reduction of rice demand, under the high price level of rice. On the other hand, simulation result of Case-3 and 4 indicated that impact of tariff policy would be more visible when commercial farming becomes more popular in Timor-Leste due to intensive investment in agriculture sector.

Based on above simulation result, it can be said that, if we introduce tariff policy, gradual increase of tariff rate is necessary to control inflation and reduce negative impact on consumers economy. At the same time, it is required to promote intensive investment in irrigation agriculture to enhance productivity of rice, which may result in higher response of farmers to the government intervention including tariff control.

Table 7-5-5 Simulation Result (1/2)

Case 0 (Tariff Rate 0%)

Year	Before Tariff Policy							Tariff	After Tariff Policy					
	Supply	Demand	Import	Supply/ Demand	Price Forecast (f.o.b.) /a	Price Forecast (c.i.f.) /b	Price Index		Supply	Demand	Import	Supply/ Demand	Price Forecast (c.i.f.)	Tax Revenue
	(ton)	(ton)	(ton)	(%)	($/t)	($/t)	2013=100	(%)	(ton)	(ton)	(ton)	(%)	($/t)	($)
2013	41,530	121,411	79,881	34%	384	442	100.00	2.5%	41,530	121,411	79,881	34%	453	878,687
2014	41,530	124,337	82,807	33%	389	447	101.30	2.5%	41,530	124,337	82,807	33%	458	910,873
2015	41,530	127,333	85,803	33%	393	452	102.34	2.5%	41,530	127,333	85,803	33%	463	943,829
2016	41,530	130,402	88,872	32%	397	457	103.39	0.0%	41,390	131,959	90,570	31%	457	0
2017	41,530	133,545	92,015	31%	402	462	104.69	0.0%	41,380	135,118	93,737	31%	462	0
2018	41,530	136,763	95,233	30%	406	467	105.73	0.0%	41,371	138,352	96,981	30%	467	0
2019	41,530	140,059	98,529	30%	411	473	107.03	0.0%	41,362	141,664	100,302	29%	473	0
2020	41,530	143,434	101,904	29%	415	477	108.07	0.0%	41,353	145,056	103,703	29%	477	0
2021	41,530	146,891	105,361	28%	419	482	109.11	0.0%	41,342	148,552	107,210	28%	482	0
2022	41,530	150,431	108,901	28%	424	488	110.42	0.0%	41,334	152,109	110,776	27%	488	0
2023	41,530	154,057	112,527	27%	428	492	111.46	0.0%	41,325	155,754	114,428	27%	492	0
2024	41,530	157,769	116,239	26%	433	498	112.76	0.0%	41,317	159,484	118,167	26%	498	0
2025	41,530	161,572	120,042	26%	437	503	113.80	0.0%	41,310	163,306	121,997	25%	503	0

Source: a/ Thai 5% Broken, Milled White Rice, f.o.b. Bangkok, World Bank Commodities Ptrice Forecast (July 7, 2014)
b/ c.i.f price is estimated by considering insurance (5%) and transportation (10%), as per information from Custom Office of Timor-Leste.

Case 1 (Tariff Rate 40%, PES=0.21)

Year	Before Tariff Policy							Tariff	After Tariff Policy					
	Supply	Demand	Import	Supply/ Demand	Price Forecast /a	Price Forecast (c.i.f.) /b	Price Index		Supply	Demand	Import	Supply/ Demand	Price Forecast (c.i.f.)	Tax Revenue
	(ton)	(ton)	(ton)	(%)	($/t)	($/t)	2013=100	(%)	(ton)	(ton)	(ton)	(%)	($/t)	($)
2013	41,530	121,411	79,881	34%	384	442	100.00	2.5%	41,530	121,411	79,881	34%	453	878,687
2014	41,530	124,337	82,807	33%	389	447	101.30	2.5%	41,530	124,337	82,807	33%	458	910,873
2015	41,530	127,333	85,803	33%	393	452	102.34	2.5%	41,530	127,333	85,803	33%	463	943,829
2016	41,530	130,402	88,872	32%	397	457	103.39	5.0%	41,671	128,845	87,174	32%	480	2,004,997
2017	41,530	133,545	92,015	31%	402	462	104.69	10.0%	41,905	129,613	87,708	32%	508	4,034,548
2018	41,530	136,763	95,233	30%	406	467	105.73	15.0%	42,247	129,614	87,367	33%	537	6,115,667
2019	41,530	140,059	98,529	30%	411	473	107.03	20.0%	42,625	129,626	87,002	33%	568	8,265,167
2020	41,530	143,434	101,904	29%	415	477	108.07	25.0%	43,037	129,649	86,613	33%	596	10,306,889
2021	41,530	146,891	105,361	28%	419	482	109.11	30.0%	43,507	129,452	85,945	34%	627	12,462,011
2022	41,530	150,431	108,901	28%	424	488	110.42	35.0%	43,989	129,450	85,460	34%	659	14,613,736
2023	41,530	154,057	112,527	27%	428	492	111.46	40.0%	44,502	129,456	84,954	34%	689	16,735,878
2024	41,530	157,769	116,239	26%	433	498	112.76	40.0%	44,619	132,898	88,280	34%	697	17,567,645
2025	41,530	161,572	120,042	26%	437	503	113.80	40.0%	44,842	135,557	90,715	33%	704	18,233,634

Source: a/ Thai 5% Broken, Milled White Rice, f.o.b. Bangkok, World Bank Commodities Ptrice Forecast (July 7, 2014)
b/ c.i.f price is estimated by considering insurance (5%) and transportation (10%), as per information from Custom Office of Timor-Leste.

Case 2 (Tariff Rate 110%, PES=0.21)

Year	Before Tariff Policy							Tariff	After Tariff Policy					
	Supply	Demand	Import	Supply/ Demand	Price Forecast /a	Price Forecast (c.i.f.) /b	Price Index		Supply	Demand	Import	Supply/ Demand	Price Forecast (c.i.f.)	Tax Revenue
	(ton)	(ton)	(ton)	(%)	($/t)	($/t)	2013=100	(%)	(ton)	(ton)	(ton)	(%)	($/t)	($)
2013	41,530	121,411	79,881	34%	384	442	100.00	2.5%	41,530	121,411	79,881	34%	453	878,687
2014	41,530	124,337	82,807	33%	389	447	101.30	2.5%	41,530	124,337	82,807	33%	458	910,873
2015	41,530	127,333	85,803	33%	393	452	102.34	2.5%	41,530	127,333	85,803	33%	463	943,829
2016	41,530	130,402	88,872	32%	397	457	103.39	5.0%	41,671	128,845	87,174	32%	480	2,004,997
2017	41,530	133,545	92,015	31%	402	462	104.69	10.0%	41,905	129,613	87,708	32%	508	4,034,548
2018	41,530	136,763	95,233	30%	406	467	105.73	25.0%	42,805	124,053	81,249	35%	584	9,506,098
2019	41,530	140,059	98,529	30%	411	473	107.03	50.0%	44,477	111,971	67,495	40%	710	15,996,251
2020	41,530	143,434	101,904	29%	415	477	108.07	75.0%	46,315	99,646	53,332	46%	835	19,092,791
2021	41,530	146,891	105,361	28%	419	482	109.11	85.0%	47,367	95,405	48,038	50%	892	19,695,569
2022	41,530	150,431	108,901	28%	424	488	110.42	95.0%	48,416	91,684	43,268	53%	952	20,076,392
2023	41,530	154,057	112,527	27%	428	492	111.46	100.0%	49,216	90,433	41,217	54%	984	20,278,909
2024	41,530	157,769	116,239	26%	433	498	112.76	105.0%	50,049	89,160	39,110	56%	1,021	20,454,693
2025	41,530	161,572	120,042	26%	437	503	113.80	110.0%	50,914	87,862	36,948	58%	1,056	20,432,429

Source: a/ Thai 5% Broken, Milled White Rice, f.o.b. Bangkok, World Bank Commodities Ptrice Forecast (July 7, 2014)
b/ c.i.f price is estimated by considering insurance (5%) and transportation (10%), as per information from Custom Office of Timor-Leste.

Table 7-5-5 Simulation Result (2/2)

Case 3 (Tariff Rate 40%, PES=0.52)

Year	Before Tariff Policy							Tariff	After Tariff Policy					
	Supply	Demand	Import	Supply/ Demand	Price Forecast /a	Price Forecast (c.i.f.) /b	Price Index		Supply	Demand	Import	Supply/ Demand	Price Forecast (c.i.f.)	Tax Revenue
	(ton)	(ton)	(ton)	(%)	($/t)	($/t)	2013=100	(%)	(ton)	(ton)	(ton)	(%)	($/t)	($)
2013	41,530	121,411	79,881	34%	384	442	100.00	2.5%	41,530	121,411	79,881	34%	453	878,687
2014	41,530	124,337	82,807	33%	389	447	101.30	2.5%	41,530	124,337	82,807	33%	458	910,873
2015	41,530	127,333	85,803	33%	393	452	102.34	2.5%	41,530	127,333	85,803	33%	463	943,829
2016	41,530	130,402	88,872	32%	397	457	103.39	5.0%	41,706	128,845	87,139	32%	480	2,004,190
2017	41,530	133,545	92,015	31%	402	462	104.69	10.0%	42,078	129,613	87,535	32%	508	4,026,588
2018	41,530	136,763	95,233	30%	406	467	105.73	15.0%	42,708	129,614	86,906	33%	537	6,083,410
2019	41,530	140,059	98,529	30%	411	473	107.03	20.0%	43,500	129,626	86,126	34%	568	8,181,995
2020	41,530	143,434	101,904	29%	415	477	108.07	25.0%	44,449	129,649	85,200	34%	596	10,138,858
2021	41,530	146,891	105,361	28%	419	482	109.11	30.0%	45,600	129,452	83,852	35%	627	12,158,507
2022	41,530	150,431	108,901	28%	424	488	110.42	35.0%	46,858	129,450	82,592	36%	659	14,123,159
2023	41,530	154,057	112,527	27%	428	492	111.46	40.0%	48,256	129,456	81,200	37%	689	15,996,358
2024	41,530	157,769	116,239	26%	433	498	112.76	40.0%	48,788	132,898	84,111	37%	697	16,738,013
2025	41,530	161,572	120,042	26%	437	503	113.80	40.0%	49,731	135,557	85,826	37%	704	17,250,941

Source: a/ Thai 5% Broken, Milled White Rice, f.o.b. Bangkok, World Bank Commodities Ptrice Forecast (July 7, 2014)
b/ c.i.f price is estimated by considering insurance (5%) and transportation (10%), as per information from Custom Office of Timor-Leste.

Case 4 (Tariff Rate 110%, PES=0.52)

Year	Before Tariff Policy							Tariff	After Tariff Policy					
	Supply	Demand	Import	Supply/ Demand	Price Forecast /a	Price Forecast (c.i.f.) /b	Price Index		Supply	Demand	Import	Supply/ Demand	Price Forecast (c.i.f.)	Tax Revenue
	(ton)	(ton)	(ton)	(%)	($/t)	($/t)	2013=100	(%)	(ton)	(ton)	(ton)	(%)	($/t)	($)
2013	41,530	121,411	79,881	34%	384	442	100.00	2.5%	41,530	121,411	79,881	34%	453	878,687
2014	41,530	124,337	82,807	33%	389	447	101.30	2.5%	41,530	124,337	82,807	33%	458	910,873
2015	41,530	127,333	85,803	33%	393	452	102.34	2.5%	41,530	127,333	85,803	33%	463	943,829
2016	41,530	130,402	88,872	32%	397	457	103.39	5.0%	41,706	128,845	87,139	32%	480	2,004,190
2017	41,530	133,545	92,015	31%	402	462	104.69	10.0%	42,078	129,613	87,535	32%	508	4,026,588
2018	41,530	136,763	95,233	30%	406	467	105.73	25.0%	43,624	124,053	80,429	35%	584	9,410,248
2019	41,530	140,059	98,529	30%	411	473	107.03	50.0%	46,834	111,971	65,138	42%	710	15,437,611
2020	41,530	143,434	101,904	29%	415	477	108.07	75.0%	50,800	99,646	48,847	51%	835	17,487,061
2021	41,530	146,891	105,361	28%	419	482	109.11	85.0%	53,546	95,405	41,858	56%	892	17,161,885
2022	41,530	150,431	108,901	28%	424	488	110.42	95.0%	56,448	91,684	35,235	62%	952	16,349,153
2023	41,530	154,057	112,527	27%	428	492	111.46	100.0%	58,925	90,433	31,509	65%	984	15,502,379
2024	41,530	157,769	116,239	26%	433	498	112.76	105.0%	61,550	89,160	27,610	69%	1,021	14,439,820
2025	41,530	161,572	120,042	26%	437	503	113.80	110.0%	64,766	87,862	23,096	74%	1,056	12,772,155

Source: a/ Thai 5% Broken, Milled White Rice, f.o.b. Bangkok, World Bank Commodities Ptrice Forecast (July 7, 2014)
b/ c.i.f price is estimated by considering insurance (5%) and transportation (10%), as per information from Custom Office of Timor-Leste.

Table 7-5-6 Cost-Benefit Analysis (1/2)

Case 0 (Tariff Rate 0%) Unit: $1,000

	Cost						Benefit			Net Benefit	Discount Rate	Present Value	
	Project Cost	Management Cost	Project Cost Total	Cost of Rice Production	Cost of Rice Imported	Total Cost	Value of Rice Production	Tariff Revenue	Total Benefit		12.0%	Cost	Benefit
2013				12,035	36,186		28,656	879					
2014				12,210	37,925		29,071	911					
2015				12,384	39,727		29,487	944			1.0000		
2016	117	0	117	11,995	41,390	53,385	28,559	0	28,559	-24,826	0.8800	46,979	25,132
2017	5,631	433	6,064	12,166	43,307	55,473	28,966	0	28,966	-26,506	0.7744	42,958	22,431
2018	5,685	219	5,904	12,337	45,290	57,627	29,373	0	29,373	-28,253	0.6815	39,271	20,017
2019	12,140	163	12,303	12,508	47,443	59,951	29,781	0	29,781	-30,170	0.5997	35,952	17,859
2020	11,834	163	11,997	12,679	49,466	62,145	30,188	0	30,188	-31,957	0.5277	32,796	15,931
2021	18,565	163	18,728	12,675	51,675	64,351	30,180	0	30,180	-34,171	0.4644	29,885	14,016
2022	10,746	163	10,909	12,846	54,059	66,905	30,587	0	30,587	-36,318	0.4087	27,342	12,500
2023	10,548	163	10,711	13,018	56,299	69,316	30,994	0	30,994	-38,322	0.3596	24,928	11,147
2024	10,565	163	10,728	13,189	58,847	72,036	31,401	0	31,401	-40,634	0.3165	22,798	9,938
2025	10,410	110	10,520	13,360	61,364	74,724	31,808	0	31,808	-42,916	0.2785	20,811	8,859
2026				13,360	63,839	77,199	31,808	0	31,808	-45,391	0.2451	18,920	7,796
2027				13,534	66,641	80,175	32,224	0	32,224	-47,951	0.2157	17,291	6,950
2028				13,708	69,406	83,114	32,639	0	32,639	-50,475	0.1898	15,774	6,195
2029				13,883	72,263	86,146	33,054	0	33,054	-53,091	0.1670	14,388	5,521
2030				13,883	75,228	89,111	33,054	0	33,054	-56,057	0.1470	13,097	4,858
2031				14,057	78,131	92,188	33,469	0	33,469	-58,719	0.1293	11,923	4,329
2032				14,232	81,428	95,660	33,885	0	33,885	-61,775	0.1138	10,888	3,857
2033				14,406	84,682	99,088	34,300	0	34,300	-64,788	0.1002	9,925	3,435
2034				14,580	88,203	102,783	34,715	0	34,715	-68,068	0.0881	9,059	3,060
2035				14,580	91,526	106,107	34,715	0	34,715	-71,392	0.0776	8,230	2,693
Total	96,241	1,740	97,981	303,624	1,394,325	1,547,482	722,914	2,733	635,701	-911,781		453,215	206,521

B/C =	0.46
NPV =	-246,693
IRR =	#DIV/0!

