

## 4.4.10 Irrigation

### 1. Present Conditions

The development of irrigation infrastructure is highly related to the fulfilment of water needs for the agricultural sector, with the intention to improve agricultural production and productivity, especially for paddy/rice which are part of the staple food. Even so, the guaranteed water supply from the existing irrigation system must be supported by the availability of agricultural inputs and facilities in addition to the technological advancement and improvement of farmer's skills. At the same time, there should be an adequate support for research and development.

Agriculture is a fundamental sector for the socio-economic life of the Timorese, particular food crops sub sector, in which rice is a staple food; the fulfilment of which up to now is still depend on import. In addition, the agricultural sector contributes a lot of job creation and is an essential income source for most of Timor-Leste people and could take in up to 85% of the existing labour force (2007 data). Therefore, the national development strategy to warrant food security in order to fulfil national food security is a prerequisite, which among others can be covered through the development of irrigation infrastructure.

According to statistical data (MAP, 2007), the total irrigation area in Timor-Leste is about 71,258 ha, but only less than half of which (33,698 ha or 47 %) are currently functional, while the remaining 37,560 ha (53 %) are not operational. These irrigation networks suffer from both major and minor damages, especially as a result of the 1999 conflicts, where most of the irrigation areas were simply abandoned and unmaintained since the farmers who owned the lands left the place.

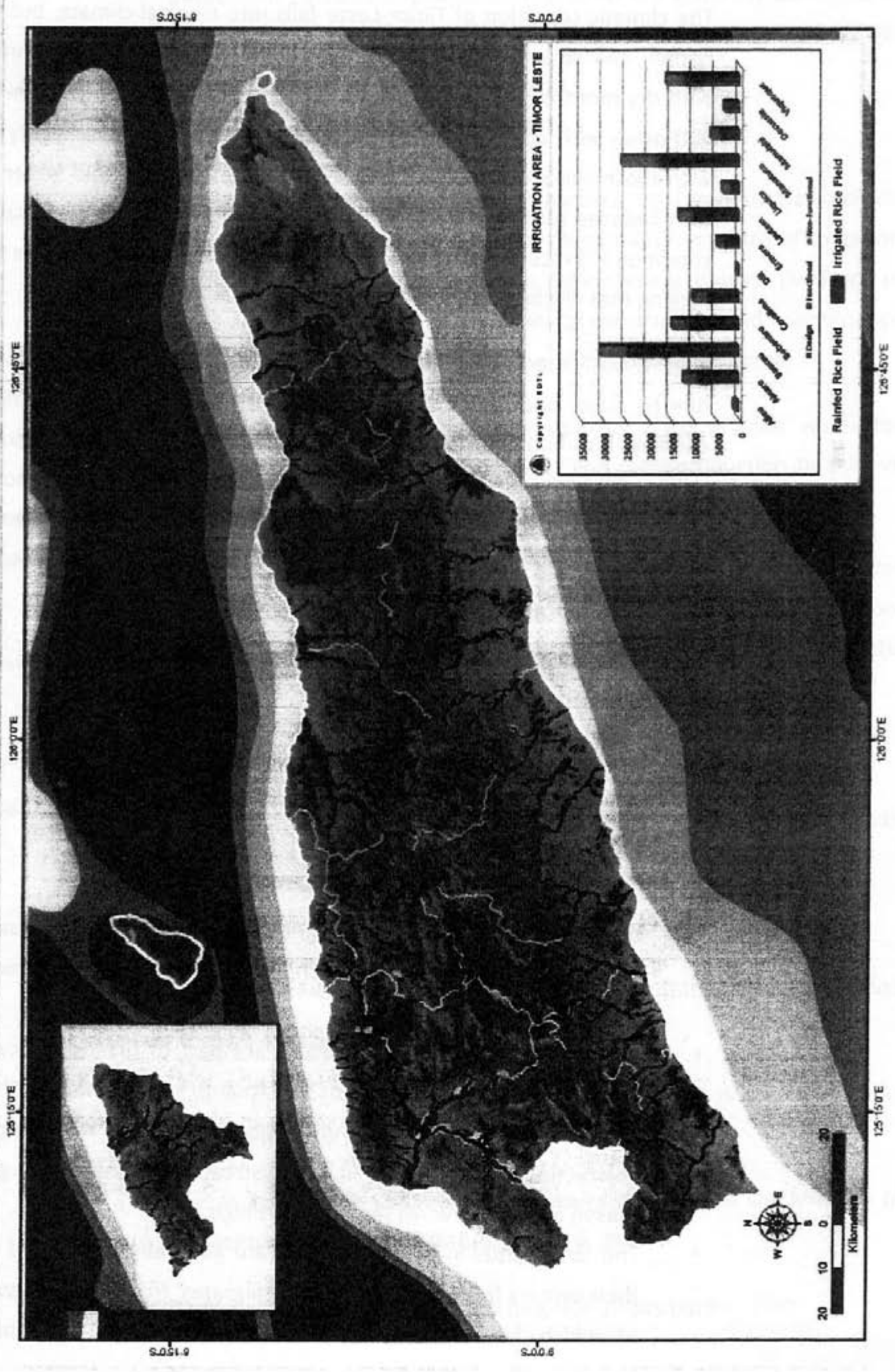
Until 2005, there had been several rehabilitation programs for the irrigation areas through the many assistance projects like the ones provided by Agriculture Rehabilitation Program (ARP), JICA, and CFET, with a total rehabilitated irrigation area of about 22,568 ha., with a remaining capacity for irrigation area of about 15,000 ha which is scattered in every district. However, according to the assessment done by the Ministry of MAP, the construction quality for the irrigation channels and building which have been

