



# REQUEST FOR CEO ENDORSEMENT

PROJECT TYPE: FULL SIZED PROJECT

TYPE OF TRUST FUND: LDCF

For more information about GEF, visit [TheGEF.org](http://TheGEF.org)

## PART I: PROJECT INFORMATION

Project Title: Enabling Climate Resilience in the Agriculture Sector in the Southwest Region of Madagascar			
Country(ies):	Madagascar	GEF Project ID: <sup>1</sup>	5233
GEF Agency(ies):	AfDB(select)(select)	GEF Agency Project ID:	
Other Executing Partner(s):	Ministry of Agriculture (Regional Rural Development Unit of Tulear and Rural Engineering Unit) and Ministry of Environment and Forests	Submission Date:	02/13/2014
GEF Focal Area (s):	Climate Change	Project Duration(Months)	48
Name of Parent Program (if applicable):		Agency Fee (\$):	595,840
➤ For SFM/REDD+ <input type="checkbox"/> ➤ For SGP <input type="checkbox"/>			

### A. FOCAL AREA STRATEGY FRAMEWORK<sup>2</sup>

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount (\$)	Cofinancing (\$)
CCA-1(select)	Outcome 1.2: Reduced vulnerability to climate change in development sectors	Output 1.2.1: Vulnerable physical, natural and social assets strengthened in response to climate change impacts, including variability	LDCF	2,700,000	24,200,000
CCA-1(select)	Outcome 1.3: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted area	Output 1.3.1: Targeted individual and community livelihood strategies strengthened in relation to climate change impacts, including variability	LDCF	2,200,000	5,500,000
CCA-2(select)	Outcome 2.3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level	Output 2.3.1: Targeted population groups participating in adaptation and risk reduction awareness activities	LDCF	750,000	3,000,000
CCA-3(select)	Outcome 3.1: Successful demonstration, deployment, and transfer of relevant adaptation technology in targeted areas	Output 3.1.1: Relevant adaptation technology transferred to targeted groups	LDCF	315,000	2,500,000
(select)(select)			(select)		
(select)(select)			(select)		
(select)(select)			(select)		
(select)(select)			(select)		

<sup>1</sup>Project ID number will be assigned by GEFSEC.

<sup>2</sup> Refer to the [Focal Area/LDCF/SCCF Results Framework](#) when completing Table A.

Project management Cost (PMC) <sup>3</sup>	LDCF	307,000	2,000,000
<b>Total project costs</b>		6,272,000	37,200,000

## B. PROJECT FRAMEWORK

**Project Objective: To secure and improve rural farmers' livelihoods through water management and health interventions in Southwest Madagascar.**

Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount (\$)	Confirmed Cofinancing (\$)
Making agricultural water infrastructure resilient	Inv	Outcome 1. Agricultural water infrastructures as well as water-related and health community infrastructures in the irrigated areas of Taheza, Monombo Ranozaz and Bas Mangoky are resilient to climate change	Output 1.1. Twenty-five km of the protective dike in the Bas Mangoky irrigated area are raised and lengthened to be resilient to floods  Output 1.2. Irrigation infrastructures in the Taheza irrigated area are renovated and resilient to climate change  Output 1.3. Irrigation works in the Manombo Ranozaza irrigated perimeter are renovated and resilient to climate change  Output 1.4. The irrigated areas of Taheza, Manombo Ranozaza and Bas Mangoky are equipped with community infrastructures that are resilient to climate change	LDCF	3,000,000	24,200,000
Strengthen Community livelihoods strategies in relation with Climate Change	TA	Outcome 2: Community activities resilient to climate change are implemented in the Rural Municipalities of Bezaha and Andranomangatsiaka (Taheza), Ankililoaka	Output 2.1. Municipal Development Plans for the four municipalities are reviewed, updated and implemented to integrate effective management of climate risks and provide financing for resilience-building	LDCF	2,650,000	9,500,000

<sup>3</sup>PMC should be charged proportionately to focal areas based on focal area project grant amount in Table D below.

		(Manombo Ranozaza), and Ambahikily (Bas Mangoky), and targeted community and municipal authorities have strengthened capacity to promote a local resilient development	<p>activities</p> <p>Output 2.2. Women's Groups are strengthened, structured, and supported to implement promising income-generating activities that are resilient</p> <p>Output 2.3. Community Council members, extension workers for the DRDR, DREF and the DREau, and farmers have the capacity to plan and adapt to climate change impacts</p> <p>Output 2.4. Technical assistance in water management and improvement of the irrigated areas</p> <p>Output 2.5. A supply chain for producing, storing, and distributing resilient seeds for rice, maize, and lima beans is put in place</p>			
Knowledge management and monitoring and evaluation	TA	Outcome 3: Knowledge and best practices are monitored, evaluated and disseminated	<p>Output 3.1. M&amp;E System developed and implemented</p> <p>Output 3.2. Best practices for adaptation (including gender-specific measures) are identified and diffused, and intercommunity learning on adaptation measures is put in place in the Atsimo Andrefana region and in the country to support replication of results in other vulnerable communities</p>	LDCF	315,000	1,500,000

	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
	(select)			(select)		
Subtotal					5,965,000	35,200,000
Project management Cost (PMC) <sup>4</sup>				LDCF	307,000	2,000,000
<b>Total project costs</b>					6,272,000	37,200,000

### C. SOURCES OF CONFIRMED COFINANCING FOR THE PROJECT BY SOURCE AND BY NAME (\$)

Please include letters confirming cofinancing for the project with this form

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount (\$)
GEF Agency	African Development Bank - African Development Fund	Soft Loan	27,450,000
GEF Agency	African Development Bank - Special Nigerian Fund	Soft Loan	9,750,000
(select)		(select)	
(select)		(select)	
(select)		(select)	
(select)		(select)	
(select)		(select)	
(select)		(select)	
<b>Total Co-financing</b>			37,200,000

### D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY<sup>5</sup>

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in \$)		
				Grant Amount (a)	Agency Fee (b) <sup>6</sup>	Total c=a+b
AfDB	LDCF	Climate Change	Madagascar	6,272,000	595,840	6,867,840
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
(select)	(select)	(select)				0
<b>Total Grant Resources</b>				6,272,000	595,840	6,867,840

<sup>4</sup>PMC should be charged proportionately to focal areas based on focal area project grant amount.

<sup>5</sup> In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for this table. PMC amount from Table B should be included proportionately to the focal area amount in this table.

<sup>6</sup>Indicate fees related to this project.

**F. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:**

Component	Grant Amount (\$)	Cofinancing (\$)	Project Total (\$)
International Consultants	52,000	380,000	432,000
National/Local Consultants			0

**G. DOES THE PROJECT INCLUDE A “NON-GRANT” INSTRUMENT?** No

(If non-grant instruments are used, provide in Annex D an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/NPIF Trust Fund).

**PART II: PROJECT JUSTIFICATION****A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF<sup>7</sup>**

A.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.

N/A

A.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities.

N/A

A.3 The GEF Agency's comparative advantage:

N/A

A.4. The baseline project and the problem that it seeks to address:

The following section presents the current situation in the Southwest region along with PRIASO's proposed initiatives, paying special attention to the different vulnerabilities the region faces with respect to climate change.

**Madagascar Country Overview**

Agriculture is an important sector to Madagascar both in terms of the national economy and in terms of livelihoods of the country's inhabitants. As of 2009, 26 percent of the country's Gross Domestic Product (GDP) and 78 percent of the country's employment were derived from the agriculture sector, and over 2.5 million households were engaged in farming activities. Much of this activity concerns the food crops of rice, cassava, and maize, and these three crops cover 87 percent of cultivated land in the country. Moreover, a large percent of agriculture yields, as much as 70 percent, are dedicated to household consumption, making agriculture an important source of food security for the nation.

Agricultural yields in general in Madagascar are considered low, attributable to a low use of agricultural inputs, poor condition of basic agricultural infrastructure, and weak local services. Increases in production have not kept up with increases in population, and the production gains that have been made are mostly due to extensification of farmland and not intensification of farming practices.

The Climate Change Vulnerability Index of 2011 ranks Madagascar as the third country in the world in terms of vulnerability to climate change. The most significant threats facing the country include high flood waters occurring during cyclones, drought due to changes in rainfall patterns, and locust infestations. As part of the Madagascar NAPA, different training workshops have been carried out. Despite these efforts, however, the idea of climate change and knowledge about adaptation to climate change can be said to remain relatively low throughout communities in the country.

<sup>7</sup> For questions A.1 –A.7 in Part II, if there are no changes since PIF and if not specifically requested in the review sheet at PIF stage, then no need to respond, please enter “NA” after the respective question

## **Profile of the Southwest Region**

### Geography and Climate

Atsimo Andrefana, the Southwest region of Madagascar, has an area of approximately 6.6 million hectares (ha), which constitutes over 11 percent of the land area of the country. Politically, the region is comprised of nine districts, 105 municipalities within those districts, and 1,564 *fokontany* (local villages). Its terrain includes alluvial plains, plateaus, as well as mountainous areas with relatively jagged topography.