Case 1 (Tariff Rate 40%, PES=0.21) Unit: $1,000

	Cost						Benefit			Net Benefit	Discount Rate	Present Value	
	Project Cost	Management Cost	Project Cost Total	Cost of Rice Production	Cost of Rice Imported	Total Cost	Value of Rice Production	Tariff Revenue	Total Benefit		12.0%	Cost	Benefit
2013				12,035	36,186		28,656	879					
2014				12,210	37,925		29,071	911					
2015				12,384	39,727		29,487	944			1.0000		
2016	117	0	117	12,776	41,843	54,620	30,420	2,005	32,425	-22,195	0.8800	48,065	28,534
2017	5,631	433	6,064	13,552	44,555	58,108	32,267	4,035	36,302	-21,806	0.7744	44,999	28,112
2018	5,685	219	5,904	14,550	46,916	61,466	34,643	6,116	40,758	-20,707	0.6815	41,887	27,776
2019	12,140	163	12,303	15,575	49,417	64,992	37,084	8,265	45,349	-19,643	0.5997	38,975	27,195
2020	11,834	163	11,997	16,629	51,621	68,250	39,594	10,307	49,900	-18,350	0.5277	36,018	26,334
2021	18,565	163	18,728	17,542	53,887	71,430	41,767	12,462	54,229	-17,201	0.4644	33,172	25,184
2022	10,746	163	10,909	18,660	56,318	74,979	44,429	14,614	59,043	-15,936	0.4087	30,642	24,129
2023	10,548	163	10,711	19,812	58,533	78,345	47,172	16,736	63,908	-14,437	0.3596	28,176	22,984
2024	10,565	163	10,728	20,052	61,531	81,582	47,742	17,568	65,309	-16,273	0.3165	25,819	20,669
2025	10,410	110	10,520	20,529	63,863	84,392	48,878	18,234	67,112	-17,280	0.2785	23,503	18,691
2026				20,529	66,717	87,246	48,878	19,075	67,954	-19,292	0.2451	21,382	16,654
2027				20,698	70,136	90,834	49,281	20,025	69,306	-21,528	0.2157	19,590	14,947
2028				20,867	73,575	94,442	49,684	21,007	70,691	-23,751	0.1898	17,924	13,416
2029				21,275	76,382	97,657	50,655	21,808	72,464	-25,193	0.1670	16,310	12,103
2030				21,275	79,758	101,033	50,655	22,773	73,428	-27,606	0.1470	14,849	10,792
2031				21,444	83,434	104,879	51,058	23,854	74,912	-29,966	0.1293	13,565	9,689
2032				21,852	86,661	108,513	52,029	24,744	76,773	-31,740	0.1138	12,351	8,738
2033				22,021	90,695	112,717	52,432	25,896	78,328	-34,389	0.1002	11,290	7,845
2034				22,191	95,114	117,304	52,835	27,211	80,046	-37,259	0.0881	10,339	7,055
2035				22,191	98,861	121,052	52,835	28,228	81,063	-39,989	0.0776	9,389	6,287
Total	96,241	1,740	97,981	420,652	1,463,656	1,733,840	1,001,551	347,694	1,259,298	-474,542		498,246	357,135

B/C =	0.72
NPV =	-141,111
IRR =	#DIV/0!

Case 2 (Tariff Rate 110%, PES=0.21) Unit: $1,000

	Cost						Benefit			Net Benefit	Discount Rate	Present Value	
	Project Cost	Management Cost	Project Cost Total	Cost of Rice Production	Cost of Rice Imported	Total Cost	Value of Rice Production	Tariff Revenue	Total Benefit		12.0%	Cost	Benefit
2013				12,035	36,186		28,656	879					
2014				12,210	37,925		29,071	911					
2015				12,384	39,727		29,487	944			1.0000		
2016	117	0	117	12,776	41,843	54,620	30,420	2,005	32,425	-22,195	0.8800	48,065	28,534
2017	5,631	433	6,064	13,552	44,555	58,108	32,267	4,035	36,302	-21,806	0.7744	44,999	28,112
2018	5,685	219	5,904	16,000	47,449	63,450	38,096	9,506	47,602	-15,847	0.6815	43,239	32,440
2019	12,140	163	12,303	20,361	47,921	68,283	48,480	15,996	64,476	-3,807	0.5997	40,949	38,666
2020	11,834	163	11,997	25,093	44,532	69,625	59,746	19,093	78,839	9,213	0.5277	36,744	41,606
2021	18,565	163	18,728	27,255	42,850	70,105	64,892	19,696	84,588	14,483	0.4644	32,557	39,283
2022	10,746	163	10,909	29,688	41,191	70,880	70,687	20,076	90,763	19,884	0.4087	28,967	37,093
2023	10,548	163	10,711	31,420	40,558	71,977	74,809	20,279	95,087	23,110	0.3596	25,886	34,197
2024	10,565	163	10,728	33,213	39,932	73,144	79,078	20,455	99,533	26,388	0.3165	23,149	31,500
2025	10,410	110	10,520	35,070	39,017	74,087	83,499	20,432	103,932	29,844	0.2785	20,633	28,945
2026				35,070	41,596	76,665	83,499	21,794	105,293	28,628	0.2451	18,789	25,805
2027				35,492	44,472	79,964	84,504	23,289	107,793	27,829	0.2157	17,246	23,248
2028				35,913	47,417	83,330	85,508	24,842	110,350	27,019	0.1898	15,815	20,943
2029				36,335	50,426	86,761	86,513	26,407	112,920	26,159	0.1670	14,490	18,859
2030				36,335	53,508	89,843	86,513	28,033	114,545	24,702	0.1470	13,205	16,835
2031				36,757	56,638	93,395	87,517	29,663	117,180	23,785	0.1293	12,079	15,156
2032				37,179	60,139	97,319	88,522	31,507	120,029	22,710	0.1138	11,076	13,661
2033				37,601	63,607	101,208	89,527	33,310	122,837	21,628	0.1002	10,137	12,303
2034				38,023	67,373	105,396	90,531	35,293	125,824	20,429	0.0881	9,290	11,090
2035				38,023	70,885	108,909	90,531	37,122	127,653	18,744	0.0776	8,447	9,901
Total	96,241	1,740	97,981	647,788	1,099,749	1,597,069	1,542,352	445,565	1,897,969	300,901		475,762	508,177

B/C =	1.07
NPV =	32,415
IRR =	22%

Table 7-5-6 Cost-Benefit Analysis (2/2)

Case 3 (Tariff Rate 40%, PES=0.52) Unit: $1,000

	Cost						Benefit			Net Benefit	Discount Rate	Present Value	
	Project Cost	Management Cost	Project Cost Total	Cost of Rice Production	Cost of Rice Imported	Total Cost	Value of Rice Production	Tariff Revenue	Total Benefit		12.0%	Cost	Benefit
2013				12,035	36,186		28,656	879					
2014				12,210	37,925		29,071	911					
2015				12,384	39,727		29,487	944			1.0000		
2016	117	0	117	12,787	41,827	54,614	30,445	2,004	32,449	-22,164	0.8800	48,060	28,556
2017	5,631	433	6,064	13,608	44,468	58,076	32,400	4,027	36,427	-21,649	0.7744	44,974	28,209
2018	5,685	219	5,904	14,709	46,668	61,377	35,021	6,083	41,104	-20,273	0.6815	41,827	28,011
2019	12,140	163	12,303	15,895	48,920	64,815	37,845	8,182	46,027	-18,787	0.5997	38,869	27,602
2020	11,834	163	11,997	17,175	50,779	67,954	40,893	10,139	51,032	-16,923	0.5277	35,862	26,931
2021	18,565	163	18,728	18,386	52,575	70,961	43,776	12,159	55,935	-15,026	0.4644	32,955	25,976
2022	10,746	163	10,909	19,877	54,428	74,305	47,327	14,123	61,450	-12,855	0.4087	30,367	25,113
2023	10,548	163	10,711	21,484	55,947	77,430	51,151	15,996	67,148	-10,282	0.3596	27,847	24,149
2024	10,565	163	10,728	21,925	58,625	80,550	52,203	16,738	68,941	-11,610	0.3165	25,492	21,818
2025	10,410	110	10,520	22,767	60,421	83,188	54,207	17,251	71,458	-11,730	0.2785	23,168	19,901
2026				22,767	63,246	86,013	54,207	18,083	72,290	-13,723	0.2451	21,080	17,717
2027				22,928	66,669	89,598	54,592	19,035	73,627	-15,971	0.2157	19,324	15,879
2028				23,090	70,118	93,208	54,977	20,020	74,997	-18,211	0.1898	17,690	14,234
2029				23,585	72,819	96,404	56,155	20,791	76,946	-19,458	0.1670	16,101	12,851
2030				23,585	76,161	99,746	56,155	21,746	77,901	-21,846	0.1470	14,660	11,449
2031				23,747	79,852	103,599	56,540	22,830	79,370	-24,229	0.1293	13,399	10,265
2032				24,242	82,967	107,209	57,718	23,689	81,408	-25,801	0.1138	12,202	9,266
2033				24,403	87,012	111,415	58,103	24,844	82,947	-28,468	0.1002	11,159	8,308
2034				24,565	91,430	115,995	58,488	26,157	84,645	-31,350	0.0881	10,224	7,461
2035				24,565	95,154	119,718	58,488	27,169	85,657	-34,061	0.0776	9,286	6,644
Total	96,241	1,740	97,981	452,720	1,413,923	1,716,175	1,077,904	333,800	1,321,757	-394,418		494,544	370,340

B/C =	0.75
NPV =	-124,204
IRR =	#DIV/0!

Case 4 (Tariff Rate 110%, PES=0.52) Unit: $1,000

	Cost						Benefit			Net Benefit	Discount Rate	Present Value	
	Project Cost	Management Cost	Project Cost Total	Cost of Rice Production	Cost of Rice Imported	Total Cost	Value of Rice Production	Tariff Revenue	Total Benefit		12.0%	Cost	Benefit
2013				12,035	36,186		28,656	879					
2014				12,210	37,925		29,071	911					
2015				12,384	39,727		29,487	944			1.0000		
2016	117	0	117	12,787	41,827	54,614	30,445	2,004	32,449	-22,164	0.8800	48,060	28,556
2017	5,631	433	6,064	13,608	44,468	58,076	32,400	4,027	36,427	-21,649	0.7744	44,974	28,209
2018	5,685	219	5,904	16,307	46,971	63,277	38,825	9,410	48,236	-15,042	0.6815	43,122	32,871
2019	12,140	163	12,303	21,441	46,248	67,688	51,049	15,438	66,487	-1,202	0.5997	40,592	39,872
2020	11,834	163	11,997	27,523	40,787	68,310	65,532	17,487	83,019	14,709	0.5277	36,050	43,812
2021	18,565	163	18,728	30,811	37,338	68,148	73,359	17,162	90,521	22,372	0.4644	31,648	42,038
2022	10,746	163	10,909	34,614	33,544	68,158	82,415	16,349	98,764	30,606	0.4087	27,855	40,362
2023	10,548	163	10,711	37,617	31,005	68,622	89,565	15,502	105,068	36,446	0.3596	24,679	37,786
2024	10,565	163	10,728	40,845	28,189	69,034	97,249	14,440	111,689	42,655	0.3165	21,848	35,347
2025	10,410	110	10,520	44,611	24,390	69,001	106,217	12,772	118,989	49,988	0.2785	19,217	33,139
2026				44,611	26,843	71,454	106,217	14,064	120,281	48,827	0.2451	17,512	29,479
2027				45,141	29,567	74,707	107,478	15,483	122,961	48,254	0.2157	16,112	26,519
2028				45,671	32,372	78,043	108,739	16,960	125,699	47,656	0.1898	14,812	23,856
2029				46,200	35,255	81,456	110,001	18,463	128,463	47,008	0.1670	13,604	21,455
2030				46,200	38,185	84,386	110,001	20,005	130,006	45,620	0.1470	12,402	19,107
2031				46,730	41,218	87,948	111,262	21,587	132,849	44,901	0.1293	11,375	17,182
2032				47,260	44,552	91,812	112,524	23,341	135,864	44,052	0.1138	10,450	15,464
2033				47,790	47,894	95,684	113,785	25,082	138,867	43,182	0.1002	9,584	13,909
2034				48,319	51,493	99,812	115,046	26,975	142,021	42,209	0.0881	8,797	12,518
2035				48,319	54,895	103,215	115,046	28,748	143,794	40,579	0.0776	8,006	11,153
Total	96,241	1,740	97,981	783,035	890,878	1,523,445	1,864,369	338,031	2,112,453	589,008		460,698	552,634

B/C =	1.20
NPV =	91,936
IRR =	31%

7-5-3 Other Non- Border Control Policy

(1) Import Quota

Under the import quota policy, price of imported rice increases, as volume of import quota increases. As a result, self-sufficiency rate increase since production of domestic rice increases while total demand of rice decreases. The mechanism to rise self-sufficiency rate of rice is the same as tariff policy does. However, revenue from price increase of imported rice goes to the government under the tariff policy, whereas the benefit goes traders under the import quota policy.

For example, if volume of import quota was set as the same volume of rice import in Case-2 of the tariff policy, which was estimated at 37 thousand ton in 2025, price of imported rice increases to the same level of 110% of tariff rate. In Case-2 of the tariff policy, the price gap between domestic price and international price generates additional government revenue, and is estimated at $20 million in 2025. However, under the import quota system, the additional income goes to traders, and the

government have to make money from another source if they want to support poor households. In this regards, import quota policy benefits importers and rice producers, but not consumers, and rather costly the government.

It should be noted that the government can gain revenue depending on the quota system, if the government tolls the import gap between imported price and domestic price.

(2) Import with Conditionality

Other policy to restrict rice import is set conditionality on the rice import, such as quality restriction and seasonal quota. In the case of quality restriction, high quality rice and special variety of rice including waxy rice are allow to import but others cannot be imported. As for seasonal quota, Indonesia allows import of rice only during limited season, from 2 month after harvesting of domestic rice until one month before starting harvest. These kind of border measures are also effective to provide production incentive to farmers, and to rise self-sufficiency rate of rice. However, in either case, price of rice in domestic market increases, and support measures to the poor household is necessary.

7-6 DEVELOPMENT SCENARIO-4

The development scenario-4 aims to achieve 100% rice self-sufficiency by setting high enough tariff rate so as to restrict actually importing rice and applying full scale programs and projects to improve rice productivity. High tariff rate can stimulate rice farmers for moving paddy cropping.

In order to meet future rice demand on population increase, rice production (milled rice 162,000 ton in 2025) should be produced for 100% rice self-sufficiency. In order to achieve this demand, both increase of cropping area and increase of crop yield. For example, it is required to reach the 5.1 ton/ha of the yield in the irrigation area 60,000 ha. To meet with this requirement, irrigation area should be newly reclaimed and yield should be increased. To cope with increase of yield and expansion of the area, large investment to provide irrigation system, land reclamation and apply full scale programs/ projects to improve rice productivity is required under the limitation of available water resources. Considering present irrigation area 34,359 ha and yield 3.0 to 3.5 ton/ha, it is considered to be hard to provide such conditions of expansion of the irrigation area and yield

In order to promote this scenario, social and economic validity of this investment including in setting such a high tariff rate should be approved by the government authorities. It is also required to provide suitable food security policy to ensure national food supply during implementation of this scenario.

7-7 PREPARATION OF THE AGRICULTURE MASTER PLAN

7-7-1 Choice of the Development Scenario

(1) Discussion on joining to ASEAN and rice policy

To find the development direction of the master plan, discussions with related organizations such as related donor agencies, namely, MAF, Ministry of Foreign Affairs and Ministry of Finance was held from April to June, 2014. Discussion subject was put on the rice policy and joining to ASEAN. Through the discussion, the following points were revealed.