rehabilitated is still far from adequate. Therefore, a revitalization and sustainable maintenance of the irrigation network needs to be carried out in order to prevent further water losses. The following table and map (figure) will provide the data to have a better understanding on the spread and total irrigation area for every district and its corresponding rehabilitation programs

**Table 4.57 - Irrigated Area and Rehabilitated Scheme by District (Ha)**

District	Irrigated Area	Functional Irrigated Area 2005	Not Functional	Rehabilitation Program			Total Rehabilitated	Total Functional	Area Not Rehabilitated
				ARP	JICA	CFET			
Aileu	597	184	413	271	-	-	271	455	142
Ainaro	6,076	3,000	3,076	745	-	-	745	3,745	2,331
Baucau	15,191	9,556	5,635	2,270	-	1,650	3,920	13,476	1,715
Bobonaro	7,327	2,563	3,734	1,094	1,030	230	2,314	4,917	2,410
Covalima	5,003	2,033	2,970	2,550	-	695	3,245	5,278	-
Dili	350	65	285	20	-	15	35	100	250
Ermera	2,345	1,055	1,290	698	-	50	748	1,803	542
Lautem	6,658	3,593	3,070	2,282	-	209	2,491	6,084	574
Liquica	1,866	293	1,573	633	-	-	633	926	940
Manatuto	12,996	4,876	8,120	1,722	720	100	2,542	7,418	5,578
Manufahi	3,102	1,118	1,984	1,230	-	670	1,900	3,018	84
Oecussie	1,659	1,109	550	443	-	111	554	1,663	-
Viqueque	8,088	4,253	3,829	1,270	-	1,860	3,130	7,383	699
<b>Total (ha)</b>	<b>71,258</b>	<b>336,998</b>	<b>36,529</b>	<b>15,228</b>	<b>1,750</b>	<b>5,590</b>	<b>22,568</b>	<b>56,266</b>	<b>14,992</b>

Figure 4.41 - Map of Irrigation Area



## 2. Problem and Constrains

The climatic condition of Timor-Leste falls into tropical climate, but has low rainfall, characterized by a relatively low annual rainfall (500 - 600 mm/year), with dry months (<100 mm) of up to 10 months and without wet months (> 200 mm), with dominant of limestone, in which water could easily pass by with loose soil structure and sandy texture less able to hold water. This in turn reduces surface water availability as a source of irrigation water. This condition is exacerbated by the destruction of forest vegetation due to illegal logging that will increase the critical lands.