Rainfall in the region is low, not passing more than 600 mm per year, and the region experiences a substantial dry season from April to October with a rainy season from November to March. While precipitation is too low to be conducive to farming, the region contains three important river valleys, the Mangoky Delta, the Taheza Valley, and the Onilahy Delta. Together, these three rivers generate a region of high soil fertility that is propitious for farming with irrigation.

### Population Characteristics and Poverty

The Southwest region is predominantly rural with 72 percent of the population living in rural areas and a low population density of 25 inhabitants per km<sup>2</sup>. Poverty rates in rural areas are higher than the regional average, 87 percent compared to 82 percent, and both of these rates are higher than the national average.

Average households in the Southwest are large with nearly five persons on average per household, and the demographic profile of the region leans towards a substantial youth population - 84 percent of the population is between the ages of 13 and 24. There is low access to health services or potable drinking water, and food insecurity is high registering at 35 percent of the population undernourished. Additionally, the urban population has doubled since 1993 indicating a significant pattern of rural to urban migration.

### Agriculture

The agriculture sector forms the backbone for livelihoods and economic activity in Atsimo Andrefana, and over 86 percent of the population is active in farming. The largest crop in the region is cassava followed by rice. Similar to national averages, it is estimated that 70 percent of rice production is used for household consumption in the region. It is also common to grow crops such as lima beans, green beans, and onions, as well as fruits such as mango and papaya to bring additional sources of revenue to households. Yields in the region in general are considered to be low and even decreasing. Farming is mostly non-mechanized, and there is very low use of farming inputs such as improved seed varieties, fertilizer, or phytosanitary products. Husbandry is both traditional and common to much of the region, and livestock include zebu, goat, sheep, and poultry. In certain areas fishing also contributes to livelihood activities.

### Gender Roles

Gender roles in the region can be summarized as leaving women little decision-making power over or ability to own and accumulate productive assets. This tendency is perpetuated by inheritance practices that largely exclude female children from inheriting substantial assets, as well as by marriage practices that allow for polygamy but result in a high number of separations. It is estimated that over half of marriages result in separation, leaving a large proportion of women as heads of their own households.

Female heads of household will likely have lost most of their resources, and they rarely own irrigated land parcels. Women who do own irrigated parcels are disproportionate victims of water theft, where their irrigation waters are diverted illegally. There appears to be little community initiative to penalize those caught stealing water from women.

Women in general have been expanding their workload and participation in livelihood activities in recent years. They engage today in many farming chores alongside men in addition to their household chores and any income-generating activities they may do on the side. Despite physical contributions to crops, women will rarely be given decision-making authority over management of the household farming activities or use of revenues. While women may have authority in deciding the way they conduct their own income-generating activities, they will not necessarily have authority in how to utilize the revenues earned.

Finally, women also have low participation rates in community-level forums. Women describe either not being called upon in community meetings or being too intimidated to speak. There are few female staff members in local

government and administrative offices adding to this intimidation. Illiteracy is also a factor that inhibits women from participating in social and community structures.

Notwithstanding these challenges, there are certain areas in the region where women's groups are active, and women participate dynamically in these groups. While access to and control over resources is difficult for women, there is the possibility of acquiring land through inheritance, purchase, or under conditions of certain marriage separations.

#### Environmental and Climate Change Vulnerabilities

Atsimo Andrefana is a sub-arid climate in which, under natural rainfall conditions, agriculture is not possible. As agriculture is dependent on irrigation and drought can affect the availability of irrigation waters, the regional population is at considerable risk to food insecurity and even famine triggered by drought conditions. Since the large famine of 1992 which affected nearly 1 million people across the country, food insecurity continues to affect people across the South of Madagascar almost chronically.

Food insecurity by some accounts is spreading, and the World Food Programme (WFP) has increased the number of municipalities in Madagascar that it considers to be food insecure from 31 in 2008, to 45 in 2009, and finally 53 in 2010. Most of the municipalities identified by the WFP are in the Southern regions including Atsimo Andrefana, Anosy, and Androy.

While low rainfall and drought are common to the Southwest, it is also prone to cyclones capable of generating high flood waters that degrade agricultural infrastructure and further threaten agricultural production. High vulnerabilities to extreme weather events are, in fact, considered to be one of the main reasons that the Southwest experiences higher poverty rates than the country as a whole. Dependence on irrigation infrastructures to conduct farming activities and the inability of those infrastructures to withstand the types of extreme weather events that occur in the region engenders deteriorating socioeconomic conditions.

According to the IPCC special report on Extremes, cyclones in Madagascar Region are predicted to occur with greater magnitude in the future. Climate Change projections according to SRES A2 scenario conducted as part of the Second National Communication show that temperature should increase by 2°C by 2050 in the Southwest Region as compared to the 1961-1990 period. Rainfall should also increase by 50% by 2050 in the Southwest Region as compared to the 1961-1990 period. Rainfall will be more intense and will occur with high variations, both in time and space, and should be more concentrated during cyclones event as shown by the A2 climate model humid scenario.

A climate change baseline and trend study conducted as part of the Programme on Climate Change Adaptation and Mitigation in the COMESA-EAC-SADC region was released in November 2013. It showed that climate change effects vary from region to region in Madagascar. This study indicated:

- A significant increase in temperature in the South of Madagascar from 1950s, and in the north from 1970s;
- A high variability in the precipitation pattern: shifting rainy season or rainfalls are more intense in the Western part of Madagascar;
- The number of extreme weather events (cyclones, droughts, floods) has increased during the period 1994 – 2005. Since 1994, though the annual frequency of landing cyclones unchanged, increase in the frequency of intense ones (more than 150 km per hour)

This study indicated also the future projections for 2055 (GCM, scenarios A2 and downscaling):

- Temperature: increase between 1.1 to 2.6° C with the highest increase in the south;
- Precipitation: a general increase around the country except in the south east;
- Cyclones: stable frequency but shift of trajectory to the country northern part.

The following table outlines the main forecasted climate change impacts, based on the projection of an increase of precipitation, more intense and more concentrated in time, and an increase in temperature, for the three principal economic sectors in the Southwest Region, agriculture, livestock raising and fishing. It is based on the results of the climate change study conducted as part of the design of this project, but also on the results of climate change baseline and trend study conducted as part of the Programme on Climate Change Adaptation and Mitigation in the COMESA-EAC-SADC region.

	Increase of temperature	Droughts	Floods
Agriculture	<ul style="list-style-type: none"> <li>• Disturbances and changes in agricultural calendar and in crop development;</li> <li>• Loss of crops and decrease in production and yields</li> <li>• Needs of adapted varieties</li> </ul>	<ul style="list-style-type: none"> <li>• Decrease in water availability and decrease in hydrological regimes;</li> <li>• Loss of crops and decrease in production and yields;</li> <li>• Field fires and bush fires;</li> <li>• Disturbances and changes in agricultural calendar and in crop development;</li> <li>• Soil desiccation.</li> </ul>	<ul style="list-style-type: none"> <li>• Submersion of productive and arable lands;</li> <li>• High air and soil humidity;</li> <li>• Development of crop pathogens;</li> <li>• Agricultural infrastructure destruction (dams, channels, tracks, warehouses ...);</li> <li>• Disturbances in agricultural calendars and in crop development;</li> <li>• Displacement of crops in low productive areas</li> </ul>
Livestock raising	<ul style="list-style-type: none"> <li>• Change in livestock practices</li> <li>• Grazing and fodder shortage</li> </ul>	<ul style="list-style-type: none"> <li>• Decrease in water availability;</li> <li>• Grazing and fodder shortage;</li> <li>• Livestock loss and decrease in production;</li> <li>• Animal dehydration;</li> <li>• Development of respiratory diseases;</li> <li>• Increase in livestock mortality.</li> </ul>	<ul style="list-style-type: none"> <li>• Submersion of grazing and fodder production lands;</li> <li>• Development of water borne diseases;</li> <li>• High air humidity.</li> </ul>
Fishing	<ul style="list-style-type: none"> <li>• Loss of quality of fishing products</li> <li>• Risk of introduction of more adapted invasive species</li> </ul>	<ul style="list-style-type: none"> <li>• Loss of productivity</li> </ul>	<ul style="list-style-type: none"> <li>• Loss of productivity</li> </ul>

### Introduction to the three Project Sites

The project is targeted to three specific irrigation areas located within the Southwest. The three sites represent the primary poles of irrigated agriculture in the region and are the following:

- Taheza area - 2,440 ha located in Beioiky South district, about 137 km to the south east of Tulear City on RN A 17;
- Manombo Ranozaza area - 5,190 ha located in Tulear II district, about 70 km from Tulear City on RN9; and
- Bas Mangoky area - 5,800 ha located in Morombe district, about 220 km from the city of Tulear on RN9.

A summary of each of the project sites is presented below including baseline conditions of farming and farming livelihoods, irrigation infrastructure, social infrastructure, and vulnerabilities to environmental threats and climate change. In addition, a detailed description of the project sites formulated based on site visits undertaken in the preparation of this project document are included in Annex E.