- Joining to ASEAN is the nation's consensus. At this present, working groups organized by each Ministry are tackling the preparation to be admitted to ASEAN. For MAF, priority subject is put on the making various standards to be accorded with ASEAN's level for going forward the free trade. Agriculture protection policy such as border control and protection of rice farmers are considered to be the next discussion topic.

- Under such political situation, at present, it is hard to discuss about border control policy focused on the rice and make consensus on setting tariff wall.

Main comments in the discussion with the related officer of the Ministry of Finance are as follows.

- Price of rice is the sensitive problem for the nation. As the serious problem when taking tariff policy, all the people including rice farmers will face with higher rice price. Considering possible serious problem between the protection of rice farmers and the hardship of consumer's life, it is difficult to set an erecting tariff wall.
- On the other hand, ensuring food security is the nation's important subject. To realize this situation, it is required to take measures including indirect investment to the food production field and provision of marketing system through improvement of road network and marketplace. Such overall conditions surrounding the food security should be improved together, not directed to only the rice production

(2) Choice of development scenario

Looking at the degree of increase of rice production and achievement of rice self-sufficiency from the simulation results, followings are summarized.

- Development scenario-4 is excluded from the choice of development scenario because it is required to take political judgment in high governmental level.
- Related with the development scenario-1, increase effect of rice production and achievement level of rice self-sufficiency is smaller than the other scenarios since current rice cultivation activities are continued under the cheap import rice. Rice production activities will be maintained in the subsistent level, not move into commercial rice production. Nation's food security will largely rely on the import rice as well as the present situation.

Table 7-7-1 Rice Self-sufficiency of Each Development Scenario

Simulation Case	Development Scenario-1	Development Scenario-2	Development Scenario-3
Pessimistic	14%	22%	Based on the moderate case. Tariff 0% ; 25% Tariff 40%(PES=0.21）; 33% Tariff 110% (PES=0.21); 58% Tariff 40% (PES=0.52）; 37% Tariff 110% (PES=0.52); 74%
Moderate	26%	43%	
Optimistic	35%	44%	

Compared with the development scenario-2 and the scenario-3, the followings are pointed out.

- Judging from the simulation results, the development scenario-3 (tariff rate = 110%) has advantage to realize the increase of rice production and improve the nation's rice self-sufficiency. However, taking accounts of the discussion as mentioned above, it is hard to make governmental consensus of this scenario during the implementation period of this project, under the political situation going forward with joining to ASEAN. In this scenario, price burden on consumers become heaver as the tariff rate is going up. Especially for the poor, protection measures such as distribution of rice and corn to them are needed. On the other hand, if rice price would go up by tariff policy, people may restrict to consume rice, as a result, it is expected to increase consumption of maize. To cope with such situation, it is required for nation's food security to provide the measures to encourage farmers to cultivate suitable crops such as maize and other cash crops planted in the farm land where rice cannot be cultivated.

- Development scenario-2 has less advantage than the scenario-3 (tariff 110%) from the viewpoint of the increase effect of rice and the achievement process of country's rice self-sufficiency. However, it has more advantage in creating commercial sense on farmers in the shifting time from subsistent farming to commercial agriculture. This scenario needs to provide well designed system including in bearing the expenses to purchase paddy and operating the system precisely and carefully under the competition with import rice. MAF can learn the lessons from the MCIE's experience.

Considering these situations, choice of the development scenario-2 is presently recommendable as a realistic one although it is required to make governmental judgment and improve the on-going purchasing system with MCIE. Considering future outlook of nation's rice policy, it should be taken into consideration.

- Tendency of supply and demand with pricing of the agricultural products should be put on free market mechanism, not managed by government. Considering future prospect of the paddy purchasing system, current purchasing system should be improved. Mechanism to shift from government managed purchase to free marketing system should be incorporated into the improvement direction.

- As for the paddy purchasing system, government is continuously obliged to bear the expenses to purchase paddy. To lighten the burden on government, it may be necessary to combine the paddy purchasing system and tariff policy. Tariff rate is set considering the burden on consumers. Revenue from the tariff may be provided as a capital for paddy purchase. This policy may be considered in the progressing of the purchasing system.

- Related with joining to ASEAN, tariff rate should be applied zero according to the AFTA (ASEAN Free Trade Area). It may be hard to set the new tariff, after joining. If the tariff policy would be chosen, introduction timing is recommendable before joining.

7-7-2 Basic Concept for Realizing the Agriculture Master Plan

(1) Basic implementation concept of the master plan

Paddy purchasing system is proposed as production incentive stimulating policy. Master plan, rice policy, is materialized under the following basic implementation concept.

Overall target;	Local rice production is increased thereby contributing to national food security
Project target;	Local rice production is increased through enhancing farmers' production incentive by improving enabling environment.
Project component;	- Production incentive stimulating policy (paddy purchasing system) - Productivity improvement supporting policy (19 programs/ projects/ institution in the fields of irrigation, rice farming, processing/ marketing)
Project target area;	425 irrigation areas (Total area; 34,360 ha)
Implementation organization;	MAF

Target of the master plan is achieved by applying both policies in the 425 irrigation areas in order of the rehabilitation intensity. Both policies, component of the projects/ programs are selected based on the condition of the areas.

Implementation organization of the master plan is MAF who is responsible for increasing local rice production. MAF should take initiative in materialize the master plan, rice policy.

As for the productivity improvement supporting policy, programs/ projects can be operate and manage

under the MAF. Accordingly, its working progress can be arranged in cooperation with related MAF directorates. On the other hand, as for the productivity improvement supporting policy, it is required to make policy arrangement among related ministries, MCIE and MoF. MAF should lead it.

(2) Nationwide master plan implementation

Considering such basic concept, an action plan is prepared for overall master plan implementation, which includes the three steps, as shown in Table 7-7-2.

Table 7-7-2 Necessary Steps Taken for Nationwide Master Plan Implementation

Steps	Activities
1. Making governmental approval of the master plan (rice policy)	Master plan with governmental approval, Preparation of overall nationwide master plan implementation, Establishment of master plan implementation organization in the MAF, Discussion with MCIE on improvement of paddy purchasing system (referred to the Table 7-7-3)
2. Implementation of the priority projects (referred to the report "Priority Projects")	Implementation under the On the Job training manner for strengthening MAF implementation organization, Establishment of the implementation organization in central and district levels.
3. Nationwide master plan implementation	Necessity survey of 425 irrigation schemes, Selection of irrigation scheme based on the survey, Applying the policies, programs/ projects in the selected ones.

At first, MAF should make consensus of master plan i.e. rice policy in governmental level. Together with this, MAF should establish an organization for the master plan implementation in the MAF. MAF has taken development actions in the directorate basis so far. However, in the master plan implementation, the target can be achieved by taking integrated approach of the development fields of irrigation, rice farming and processing/ marketing. This organization would consist of staff recruited from the existing related directorate. No staff is recruited from outside. Responsibility of this organization is to promote the master plan in cooperation with related directorates (detail is mentioned in the report "priority project").

7-7-3 Action for Realizing the Paddy Purchasing System in MAF

As described in the section 7-4-3, in order to realize the paddy purchasing system, it is needed to make political consensus in the governmental level. After making the consensus, MAF should establish an operation and management body in the MAF. Subsequently, MAF should tackle to improve the present system in corporation with MCIE based on the lessons learned from the on-going MCIE led purchasing system.

Table 7-7-3 Action for Improving the Paddy Purchasing System

Main task	Contents
Making political consensus in the government	- Making political consensus on improving purchasing system - Discussion with MCIE for providing collaborative system - Making consensus in KONSSANTIL
Discussion with MCIE for improving the purchasing system	- Planning of the basic concept of the purchasing system - Finding and analyzing subjects and improvement from the on-going purchasing system - Clarifying responsibility between MAF and MCIE in the system
Establishment of operation and management organization in the MAF	- Establishment of the organization dealing in the purchasing system in MAF - Capacity development of the organization

Judging from the execution capacity of the present organization in the MAF, it is not enough to cope with the tasks as mentioned in the table. Supporting from outside related organizations including human resources development is required according to the degree of difficulty.

7-7-4 Outline of the Programs/ Projects

Input plan of the programs/ projects for rice productivity improvement supporting policy is shown in Table 7-7-4. Outline of the 19 programs/ projects/ institution is attached in this section.

Table 7-7-4 Input Plan for Programs/ Projects

Supporting policy/ Program, Project	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Input Cost (US$1,000)	Remarks
<Productivity Incentive Stimulating Policy> (MAF's rice purchasing policy)													
Governmental making consensus													
Establishment of MAF policy operational organization													Adjustment with MICE
Operation of MAF rice purchasing policy													
<Productivity Improvement Supporting Policy> (Programs & Projects)													
Establishment of MAF operational organization													
1 Intake weir construction project												72,000	Targeted 8,000 ha of uncultivated paddy paddy field. Priority is put on the rice bowl area.
2 Tube well construction project												0	Tube well irrigation with energy pump is not introduced until cost share for operation and maintenance works is established.
3 Regulating pond construction project												0	Together with No.1. Survey and planning are conducted in river basin basis. Work adjustment with MPW required.
4 Small irrigation water storage pond/ tank construction project for smallholders												100	Survey, planning and construction are linked with No.1, No.5 and No.16.
5 Strengthening program for operation and management system of irrigation system												1,148	Travelling training to district/ sub-district/ irrigation schemes. Priority is put on rice bowl area.
6 Farmers participation irrigation related facilities construction project												1,200	Planning and construction are led in parallel with No.1and No.5.
7 River control facilities construction project for protection of irrigation system and farmland												0	Planning and construction with No.1. Adjustment with MPW is necessary. .
8 Capacity development program of NDIWM for leading irrigation development project												286	Targeted on NDIWM staff and irrigation related staff in the district agricultural directorate.
9 Program for obtaining and breeding quality seed												214	Cooperation with SoL. Linked with No.13.
10 Promotion program for private mechanization												70	Linked with No.11. Priority is put on rice bowl area.
11 Establishment of agricultural fund system												3,935	Farmers groups in the rice bowl area targeted. Including preparation fund for agricultural fund.
12 Local resource circulative agriculture promotion project												97	Making the use of local resources. Linked with No.13.
13 Dissemination program for cultivation techniques												301	425 irrigation schemes targeted, but, priority is put on the irrigation schemes in the rice bowl area.
14 Strengthening program for pest and disease control												168	Linked with No.13.
15 Establishment and dissemination program of manure management technique												128	Linked with No.13.
16 Strengthening program of integrated farming with livestock breeding												176	Linked with No.12, No.13 and No.4.
17 Training program for rice farmers for organizing commercially oriented organization												246	It is implemented based on the capacity/ maturity of the existing organization and farmers groups.
18 Rice value chain establishment project in rice production area												736	Linked with No.13 and No.17.
19 Post harvest processing improvement project of local rice												1,194	Linked with No.17 and No.18.
23 Support in strengthening of MAF's project operation and management capacity												496	Support in providing MAF's organization structure for "Production incentive stimulating policy" and "Productivity improvement supporting policy" and monitoring system
Sub-total (US$1,000)		118	5,060	5,257	10,375	10,570	13,798	9,511	9,299	9,300	9,208	82,494	
Programs and projects operation cost (US$1,000)		0	377	181	151	151	151	151	151	151	122	1,588	
Total Input Cost (US$1,000)		118	5,437	5,438	10,526	10,721	13,949	9,662	9,450	9,451	9,330	84,082	

Project Outline (No.1)

Project Number	No.1 (1/3)
Project Name	Intake weir construction project
Target Group / Area	Small irrigation scheme in the middle of mountain out of 425 irrigation schemes
Implementation Organization	MAF
Cooperating Organization	MPW, International aid agency (JICA)

Back Ground

The location of irrigation scheme in Timor-Leste is roughly separated. One is comparatively large irrigation scheme located at downstream of river, another is comparatively small irrigation scheme located at mountainous area.

Especially, later schemes are located geographical place where it is difficult to access main consumption region and the farmers performs subsistent farming. In addition, the water source of these schemes supply a certain volume with fluctuation depending on season, but water source is few dried up. Therefore these schemes perform the various cropping vegetable and/or others in conformity with water volume.

However, these schemes in middle of mountainous area which water source from river, suffer from securing stable intake, due to the steep slope river and damaging of structure in flood season. Actually, some weir in river was broken after construction promptly.

As the feature of river discharge in Timor-Leste, these rivers relatively trend to enlarge the flow velocity and discharge per unit, even intake facility become small. Therefore, as a one of reasons, broken structure might be designed without necessity strength and durability, in spite of above feature of river discharge.

As above mentioned, schemes in middle of mountainous area suffer from shortage of water and impossible intake water, which may force farmers to expire the paddy. Then un-functional intake facilities at river are obstruction of expanding rice production. In order to secure the water source, design and construction of intake facility should be taken the feature of river discharge into consideration

Objective

Contribution to increasing of irrigation area in Timor-Leste through secured irrigation water

Implementation Period

8 years: Survey, design and construction

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

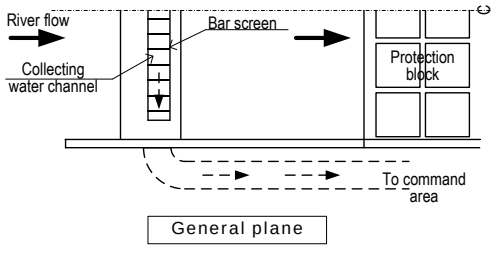
1. Rice cropping conduct at abundant or un-functional intake irrigation scheme
2. Water intake make possible through year.

Project Outline

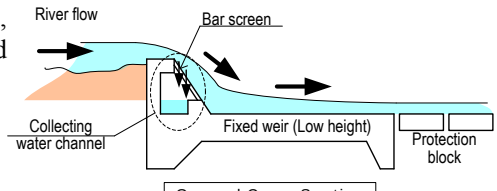
The way of intake water is some variety, though inhere, a weir apply to type of mountain stream diversion works placed in steep slope river.

Weir which is low head type wire like drop weir, is constructed in the river. Wire has the collecting water channel at the top of weir and water drop into channel at over flow on it. To prohibit sand and stone from dropping into channel, a bar screen (steel or stainless) should be installed in front of channel.

However, bar screen cannot prohibit sand and stone which is larger than interval of bar from dropping into it. In usual, therefore, sedimentation pond (sand trash) should be entailed with weir.



General plane



General Cross Section

Main Activities	Input Cost
Activity-1 : Selection of targeted area Activity-2 : Survey of river discharge Activity-3 : Design and construction of intake facility in the river Activity-4 : Instruction of operation and maintenance	US$5,000-10,000/ha

Fund Source	MAF
Risk	
Impossible situation to take water such as dry up river. River alignment is extremely changed by flood.	

Project Number	No.1 (2/3)
Project name	Intake weir construction project
Target Group / Area	Irrigation schemes involved changing water stream out of 425 irrigation schemes
Implementation organization	MAF
Cooperating Organization	MPW, International aid agency (JICA)

Back Ground

The irrigation schemes in Timor-Leste almost rely on river water. However, in rainy season river water rapidly make discharge increase with sand and stone in short term, while in dry season, river water become underground water or small stream, due to few rain in dry season.
The structures constructed in river such as weir and intake should be equipped with two (2) functions which are necessary durability of structure against attacking stones and make available to take water in dry season. However, it is so costly to construct such weir and enhance structures that the farmers generally construct the intake along a bank and lead water stream to intake. This intake can be avoided the flood effect as much as possible, but they have to lead water stream to intake frequently, in addition, location of intake head to the river flow directly. Therefore the sand and stone are inflow and sedimentation to intake and canal, which is flaw of the structure and is burden to farmers and agricultural activity. In addition, since water stream frequently change the alignment depending on form of river bed, farmers generally lead water stream to intake.