As previously mentioned more than 50% of irrigated areas are not functional, due to major and minor damages, largely attributed to past conflicts. The conflicts also had a severe impact which noticeably reduced the number of skilled farmers with good capability in the wetland and food crops production, since they abandoned the locations. Moreover, damages on the irrigation channels and buildings were also caused by floods as a result of the forest destruction in upstream areas.

Some of the problems and constraints to be dealt with in the development and utilization of irrigation areas are:

- Evident damage on some existing irrigation systems, including destructions of dams/water reservoirs, irrigation channels, and other buildings.
- Lack of irrigated rice fields to meet national food security.
- Lack of rice field farmers in terms of quantity as well as quality who posses necessary skills and technology in rice field and food crops productions.
- Damage on the forest areas which are part of the rainfall catchment area in the upper of mountains (upstream), which results in the failure to guarantee the quantity and quality of irrigation water supply. The destruction of forest areas in the upstream also causes drought in dry season and floods when the rainfall is high.
- The land status in irrigation areas are generally abandoned lands by their owners (mostly, was the 'transmigrates' from Bali and Java); some of which have already been certified and has legal supremacy

(according to former Indonesian Law), and are unoccupied at the present.

- Settlement patterns of people in rural areas are generally scattered, in small ethnical groups, with a subsistent agricultural pattern to fulfil the family needs.

### 3. Policy and Strategy

Irrigation infrastructure development is handled by Direcção Nacional da Irrigação e Gestão da Utilização de Água' (National Directorate of Irrigation and Water Management), Ministério da Agricultura e Pescas; (Ministry of Agriculture and Fisheries /MAP), in the case of construction and maintenance of the physical infrastructure of the dams and its irrigation scheme.

The goal of *wier* (irrigation dam) development is to provide water for agriculture in order to increase productivity and food production to achieve food self-sufficiency and sustainability of national food security.

The objective of dam is the provision of continuous and sustainable water for the various needs in the field of hydropower, irrigation (crops, plantation, livestock and fisheries), raw water, and drinking water and other domestic water needs, tourism and industry.

Objectives of irrigation scheme development are:

- a) Build irrigation scheme to provision water to the farmer for agriculture production.
- b) Perform maintenance of irrigation scheme and water management
- c) Protecting rivers, water resources and agricultural land from flood damage, erosion and sedimentation

Government policy of irrigation and water management is currently being prepared. The existing laws and regulations are:

- a) Decree Law No.18 /2008 on the Structure and Rule of the Ministry of Agriculture and Fisheries (MAP), June, 19. 2008.
- b) Food Security Policy, status promulgated 16 September 2005

c) irrigation water policy , under preparation

Other than the government through the Ministry of MAP, for the end-user there is also a term called 'Water User (WUA)', which is the institution that manages the irrigation system at the level of farmers who utilize the irrigation water.

Development of irrigation infrastructure in Timor-Leste is strategic in the framework for enhancing the agricultural production to meet national food security so that it could ultimately achieve self-sufficiency in rice. However, guarantees for the availability of irrigation water supply should be followed by efforts to improve farmers' human resources quality which are able to have a grip on technology, and supported by the provision of agricultural inputs and facilities, funding, post-harvest technology and marketing. In addition to ensuring supply continuity of irrigation water resources, it is important to conduct conservation and reforestation in the upstream area.

Irrigation development policy is intended to extensively support increased agricultural production and productivity, especially rice to meet national food security and achieve self-sufficiency in the year 2015. Furthermore, the development of the full potential of water resources is carried out by conducting identification and feasibility Study and subsequent planning and design of dams. The irrigation networks of the dams can also be plan and design as a source of water irrigation. However, not all planned dams can serve as a source of irrigation water (agriculture).