### Taheza Irrigated Area

#### Overview of Farming in the Area

The Taheza irrigated area lies in the Bezaha and Andranomangatsiaka municipalities in the north of Betioky South district. Rainfall in this area is very low with less than 413 mm average per year and an accentuated dry season. Such low rainfall does not facilitate agriculture; however, the presence of the Onilahy and Taheza Rivers creates fertile agricultural land with a strong possibility for productive farming when irrigation is present. The specific project site lies on a narrow, 20 km band of land along the Taheza riverbed and watershed.

In the Taheza irrigated area, rice is the largest crop followed by onion, cassava, and peanuts. Farmers in irrigated areas are able to harvest two rice crops per year in addition to harvesting a cassava crop alongside the rice. Other livelihood activities include growing vegetables for sale at market, engaging in entrepreneurial activities such as buying and selling produce, and doing artisanal activities.



Rice yields are 2.5 tons per ha according to a 2008 survey. Growing practices in the area are mostly traditional, though there is some use of improved seeds as well as SRA (Ameliorated Rice-production Aystem) and SRI (Intensive Rice-production System) growing techniques. There is little or no use of urea, fertilizer, or pesticides, however, and slash-and-burn practices are common. Farmers report a need to alter their planting schedules due to shifting rain patterns in recent years.

Despite its potential, the Tazheza irrigated area is in poor condition, and less than 20 percent of the irrigated area receives the kind of irrigation that permits two rice crops per year. Furthermore, as farming under rain-fed conditions is not viable, 23 percent of land in the area has been completely abandoned due to insufficient irrigation.

### Irrigation Infrastructure

The Taheza irrigated area was originally outfitted with irrigation facilities in 1958, and includes an irrigated area of 2,442 ha. The system has a total of 25 km of mostly earthen canals that provide water to farmers through approximately 45 distribution points. Recently, the system stopped functioning in November 2012 due to water damage to the dam at the head of the system. Even prior to November 2012, however, the network contained serious flaws and often only reliably delivered water to the first 8 km on the network, leaving downstream areas without water.

The largest weakness in the Taheza system relates to the dam at Ambarinakoho which supplies water for the entire irrigation network but has suffered damages from floods. The Taheza River at the dam location has a particularly strong current registering 10 meters cubed per second (m<sup>3</sup>/s).

Other problems in the network include heavy sedimentation in the canals. Sedimentation problems stem from erosion throughout the watershed that is the result of deforestation. In addition, during times of heavy flooding water flows over the network's protective embankments bringing more sediment into the system. Even where protective embankments have been reinforced, they are not high enough to withstand the types of flood levels that the system experiences, and the canal bed is slowly rising, in turn reducing water flow in the network.

Problems with the primary canal have created downstream areas that for over ten years have lacked sufficient water to produce rice. The flow of water at the head of the system is in theory sufficient to feed the entire area, and yet distribution problems prevent water from reaching downstream sections.

### Social System

The Taheza irrigated area includes a Federation, called Komity Ny Rano, that was created in 1994 and is in charge of maintaining the primary canals in the irrigation system. The President confirms that the Federation has been ineffective since 2008, and water has not been adequately supplied to farmers. The Federation's weakness, it should be said, lies in many senses in the fact that the irrigation system is not operating. Confidence in the Federation is low amongst farmers, and the Federation has few financial resources. The Federation also has difficulty imposing its authority in dealing with unofficial outlets and enforcing communal efforts at maintenance.

The Federation is the agglomeration of 16 Water Users Associations, each with approximately 100 members, and these associations are in charge of the secondary canals. Of the 16, only one could be considered functional currently. The associations are not legally incorporated or formalized, and users do not pay fees or participate in communal maintenance. In the downstream section where there is no water, no maintenance work is being performed. Upstream users do organize some work, but the quality and frequency is not sufficient.

### Vulnerability to Climate Change

The Taheza network is at considerable vulnerability to floods, as can be seen by the fact that in recent decades the network has fallen victim to high floods that damaged the network to the point of ceasing operations. Currently the network is not operating at all. It is evident that the network is not equipped to handle the types of flood events and strong water currents that occur relatively regularly given its location.

The system is also vulnerable to deforestation which, combined with specific weaknesses along the canal system, is creating sedimentation in the network. Even in periods where the dam is functioning properly, sediment build-up hinders water delivery to downstream areas of the network.

One of the disconcerting results of the infrastructure state is that the Taheza River is, in theory, capable of supplying enough water to the area to dramatically reduce and even eliminate the risk drought poses to agricultural production.

Nonetheless, its current state of disrepair makes local farmers once again vulnerable to drought since irrigation waters are not being delivered.

Other vulnerabilities include that the area is susceptible to locust infestations, and farmers frequently report that rainfall patterns are changing necessitating alterations in the seasonal calendar they have for planting crops.

## **Manombo Ranozaza Irrigated Area**

### Overview of Farming in the Area

The Manombo Ranozaza irrigated area covers 5,190 ha with a total irrigation potential of 4,500 ha. It is located in the district of Tulear II, in particular in the upstream portion of the vast Ankililaoka Plain. The climate there is hot, tropical, and semi-arid. Water scarcity is a problem in the district, and only two thirds of arable land is currently farmed due to lack of materials and financing.

Average yields across Tulear II are high compared to other regions with rice yielding 3.5 tons per ha and maize yielding 2.5 tons per ha. Livestock rearing in this region is an important livelihood activity, but lack of water is leading to a decrease in livestock numbers. These reductions could affect farming because farmers in the area use livestock manure to fertilize fields.

As growing techniques, farmers in this area reported using some types of improved seeds, including different short cycle varieties for rice. Farmers also used manure and urea. In general, provision of inputs was low including availability of tools, seeds, phytosanitary products in addition to post-harvest storage facilities. It is notable that in this area farmers did not tend to engage in complementary activities to rice production making them highly dependent on the irrigation system despite the fact that the system is deteriorating rapidly.

### Conditions of Irrigation Infrastructure

The Ranozaza network was originally created in the 1930s and receives its water supply from the Amboboka River, which is fed by groundwater. Water currents on the Amboboka are roughly 1 to 2 m<sup>3</sup>/s and increase to 4 or 5 m<sup>3</sup>/s at certain points along the river bed.

The most substantial problem with the infrastructure network is the insufficiently low water volume in the system. By certain calculations the Amboboka River is simply not a large enough water source to supply water to the size of the Manombo Ranozaza irrigated area. A study in 2010 found that the total area possible to irrigate using the Amboboka intake point (the point where irrigation water is diverted from the river) is a mere 1,750 ha - only 34 percent of the current area connected to the system. This problem is made worse by a number of structural problems along the canals.

A second substantial problem in the area is the quantity of unofficial water outlets that have been created. Distribution outlets allow water to pass from the network canals into farmers' fields, and typically farmers pay money to receive these waters and be integrated in the network's maintenance. Unofficial outlets occur when farmers construct distribution channels on their own and do not pay fees to be part of the network. A large number of these outlets can also change the total water flow and water supply.

### Social System

There is a water Federation in the area that manages the canal networks. The Federation groups six WUAs where it is the responsibility of the latter to repair, clean and maintain canals as well as to enforce user rules and penalize infractions.

The six WUAs are grouped under a Union President who monitors the activities of the WUA. The Union, however, has few resources and no office. It would normally receive funding from the WUAs that it uses to fund canal maintenance; however, the system of financing is not functioning properly. The WUAs themselves have significant difficulty enforcing both membership fees and fines for illegal water outlets. Complicating matters, there are reports that large farmers are, in fact, those who often build the illegal outlets. WUAs are too intimidated by these large farmers, who may be in possession of intimidation tactics, to pursue action against their infractions.

## Vulnerability to Climate Change

A relatively unique characteristic of the Manombo Ranozaza area is that it is not particularly vulnerable to the threat of floods the way the other two project sites are. Because the system draws water from a river with a groundwater source, flooding is much less influential compared to flooding found in other rivers.

Nonetheless, the reduced risks of flooding in the system are accompanied by increased vulnerability to drought. Under normal rainfall conditions, the irrigation system does not have a high enough water load to support the irrigation needs for over half of the area. During drought, the irrigation capacity becomes even less, and much of the area is no longer arable. Rain-fed agriculture is not possible in this area, making the irrigation supply very important.

Deforestation is also a problem in the Ranozaza watershed, as it is in the other two project sites. In the case of the Manombo Ranozaza area, however, erosion and sedimentation is not the threat. Rather, deforestation reduces water infiltration across the watershed which reduces the ground water supply of the river. Finally, locust infestations are also a substantial problem in this area, and as in other parts of the Southwest, farmers report changes in annual rain patterns.

## **Bas Mangoky current situation**

### Overview of Farming in the Area

The Morombe district is in the northern area of the Southwest region. The district contains eight municipalities, of which the project will have activities in the Ambahikily municipality. The Mangoky River is the largest river in Madagascar, and its waters supply the Bas Mangoky irrigated area.

In the Ambahikily municipality rice occupies 60 percent of cultivated area. Other important activities include raising livestock and freshwater fishing. With irrigation, two growing seasons are possible, and currently 3,000 to 4,500 ha are cultivated in the main season while 2,000 to 3,000 ha are cultivated in the second season. Average rice yields in the area are particularly high registering 4.5 tons per ha on average.