Objective

Contribution to increasing of irrigation area in Timor-Leste through secured irrigation water

Implementation Period
8 years: Survey, design and construction

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

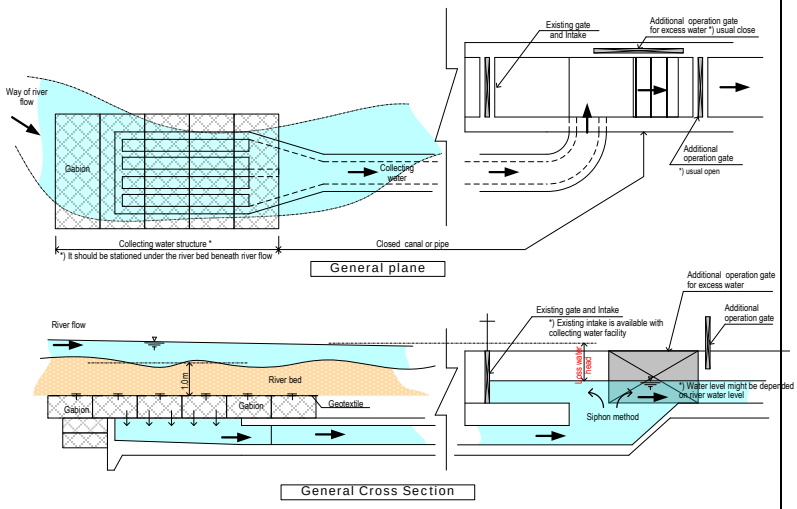
Project Goals

1. Works for removal of sedimentation in rainy season become half
2. Cropping rice area increase in dry season

Project Outline

The way of intake water is some variety, inhere, a proposed weir apply to type of colleting water channel.

Collecting water channel is constructed under the river bed and takes irrigation water.
This structure is available to take water under flooding, but flood water is not inflow to intake directly because surface water of river does not target to intake water.
Therefore, it reduces the containing sand to water and famer can be supplied irrigation water as long as water stream flow on the collecting channel, even water stream change alignment a little.



Accordingly, works for leading water stream by famers will be reduced.

Main Activities	Input Cost
Activity-1; Survey of river condition Activity-2; Design and construction of collecting water channel and intake facility in the river Activity 3; Instruction of operation and maintenance	US$5,000-10,000/ha (depend on river condition and design intake water)

Fund Source	MAF
Risk	
Reduction of intake volume is caused by clogging filter Impossible situation to take water such as dry up river. River alignment is extremely changed by flood.	

Project Number	No.1 (3/3)
Project name	Intake weir construction project
Target group / area	425 irrigation schemes which need supporting facility to guide water stream
Implementation organization	MAF
Corporation organization	MPW, International aid agency (JICA)

Back ground

The irrigation schemes in Timor-Leste almost rely on river water. However, in rainy season river water rapidly increase discharge with sand and stone in short term, due to steep slope of river bed. While in dry season, river water becomes underground water or small stream, due to little rain in dry season.
The structures constructed in river such as weir and intake should be equipped with necessary functions which are necessary durability of structure against attacking stones and make possible to take water in dry season. However, it is so costly to construct such weir and enhance structures that the farmers generally construct the intake along a bank and lead water stream to intake. Although these intakes can alleviate the flood effect as much as possible, they have to lead water stream to intake frequently. In addition, layout of intake heads to the river flow directly. Therefore the sand and stone are inflow and sedimentation to intake and canal, which is flaw of the structure and is burden to farmers and agricultural activity.

Objective

Contribution to increasing of irrigation area in Timor-Leste through secured irrigation water

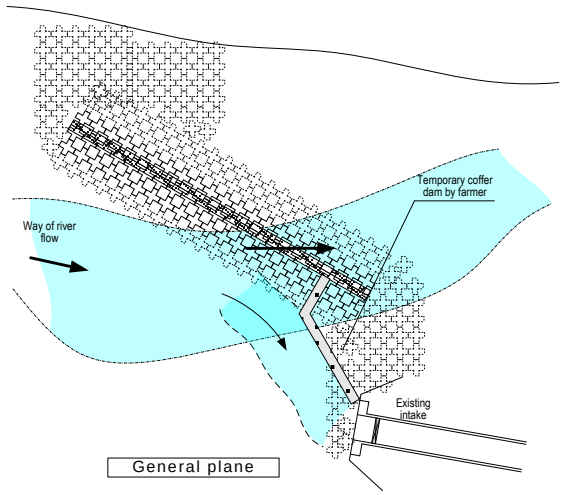
Implementation period
8 years : Survey, design and construction

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goal

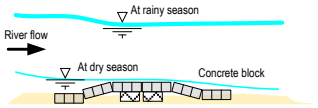
Contribution to increasing of irrigation area in Timor-Leste through secured irrigation water in dry season

Project Outline



General plane

In order to stable intake water, river bed is improved so that the water stream could be lead to existing intake. The purpose of guiding structure lead water stream to intake in dry season in which discharge of river is small and this structure has features of less obstruction against flood.
Lead water stream by guiding structure near intake is finally reached by coffer dam which is constructed by piled up the bolder at river.
Farmers have to construct coffer dam as well as present situation, but its burden on farmers will be reduced because of diminishing of necessary construction range.



General Cross Section

Main Activities	**Input Cost**
Activity 1 : Survey of river condition Activity 2 : Design and construction of guiding structure to lead water stream supportably Activity 3 : Instruction of operation and maintenance	US$5,000-10,000/ha (depend on river condition)

Fund Source	MAF, MPW
Risk	
Impossible situation to take water such as dry up river. River alignment is extremely changed by flood.	

Project Outline (No.2)

Project Number	No.2
Project Name	Tube well construction project
Target Group / Area	Irrigation scheme in south area which has potential of underground water
Implementation organization	MAF
Cooperating Organization	International aid agency

Back Ground

In south plane area of Timor-Leste, a clastic gravel and sand is observed, which has a feature of high porosity. These geological features make the rainfall in void preserve, which consist the fine aquifer at underground. Irrigation is available to use such abundant ground water through the year, and famers' income expects to increase by vegetable or other crops in dry season.

In general, although individual irrigation by underground water is conducted by a hand pump, group irrigation or large irrigation need to use a power pump to supply the stable and certain water. However, in order to operate and maintain of power pump need the sustainable expense by water fee. If WUA does not establish at targeted irrigation scheme, sustainability of power pump will not be expected due to unsatisfied or nothing water fee. As a premise of installation of power pump, farmer's obligation such as demarcation of expense or responsibility should be clarified. In addition, establishment of WUA is essential matter, but NDIWUN have not authorized demarcation of expense or responsibility for power pump.

Given above situation, the test pit should conduct at expected potential area of underground water which combined with the intake weir construction project. Furthermore, the pilot project should conduct taking it into account operation fee and management of operation/maintenance.

Objective

Formulation of possible water demand through test pit, and irrigation by underground water conduct pilot project after installation of power pump at test pit

Implementation Period

8 years : Survey, design and construction

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

Contribution to increasing of irrigation area in Timor-Leste through secured irrigation water in dry season

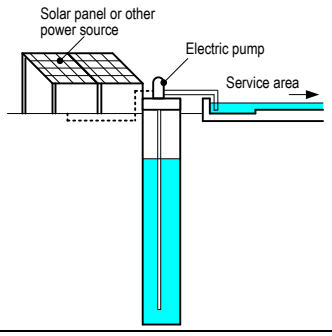
Expected Outcomes

1. Increase of cropping area in dry season
2. Cultivation of vegetable
3. Authorization of management on operation and maintenance for underground water
4. Authorization of the method of construction for tube well

Development Indicators and Monitoring Method

1. Cultivation area of rice in dry season
2. Cultivation area of vegetable
3. Number of farmer and WUA by irrigation with underground water
4. Situation of collecting operation fee or water fee
5. Measurement of water demand and ground water level

Main Activities	**Input Cost**
Activity-1 : Construction of test pit and formulation of possible water demand Activity-2 : Installation of power pump such as electric pump Activity-3 : Monitoring and evaluation (Reference image of pump show on left)	US$30,000/unit (target area of one tube well is around 10 ha)



Fund Source	MAF

Risk

Ground water is not available to irrigation due to the dried up and contaminated water

Social and Environment Consideration
Changing water quality and reduction of water level by pumping

Project Outline (No.3)

Project Number	No.3
Project Name	Regulating pond construction project
Target Group / Area	Watershed of xxx river (Command areas within watershed)
Implementation Organization	MAF
Cooperating Organization	MPW, International aid agency (JICA)

Back Ground

Many irrigation development plans have been planned based on annual cropping ratio 200% in Timor-Leste. However since river discharge amount in dry season is quite small, to achieve annual cropping ratio 200% is very difficult in whole the country of Timor-Leste. While river discharge amount in rainy season is huge and flood often happens. Therefore reservoirs to store flood in rainy season and distribute stored water for irrigation in dry season are constructed to increase annual cropping ratio.

Additionally, national land of Timor-Leste consists of weak geological structure such as limestone and production of earth and soil with heavy rain is active. Therefore after construction of reservoirs, there is a high possibility that a part of reservoir capacity is occupied by sedimentation and reservoir cannot store enough water for irrigation in dry season. To deal with this matter, slope protection structures are constructed and forestation activities are done on bare land within watershed to reduce the production of earth and soil, and sabo (erosion and sediment control) structures to control the flow of produced earth and soil are required as well.

Objective

To contribute to increase irrigated area by reservation of flood water in rainy season and distribution of reserved water for irrigation in dry season

Implementation Period
8 years
(implemented according to the rehabilitation plan of beneficiary areas)

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

Required irrigation water for dry season is reserved in reservoirs and irrigated area increases to xxx ha in watersheds of xxx river

Expected Outcomes

1. Increase of available water amount for irrigation in dry season
2. Increase of irrigated area in dry season

Development Indicators and Monitoring Methods

1. Water volume taken from river for irrigation
2. Construction of reservoirs and sabo structures
3. Change of vegetation within target watershed
4. Area covered by slope protection structures and forestation

Main Activities	**Input Cost**
Activity-1; Land use and vegetation survey targeting within the target watersheds Activity-2; River discharge measurement at intake point Activity-3; Planning of slope protection structures and forestation activities Activity-4; Surveys necessary to plan, design and construct sabo structures Activity-5; Planning, designing and construction of structures	Need coordination with MPW

Fund Source	MAF, MPW, and related others

Risk

River discharge amount in rainy season reduce due to climate change and enough water for irrigation in dry season cannot be stored in reservoir.

Environmental Impacts

1. Resettlement of people living within construction sites and reservoir areas
2. Change of landform by taking earth material
3. Change of habitat of downstream area due to change of river stream flow
4. River bed degradation and retreatment of coastline due to decrease of volume of earth and sand flowing to downstream of reservoirs (earth and soil are obstructed its flow to downstream by reservoirs)

Project Outline

(1)Priority watershed

As a result of irrigation potential assessment from the view point of water source, especially potential of watersheds of Comoro, Tafara, Loumea and Sahen river is low because river discharge amount in dry season is small. At these watersheds, reservoirs to store flood in rainy season and to provide stored water as irrigation water in dry season is considered to contribute to increase the irrigated area effectively.

Among the five (5) watersheds mentioned above, watersheds of Loumea river and Sahen river are selected as priority watersheds for this project. Watersheds of Comoro river becomes out of selection due to small beneficially area and watersheds of Tafara river is also out of selection because Tafara river's discharge in rainy season varies year by year (sometimes very small) and occasionally it may become difficult to store necessary volume of water for irrigation in dry season.

(2)Outline of project

This project consists of four (4) sub-projects shown as below.

1) Construction of reservoir

To store flood in dry season and provide stored water for irrigation in dry season

2) Construction of sabo (erosion and sediment control) structure:

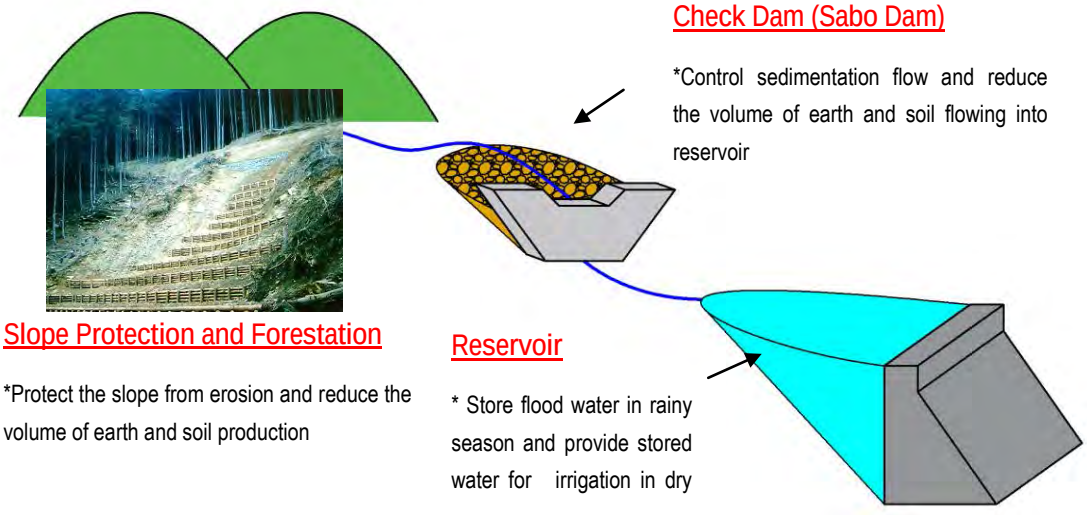
To reduce the volume of earth and soil flowing in to reservoir by controlling flow of sedimentation

3) Construction of slope protection structures and forestation activities on bare lands within watershed:

To reduce production of earth and soil produced by heavy rain

4) Training for operation, management and maintenance of reservoir:

To establish operation, management and maintenance structure for reservoirs



(3) Notice point for reservoir construction

Construction site shall be selected from both technical and environmental impacts view points.

1)Site selection from technical view point

i) Main part of national land of Timor-Leste is consists of limes tones. However since lime stone react with water and dissolves, lime stone should not be selected as reservoir foundation.

ii) For economical construction, material for structure, e.g. coarse aggregate for concrete dam and rocks for rock fill dam, shall be collected from nearby areas of construction site. However same reason as above, lime stone shall not be utilized for structure material. Under this condition, earth dam structured by homogenous material is considered suitable, however soil materials including granule, which is the main material for dam body, is limited because thickness of topsoil (generally the target for earth dam material) is very thin in Timor-Leste.

These means that construction site is limited and careful investigation and examination to select the site is

required.

2) Site selection from environmental impact view point

Site with no or almost no habitants within reservoir area shall be selected to avoid resettlement. Additionally, since reservoir obstructs residents, livestock and wild animals to cross the river, site shall be selected considering reducing this kind of environmental impact.

(4) Necessary survey for reservoir construction

Main surveys necessary to design and construct reservoir are shown as below.

- Topographic survey
- Geological survey (Boring survey)
- Permeability survey
- Material survey (Physical and chemical)
- Rainfall and river discharge measurement
- Environmental survey

Project Outline (No.4)

Project Number	No.4
Project Name	Small irrigation water storage pond/tank construction project for small holders
Target Group / Area	Hillside area within self sufficient zone or upland cropping area with its water source spring
Implementation Organization	MAF
Cooperating Organization	International aid agency, NGOs

Back Ground

Huge area of Timor-Leste's national land is occupied by mountainous area. In mountainous and hillside area, spring water and rainfall is mainly utilized for small scale cultivation however due to steep slope it is difficult to store and utilize spring water and rainfall effectively.

To improve this situation, structures to store spring water and rainfall and to distribute stored water to farmland is constructed to increase upland cropping area and yield.

Objective

To contribute to consolidate agricultural foundation of farmers in self sufficient zone by enabling to start upland cropping

Implementation Period

8 years

(implemented according to the rehabilitation plan of irrigation schemes)

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

1. Ponds or tanks are constructed/installed in the 20 % of 221 areas within self sufficient zone
2. Upland cropping is started at the areas where pond or tanks are constructed/ installed.
3. Area of upland cropping increases.
4. Yield of upland cropping increases.