In the construction of the dam, special attention is dedicated to the construction of dam which could have a multifunction as a hydropower generator, bulk water resources, and to develop a large-scale agricultural area which would eventually as a a food production centre and become a new centre of growth as a town (*agropolitan*).

The irrigation development policy strategy is aimed to increase agricultural production and productivity to fulfil national food security with the support of modern agricultural technology.

a) Short Term Development Policy (2011-2015)

The short term development strategy in the first 5 years of development phase (2011-2015) in the irrigation sector is as follow:

- i) Completed rehabilitation irrigation scheme of the remaining existing irrigation areas of  $\pm$  10.000 ha, which suffer from both major and minor damages
- ii) Maintenance and revitalizations of irrigation scheme which have been rehabilitated.
- iii) Develop water management and implementation policy.
- iv) Identification and feasibility study of dams as well as planning and detail engineering design of dams and irrigation scheme.
- v) Construct new DAM and irrigation scheme of the area has been designed.
- vi) Construct access road to connect from the existing road to the irrigated area, and farm road within access from the settlement (suco or aldeias) to farm/ rice field.
- vii) Develop new rice field area in utilize of irrigation areas which have been rehabilitated.
- viii) Support development of new settlement for 'resettlement' of the farmer families with the intention of utilize new rice field in the functional irrigation areas
- ix) Prepare Decree law of water resources and water management.

b) Medium Term Development Policy (2016-2020)

For the Medium Term Development (2016-2020), the irrigation policy is aimed at establish developing and constructing the potential of DAM and new irrigation areas based on feasibility study. Simultaneously, maintenance and water management of existing irrigation scheme must also be taken. The policy strategies for medium term irrigation development plan are:

- i) Continuing construction of new dams and irrigation scheme.
- ii) Maintenance and water management of the existing irrigation, which have been completed.
- iii) Extend new agricultural areas and establish new rice fields.
- iv) Supporting the resettlement program in order to utilize the irrigated areas and establish new rice fields.

- v) Develop check dam and irrigation protection to prevent the risk of disasters and damage of the agriculture areas and settlements caused by flooding and erosions.

c) Long Term Development Policy (2020-2030)

In the long term development phase (2021-2030), it is expected that all of the existing irrigation area have been functional, and all of rice field areas are cultivated. At the same time, most of the existing dams can serve a multifunction purpose as a hydropower generation, in which raw water sources and irrigation water sources have been tapped and established. In this long term phase, it is deemed imperative for the policy to continue the development of new irrigation areas. So as to widely increase rice production and agricultural production in general (pulses, vegetables, horticulture, plantation, and livestock), in order to ensure a sustainable national food security in proportion to the level of population growth.

The policy strategies for irrigation sub sector in the long-term development plan (2021-2030) are the following:

- i) Continue to construct new DAM and irrigation scheme.
- ii) Maintain and water management of the dam and irrigation scheme.
- iii) Continue to extend the agricultural areas and develop new rice fields to increase agricultural production and establishment of national food security.

#### 4. Regulatory Framework

The morphology, physical, and climatic conditions of Timor-Leste have revealed that the water resource is critical and the potential area for irrigated rice fields are relatively very limited. Therefore, prioritize and 'security' designation of water uses and the irrigated areas need to be taken into consideration through the establishment of the National Spatial Plan. In this regard, it is essential for the protection of water resource and irrigated fields. The required laws or government regulations are as follow:



- a) Spatial Plan for the development water conservations and irrigated agricultural food crop areas. Subsequently, it must be enacted through laws or government regulation.
- b) Law of water resource conservation and water uses.
- c) Government Regulation which imposes restriction on the conversion of irrigated lands into other uses (residential, industrial, etc.), since the irrigation areas are sustain to produce rice and food for self sufficient of the Timorese people.