Farmers in the area tend to use traditional growing practices, including slash and burn. There is a general lack of quality farming materials and little use of credit. At the same time, the area has good access to market due to the proximity to national roads, and there are nine storage facilities. Seed producers are present as well as a number of technical partners. Overall, however, skills related to growing practices as well as market operations are low. Literacy is also low in the area.

### Irrigation Infrastructure

The original Bas Mangoky irrigation structure dates to 1952 and holds the distinction of being the only irrigated area in the country equipped with concrete canals that extend to the parcel level of the network. The system also benefits from a dike that runs the length of the network protecting it from flooding on the Mangoky River as well as the river's natural movements.

Following a high frequency of cyclone events in recent decades, the dike system is in danger of collapsing, and the region requires a number of emergency infrastructure works to remove this danger. Previous repairs on the dike were carried out as emergency efforts, but did not manage to sufficiently reinforce the structure. In addition to vulnerabilities posed by the dike, the network's intake point has considerable weaknesses since the Mangoky River has changed course slightly over the years. Currently, the Bas-Mangoky Rehabilitation Project (*Projet de Réhabilitation du Bas-Mangoky - PRBM*) is constructing a new intake point just upstream from the current one.

A third weakness in the system is sedimentation. While the network is built with good mechanisms to handle sedimentation, sediment removal requires as a last step the use of a dredger and bulldozer, and often there is not money to operate these machines. As a result, sediment buildup in the primary canals has become a problem, reducing water flow in the system.

### Social System

The Federation in the irrigated area is in charge of the primary canal; however, the Federation lacks materials as can be seen in its inability to maintain the dredger and bulldozer needed for sediment removal. Purchasing fuel to operate these machines is a large burden for the Federation which is not currently being met. The Federation is comprised of 23 WUAs each with 100 to 600 members. The WUAs in Bas Mangoky are relatively well-functioning compared the

Taheza and Manombo Ranozaza project sites, and the WUAs in this area have received support from the PBRM Project. There are reported problems with unofficial distribution outlets and difficulty or inaction in imposing penalties.

### Vulnerabilities to Climate Change

As with the other two project sites, the Bas Mangoky irrigated area depends on its irrigation network since farming is not possible based on rainfall alone. The biggest risks to the network are floodwaters from the Mangoky River and their resulting damage. The irrigated network has witnessed a near constant cycle of cyclones that cause flooding and damage, followed by emergency repairs, followed by new cyclones and more damage. At this point, flooding to the area also arises from the risk that the dike structure will collapse. In this case, 95 percent of inhabitants in the Bas-Mangoky area will have no means of economic activity.

Vulnerability to drought in the area should be considerably if not completely mitigated by the sheer force of the Mangoky River. The current at low water mark for the Mangoky at the network's intake point is a strong 24 m<sup>3</sup>/s, which is capable of meeting twice the irrigation needs of the area. Vulnerability to drought in the area thus arises primarily from the risk that flood waters will degrade the irrigation infrastructure to the point of not operating.

Similarly to the other watersheds concerned with the project, Bas Mangoky experiences considerable risk from locust infestations. Deforestation is also linked to the sediment, erosion, and flooding problems of the network, and farmers notice changes in the seasonal rains.

### **Baseline Project**

The “Project to Renovate Agricultural Infrastructure in the Southwest Region of Madagascar” (*Projet de réhabilitation des infrastructures agricoles de la région Sud-ouest – PRIASO*) is the baseline project. It is a project supported by the African Development Bank (AfDB) with funding in the form of soft loans from the African Development Fund (ADF) and the Nigeria Trust Fund (NTF). PRIASO's overarching objective is to improve the quality of life for the Southwest region's predominantly rural population through making improvements to agricultural infrastructure. Its expected impact is to improve food security and reduce poverty in the Southwest region. The project's activities thus focus on addressing repair and renovation needs of irrigation structures that are the basis for farming activities in the project sites so that agricultural yields will increase, reducing, in turn, food insecurity and poverty. The project's expected outcomes are correspondingly: 1) to improve average yields that farmers achieve in the project sites; 2) to increase overall farming productivity in the project sites; and 3) to improve average income for farmers in the sites.

GEF-LDCF funding is being requested to supplement PRIASO's activities with important climate change actions. The GEF-LDCF project titled “Enabling Climate Resilience in the Agriculture Sector in the Southwest Region of Madagascar” will thus serve to incorporate the crucial element of resilience into PRIASO's activities and outcomes.

PRIASO has recently started and will be implemented from 2014 to 2018. Activities will be conducted in three target irrigation areas within the Southwest region of Atsmino Andrefana, and the project has been designed with three major components: 1) carry out specific improvements to infrastructure works; 2) conduct capacity building and agricultural development; and 3) coordinate management and monitoring for the project. The overarching rationale is that if water management can be improved in the target areas, agricultural production will improve in turn generating positive social and economic outcomes on the quality of life for rural inhabitants.

PRIASO's design acknowledges the importance of environmental phenomena and climate change; however, PRIASO will be made stronger if activities are included that directly address climate change threats and propose adaptation measures to these threats.

### **Component 1: Resilient Irrigation and Community Infrastructures**

#### **Outcome 1: Agricultural water infrastructures as well as water-related and health community infrastructures in the irrigated areas of Taheza, Monombo Ranozaz and Bas Mangoky are resilient to climate change**

PRIASO first component responds to specific irrigation infrastructure needs in the three project sites described above. Included in this component is watershed rehabilitation efforts designed to address erosion, sedimentation, and infiltration in the irrigated areas.

Expected PRIASO outputs regarding this component include renovating irrigation infrastructure so that it becomes functional, protecting to some extent infrastructure from floods and erosion. Activities supported by AfDB loans include

specific irrigation construction that has been identified in each of the three irrigation areas, conducting a study on the Madagascar Maintenance Fund for Agricultural Irrigation Networks to make it effective (*Fond d'Entretien de Réseaux Hydro-Agricoles – FERHA*), and creating management protocols for irrigated areas.

Since rain-fed farming is not possible in the three project sites, it is important to emphasize that local communities are dependent on irrigation structures to supply water to crops. Without irrigation, large portions of communities (nearly all in some cases) would be left with little ability to meet their household food needs or generate household revenues.

Irrigation structures need to be designed to meet conservative estimates for flood levels. The Bas Mangoky network, in particular, was constructed to meet only 10 years flood frequencies – a fact that has led to numerous damages and renovations to the network. While the PRIASO project will identify structural weaknesses in irrigation works and improve their capacity to withstand flood waters, past experiences with the irrigation network combined with predictions for increased extreme weather events caused by climate change indicate that it is prudent to design these networks with climate change in mind. AfDB soft loans will not support specific infrastructure works that will include climate change aspects and prospects. Without additional activities that focus on making infrastructure resilient to the types of flood levels predicted with climate change, the structures may return to their current state of decay.

Moreover, activities supported by AfDB loans do not include a mechanism that could mainstream climate change aspects within construction work procurement processes and construction management processes, and propose adaptation options or more climate resilient investments. PRIASO activities funded by AfDB and its expected results will not be effective without considering climate change in its construction works.

Furthermore, while PRIASO supported by AfDB loans will finance the renovation of irrigation infrastructures, without additional funding provided by the GEF LDCF, climate change increased impact, such as soil erosion, will not be adequately considered and its management will remain weak.

## **Component 2: Resilient Livelihoods**

**Outcome 2: Community activities resilient to climate change are implemented in the Rural Municipalities of Bezaha and Andranomangatsiaka (Taheza), Ankililoaka (Manombo Ranozaza), and Ambahikily (Bas Mangoky), and targeted community and municipal authorities have strengthened capacity to promote a local resilient development.**

The second AfDB PRIASO project component responds to broader agricultural development needs ensuring that adequate irrigation facilities are plugged into a larger social milieu that maintains infrastructure conditions and transforms increased agricultural yields into economic and social gains. Specifically, this component extends project activities to include capacity building for WUAs, formalization of land tenure practices, and strengthening the agricultural value chain by improving market access.

Expected outputs for this component include the number of WUAs with strengthened capacities, the level of land titles delivered to farmers, and improvements in the overall value chain for farming products. Planned activities include training and support for the WUAs in irrigation infrastructure management, construction of rural markets, support to local governments to deliver land titles, support to the National Anti-Locust Center, and institutional support to the Directorate of Rural Engineering (Direction du Génie Rural – DGR).

PRIASO activities are directed to strengthening the WUAs and their Federations in the irrigated areas so that these social structures have ownership of infrastructure works and will be interested in and able to maintain them. Many of the WUAs are not currently functional and lack capacity to carry out basic practices such as setting and enforcing fine and fee structures and generating revenue to be able to perform maintenance work. Bringing the WUAs up to task on these basic management issues is an important contribution of PRIASO activities supported by AfDB. However, while WUAs and their Federations would have increased capacities to manage water and irrigation infrastructures, without additional GEF LDCF support their awareness vis-à-vis climate change aspects and their understanding of climate change risks and their impacts on local development will remain weak.

It is furthermore important to indicate that many of the environmental threats to current infrastructure networks, such as sedimentation and flooding, may very well increase with predictions of future climate changes. It will be important for WUAs as well as local community administrative offices to understand these changes and incorporate an understanding of increased environmental risks into their planning. These entities will need to be conscious of predicted climate change and informed on adaptation possibilities to ensure the longevity of physical infrastructure.