Expected Outcomes

Increase of available water volume for upland cropping through year

Development Indicators and Monitoring Methods

1. Annual planted area and annual yield of upland cropping utilizing water from ponds or tanks
2. Establishment of cooperative structure for ponds/tanks utilization
3. Establishment of cooperative rule for ponds/tanks utilization

Main Activities	**Input Cost (US$1,000)**
Activity-1; Field surveys necessary to plan, design and construct structures Activity-2; Creation of consensus among beneficial families, and workshop by district irrigation officers regarding construction and operation of structures Activity-2; Construction of ponds/tanks and roof water harvesting structures Activity-4; Support to establish structure for cooperative utilization Activity-5; Support to establish rules for water distribution among beneficial families	US$5,000/area Depending on the condition of water source and characteristics of target area.

Fund Source	MAF

Risk

Farmers in the target areas abandon upland cropping.

Project Outline

This project consists of four (4) sub-projects shown as below.

(1) Construction of spring consolidation structures

Source of spring water is covered by concrete structure to prevent garbage coming in and livestock coming close to prevent water from pollution. Additionally, flexible pipe connecting water source and storing structure is settled as well.

(2) Construction of roof water harvesting structures

Rainwater gutters to collect rainfall are settled at the houses with tin roofs.

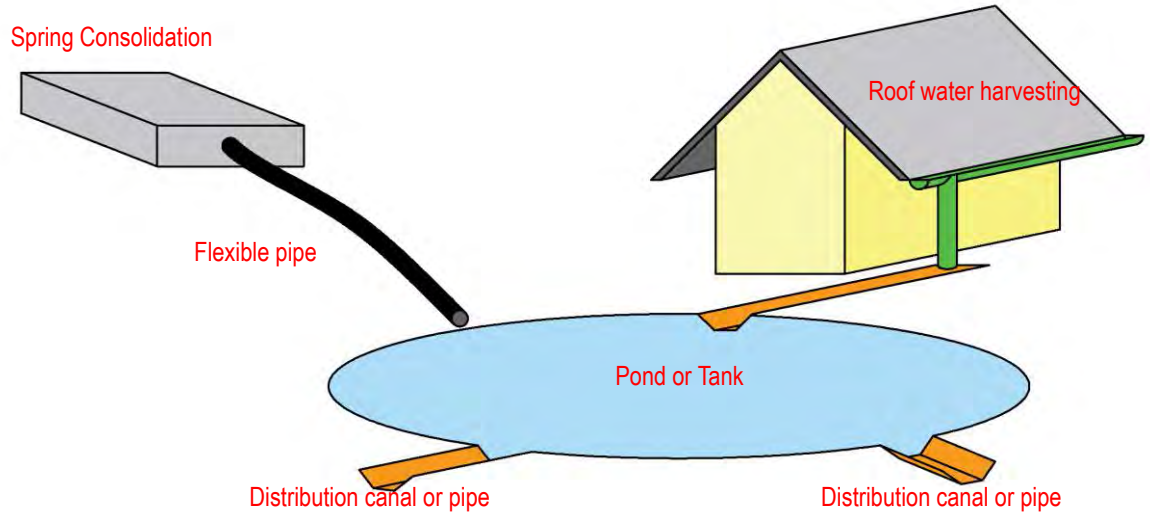
(3) Construction of spring water and rainfall storing (small pond/tank) and distribution structures

Small ponds/tanks are constructed/ installed to store water guided from water source and roof of houses. In addition to these structures, water distribution structures (canal/pipe) are settled as well.

To design water storing structure, especially excavated pond, it is required to confirm if elevation of structures are higher than target farmland.

(4) Establishment of rule for water distribution

Stored water is shared among some beneficial families. Rules for cooperative utilization of water are settled to establish appropriate operation and management system by beneficiaries.



Project Outline (No.5)

Project Number	No.5
Project Name	Strengthening program for operation and management system of irrigation system
Target Group / Area	425 irrigation schemes in the country and irrigation section in the district agriculture directorate
Implementation organization	MAF
Cooperating Organization	International aid agency (JICA)
Background	
The actual irrigation area of the 425 irrigation schemes in the country is reported at 35,000 ha out of 67,000 ha of the potential irrigation area. In some cases the potential area is planned from the possible intake capacity and actual intake amount is always less than the possible one. In many cases, actual irrigation area is decreased because the irrigation water does not reach to all the planned irrigation plots. The reason is summarized into the i) poor operation and maintenance of irrigation facilities causes decrease of intake capacity because of the sedimentation deposited around intake facility , and ii) decrease of flow capacity of delivery canals by sedimentation and weed in canals. The operation and maintenance of the irrigation schemes have been practiced by traditional water use groups in the country. At present, out of the 425 irrigation schemes, only 27 schemes have institutionally authorized as a WUA, which is equivalent 6% to the whole schemes. Remaining 398 schemes have no any water use organization or traditional water use group. Many irrigation schemes suffer from the sedimentation in the irrigation system. Heavy machine such as excavator is needed to remove the deposited sedimentation. MAF has	

three units of the excavators, so that removal work is conducting by using it which MAF lends in response to the request from the district. Present three units are very few to meet with the requests from the districts of the irrigation schemes suffered sedimentation. Adjustment of the transportation of it to the district is also hard in the aspects of timing of delivery and transportation cost. Removal of the sedimentation is crucial for maintaining irrigation agriculture.
In order to assure proper operation and maintenance of the irrigation facilities including in removal of deposited sedimentation, establishment of the WUA and strengthening the O/M capacity are essential for the proper water management, which will lead to the expansion of the actual irrigation area and increase of agriculture production.

Objective

To establish institutionally authorized Water Users Association (WUA) in the 425 irrigation scheme.
To strengthen function of the irrigation system and capacity of the WUA for proper O/M of irrigation facilities.

Implementation Period
8 years: Training on the targeted irrigation schemes and un-organized groups, conducted by travelling guidance.

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

1. Institutionally authorized WUAs are established in 398 irrigation schemes in the country. Especially, focus put on the 204 irrigation schemes which are located in rice bowl area.
2. Proper operation and maintenance is practiced in 425 irrigation schemes in the country and appropriate distribution of irrigation water is guaranteed.

Expected Outcomes

1. Institutionally authorized WUAs are established.
2. Proper operation and maintenance of irrigation facilities are practiced
3. Irrigation water is distributed to every farm plot and actual irrigation area is increased.
4. Crop production is increased by the effect of irrigation water application with adequate quantity and timing.
5. Farmers are organized through the activity of WUA.
6. Women participation is stimulated and increased through activities of WUA
7. Facilitation capability of NDIWM and district agriculture offices on WUA and O/M is strengthened.

Development Indicators and Monitoring Methods

1. Number of WUAs
2. Number of members of WUAs
3. Amount of collected water fee
4. Quantity of diverted water
5. Actual irrigation area

Main Activities	**Input Cost (US$1,000)**
Activity-1; Related expert facilitates NDIWM staff on establishment and capacity building of WUA Activity-2; Expert and NDIWM staff facilitates related staff of district agricultural directorate on establishment and capacity building of WUA Activity-3; Staff of district agricultural directorate facilitates representatives of the irrigation schemes on establishment and capacity building of WUA Activity-4; To support related WUAs to establish WUAs. Activity-5; To support related WUAs to strengthen system and capacity of O/M of irrigation facilities. (5 years)	1,147.8 (Include the heavy machine for removal of the deposited sedimentation)

Fund Source MAF

Risk

Farmers willing to irrigation agriculture is spoiled by the sluggish price of rice and other agriculture products

Project Outline (No.6)

Project Number	No.6
Project Name	Farmers participation irrigation related facilities construction project
Target Group / Area	425 irrigation schemes which need rehabilitation and improvement for access roads, secondary and tertiary canals.
Implementation Organization	MAF
Cooperating Organization	MPW, International aid agency (JICA, DFAT, GIZ)

Back Ground

MAF has implemented the headworks construction or to be implementation at large irrigation schemes in Timor-Leste. However the almost project focus on large structure such as the headworks and/or the main canal, hence the secondary and/or tertiary canal is out of works for the project.
Despite of the fact that these areas establish the WUA in the project, WUA for now it has dismissed and agricultural works become careless activity as well as before the project. Because farmers in service area cannot be delivered irrigation water as project plan. Therefore, such irrigation facility is un-functionally operated, which might be improved or rehabilitated by regular maintenance and cooperative activity. Especially, the paddy field in middle or downstream area cannot be delivered appropriate irrigation water.
To take measure for above situation, these farmers need to grow the ownership for their irrigation facility and water management. Hence farmers in service area should participate in rehabilitation works. Farmers' ownership is obtained by participation of the project works at construction.

Objective

Contribution to be stable of rice production and others in Timor-Leste through secured irrigation water Increase of the rice production in Timor-Leste

Implementation Period
8 years : Survey, design and construction

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

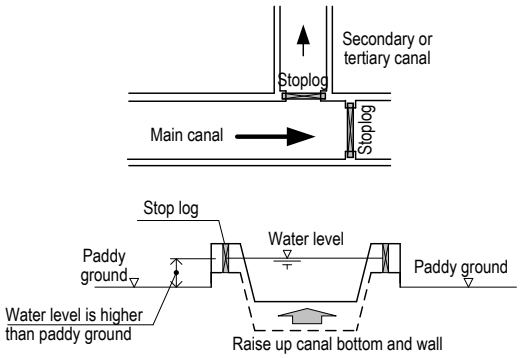
Project Goals

Activity related to rice production conduct as original plan

Project Outline

Below contents shows example for the farmers participation works.

The canal alignment survey conduct to detect and ascertain the shortage of water level in service area firstly. And the section of shortage of water level rises up the canal bed.
These secondary and tertiary canals are almost consisted of earth canal, hence section of low bed extremely should improve to alter into wet masonry canal. In addition, the diversion point of canal should set the guide for the stop log.
Farmers lean the knowledge for operation and maintenance, and have an opportunity to understand the significance. In addition, these cooperative works will contribute to establish and strengthen WUA. Furthermore, as farmers' participation works, construction of access road will be component.



Main Activities	**Input Cost**
Activity-1; Facilitation of farmers' participation works by NDIWM and district irrigation stuff. Activity-2; Conduction of workshop for cooperative works Activity-3; Construction works by farmers participation such as secondary, tertiary and access road Activity-4; Instruction of construction and rehabilitation works to NDIWM and district irrigation stuff	1,000 $/ha (depend on site situation)

Fund Source	MAF

Risk

1. Headworks cannot take water and deliver irrigation water
2. River is dried up and cannot take water.

Social and Environment Consideration

Implementation plan of canal and access road should take into consideration the relation with land property

through workshop and participation works

Project Outline (No.7)

Project Number	No.7
Project Name	River control facility construction project for protection of irrigation system and farmland
Target Group / Area	At the intake point of Technical or Semi-Technical type intake facilities located at middle stream area
Implementation Organization	MAF
Cooperating Organization	MPW, International aid agency (JICA)

Back Ground

In Timor-Leste, intake facilities are categorized into three (3) types according to its structure, Technical (weir is made by concrete), Semi-Technical (intake facility is made by concrete) and Traditional (intake facility is made by soil and rocks). Among them, Semi-Technical and Traditional type have been damaged by flood such as damage on structure, erosion of farmland, and blockade of intake or canal by sedimentation. Additionally, there are many intake facilities which cannot take water from river stably due to gap of river bed and intake point due to river bed degradation by flood.
To deal with these matters, river channel stability structures are constructed to control river bed degradation, to reduce river flow velocity and to reduce volume of sedimentation transportation.

Objective

1. To keep stable water intake structure
2. To control sedimentation volume flowing into facilities and farmlands

Implementation Period
8 years
(implemented according to the rehabilitation plan of irrigation schemes)

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

Planted are of paddy becomes stable.

Expected Outcomes

1. River discharge volume becomes stable at intake point.
2. Volume of sedimentation flowing into facilities and farmland decreases.

Development Indicators and Monitoring Methods

1. Planted area of paddy
2. Volume of excavated sedimentation
3. River bed degradation amount at intake point

Main Activities	**Input Cost (US$1,000)**
Activity-1; River discharge measurement at intake point Activity-2; Planning of river channel stability structures Activity-3; Construction of river channel stability structures (drop structures and river bank protection structures)	- Highly depends on the condition of river (width, bed slope, discharge, and so on) - Need coordination with MPW to share the expense of survey, design and construction

Fund Source	MAF, MPW

Risk

Rainfall amount and river discharge volume reduce due to climate change and river discharge amount at intake point becomes not enough for irrigation.

Environmental Impacts

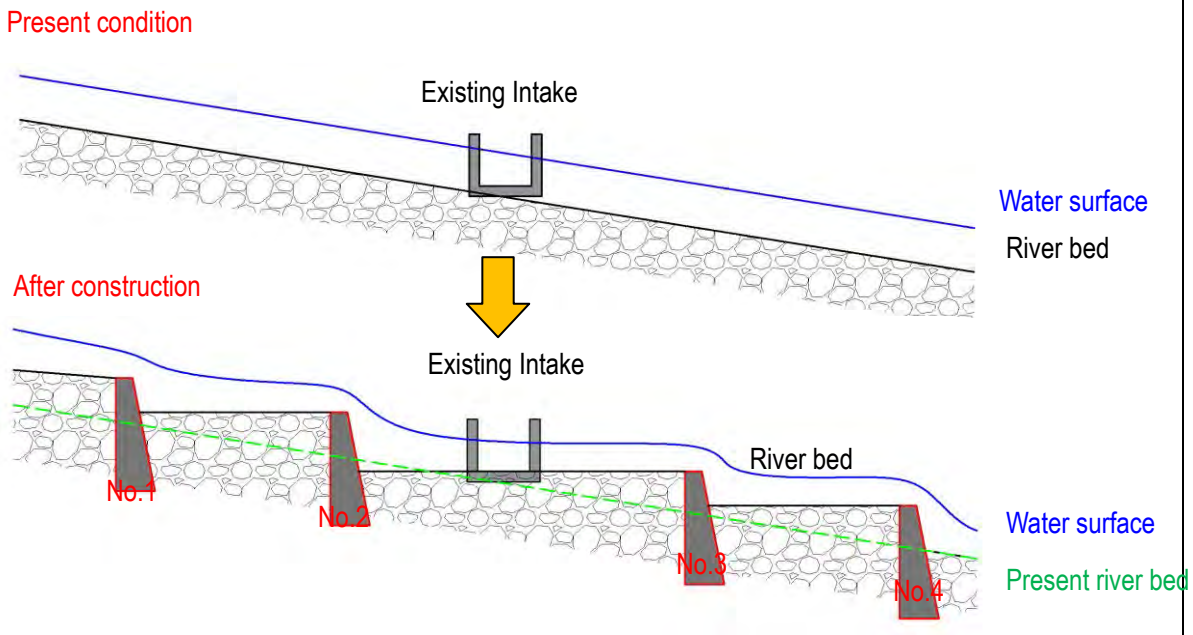
Resettlement does not happen and change of landform is slight because construction site is within the river channel.

Project Outline

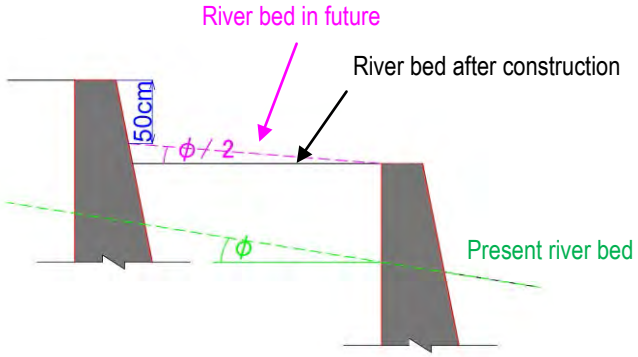
(1) River bed stabilization by drop structures

Four (4) lines of drop structures across the river channel are constructed. The main role of each structure is mentioned below.