## 5. Program and Project

The rehabilitation program and projects of the irrigation networks have been conducted since 2005 through the ARP (Agriculture Rehabilitation Program) projects I, II, and III and JICA (Japan International Agency Cooperation) aid projects, limited to the rehabilitation of existing networks, with the purpose of maintenance of irrigated areas about 21,538 or about 30% of the total non-functional irrigated areas. However, the rehabilitation projects of irrigation networks which have been conducted in the past are deemed inadequate, while the existing infrastructures need to be thoroughly reconstructed due to the devastating extent of damage.

The rehabilitation and reconstruction of the irrigation networks need to be put as a priority, as far as the national strategy to reduce food import and achieve self-sufficiency and sustainable food security in the long term. To identify with the potential areas for the development of irrigation networks in the future, a comprehensive identification and feasibility study of dams must be conducted, together with the feasibility and design study for the irrigation scheme.

From table above, it can be seen that the remaining irrigation areas which have not been dealt with cover an area of about 14,986 ha (21%), which the small irrigation areas cover up to 751 ha in 16 different locations. Therefore, the rehabilitation programs of the irrigation areas are focused in 8 (eight) districts which contain the remaining widely untreated irrigation areas (> 500 ha), which are spread in the districts of Bobonaro, Ainaro, Ermera, Liquica, Manatuto, Baucao, Viqueque and Lautem with targeted areas to be handled of about 12,000 ha and will be implemented in the upcoming short term 5-

(five) year development period, from 2011 to 2015. The remaining irrigation areas are relatively small and have yet to be programmed through revitalization project and maintenance of irrigation scheme.

There are 4 (four) types of program and projects that are directly related to irrigation and provision of water for agriculture and other program related to utilize the irrigated area by developing new settlements for the farmer. The short term development program (2011-2015), is:

- a) Rehabilitation and reconstruction of irrigation scheme in the remaining irrigation areas, with a total of about 10,000 ha spread in 8 districts, i.e., Bobonaro, Ainaro, Ermera, Liquica, Manatuto, Baucao, Viqueque dan Lautem.
- b) Revitalization and maintenance of the already-rehabilitated irrigation areas through ARP, JICA, and CFET projects in a total area of about 22,568 ha as well as the maintenance of irrigation areas which have been dealt with before.
- c) Identification, feasibility study and designs for the development of new dams to obtain water sources in the future for the purposes. Moreover, the planning and design of the irrigation dam (weir).
- d) Resettlement of the rice field farmer to utilize the irrigation areas, which have been rehabilitated and functional.

Details of the annual rehabilitation program for the remaining irrigation areas in the following table.

Table 4.58 - Rehabilitation Programs of Irrigation Area (Ha)

DISTRIC	IRRIGATION AREA (ha)		SHORT TERM DEVELOPMENT PLAN, FY (Ha)				
	Total Area	Rehabilitation Program	2011	2012	2013	2014	2015
Ainaro	6.076	1.800	300	300	400	400	400
Bobonaro	7.327	2.000	400	400	400	400	400
Ermera	2.345	500	250	250	-	-	-
Liquica	1.866	950	250	250	250	200	-
Manatuto	12.996	2.000	400	400	400	400	400
Baucau	15.191	1.500	300	300	300	300	300
Viqueque	8.088	700	250	250	200		
Lautem	6.658	550	250	300			
Total Rehabilitation		10.000	1.600	1.700	1.400	1.450	1.250

Source: Data analysis.2010.

The budget needed for the rehabilitation and reconstruction project of irrigation areas in 8 (eight) districts as mentioned in above table, with a total area of 10,000 ha, is about USD 23,900,000. The projects will be carried out over the first short term development period (2011 – 2015), with an annual budget between USD 4,000,000 to USD 5,000,000.

Feasibility study and design of the dams and irrigation dam (weir) as well as the planning and design of irrigation schemes are conducted coverage all over the Timor-Leste based on the initial identification study from the Ministry of Agriculture and Fisheries (MAP). For the dams program, 11 (eleven) districts have been identified, other than the districts of Aileu and Liquica. For the districts that have potential for the development of irrigation dams in the future.