Additionally, farmers in the three project sites are rarely using farming practices that could help them tolerate changing weather patterns such as shortened rainy seasons/lengthened dry seasons. There are a number of adaptation measures related to individual farming practices that would help farmers in the area build resilience to drought and reduce their vulnerability to low irrigation waters, and that will not be supported without additional GEF LDCF support. Similarly, other beneficial adaptation strategies include diversifying household incomes through income-generating activities that reduce vulnerabilities by reducing dependency on specific crops. These are important complements to water management and to an agricultural development that is climate change resilient.

Furthermore, most of local development plans existing in all four targeted municipalities do not take into account climate change in their planning and are poorly implemented. Building capacities of municipal leaders and technical services to understand climate change risks and plan to mitigate these risks is therefore a priority. Without additional GEF LDCF support, climate change aspects will not be mainstreamed into the local development plan of the four targeted municipalities and most of development activities identified will not be implemented due to lack of financial support. Implementation of local development plans would have to be supported to make adaptation actions identified effective.

### **Component 3: Knowledge-Sharing and M&E Systems**

#### **Outcome 3: Knowledge and best practices are monitored, evaluated and disseminated**

The third PRIASO component deals with knowledge development and M&E compliance.. It concerns defining and adhering to knowledge sharing practices and following an M&E process.

Expected PRIASO outputs supported by AfDB loans for this component include results based M&E activities. Activities include steering and coordinating project activities, and managing M&E processes.

The PRIASO project management includes a number of management procedures that take into account some of the capacity levels of implementing staff as well as the support on the monitoring of results; such as outputs- infrastructure works and as far as possible outcomes – implementation of climate change practices among the communities.

While PRIASO plans to use clear management, financial, and procurement plans alongside regular internal and external monitoring are strengths to the program, without additional GEF LDCF funding, technical, institutional and financial capacities at the local and regional levels to identify, disseminate and scale-up best M&E practices will remain insufficient. Best practices and lessons learned vis-à-vis climate change adaptation practices would need to be spread to a wider audience through additional support. In addition to the expected knowledge activities the M&E Budget will cover, i.e.:

- Tracking tool measurement and any associated monitoring expenses;
- Monitoring of all project indicators
- Periodic monitoring reporting for the project;
- Independent terminal evaluation of the project; and
- Independent Midterm review

A. 5. [Incremental /Additional cost reasoning](#): describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the associated [global environmental benefits](#) (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:

The GEF LDCF project “Enabling Climate Resilience in the Agriculture Sector in the Southwest Region of Madagascar” is closely associated to all activities planned for the AfDB PRIASO project, while retaining a focus specifically on adaptation and resilience-building. There are several overarching rationales for complementing PRIASO with additional climate change adaptation and resilience activities, especially when taking into consideration the environmental vulnerabilities of agricultural livelihoods in the three project sites as described above (and available in additional detail in Annex E). The Government of Madagascar requests the LDCF to finance the additional costs of enhancing the resilience of irrigation infrastructures and rural communities in three irrigation areas in one of the most vulnerable regions of Madagascar by ensuring that: agricultural water infrastructure planned under a business-as-usual scenario is modified to be resilient to climate change; the vulnerability of the catchment to cyclones and flooding is reduced; and local agricultural livelihoods are adapted to climate change through water management and health interventions.

The objective of this initiative is to secure and improve rural farmers' livelihoods through water management and health interventions in Southwest Madagascar. This will be achieved through: (i) strengthening the resilience of agricultural water infrastructures as well as water-related and health community infrastructures in the irrigated areas of Taheza, Monombo Ranozaza and Bas Mangoky; (ii) implementing community activities resilient to climate change in the Rural Municipalities of Bezaha and Andranomangatsiaka (Taheza), Ankililoaka (Manombo Ranozaza), and Ambahikily (Bas Mangoky), and strengthening capacities to promote a local resilient development of targeted communities and municipal authorities; and (iii) monitoring, evaluating and demonstrating adaptation knowledge and best practices.

Irrigation infrastructures renovation work planned against a business-as-usual scenario will be upgraded to include climate change aspects to become resilient to climate change. Projected climate change impacts will be fully taken into account while programming infrastructure renovation works and while organising procurement processes. The project team will use data and analysis conducted by the National Directorate for Meteorology, and the results of the Second National Communication and of the climate change baseline and trend study conducted as part of the Programme on Climate Change Adaptation and Mitigation in the COMESA-EAC-SADC region.

In order to overcome the identified barriers, close support at the municipality level and capacity building through awareness-raising, training on climate change, its impacts and possible adaptation options, are necessary. Trainings and awareness-raising on opportunities and threats associated with long-term climate change will be provided to municipal leaders, farmers, UWAs members, community based organisations and women associations. These trainings will be conducted in a way to ensure that local targeted stakeholders have sufficient capacities to further integrate climate risk management into programming, including municipal development plans.

Taking due account of local knowledge, customs and risk reduction strategies, the project will aim to demonstrate how efficient and effective community-based climate resilient strategies and practices can be promoted and adopted by a large audience and improve living conditions in a sustainable manner. The project will promote climate resilient farming and livestock breeding pastoral practices and technologies and resilient income generating activities in the targeted four municipalities. These measures will be implemented through a close collaboration with local authorities and technical partners such as local civil society organizations, farmers' organizations, and research institutions such as FOFIFA. They will promote the use of improved farming and livestock breeding technologies and practices and disseminate research results across the region. These technical partners will be key vehicles to promote and disseminate climate resilient options and best practices widely. Women's groups, who are deemed highly vulnerable to the projected impacts of climate change and variability, will be specifically targeted as main beneficiaries of project activities.

Finally, adaptation best practices (including gender differentiated issues) from the implementation and promotion of community-based resilient practices and income generating activities will be captured and widely disseminated to support replication (with appropriate adjustments) in other vulnerable areas, landscapes and regions. Cross-community learning on adaptation across Madagascar will also be promoted.

## **Project Strategy**

### **Component 1: Resilient Irrigation and Community Infrastructures**

**Outcome 1: Agricultural water infrastructures as well as water-related and health community infrastructures in the irrigated areas of Taheza, Monombo Ranozaza and Bas Mangoky are resilient to climate change.**

#### Adaptation Alternative

GEF-LDCF support will be used to ensure that water-related infrastructure works are both designed and maintained taking climate change into consideration. In the case of irrigation infrastructures, GEF-LDCF resources will fund additional protective elements along the irrigation networks ensuring that the networks are preventatively designed to withstand the types of high flood levels that are predicted given likely increases in extreme weather events and strong cyclones. The project team at DRDR and Ministry of Agriculture will link with technical staff at the National Directorate of Meteorology to get up to date weather data and climate projections while programming infrastructure renovation works and while organising procurement processes.

Increasing the durability and reliability of these infrastructure networks greatly reduces vulnerabilities to flooding for farmers in the irrigated areas. The risks posed to farmers by drought could also be dramatically reduced in Bas Mangoky and Taheza if irrigation networks were resilient to strong weather events. Finally, increasing the strength of

these structures through preventative construction will avoid the previous experiences where structures fall victim to floods and must be repaired under emergency conditions.

GEF-LDCF resources will also be used to fund community infrastructure projects that are related to agricultural development to ensure that gains in agricultural productivity translate into adaptive livelihoods capable of withstanding future climate shocks. The rationale behind this project component is that resilient livelihoods are multi-dimensional, and for improved farming yields and improved farming incomes to lead to long-term resilience, they must be accompanied by comparable improvements in other livelihood components. While one project cannot address all aspects of a rural livelihood, the current project has chosen specific aspects of community and household water-use that, while not related to agricultural production, nonetheless contribute to a robust and resilient livelihood. One of these includes protecting human capital in the form of health through strengthening access to community health centers that will prevent and treat water-borne illnesses. Physical health has strong ties to farming since weakened health reduces a household's ability and capacity to adopt and implement adaptive farming practices. Reducing the toll that disease takes on farming households will ensure that farmers are able to fully capitalize on applying the types of improved irrigation and farming techniques supported by the other activities to this project. The GEF-LDCF contribution to this part of the project will thus ensure that gains made through farming adaptation are not lost to the negative effects of water-borne illnesses.

In a similar vein, GEF-LDCF funding will also be used to construct storage facilities for post-harvest crops, ensuring that improved agriculture yields can be exploited to the full extent and transformed into increased household income and food supply. Finally, GEF-LDCF funding will contribute to the construction of several boreholes and washhouses as another type of water-related community structure that stands to help rural livelihoods adapt to climate change in a way that is well-rounded. Boreholes and washhouses will improve water access, hygiene and reduce the time women, in particular, must spend fetching water. Finally, GEF-LDCF support includes creating watershed restoration plans specifically for the Taheza watershed. This is an important climate-proofing activity since deforestation in the watershed leads to high sedimentation in irrigation infrastructures that is costly to remove.