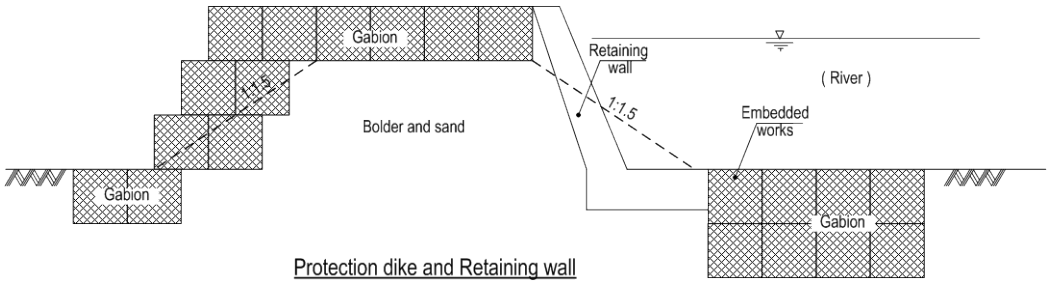
No.1 : To reduce flood flow velocity and volume of sedimentation transported to downstream by flow by making upstream side river slope mild
No.2 : To reduce sedimentation volume transported to intake point by structure of area between the No.1 and the No.2 as sedimentation basin.
No.3 : To stable the river bed at intake point with No.2
No.4 : To prevent river bed degradation and river bank erosion happened downstream side reach to No.3



To avoid the drop structures to be buried by sedimentation, enough drop height shall be designed. Since it is said that river bed slope after construction of structures becomes half of present one, present river bed slope is measured by topographic survey and the drop height shall be designed more than 50 cm of future river bed (show the right figure).
In addition to these structures, slope protection structures/activities at the bare land within watersheds are expected to be done because slope protection structures/activities work to reduce earth and soil production by heavy rain.



(2) River channel stabilization by drop structures
River bank protection structures shown as below are needed as well because even if drop structures are constructed, it is impossible to prevent river bank from erosion completely.



Project Outline (No.8)

Project Number	No.8
Project Name	Capacity development program of NDIWM for leading irrigation development project
Target Group / Area	Staff of NDIWM, Irrigation staff of District National Directorate
Implementation Organization	MAF
Cooperating Organization	International aid agency (JICA)

Back Ground

NDIWM is responsible for leading irrigation development project for countrywide irrigation scheme. NDIWM should work from survey to study, design and implement the irrigation scheme. But, presently, such works are entrusted to the donor agencies and Indonesian consultant in which survey and design works are dependent on their engineering standard dealing with the series of irrigation development. NDIWM has no engineering standard for leading irrigation development projects, so that NDIWM itself cannot operate and manage the irrigation development.

In order to lead appropriate irrigation development projects, it is required to provide engineering standard dealing with the series from surveying to studying, designing and supervising processes under the various river conditions such as debris flow and rapid fluctuation of river flow. In this project, a technical guideline to lead irrigation development plan and design irrigation facilities is prepared as a basic approach. To promote countrywide irrigation development projects, NDIWM should prepare an engineering standard dealing in irrigation development works from survey to design and supervision based on the technical guideline. NDIWM should promote concrete irrigation development project according to the prepared engineering standard.

It was surveyed there are total 425 irrigation schemes in this country according to the irrigation inventory survey conducted in this project. Survey result is compiled as an electronic file in the ALGIS to supply information related with irrigation agriculture. In order to make promotion of irrigation development project more easy and effective, the file should be regularly updated by NDIWM.

However, organization capacity of NDIWM and implementation capacity of related staff are too low to do these works. In order to provide engineering standard for operating process from survey to make plans and design, and supervise the project implementation, it is required to develop the organization capacity and engineering capacity of the staff.

Objective

To enable the NDIWM to provide the appropriate irrigation development projects, operate and supervise the implementation process of them through improving their organization and engineering capacity.

Implementation Period
5 years

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

NDIWM conducts a series of irrigation development works from surveying to planning, designing and supervising the projects which are selected based on the inventory survey data.

Expected Outcomes

1. Engineering guidelines are provided by working process of survey, planning, designing, implementation and supervision.
2. Capacity of the 48 NDIWM staff and 13 irrigation section's staff of the district national directorate is improved.
3. Inventory survey data of 425 irrigation schemes is updated.
4. Inventory survey data is applied for providing irrigation development project.
5. Technical specification of the irrigation development projects is prepared by making the use of the technical guideline and engineering standard.

Development Indicators and Monitoring Methods

1. Section in charge of preparing technical guideline is established in the NDIWM.
2. Engineering guideline is prepared by working process.
3. Responsible organization for updating the irrigation inventory data is established in NDIWM, district agricultural directorate, and ALGIS section.
4. Frequency of updating GIS file related to the irrigation inventory
5. Degree of making the use of irrigation inventory data by MAF and related organization for providing irrigation agriculture development projects
6. The number of irrigation development projects provided based on the engineering standard

Main Activities	**Input Cost (US$1,000)**

Activity-1: To establish the responsible organization for preparing technical guideline. Activity-2: To prepare training programs for related staff to prepare technical guideline. Activity-3: To execute the training programs by technical fields by the versed experts. Activity-4: To organize the oversee training for related staff. Activity-5: To establish the updating system of irrigation inventory data. Activity-6: To prepare training programs dealing in the way how to update and make the use of the irrigation inventory data. Activity-7: To execute the training programs for updating and making the use of the irrigation inventory data.	US$285.5
Fund Source	MAF
Risk	
No needs to provide irrigation development project	
Social and Environment Consideration	
No negative impacts due to the survey and analysis works	

Project Outline (No.9)

Project Number	No.9
Project Name	Program for obtaining and breeding quality seed
Target Group / Area	NDR, Rice farmers in rice production areas
Implementation Organization	NDR, NDAH
Cooperating Organization	NDEACD, International aid agency (DFAT, GIZ)

Back Ground

Although, the government has distributed seeds of rice and maize to farmers, that amount is small. There is a case different seeds are distributed by years. Variety, Ciherang, imported from Indonesia, was distributed in 2013. Cultivation method on the variety is not disseminated, so that it is not expected to get yield planned on the varieties.

The test cultivation of rice varieties introduced from IRRI has been conducted by SoL and NDR of MAF. However, they have not tried to breed rice varieties with local varieties. Research on breeding of maize by trial cultivation is planned in Loes Research Center of NDRSS. Currently, they have tried to compare the local rice with imported rice such as Sele or Noi Mutin. It is necessary to identify and preserve local varieties including red rice and black rice. It is important to breed the local varieties and introduced varieties in order to make suitable varieties with favorable taste and quality for Timorese.

SoL started a program to produce commercial seed and community seed through contract farming. Currently amount of seed distributed from MAF is not enough to meet with farmers' demand. The amount of rice seed which is recommended by MAF is distributed for approximately 25% of cultivation areas in 2012. It is needed to disseminate the appropriate techniques of self seed collection to farmers.

Objective

Yield is improved and crops of good quality are produced when farmers can use the seed of good quality. It is necessary to breed rice and maize varieties with local varieties and to disseminate how to regenerate or collect self seed.

Implementation Period
5 years

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

1. 50% of farmers in whole country can regenerate seeds each two or three years.
2. All local varieties are identified and crop breeding of rice and maize is conducted between local varieties and imported rice.

Expected Outcomes

1. System of seed certification is established, and then local varieties and introduced varieties are certified.
2. Manuals about self seed collection method and regeneration of seed are made.
3. The self seed collection method is disseminated to farmers and then farmers carry out adequate seed self collection.
4. Farmers regenerate seed with certified seed (include local varieties and introduced varieties) by manual of

regeneration of seed.
5. The system of crop breeding is organized in NDR and some officers are arranged.
6. Crop breeding between local varieties and imported rice from IRRI is carried out.

Development Indicators and Monitoring Methods

1. The amount of rice seed which is imported from IRRI or produced by seed production farmers from MAF, the number of farmers from whom distributed seeds and frequency of regeneration of ride.
2. The survey about self seed collection method.
3. Organization of system of crop breeding.
4. Report about crop breeding and number of varieties bred.

Main Activities	**Input Cost (US$1,000)**
Activity-1. To make manuals about self seed collection method and regeneration of seed and introduce it to extension workers Activity-2. To disseminate self seed collection method and regeneration of seed Activity-3. Organization of system of crop breeding Activity-4. Training of officer charged in crop breeding at other country Activity-5. To identify local varieties Activity-6. To make a plan of crop breeding Activity-7. To carry out crop breeding along the plan	US$214

Fund Source	MAF

Risk

The government of policy about commercial seed distribution is changed and then seeds are distributed to all farmers.

Project Outline (No.10)

Project Number	No. 10
Project Name	Promotion program for private mechanization
Target Group / Area	Farmers groups in rice bowl area
Implementation Organization	NDAH
Cooperating Organization	NGOs, Private agricultural machine repair shops

Back Ground

In cultivation activities of rice, the stages of ploughing, irrigating, and harvesting are especially required intensive labour force. On the other hand, ensure the labour force is becoming difficult, and it often leads labour shortages and an increase in labour costs of agricultural activities. To respond the problems, MAF is currently lending large tractors and providing fuel for them as one of the subsidy programmes. However, the large tractors are not likely to be suitable for the land situation of the Timor-Leste because most of the land is mountain terrain. As result, a lot of the large tractors are left not been used. In addition, many tractors are not appropriately maintained since there are not enough facilities for maintenance in the region. Moreover, it is concerned that lending large tractors for free by government leads farmers' discourage to grow ownership of the agricultural machinery. Since the production activities become intensive in the domestic commercial rice production area, there is a need to support motivated farmers to promote agricultural mechanization.

Objective

To solve a shortage of labour force to produce commercial rice by promoting small hand-tractors which are affordable for commercial farmers and suitable for land situation of the Timor-Leste through development of private maintenance facilities in the region.

Implementation Period
3 years

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

1. Small hand tractors, which can be maintained by farmers' self-help, are widely introduced in the domestic commercial rice production areas.
2. Maintenance facility for small hand tractors is improved through developing private machine repair shops.

3. Agricultural mechanization promotion committee is established in order to formulate and reinforce a regulation for safety operation, environmental consideration, and appropriate maintenance for agricultural machinery which is supposed to be installed in Timor-Leste in near future.
Expected Outcomes
1. Shortage of Labor force is solved through extension of small hand tractors to rice farmers. 2. Small hand tractors are well maintained by farmers' self-help. 3. Business model for repairing small hand tractors is established in the region. 4. Skill of private repair shop is improved. 5. Shortage of the number and low technical capacity of government machinery mechanics are resolved by improving service level and increasing the number of agricultural machinery repairers of the private sector. 6. The regulation of operation and maintenance for agricultural machinery formulated by the agricultural mechanization promotion committee is compliance by agricultural machinery distributer, repair shops and user farmers.
Development Indicators and Monitoring Methods
1. Extension of small hand tractors in the region. 2. Number of private repair shops in the region. 3. Frequency of repair services 4. Training for farmers and technical workshop for private repair shops 5. Activity monitoring of the agricultural mechanization promotion committee

Main Activities	**Input Cost (US$1,000)**
Activity-1 To Conduct training for farmers about operation and maintenance of small hand tractors. Activity-2 Support for business activity of private repair shops (demonstration sale, matching meeting with farmers, etc.) Activity-3 To Conduct technical workshop for private repair shops. Activity-4 To establish agricultural mechanization promotion committee, and to conduct regularly meeting to exchange opinion among Agricultural machinery distributors, repairer, and user farmers.	US$70.2

Financial Source	MAF

Risk
Agricultural machinery repair shops and distributers are not deployed in the region.
Social and Environment Consideration

Project Outline (No.11)

Project Number	No. 11
Project Name	Establishment of agricultural fund system
Target Group / Area	Farmers or farmers' groups who promote commercial agriculture
Implementation Organization	MAF
Cooperating Organization	Ministry of Finance (MOF), Ministry of Economic Development (MED), Ministry of Commerce, Industry and Environment (MCIE), NGOs, Donors

Back Ground
In terms of extension of financial service in Timor-Lest, private and NGO owned financial institutes are expanding their business activities to nationwide. However, since their loan program requires a short period of repayment and high interest rate, the nature of the loan is targeting to the people who are conducting small-scale business, rather than farming activities. Farmers have difficulties to access those loans since they cannot expect their income until the harvest season. Besides, the development of land law is still undergoing in Timor-Leste, farmers living in rural area do not have resource which can be utilized as collateral expect their land. Therefore,

famers and farmers group who have a limited resource cannot access to the loan which is necessary to conduct commercial agriculture. In order to promote commercial agriculture in domestic production, support to improve financial service is greatly required.

Objective

To establish a support system in order to reduce risks and burdens imposed on loan from financial institutions so that farmers in Timor-Leste are able to procure agricultural inputs and equipment which are necessary for transforming from subsistence agriculture to commercial agriculture. Beside, agricultural system funds are operated on purpose of supporting commercial rice growing farmers, however, target farmers should be selected without distinction of crops to secure flexibility of the programme as promotion to commercial agriculture comprehensively.

Implementation Period
3 years

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

To establish the agricultural fund which is utilized for operating the interest subsidy system and credit guaranty system of agricultural loans so that commercial farmers utilizing financial service are increased.

Expected Outcomes

1. The agricultural fund is established and properly operated.
2. Financial service in domestic rice production area is improved by establishing the interest subsidy system and the credit guaranty system
3. Farmers' agricultural investments by utilizing loans such as procuring input material and small hand-tractors are activated.
4. Agricultural business entrepreneurs such as agricultural products processing business are activated by improving farmers' access the loan
5. Business activities of agricultural inputs and material are activated in the region.

Development Indicators and Monitoring Methods

1. Financing Operational status of the agricultural fund
2. Guideline of the interest subsidy system and credit guaranty system
3. The number of farmers who are applied to the interest subsidy system and credit guaranty system, and their financing status
4. The number of subrogation cases, and the loan recovery status from debt farmers
5. The number of private sectors related to agriculture in the region, and the situation of their business activities.

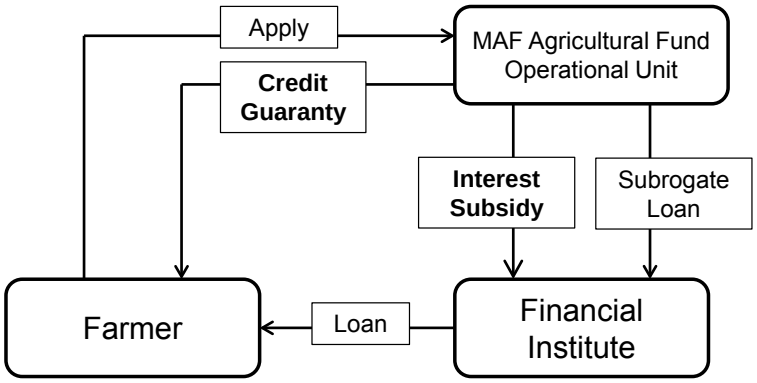
Main Activities	**Input Cost (US$1,000)**
Activity-1 Support for establishment of the agricultural fund and necessary modification of related regulation and law. Activity-2 Establishment of the agricultural fund Activity-3 Establishment of the operational unit of the agricultural fund under MAF Activity-4 Formulation of guideline of interest subsidy system and credit guaranty system Activity-5 Negotiation with financial institute and other related stakeholders. Activity-6 Operation and monitoring of interest subsidy system and credit guaranty system. Activity-7 Facilitation of business activity between farmers and private agricultural dealers (group procurement, demonstration selling, matching meeting, etc.)	Project activity: US$435 Agricultural fund reserve: US$7,000

Fund Source	The funding source of the agricultural fund is considered to be the petroleum fund in addition to donors and MAF budget.

Risk
The funds of interest subsidy system and credit guarantee system are not secured.

Summary of Interest Subsidy System and Credit Guaranty System

The farmer, who wants to get a loan from financial institutes utilizing the interest subsidy system and credit guaranty system, should submit an application to the agricultural fund operation unit in MAF. The agricultural fund operation unit will select the target farmer. The financial institution will be received the interest subsidy of the selected farmer' loan from the agricultural fund operation unit. The selected farmer will also provide credit guaranty from the agricultural fund operation unit. If the debt farmer fails to repay his loan, the agricultural fund operation unit will subrogate the farmer's loan to the financial institute. Then, the farmer will formulate a repayment plan with supports from the agricultural fund operational unit and will repay his debt to the agricultural fund operation unit instead of the financial institution.