The following table shows the feasibility study and dam design as well as irrigation planning and design.

Table 4.59 - Feasibility Study, Planning and Design of DAM and Irrigation Network

DISTRICT	Number of Weir Location	Feasibility Study and design of DAM & Irrigation( FY)				
		2011	2012	2013	2014	2015
Ainaro	1	-	-	-	FS - DAM	FS - DAM
Bobonaro	1	-	-	FS - DAM	FS - DAM	DI
Kovalima	4	-	-	-	FS - Ir	FS - Ir
Oecussi	1	-	FS - DAM	FS - DAM	FS - Ir	DE - Ir
Manatuto	3	FS - DAM	FS - DAM	FS - Ir	DE - Ir	-
Baucau	3	FS - Ir	FS - Ir	DE - Ir	-	-
Manufahi	1	FS - DAM	FS - DAM	FS - Ir	DE - Ir	-
Viqueque	4	FS - DAM	FS - DAM	FS - Ir	DE - Ir	-
Lautem	2	FS - Ir	FS - Ir	DE - Ir	-	-
Total	20					

Source: Directorate Irrigation, MAP (2009)

Note: FS-DAM: Feasibility Study of DAM and Irrigation

FS-IR: Feasibility of Irrigations

DE-Ir: Design of Irrigations

For the feasibility study and planning/design of the dams, a budget of USD 7,500,000 is needed, which comprises of dams for bulk water sources worth USD 3,500,000 (7 locations) and multifunction dams which could be used for irrigation totaling USD 4,000,000 (8 locations). In addition, there are other 20 locations of the weir which are specifically intended for irrigation, with a total cost for planning and design of the dams along with their irrigation scheme of about USD 6,000,000.

In order to utilize the irrigation areas which have been rehabilitated and functional, in this regard, a resettlement plan for the farmer must be endorsed. The resettlement plan must be implemented in an integrated manner between the related ministries. In this regard, the Directorate of Housing and Urbanization under the Ministry of Infrastructure can assume the role as the leading sector which will lead the program. Other related ministries which must be involved in the program are the Ministries of Agriculture and Fisheries (MAP), Infrastructure (housing, roads, power, telephones, and public facility buildings), Education, Health, Youth, and Land Property, among other related ministries/institutions. If necessary, inter-district cooperation can be established to bring in farmers from other districts, but with a priority on the recruitment of local district farmers.

The resettlement program of the rice field farmer in the irrigation areas as previously mentioned takes into account the total functioning irrigation areas

in every district, with the assumption that every head of family (household) will get two hectares of rice field, as in the following table.

**Table 4.60 - Resettlement of Irrigation Area's Utilization (hh)**

DISTRICT	Resettlement Program (hh)	SHORT TERM DEVELOPMENT PLAN, FY ( hh)				
		2011	2012	2013	2014	2015
Ainaro	900	150	150	200	200	200
Bobonaro	1.000	200	200	200	200	200
Ermera	250	125	125	0	0	0
Liquica	475	125	125	125	100	0
Manatuto	1.000	200	200	200	200	200
Baucau	750	150	150	150	150	150
Viqueque	350	125	125	100	0	0
Lautem	275	125	150	0	0	0
Total KK	5.000	1.200	1.225	975	850	750

*Note: One family (hh) will get 2 (two) hectares.*

The budget for the resettlement program includes the land preparation and house lots as well as basic housing facilities such as roads, clean water, power, and public/ social facility. In addition, there will also be social security funds to cover for the farmer's needs before the agricultural activity can reap revenues, between the first to second initial years. Moreover, assistance and extension for the agricultural activities will be conducted to prepare for stated for the production activities and farmer's association.

The total cost required for the resettlement program is about USD 150 million, which is spread over a period of 5 years in line with the short term development period. Or about USD 30.000 per house hold.