### Outputs and Activities

Four major outputs will contribute to attaining this outcome. They consist of:

#### ***Output 1.1. Twenty-five km of the protective dike in the Bas Mangoky irrigated area are raised and lengthened to be resilient to floods.***

The Bas Mangoky irrigated area has suffered repeated cyclones which damaged the original irrigation structure and necessitated emergency repair. It is currently considered in great danger of collapsing, putting at risk the livelihoods of nearly all of the area's inhabitants. The following activities will strengthen this infrastructure network's ability to withstand high floodwaters, particularly floods resulting from strong cyclones. Also included are plans to plant grasses along the structure's embankment at certain locations to reduce erosion.

Activity 1.1.1. Protection of riverbanks upstream from the village of Ankilimarovahatra – installation of 4 spurs between Metric Point (MP) 5785 and MP 6282.

Activity 1.1.2. Protection of riverbanks at Ankilimarovahatra – installation of 6 spurs between MP 7037 and MP 8762.

Activity 1.1.3. Raising and expanding the banks of the protective dike between MP 19129 and MP 29910.

Activity 1.1.4. Treatment of the Betakoana breach between MP 27908 and MP 29508 – extension of the 4 spurs constructed as an emergency to protect the dike as well as construction of a new 260m long spur upstream from the D1 spur.

Activity 1.1.5. Strengthening and planting grass seeds on the banks of existing structures: (i) strengthening the head of the spur at Tanandava; (ii) resurfacing the banks and planting grass along the N3 spur; (iii) resurfacing the banks and planting grass along the N4 spur.

#### ***Output 1.2. Irrigation works in the Taheza irrigated area are renovated and resilient to climate change.***



The Taheza irrigated area suffers from low water delivery due to a poor condition of the dam at the head of the network as well as sediment build-up throughout the canals. The following activities will improve water flow in the canal network increasing the likelihood that downstream users have access to reliable water supply, in times of drought and flood alike. Also included are activities to improve watershed management in the area.

Activity 1.2.1. Rehabilitation of the dam at Ambarinako.

Activity 1.2.2. Levelling of the 25 km of primary canal.

Activity 1.2.3. Renovation of specific canal works: sedimentation basin, inverted siphons, water flow controls, distribution mechanisms in the secondary canals, zebu crossings, and enabling water supply to the JIRAMA hydroelectricity plant.

Activity 1.2.4. Resurfacing of the 25 km of primary canal.

Activity 1.2.5. Blueprint study on protecting the Taheza watershed and development of a water and soil conservation management plan.

Activity 1.2.6. Baseline technical study for infrastructure work to protect the Taheza watershed.

Activity 1.2.7. Restoration of degraded zones in the Taheza River watershed : (i) reforestation of the watershed with vetiver, acacia, jatropa, and eucalyptus; (ii) planting of sisal in specific places along the water bed to reduce erosion and sediment transport, signing an agreement with the Regional Environment Directorate (DREF).

***Output 1.3. Irrigation works in the Manombo Ranozaza irrigated perimeter are renovated and resilient to climate change.***

The Manombo Ranozaza system currently suffers from low water current levels due to reduced water flow at the source of the network. The following activities will improve canal structure increasing the likelihood that downstream farmers are supplied with reliable water, even in times of drought.

Activity 1.3.1. Restoring the Antsakoandahy spillway dam/dike: fill breaches at the intake point, conduct specific restoration works on the spillway dike.

Activity 1.3.2. Levelling and surfacing of 5.6 out of 6.6 km of the right canal bank to limit water loss and prevent the creation of illegal water outlets.

Activity 1.3.3. Levelling and surfacing of 5.4 out of 17.7 km of the left canal bank.

Activity 1.3.4. Levelling and surfacing of 4.6 of 16.1 km along the Saondraza Canal.

Activity 1.3.5. Levelling and surfacing of 3.6 of 6.2 km on the Upstream Vezo canal.

***Output 1.4. The irrigated areas of Taheza, Manombo Ranozaza and Bas Mangoky are equipped with community infrastructures that are resilient to climate change.***

Storage facilities, boreholes, washhouses, and health centers will be created in the three irrigated areas to improve water management for domestic uses and health conditions, ensuring that not only agricultural production but other daily life activities are resilient to climate change.

Activity 1.4.1. Construction and installation of management groups for 3 storage facilities with a 100 ton capacity in the Taheza irrigated area as well as 3 facilities in the Monombo Ranozaza irrigated area.

Activity 1.4.2. Construction of 6 bore holes equipped with a manual pump to supply a drinking trough for livestock and a washhouse in the Bezaha and Andanomanagatsiaka municipalities, 4 bore holes with manual pumps supplying a drinking trough and a washhouse for the Ankililoaka municipality and 3 washhouses in the Bas-Mangoky area to reduce illnesses linked to drinking non-potable water. Signing of an agreement with the Regional Water Direction (*Direction Régionale de l'Eau*).

Activity 1.4.3. Construction of a health center in the Ankililoaka municipality (Monombo Ranozaza), another in the Ambahikily municipality (Bas-Mangoky), and one in the Bezaha and Andranomangatsiaka municipalities (Taheza).

Activity 1.4.4. Furnishing of equipment and medicines for the constructed health centers, especially for treating water-borne illnesses.

Activity 1.4.5. Awareness building campaigns in communities in the 3 areas on hygiene and water-borne illnesses.

## **Component 2: Resilient Livelihoods**

**Outcome 2: Community activities resilient to climate change are implemented in the Rural Municipalities of Bezaha and Andranomangatsiaka (Taheza), Ankililoaka (Manombo Ranozaza), and Ambahikily (Bas Mangoky), and targeted community and municipal authorities have strengthened capacity to promote a local resilient development.**

### Adaptation Alternative

Experience in the three project sites has shown that for physical irrigation structures to be resilient they must be managed by and complemented with community structures that are themselves resilient. The second component to the GEF-LDCF project includes conducting capacity building activities on climate change and adaptation measures to a variety of local community structures in the irrigation areas.

Recipients of capacity building activities include the municipalities for the three irrigated areas (there are four municipalities in total), employees of the Extension Service in the irrigated areas, Water Users Associations and Federations in the areas, and women's groups. Content for capacity building will range from helping municipalities to develop climate proofed Community Development Plans, helping extension workers to promote resilient farming practices such as SRA and SRI techniques and the use of improved seed varieties, and assisting to mobilize women's groups improving women's social standing and independence.

### *Specific Gender Outputs*

Studies and preparation for the project included understanding how gender creates different types of vulnerabilities for male and female farmers in the region. Women were consulted to understand how their daily lives, responsibilities, and tasks might differ from those of men. They were also consulted to understand how their positioning within the household and within communities affects their own livelihood activities, quality of life, and vulnerability to climate change. Conclusions about women's implication in irrigated farming in turn influenced several specific GEF-LDCF project components.

Women are active in many farming tasks in the irrigated areas; however, women have difficulty participating in community forums, hampering their ability to contribute to discussions concerning farming activities that they are heavily involved in. GEF-LDCF funding will be used to build women's associations, to conduct awareness building on gender issues in local communities, and to encourage positioning women in management positions within WUAs and Federations.

Women are also disproportionate victims of water theft, and their water is occasionally rerouted even legally during times of water shortage. GEF-funded awareness raising activities on gender as well as GEF-funded efforts to incorporate women into WUAs stand to improve female farmers' ability to demand equal protection from water theft and equitable treatment during times of water scarcity.

Finally, women in the Southwest region have very low opportunities to accumulate their own assets. GEF-LDCF funding to encourage, facilitate, and provide training on income-generating activities will help improve women's independence by enhancing the revenues they achieve through their existing activities. Diversified household income is, in turn, an important adaptation strategy to build resilience and reduce dependency on individual crops.

GEF-LDCF activities in the above-mentioned areas will be accompanied by specific outcome and output indicators that will monitor women's involvement in the project and that will inform M&E activities on women's benefit through the project.

### Outputs and Activities

Five major outputs will contribute to attaining this outcome. They consist of:

***Output 2.1. Community Development Plans for the four municipalities are reviewed and updated to integrate effective management of climate risks and provide financing for resilience-building activities.***

Engaging municipalities in the process of development of climate proofed local development plans will ensure that communities have the tools to anticipate and prepare for the types of weather events likely to occur in the future. Municipalities will thus be enabled to create ongoing practices that build resilience in their municipalities.

Activity 2.1.1. Update Local Development Plans integrating climate change adaptation for the Ankililoaka, Ambahikily, Bezaha and Andranomangatsiaka Municipalities.

Activity 2.1.2. Support implementation of the 4 Local Development Plans, especially activities/infrastructures that effectively strengthen resilience of local residents.

***Output 2.2. Women's Groups are strengthened, structured, and supported to implement promising income-generating activities that are resilient.***

Women's groups will be reinforced to enable women to demand more decision-making power in the activities that concern their daily lives. Their income-generating activities will also be supported. Activities will ensure that women do not remain a disproportionately vulnerable group to the effects of climate change. The project will specifically provide training to women on different types of income activities and how diversifying livelihood activities could be a strong source of resilience in the face of future climate variability.

Activity 2.2.1. Analyze the following income-generating activities proposed by women for resilience, economic viability, and potential to open markets: (i) gardening, (ii) food crops, (iii) artisan crafts (weaving, basketwork) (iv) small-scale trade (especially rice); and (v) small livestock.