Summary of Interest Subsidy System and Credit Guaranty System (Draft)

Project Outline (No.12)

Project Number	No.12
Project Name	Local resource circulative agriculture promotion project
Target Group / Area	NDAH, Rice miller, livestock breeding farmers
Implementation Organization	NDAH, NDR, NDAECD
Cooperating Organization	International aid agency (GIZ), NGOs

Back Ground

Although chemical fertilizer is distributed for free to farmers from MAF, the amount of distribution is limited. Particularly in the local area, there are few stores selling agricultural materials, and the price is expensive. Therefore in the area where chemical fertilizer is hard to available, it is required to make compost and organic fertilizer using valuable plant, crop residues and animal residues and to cultivate green manure as off-season crop. It is important to improve soil condition by those methods.

Many rice millers leave rice husk after milling. And also, rice bran and rice straw are not utilized effectively. It is impossible to make rice bran charcoal, "bokashi" compost and compost with rice straw in rice miller and to sell them to farmers. In addition, poultry manure drained from a poultry farming farmhouse (including a poultry farming company) are not used effectively and the use technology is poor. The locale resources can be utilized widely by spreading how to make and use them to rice miller or poultry farming farmhouse.

Objective

Production activity using available local resources is promoted in agricultural production areas.

Implementation Period
3 years

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

1. 30% of all farmers utilize compost with local resources and cultivate green manure. Rice yield increase 10%.
2. Compost or rice husk charcoal are made from local resources in rice miller and rice farming.

Expected Outcomes

1. Manuals about green manure as off-season crop and compost or organic fertilizer using local resources are

made. 2. Training about green manure and compost is conducted for extension workers. 3. Training about green manure and compost is conducted for farmers. 4. Soil and yield is improved by using green manure or compost in farmer's field. 5. Rice husk charcoal, "bokashi" compost and poultry manure are made in rice miller and poultry farming farmhouse, and then they are sold to farmers. 6. Agricultural productions which are produced with organic materials are sold in a trade fair.
Development Indicators and Monitoring Methods
1. Manual of green manure, compost and organic fertilizer. 2. The number of extension workers trained. 3. The number of farmers trained. 4. The number of farmers who applied green manure or compost. 5. Yield of pilot field using organic materials. 6. Sales amount of organic materials made in rice miller or poultry farming farmhouse.

Main Activities	**Input Cost (US$1,000)**
Activity-1. To make manual about green manure, compost and organic fertilizer. Activity-2. To train to extension workers. Activity-3. To train to farmers. Activity-4. To make model farmland and exhibit the result. Activity-5. To train how to make compost for rice miller and poultry farming farmhouse. Activity-6. To train how to sell for rice miller and poultry farming farmhouse. Activity-7. To carry out agricultural trade faire (exhibit a result, development of market).	US$96.7

Fund Source	MAF

Risk
Cheap chemical materials circulates in large quantities, and farmers come to be available them by cheap price.

Project Outline (No.13)

Project Number	No.13
Project Name	Dissemination program for cultivation techniques
Target Group / Area	NDAH, NDAECD, Rice farmers in Rice bowl area
Implementation Organization	NDAH, NDAECD
Cooperating Organization	Internation aid agency (GIZ), NGOs

Back Ground

MAF is promoting the GAP classified into ICM, SRI and Hybrid in the country. Roughly ICM is in the eastern region, SRI in the western region, Hybrid and IRCS mainly in Manatuto area. Although the yield is grown in the fields with ICM and SRI, it is still low compared with neighboring countries.

Technical manual of ICM and SRI has been prepared. Training for extension worker and practice in the fields are conducted. However, currently those cultivation methods are carried out only 5% of farmers in rice bowl area. Because the target to spread is limited to the farmhouse group, it is necessary to spread the target not only the farmhouse group but also the individual farmhouse. In addition, the accumulation of the correct data such as the rice cultivation area which enforced ICM and SRI and the yield is poor. Therefore establishment of measurement of the crop yield unified in the whole country is demanded.

Otherwise even if rice cultivation methods are disseminated, it is one problem that the work force to enforce it is shortage. Therefore it is required to spread the simple model agricultural machinery (rotary weeder, line marker, standstill thresher) which are made and disseminated by IRCP depending on the present conditions of the local

agriculture work force.

Objective

Cultivation methods such as ICM or SRI are disseminated to farmers or farmer' groups, and then yield and quality of crop production are improved. Additionally by the spread of simple model agricultural machinery, reduction of work force is resulted.

Implementation Period
9 years

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

1. By the dissemination of ICM, SRI and IRCS carried out by 95% of farmers in the rice bowl area, yield and quality come to be improved in 50% of farmers.
2. 30% of farmers utilize the simple model agricultural machinery in rice bowl area.

Expected Outcomes

1. The manual of dissemination of cultivation methods for extension worker and for farmers are made. Materials of dissemination are also made.
2. The training about the cultivation methods was carried out for extension workers, and the agricultural skill and the leadership of them improves.
3. The training about the cultivation methods was carried out for farmers and farmer' groups and conducted them in the field.
4. The follow up of the cultivation methods such as improvement of material for records, technical consultation and yield investigation carried out by extension workers.
5. The spread of manufacturing methods of the simple model agricultural machinery and the spread of usage are carried out.

Development Indicators and Monitoring Methods

1. The manual of dissemination of cultivation methods for extension worker and for farmers
2. Number of extension workers, farmers and farmer' group which are trained
3. Cultivation area which applied cultivation methods
4. Yield of farmer' field which applied cultivation method
5. Number of organization which product products simple model agricultural machinery and number of products
6. Number of farmers who utilize simple model agricultural machinery

Main Activities	**Input Cost (US$1,000)**
Activity-1. To make the manual of cultivation methods for extension worker and for farmers Activity-2. To train cultivation method to extension workers Activity-3. To practice in farmers model plot with cultivation method Activity-4. To disseminate to farmers and farmers group Activity-5. To disseminate manufacturing, selling and usage instruction Activity-6. To conduct a competitive show with farmers who practice cultivation methods Activity-7. To carry out yield survey and follow up after applying of cultivation methods	US$300.5

Fund Source	MAF

Risk

Farmers do not show will to accept the cultivation methods for improving rice production because cheap rice is imported.

Project Outline (No.14)

Project Number	No.14
Project Name	Strengthening program for pest and disease control
Target Group / Area	NDAH, NDAECD, Rice farmers
Implementation Organization	NDAH, NDAECD, NDR
Cooperating Organization	Internation aid agency (GIZ, DFAT), NGOs

Back Ground

The rice production is highly affected by pest and disease such as rice blast and rice bug. MAF has distributed agricultural chemicals to farmers, however the amount of distribution is limited. In Dili or Bobonaro district, the imported agricultural chemicals from Indonesia is sold, however there are few volumes. The price of them is expensive, therefore farmers generally cannot purchase them. In 2013, rice field of Oecussi district suffered from disease, and the amount of production greatly decreased. However the action to prevent them was not taken. It is necessary to introduce the knowledge about pest and disease and protective measure of them.

It is realistically required to improve cultivation techniques such as utilizing healthy seed and cultivation at appropriate time while the acquisition of the agricultural chemicals is limited. It is characteristic that the soil of Timor-Leste is not invaded by a chemical substance. It is important to disseminate the prevention plan without agricultural chemicals on the point of environmental conservation and producing secure crops. Additionally it is effective to utilize natural pesticide of grass taken in local area. It is necessary to make a manual about usage of natural pesticide with NGOs or practical farmers and to disseminate it. Hot water treatment for seed disinfection of paddy is effective to rice blast or “bakanae” disease same as agricultural chemicals.

Objective

Knowledge about pest and disease is acquired and technology of prevention is established. The manual of natural pesticide made by natural resources, and then prevention of pest and disease using natural pesticide is disseminated. Additionally, the cultural prevention such as hot water treatment for seed disinfection of paddy and improvement of cultivation method is carried out.

Implementation Period

8 years : with dissemination of cultivation method

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

1. Knowledge about pest and disease is acquired by MAF officer including extension workers and technology of prevention is established.
2. The manual of natural pesticide is made and disseminated.
3. The cultural prevention such as hot water treatment for seed disinfection of paddy and improvement of cultivation method is disseminated to 50% of farmers and the rice production of 30% of farmers is improved.

Expected Outcomes

1. The training about pest and disease, and technology of prevention is conducted for MAF officer including extension workers.
2. A manual of natural pesticide made by natural resources which are taken in local area.
3. Natural pesticide is disseminated to farmers using the manual.
4. The training about cultural prevention such as hot water treatment for seed disinfection of paddy and improvement of cultivation method is carried out.

Development Indicators and Monitoring Methods

1. Number of MAF staffs trained about pest and disease and technology of prevention.
2. A manual about natural pesticide.
3. Number of farmers trained about natural pesticide.
4. Number of hot water treatment for seed disinfection
5. Number of farmers who applied the cultural prevention

Main Activities	**Input Cost (US$1,000)**

Activity-1. To conduct the training about pest, disease and technology of prevention Activity-2. To identify pest and disease occurred in each district Activity-3. To introduce microbial controlling agents suitable for pest and disease Activity-4. To make a manual about natural pesticide Activity-5. To disseminate natural pesticide by NGOs and farmer' group Activity-6. To carry out the training about cultural prevention Activity-7. To establish facilities of hot water treatment for seed disinfection	US$168.4
Fund Source	MAF, International institution
Risk	
Farmers do not show will to produce rice more because cheap rice is imported.	

Project Outline (No.15)

Project Number	No.15
Project Name	Establishment and dissemination program of manure management technique
Target Group / Area	NDAH, NDAECD
Implementation Organization	NDAH, NDAECD, NDR
Cooperating Organization	International aid agency (GIZ, DFAT), NGOs

Back Ground

Although agricultural chemicals are distributed to farmers from MAF, the amount of them is limited. The result such as amount of production and yield data by each cultivation method has not been counted. It is necessary to collect and analyses the actual input and production data for establishment of dissemination of rice cultivation method and manure management system. Additionally, it is required to establish and disseminate technology of manure focusing on circulation of agricultural chemicals with the commercial base.

On the other wise, the production goes worse because the soil become unsuitable for the growth of the plant by soil acidifies with the application only for artificial manure. Then it is planned to make compost and organic fertilizer with natural resources taken in local area and to improve technology of manure management with chemical fertilizer.

Objective

Dissemination of improved technology of manure management with distribution of chemical fertilizer. Compost and organic fertilizer are made by natural resources of local area and improved technology of manure management is disseminated.

Implementation Period
7 years

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

1. Technology of manure management adopted climate and soil condition of local area is established.
2. After applying of technology of manure management, surveys of growth and yield are conducted. In addition, technology of manure management is improved.

Expected Outcomes

1. Manure testing is conducted about crops which are cultivated currently. Adequate technology of manure management is established.
2. A manual about making method and usage of compost using natural resources of local area is made.
3. After applying of technology of manure management, surveys of growth and yield are conducted. In addition, the manual of technology of manure management is improved.

Development Indicators and Monitoring Methods

1. Report of manure testing. 2. Manual of technology of manure management. 3. Data of growth and yield of farmers field applying technology of manure management.	
Main Activities	**Input Cost (US$1,000)**
Activity-1. To practice of manure testing in research center. Activity-2. To practice of manure testing in farmers field. Activity-3. To make a manual of technology of manure management. Activity-4. To collect data of growth and yield of farmers field applying technology of manure management Activity-5. To analyze the data and improve the manual	US$128
Fund Source	MAF
Risk	
Enough chemical fertilizer is not sold in the market.	

Project Outline (No.16)

Project Number	No.16
Project Name	Strengthening program of integrated farming with livestock breeding
Target Group / Area	NDAH, NDAECD, Subsistent farming strengthening area
Implementation Organization	NDAH, NDAECD, NDR
Cooperating Organization	International aid agency (GIZ, DFAT), NGOs

Back Ground

It is important to strengthen the operating of farmhouse by cultivation of various crops not to be inclined to rice production under current environment surrounding agriculture. To that end, reinforcement of the mixed farming utilizing a traditional agriculture with livestock is necessary.
In the rice growing area, it is considered that production of feed crop as the interim crop of the first cropping paddy field, the soil condition improvement by using of domestic animal residua and the security of the cash income source by vegetables cultivation, are effective. In the mountains area, cultivation of highland vegetable and the fruit utilized the climate and the soil condition is effective. Farming operation such as cultivation and selling by individual farm household develops into farming operation by the farmhouse group. It is expected that effective manufacturing and selling is developed by strengthening of mixed farming.

Objective

The operating of farmhouse is strengthened by cultivation of various crops not to be inclined to rice production.

Implementation Period
3 years

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

The crop cultivation and livestock except the rice is introduced to subsistent farming strengthening area (221 irrigation areas) according to climate, the soil, the farming situation of the farmhouse.

Expected Outcomes

In a subsistent farming strengthening area, the number of farmers cultivating horticulture crop such as highland vegetables and fruit, and the family budget of the farmhouse group are improved.

Development Indicators and Monitoring Methods

1. Production data of each horticulture crop.
2. Number of farmers and farmer' groups which cultivate horticulture crop and their income.
3. Number of farmers and farmer' groups which cultivate feed crop and livestock farming and their income

Main Activities	**Input Cost (US$1,000)**

Activity-1. To investigate number of farmers who cultivate highland vegetables and fruit, and production of them in each area. Activity-2. To make crop calendar of vegetables in each area. Activity-3. To train extension workers about cultivation of vegetables and fruit, and livestock. Activity-4. To form farmer' group and to train them about farming operation. Activity-5. To introduce feed crop as the interim crop Activity-6. To introduce livestock farming such as building livestock barn, introducing vaccine and manual of livestock management for small scale farmers and farmer' groups Activity-7. To hold agricultural fair (announce the result, marketing etc.)	US$176.2
Fund Source	MAF
Risk	
A farmhouse abandons agricultural production activity because they have an income source by the non-agricultural production activity.	

Project Outline (No.17)

Project Number	No.17
Project Name	Training for farmer groups in market-oriented rice farming
Target Area/ Group	Agriculture cooperation and/or farmers groups aiming to produce and sell local rice in the rice bowl area.
Implementation Organization	NDA, NDAECD, National Directorate for Cooperatives (MCIE)
Cooperating Organization	International aid agency (DFAT, JICA, GIZ), NGOs

Background

In Timor-Leste, market system in which consumer can select suitable rice from its brand and quality is not established countrywide. Only rice produced by Laga cooperative in Baucau district is on the supermarket in Dili, but its selling amount is very limited. In general, local rice, especially special quality rice has a certain amount of demand. To extend local rice market, it is required to nurture farmers groups who are willing to produce such rice and sell it as a producing brand. In order to produce such condition, it is necessary to provide rice farmers the learning opportunity which they can learn the way how to produce high quality rice and sell it. Rice quality favourable by Timorese is good smell, without impurities including sand, few broken rice contained, etc. Polished one is not important for consumers. Related to the marketing of produced local rice, normal rice is aimed to ship to the regional market or East Timor, special rice is shipped to countrywide consumers. To realize such conditions, farmers groups should be trained to improve the series process how to produce marketable rice and sell it including packaging, branding and shipping. Farmers groups can be strengthened through selling their produced rice.

Objective

Nurturing farmers groups so that they can produce competitive rice with import rice and sell it on the market.

Implementation Period
5 years

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

1. Total 20 farmer groups or cooperative are organized in the 6 rice bowl area.
2. Organized groups or cooperative produces the brand rice and sell it through the SIPI (Suco ida, Produt ida) promoted by NDA or Market Development Facility Project by DFAT.

Expected Outcomes	
1. Farmers groups establish market channel for their produced rice. 2. Members of the farmers groups understand cooperative working process and sharing of responsibility to produce rice suitable for consumers and sell it on the market. 3. Farmers groups practice cooperative works including in obtaining a series of rice production and marketing materials such as seed, input materials and packaging and harvesting and processing. 4. Organization capacity of the farmers groups is strengthened by making the effective use of MICE's training program to maximize the selling profit of the produced rice. 5. Members produce rice related products and other agricultural products and sell them on the market. 6. Capacity of agriculture extension workers in suco level is improved on the promotion of market development of agricultural products.	
Development Indicators and Monitoring Methods	
1. Number of the cooperative or farmers groups organized and registered 2. Rice amount produced and sold by farmers groups and cooperative 3. Agreement established by farmers groups and cooperative 4. Contents of cooperative works and working situation 5. Sounding survey on working and satisfaction by means of questionnaire and workshop survey 6. Activities except rice production 7. Activities taken by extension workers in suco level	
Main Activities	**Input Cost (US$1,000)**
Activity-1: Organizing study tour to the advanced farmers groups and cooperative to lean the practice of rice production, processing and marketing Activity-2: Training them by National Directorate of Cooperative, MCIE Activity-3: Training them in cooperation with related development partners such as DFAT and SIPI Activity-4: Establishing the selling system of produced products and the cooperative purchasing system of input materials Activity-5: Supporting the training activities led by suco extension workers	US$246.0
Fund Source	MAF, Related donors (DFAT, JICA (One Village One Product)
Risk	
Import rice is marketed cheaper and larger than the present one. Rice market is excessively intervened by government purchasing system and input subsidy. Natural disaster occurs frequently.	

Project Outline (No.18)

Project Number	No.18
Project Name	Rice value chain establishment project in rice production area
Target Area/ Group	Agricultural cooperatives and farmers' groups which are willing to conduct commercial production of domestic rice.
Implementation Organization	NDA, NDAECD, National Directorate for Cooperatives (MCIE)
Cooperating Organization	International aid agency (JICA, GIZ, DFAT), NGOs

Background

To Establish value chain of domestic rice should be considered according to types of variety and areas to be distributed such as a nationwide area or regional areas. A current situation of distribution of domestic rice with consideration of the distribution of imported rice in cheaper price in Timor-Leste is summarized as below.

【Wide Area Distribution】

Consumption of imported rice is already accounted for around 60% of total rice consumption of Timor-Leste. So, domestic rice needs to improve quality and reduce production costs in order to compete with imported rice. Alternatively, it can be also a strategy to produce unique varieties of rice, such as Black rice (*Brakau)*, Red rice (*Eroito)*, Aromatic rice (*Membramo)*, to avoid the direct competition with imported rice in the market. In this connection, GIZ promotes production of Black rice in their project named 'Managing Bio-diversification for Sustainable Livelihood'. Likewise, SoL facilitates to multiply Red rice seeds for next two years of their operation. Those alternative varieties of domestic rice are distributed to major markets in Dili, Baucau, and Maliana, however amount of supply is still small. Besides, from the view of improving nutrition, it can be suggested to introduce germ rice or brown rice. However, there are not market demands for those types of rice since they are not commonly consumed in Timor-Leste.

【Regional Distribution】

As of regional distribution of domestic rice, the area, it seems that the region has an advantage over imported rice in transportation costs if the location is far from Dili, or the production of rice is concentrated within the area. Dili, Baucau, and Ermera are relatively large rice consumption areas. However, imported rice is distributed more than domestic in those areas, since transportation from Dili is relatively easy and able to distribute at low costs. Therefore, it can be suggested that domestic rice should be produced and consumed within the region, where the location is far from Dili and transportation costs of imported rice is expensive. In order to do so, rice stakeholders such as famers, millers, and traders in the region have to cooperate in production and distribution each other.

【Developing Value Added Products and Distributing Second Crops】

Several rice farmers, especially female farmers, are willing to grow cash crops in a part of their field in dry season. It is expected to develop new agricultural products which traders and consumers are interested in, for example, snacks made from glutinous rice, mushrooms produced by utilizing rice straw, and noodles made from rice flour. It is expected to motivate female farmers for income generating activity through selling such new agricultural products.

【Problems Identified by Value Chain Analysis】

As of domestic rice, improvement of quality, price, and production amount is required to compete with imported rice in markets. The field survey identified constraints of the current domestic rice production as below.

- Procurement of input materials: Chemical fertilizer and agricultural chemicals are rarely used. Alternative farming technologies should be introduced to prevent from immature grain, white dead kernel, cracked rice kernel, and so on. It is also difficult to procure good seeds, and it causes low perfect rice rate, and non-uniformity of rice.
- Production: Mainly female farmers are conducting farming activities except tillage and operating threshing machine. However, they cannot spend enough time to cultivate rice in the field because they are usually busy to do daily household works. Eventually, water supplying in transplanting and sprouting season is not controlled well. Prevention from disease infected by insects is also not done well.
- Harvesting and post-harvesting: harvesting is likely to be delayed due to a shortage of labour force. Drying

paddy is affected by whether condition.

- Hulling and polishing rice: One-pass milling machines are usually seen in the region. Milling machines made in China tend to have bad rice yield rate and mix foreign elements in the milled rice.
- Storage: Rat damage and contamination of maize weevil are often seen because the condition of storing rice is not appropriate.
- Selling: There are not systematic actions to sell a certain amount of rice regularly. Domestic rice usually has a disadvantage in price against imported rice. It is difficult for traders to collecting rice in the region since quality, amount, and price of the domestic rice are often unacceptable for them.

It is necessary to motivate farmers to produce domestic rice much more through dealing with the constraints listed above comprehensively.

Objective

Farmers' groups or cooperatives, which are willing to produce, to process, and to sell domestic rice, can identify problems of agriculture products in the stages of production, processing, and marketing. Then, they can tackle those identified problems by themselves.

Implementation Period
7 years

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

Farmers' groups and cooperatives regularly supply a certain amount of domestic rice which quality is accepted by demands of town market, regional market, and rural consumers. In addition to rice, farmers' group and cooperatives sell other agricultural products including processed products to traders.

Expected Outcomes

1. Procurement of rice seeds from Community Seeds Production Group (CSP) is secured.
2. Quality of domestic rice is improved in terms of perfect rate, cracked kernel rate, and foreign elements rate.
3. Measurement of weight and packaging are properly done
4. Establish a system to supply rice stably.
5. Cash crops and processed rice products are traded.

Development Indicators and Monitoring Methods

1. Amount of procured seeds (counted by bags)
2. Existence of countermeasures to damages caused by livestock within a community
3. Sample inspection of milled rice quality
4. Branding of domestic rice and registration to NDA
5. Amount of supply of milled rice
6. Amount of production and sales of processed rice products and by-products

Main Activities	**Input Cost (US$1,000)**
Activity-1 To conduct a participatory workshop with farmers' groups Activity-2 To cooperate with CSP Activity-3 To conduct activity for improvement to domestic rice quality (improving whole grain rate, improving cracked kernel rice rate, improving damaged rice rate, improving foreign elements mixing, soil improvement at production stage, countermeasure to livestock damages) Activity-4 To support for Measurement of weight and packaging Activity-5 To support for establishment of stable rice supply system Activity-6 To support development and marketing of agricultural products which are made by processing or by-products of domestic rice.	US$736.0

Fund Source MAF, Related donor (JICA, DFAT)

Risk

Cheap imported rice is flooded with markets. The government rice purchasing policy becomes unstable, and

excessively intervenes in rice market. Natural disaster damages domestic rice production.

Project Outline (No.19)

Project Number	No.19
Project Name	Post-harvest processing improvement project of local rice
Target Area/ Group	Agricultural cooperatives and farmers' groups which are willing to conduct commercial production of domestic rice.
Implementation Organization	NDA, NDEACD
Cooperating Organization	International aid agency (JICA, DFAT), NGOs

Background

In the regions, imported rice is sold by grocery stores while domestic rice is sold by farmers. According to owners of grocery stores which deal with import rice, the advantages of import rice are pointed as 1) price is cheap and profit is good, 2) supply is annually stable, and 3) amount of imported rice is measurable and foreign elements is not mixed. On the other hand, it is considered that domestic rice is expensive. However, it has good tastes, aroma, and rich nutrition. Peoples in Timor-Leste tend to prefer sticky tastes of rice with less "Amylase".

In general, grocery stores need to secure quality and amount of rice to deal with as their business. Therefore, reduction of post-harvest loss is important to supply domestic rice to the grocery stores. According to field survey, causes of post-harvest loss in quality and quantity are identified as below.

- Harvesting: Shattering rice of grain sterility and immature grain caused by shortage of water in sprouting period and damages from disease and insects. Cracked rice kernel caused by rapid water movement within a grain due to strong sunlight and water shortage.
- Threshing: Losses caused by manpower or machine of threshing are not significant in this stage.
- Drying: Paddy is dried on tarpaulin by sunlight. Moisture content is not stable because it is affected by whether condition.
- Hulling and polishing rice: Low whole grain rate and shattering grain may cause low yield rate of milling rice. Inappropriate condition of storage and high moisture rate of paddy may cause low yield rate of milling rice. Removing stone is necessary before milling.
- Storage: Rural rice farmers usually utilize local available material to store paddy in the village, however, damages caused by mouse and maize weevil are often seen.

This project is designed to conduct countermeasures against the losses during the post-harvest treatments.

Objective

To improve domestic rice in quality and quantity which is produced in rice bowl area

Implementation Period
Seven years

2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Project Goals

Rate of post-harvest loss should be 12% in average by focusing on domestic rice production of farmers' groups and cooperatives in domestic commercial rice production areas.

Expected Outcomes

1. To develop capacity of rice inspectors of MAF
2. To legislate for a standard on paddy and rice
3. To establish a system for storage and distribution of paddy
4. To reduce post-harvest loss of domestic rice
5. To increase the rate of regeneration seed

Development Indicators and Monitoring Methods

1. Number of trained rice inspectors 2. Presence of the standard on paddy and rice 3. Amount of production and sales of milled rice which is applied for regulations 4. Presence of bulk storage facilities for paddy 5. Measurement of rice yield rate 6. Measurement of losses during post-harvesting process	
Main Activities	**Input Cost (US$1,000)**
Activity-1 To formulate and conduct a training plan for rice inspectors Activity-2 To formulate a draft standard for rice, and to conduct training for rice inspectors in other countries (Indonesia or Thai) Activity-3 To formulate a standard on rice quality and a grade system based on varieties Activity-4 To Enforce the grade system Activity-5 To construct bulk facilities in cooperation with private contractors and to procure rice paddy driers, ancillary equipment of milling machine such as stone remover, and milling machines for examination. Activity-6 To conduct activities to reduce post-harvest loss at farmers' field level	US$1,194.0
Fund Source	MAF, Donor agencies (JICA, DFAT)
Risk	
Cheap imported rice is flooded with markets. The government rice purchasing policy becomes unstable, and excessively intervenes in rice market. Natural disaster damages domestic rice production.	

CHAPTER 8 CONCLUSION AND RECOMMENDATION

8-1 CONCLUSION

Based on the R/D for the "Project for Agriculture Master Plan and Irrigation Development Plan", signed between JICA and MAF on 27 May 2013, the JICA study team was dispatched from October 2013 to perform the Project.

It was revealed that it is hard to increase local rice production because of recent rapid socio-economic change and unlimited inflow of imported rice to the market in Timor-Leste. Consequently, it was pointed out that it is hard to achieve the target "Food supply will have exceeded demand (by 2020)" , which is stipulated in the SDP. Current supply of food, rice as the staple food, is largely depending on importing rice whose price is fluctuated at the international market. In order to ensure the national food security and future food supply prospect against the population increase, it is required to formulate the master plan, which aims at increase of local rice production and reduction of imported rice as much as possible.

To attain this situation, it is required to provide the two policies; "**Productivity improvement supporting policy**" to improve the rice productivity technically by improving the irrigation schemes, the rice farming skill and the processing/ marketing process, and "**Production incentive stimulating policy**" to encourage rice farmers to expand rice production. Both policies should be applied to increase local rice production.

For the "Production incentive stimulating policy", there is the option of "Tariff policy" and/ or "Paddy purchasing system", however, in such cases, governmental consensus is needed. Through the technical examination and a series of discussions among the stakeholders, "**Paddy purchasing system**" is proposed as a realistic policy by the Project.

The master plan should be materialized in the 425 irrigation schemes to realize increase of local rice production. Prior to the nationwide master plan implementation, it is important to conduct priority projects. Five (5) priority projects are proposed as pilot projects to practice concrete way in the implementation process.

It is evaluated that the priority projects are feasible. Taking account of the current situation surrounding rice production such as decreasing rice self-sufficient ratio with decreasing paddy cropping area, the provided five priority projects would be effective.

8-2 RECOMMENDATION

(1) Provision of administrative environment for launching agricultural master plan and setting the execution organization in the MAF

1) Providing administrative environment for promoting the rice policy

It is forecasted to increase worldwide food demand and fluctuation in international rice price may be caused by climate change. Consequently, food procurement may become unstable at international level. On the other hand, local rice production in Timor-Leste as a staple food is unstable and rice self-sufficient ratio is decreasing.

Timor-Leste is proceeding to join to ASEAN. After joining to ASEAN, domestic industry is generally put on the under competitive environment among the ASEAN countries. Considering future prospect for joining to ASEAN, it is needed to provide survivable industries in Timor-Leste. To do so, requirement in agriculture sector, as a key industry in this country, is to promote commercial agriculture.

Looking at the food balance between supply and demand, food deficit is brought about, which is filled by importing rice. Promoting commercial agriculture should be provided to meet national food security and to activate agriculture sector in rural area. To bring such situations, it is required to promote rice policy. For the policy promotion under free importing rice, unlimited inflow of imported rice to the market in Timor-Leste is to be controlled and/ or, rice purchase system at profitable price by the government is needed, as well as the ASEAN countries do for protection of their domestically produced rice.

Considering current situations and future prospect of national food security as mentioned above, significance of the rice policy should be recognized at governmental level. The proposed priority projects are prepared as a pilot project of nationwide master plan, and they should be approved by the ministries concerned. It is recommended to make administrative consensus and budgeting for the proposed projects.

2) Setting-up of the organization in MAF for promoting agricultural master plan

The priority projects are defined as the pilot and they will be implemented prior to implementation of the master plan at nationwide. For smooth implementation, it is proposed to set up an organization newly within the MAF, apart from existing ones. It is formed by new staff recruited from related directorates of MAF. The priority projects and succeeding master plan implementation are led by this organization.

(2) Cooperation with related agencies

1) Cooperation with JICA to promote priority projects

The new organization to be set-up in MAF as mentioned above is expected to operate and manage the priority projects. Considering the present MAF's capacity, the capacity of the new organization is expected to be not high for smooth operation. It is required to strengthen their capacity. Under such background, capacity building for this organization is also conducted in the priority projects.

JICA has performed some technical cooperation projects so far to support agricultural sector in this country. As the results, JICA has accumulated experience and knowledge related to the agricultural development fields, so that JICA can mobilize some persons versed in promoting the rice policy included in technical fields on rice production. Therefore, it is recommended that MAF keeps close cooperation with JICA to execute the priority projects and promote nationwide master plan implementation.

2) Cooperation with other related donors

Many supporting projects and activities related to food production have been conducted so far by related donors. The agricultural master plan is formulated based on the outcomes from such projects/ activities, covering wide fields from production to processing/ marketing. For materializing the master plan and the priority projects, it is required to make full use of experience and knowledge accumulated by related donors.

It is recommended that MAF keeps a close cooperation with other related donors for the nationwide master plan implementation including funds securement.

(3) Cooperation with MCIE for improving paddy purchasing system

It is proposed to improve current paddy purchasing system, which is covered by MCIE, so that it is possible to provide incentives to the rice production farmers. It is needed to integrate two existing systems, namely, rice production process managed by MAF and the market-oriented rice purchase system done by MCIE. In addition to that, collaboration between MAF and MCIE should be

promoted.

The cooperation of those organizations can be arranged at the meeting of KONSSANTIL. It has been already agreed at the workshop of KONSSANTIL that such proposed improvement process is to be promoted in collaborative manner between MCIE and MAF. Applying paddy purchase system is planned in the proposed priority projects. MAF, thus, is requested to recognize the importance of the paddy purchasing system. It is recommended that MAF continues to discuss with MCIE for improving the present paddy purchasing system through the KONSSANTIL.