Activity 2.2.2. Support 40 women's groups to implement income-generating activities identified as resilient.

Activity 2.2.3. Strengthen and structure existing women's groups especially in management skills (basic accounting, etc.).

***Output 2.3. Municipality Council members, extension workers for the DRDR, DREF and the DREau, and farmers have the capacity to plan and adapt to climate change impacts.***

Local municipality council members, extension services and farmers will be trained on integrating climate change risks into the management and planning of socio-economic activities, on resilient farming techniques that conserve soil health and increase soil moisture retention, and on techniques to fight erosion. The project is designed to not only disseminate knowledge on climate change and adaptation choices but also to enable local administrative offices to incorporate this knowledge into their long-term operations.

Activity 2.3.1. Train 50 workers from the Extension Service (DRDR, DREF, DRE) and 30 members from Municipality Councils in Ankililoaka, Ambahikily, Bezaha, and Andranomangatsiaka on integrating climate change risks into the management and planning of socio-economic activities.

Activity 2.3.2. Train 50 farmers in each municipality (200 total) on climate change risks and adaptation options as well as on integrating resilient practices into their farming techniques. Total target of impacting 1,000 farmers indirectly.

Activity 2.3.3. Train 200 farmers in agro-forestry and fighting erosion.

Activity 2.3.4. Conduct awareness building activities with local communities and local authorities on ways to incorporate gender equality into their activities.

***Output 2.4. Technical assistance in water management and improvement of the irrigated areas.***

WUAs will be best positioned to guarantee that infrastructures are maintained beyond the project lifespan. These groups will be trained not only in basic operations but particularly in the anticipated effects of climate change. Provided with this information, WUAs and their Federations will be able to use an understanding of climate variability to maintain community irrigation works in a way that adapts to future climate events.

Activity 2.4.1. Support to restructure the WUAs and Federations in the Taheza, and Manombo Ranozaza areas to improve their functionality.

Activity 2.4.2. Training on water management and management and maintenance of irrigation structures for 200 members of the WUAs in Taheza, and Manombo Ranozaza.

Activity 2.4.3. Awareness building campaign with 300 members of the WUAs on climate change in the Taheza, Manombo Ranozaza, and Bas-Mangoky areas.

***Output 2.5. A supply chain for producing, storing, and distributing resilient seeds for rice, maize, and lima beans is put in place. GEF-LDCF contribution of 150,000 US\$.***

Short cycle variety seeds are an important adaptation measure to the changes in rainfall patterns that farmers are already observing in the project areas. Activities will be carried out in partnership with Madagascar's national agricultural research facility, FOFIFA, to research, design, and distribute rice varieties that are specific to conditions in the Southwest region and that are resilient to climate change.

Activity 2.5.1. Annual production by FOFIFA of pre-basic and basic seeds for improved varieties of rice (3 tons), maize (1 ton), and lima beans (1 ton).

Activity 2.5.2. Implementation of a seed production contract between FOFIFA and farmers in the irrigated areas of Taheza, Manombo Ranozaza, and Bas-Mangoky.

Activity 2.5.3. Storage and enrichment of phylogenetic resources for rice, maize and lima bean.

Activity 2.5.4. Testing of new short-cycle rice varieties.

Activity 2.5.5. Train 20 seed producers in each area, of which 25 % will be women, on producing commercial improved seeds.

### **Component 3: Knowledge-Sharing and M&E Systems**

#### **Outcome 3: Knowledge and best practices are monitored, evaluated and disseminated.**

##### Adaptation alternative

The current AfDB PRIASO project incorporates a number of measures to make project management transparent and effective. Nonetheless, the current PRIASO project alone does not include a mechanism to identify and disseminate adaptation best practices learned through the project. GEF-LDCF funding will be used to create a monitoring plan specific to identifying best practices accompanied by a communications plan used to disseminate these findings. The added GEF-LDCF component thus lends an important element of project sustainability because it ensures that the project experiences could be used to inform and influence other similar projects.

##### Outputs and Activities

Two major outputs will contribute to attaining this outcome. They consist of:

#### ***Output 3.1. M&E System developed and implemented.***

Project staff will be guided in developing an M&E framework that is results-based and used to inform project management.

Activity 3.1.1. Conduct annual monitoring and evaluation surveys.

Activity 3.1.2. Conduct environmental monitoring – visits every half year by the Ministry of Agriculture Environment Service.

Activity 3.1.3. Conduct a mid-term evaluation.

Activity 3.1.4. Conduct a final evaluation.

***Output 3.2. Best practices for adaptation (including gender-specific measures) are identified and diffused, and intercommunity learning on adaptation measures is put in place in the Atsimo Andrefana region and in the country to support replication of results in other vulnerable communities.***

Activity 3.2.1. Develop and implement a specific Communications Plan for the project.

Activity 3.2.2. Organize exchanges between project sites and amongst farmers to spread best practices and lessons learned. Some exchanges will also be organised with the first LDCF project currently implemented by UNDP and executed by the Ministry of Environment in Madagascar. Close coordination between both project teams will be organised so as to ensure that lessons learned and best practices from one project could inform the implementation of the other one.

Activity 3.2.3. Distribute lessons learned and best practices at the national and international scale.

Promoting and disseminating lessons learned and best-practices is a key part to relevance, effectiveness and impact of adaptation activities and local development on the one hand and to contributing to implement the UNFCCC on the other.

It will be important to identify pathways for communicating relevant project outcomes in a way that is sustainable so that other communities can adopt and take over activities.

This activity will be carried out through the following stages:

- Conduct a study by the end of the project on adaptation best practices and lessons learned based on project activities;
- Prepare information bulletins, guideline sheets, diverse communication products, etc.;
- Translate communication products into local languages;
- Develop an information package translated into appropriate language formats for distribution through community radio or television chains;
- Disseminate products in intervention zones using local and national media; and
- Contribute regularly to the site [www.cnedd.ne](http://www.cnedd.ne), Adaptation Learning Mechanism (ALM) and WikiAdapt.

A.6 Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks:

The following key risks were identified during project design process. For every risks, the following mitigation measures will be conducted.

- Climate change risks, such as exceptionally strong cyclones, high flood water levels, and droughts, will reduce the capacity of infrastructure.

Climate change risks will be reduced by designing and constructing farming infrastructure that resist 100 year flood frequency (and 350 year flood frequency when possible). Risk of drought will be reduced by the efficient use of irrigation water as well as through FOFIFA's research and production of seed varieties that are adapted to drought. An MoU will be signed with FOFIFA to this end.

- Threats from locust infestations.

The PRIASO portion of the project plans to support the Madagascar National Anti-Locust Center with equipment to enable it to collect and analyze information required to create locust prevention policies.

- Unstable land titles for farmers.

The project will support processes to deliver land titles to farmers by the Land Title and Topography Direction (*Direction de la conservation foncière et de la topographie – DCFT*).

- Weak functionality of the National Irrigation System Maintenance Fund (*Fond national d'entretien des réseaux hyro-agricole, FERHA*).

FERHA is the Madagascar government body responsible for financing the maintenance of large-scale irrigation schemes. It consists of a regional entity that is designed to provide funds to WUAs when they do not have sufficient financial resources to perform maintenance, as well as a national entity that provides funds during large disasters. In the past, the national entity has not been well funded. For Atsimo Andrefana, no financing was allocated to its regional FERHA in 2013. As part of the PRIASO project a study is being planned to propose ways to make FERHA more operational and to leverage funding for regional FERHAs. Furthermore, the project team is confident of being able to convince the government to allocate sufficient resources to FERHA, particularly in the South-West region.

- Weak functionality of the Water Users Associations.

The project plans on recruiting a technical assistant in water management. This person will revive the WUA and provide them with the technical information necessary to execute their mandates. GEF funded activities contribute specifically to strengthening the WUAs, including making them more inclusive of women.

- Weak technical skills and institutional structure of the DRDR

This risk will be mitigated through capacity building with personnel from the DRDR. Consultants in rural engineering, M&E, procurement procedures, and financial and administrative management will be recruited to help execute the project. An implementation manual along with administrative and financial procedures will be created. GEF funding will contribute to training DRDR personnel.

- Institutional capacity of relevant national institutions to implement the project

Recent political and economic circumstances have weakened the country's national institutions, including the Ministry of Agriculture, which will be the implementation partner on this project. DRDR of Tulear will be responsible for the project implementation with technical supervision from the DGR. In addition, a Project Management Unit will be put in place to carry out the day-to-day activities. The decentralized nature of the project coordination combined with a competitive selection of contractors, consultants, and NGOs will ensure project implementation. Creating the PMU responds to the risk of inadequate institutional capacity. M&E activities will provide an early warning of potential problems.

- Environmental Risks

In the Manombo Ranozaza area, construction work will require cutting the water supply to the canals for several months. WUA are very weak in the area, and the irrigation system is of high importance to the livelihoods of local people. There are also many illicit outlets and work could have a strong social impact leading to potential conflict. The company in charge of conducting the works will need to propose alternative solutions for supplying water (a derivation canal, alternating work on the canals, etc.) to mitigate conflict. The specific risks and the need to propose solutions should be specified in the calls for tender for these jobs.

To minimize impact on rice production, the environmental impact assessments have subdivided work into different groups so that the duration of construction does not extend beyond one dry season. Adhering to this schedule is an imperative, and it should be emphasized in consulting documents.

- Financial, Political, and Management Risks

An evaluation of financial risks to PRIASO was conducted in February 2013 as part of AfDB procedures, and the overall financial management risk to the project was deemed high. Analysis of the public finance management structure in Madagascar needs to take into account the country's ongoing political instability that has persisted since 2009 having important effects on the economy and public finances. A World Bank review of public expenditures in 2011 noted a number of limitations in Madagascar's public financial management including conflicts of interest, corruption, weak levels of financial resources, illegal trafficking, and non-transparent and inefficient management of the mining sector.

#### A.7. Coordination with other relevant GEF financed initiatives

Although this project and the first LDCF project implemented by UNDP are not implemented in the same region and are not focusing on the same activities, both projects focus on rice production and on increasing the resilience of rice production to expected climate change impacts in specific irrigation areas. Some linkages in terms of lessons learning and dissemination of best practices will be drawn through the third component of the project.

The Ministry of Agriculture and the Ministry of Environment will ensure that lessons learning exchanges will be organized and coordinated. Both project management teams will set-up coordination mechanisms to ensure that results and lessons learned from one project could inform the implementation of the other.

#### **B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:**

##### B.1 Describe how the stakeholders will be engaged in project implementation.

###### Stakeholder involvement in project design

The focus of the project has been determined through a series of national, sub-national and local stakeholder consultations and has received the full support of the GEF Climate Change Focal Point. Visits have been organized in the South-West region and in the three project sites. Consultations have also been organized at the national level with line ministries.

This proposal has been elaborated through a participatory process, and all parties at national, regional and local level have been duly involved and informed. The Ministry of Agriculture and the Regional Directorate for Rural Development Southwest took the institutional lead on the project document preparation. First consultations were held in Antananarivo, in Tuléar, in the three targeted irrigated area and in selected municipalities in November and December 2013, involving national consultants, in order to meet key local stakeholders such as beneficiaries, communities, civil society, locally elected officials, extension services, regional decision makers, government officers and partners. The project strategy, logical framework, institutional arrangements and budget were presented to and validated by national and local stakeholders during a workshop held in 21 November 2014. The data collection mission conducted at local, regional and national levels led to the development of an Aide Memoire summarizing contextual data collected and the draft proposed project strategy which was endorsed by the Government. To conclude, the draft project document was finalized and validated by AfDB and the Malagasy Government on February 2014.

This project has also been designed to address the additional costs imposed on development by climate change. As such, the project builds on a sizeable baseline. The project only supports activities that would not be necessary in the absence of climate change.

###### Stakeholders engagement in project implementation

A Project Steering Committee (*Comité d'Orientation et de Suivi – COS*) will be created with the main role of supervising the project implementation, and discussing and making recommendations on any necessary reorientation of activities or reallocation of resources based on evaluations, so long as these modifications do not change the project fundamentals or alter the project schedule. The COS will, among other duties: (i) approve work plans and annual budgets; (ii) approve operational and financial activity reports as well as M&E reports; (iii) consider questions that arise regarding project implementation, such as audit reports, roles and responsibilities of principle actors; and (iv) promote partnerships between all actors. It will be meeting twice a year. It will be chaired by the General Secretary of the Ministry of Agriculture with the project Director acting as Secretary. Meetings will be convened by the General Secretary of the Ministry of Agriculture. It will be composed of:

- General Secretary of the Ministry of Agriculture;
- Director of DRDR Southwest;
- Directorate of Public Debt;
- General Technical Directorate of the Ministry of Agriculture;
- General Environment Directorate of the Ministry of Environment;
- Directorate of Climate Change of the Ministry of Environment which is the implementing partner for the first

LDCF project implemented in Madagascar;

- Directorate of Rural Engineering of the Ministry of Agriculture;
- Directorate of Agricultural Production of the Ministry of Agriculture;
- National Office of the Environment which is in charge of overseeing the implementation and compliance to Environmental Impact Studies at the national level;
- Southwest Region Governor;
- Regional Directorate of Finance, South-West Region;
- Mayor's office for Bezaha;
- Mayor's office for Ankililoaka;
- Mayor's office for Ambahikily;
- FOFIFA, South-West;
- Regional Directorate of the Environment, South-West Region;
- Regional Directorate of Public Health; and
- AfDB Madagascar.

Additional project partners (including first LDCF project team) and technical and financial partners could be associated to this project steering committee as observers.

The key government institutions directly involved in the implementation of this initiative include:

- The DRDR - The Regional Directorates for Rural Development (*Directions Régionales du Développement Rural* – DRDR) are in charge of implementing the Ministry of Agriculture's policy at the regional level taking into consideration local context. There are a total of 22 DRDRs nationally. The DRDR for the Southwest will have a central role in implementing PRIASO and the GEF-LDCF funded project.

Each DRDR includes the following services:

- Administrative and Financial Service (*Service Administratif, Financier* – SAF)
- Regional Service for Agriculture and Plant Protection (*Service Régional de l'Agriculture et de la Protection des Végétaux* – SRAPV)
- Regional Rural Engineering Service (*Service Régional du Génie Rural* – SRGR)
- Service for Regional Agriculture Cooperation and Support to Sector Organization (*Service Régional de la Coopération Agricole et d'Appui à l'Organisation des Filières* – SRCAAOF)
- Regional Monitoring and Evaluation Service (*Service Régional du Suivi Évaluation* – SRSE)

Responsibilities for the DRDR include coordinating, programming, monitoring implementation of activities, budget use, procurement, financial management, M&E activities, and creating progress reports. The Director of the DRDR will serve as the Project Director. He/She will be supported by the following additional positions:

- Deputy Coordinator (position funded through AfDB-ADF funds, recruited nationally)
- M&E Manager (position funded through AfDB-ADF funds, recruited nationally)
- Administrative and Finance Manager (position funded through AfDB-ADF funds, recruited nationally)
- Six technicians from the DRDR to be located in project sites, 2 per site (positions funded through Government and AfDB-ADF funds)
- National Environment and Climate Change expert (position funded by the GEF-LDCF funds), to be filled by the General Environment Directorate (*Direction Générale de l'Environnement* – DGE). This expert will ensure that climate data and trends are fully considered while planning and conducting project activities, including all along the procurement process. He will also make linkages to the National Directorate of Meteorology to get up to date climate data and climate projections.



- Rural Engineer (position funded through AfDB-ADF funds, recruited nationally)
- Procurement Specialist(position funded through AfDB-ADF funds, recruited nationally)
- The DREF – The Regional Directorate of the Environment and Forests for the Southwest will be a key partner of the DRDR regarding the implementation of all environmental related activities. This include reforestation and erosion control activities. A specific MoU between the DRDR and the DREF will be signed regarding the implementation of these activities. Furthermore, an environmental and climate change expert from the DREF will be assigned to the DRDR to support the project management team regarding environmental impacts assessments and climate change mainstreaming aspects.

### Municipalities

- Taheza Irrigated Area

The area is part of the Andranomangatsiaka Municipality with approximately 7,000 inhabitants. There is a Local Development Plan developed in 2005 that needs to be updated.

The area is also part of the Bezaha Municipality which has approximately 30,100 total inhabitants. This Municipality has a Local Development plan from 2005 that is not updated. The Municipality budget for 2012 was only covered by about 50 percent. The Municipality has a staff of 23 who are mostly administrative.

- Manombo Ranozaza Irrigated Area

The area is part of the Ankililoaka Municipality which has 23 fokontany, 14 of which are in the Manombo Ranozaza area. The municipality has a Local Development Plan developed in 2006, but it is not updated and only 20 percent of the planned activities were carried out due to financing problems. The Communal Council is composed of seven members. The municipality budget receives funds from a rice production and selling tax as well as cotton, though they are not always collected.

- Bas Mangoky Irrigated Area

Located in Ambahikily municipality which is divided into 13 fokontany. The community has a Local Development Plan dated to 2003. The Town Hall has 42 staff, the majority of which are administrative. It has a Communal Council composed of seven members. The administration receives money from the State as well as from a tax on rice exported outside of the municipality.

### Water User Associations and Federations

- Taheza Irrigated Area

The Taheza irrigated area includes a Federation, called Komity Ny Rano, that was created in 1994 and is in charge of maintaining the primary canals in the irrigation system. The Federation office includes a President who is assisted by 16 technicians, who each represent one Water User's Association. The office includes a Treasurer, a Councillor, and a Commissioner.

The federation conducts work twice a year prior to each transplanting of the rice crops. It does not have its own office facilities or its own materials and machines. The President confirms that the Federation has been ineffective since 2008, and water has not been adequately supplied to farmers.

The Federation is the agglomeration of 16 WUAs, each with approximately 100 members, and these associations are in charge of the secondary canals. Of the 16, only one could be considered functional currently. The associations are not legally incorporated or formalized, and currently users do not pay fees or participate in communal maintenance.

In general, the Federation and WUAs lack training in basic management, as well as how to negotiate water management questions such as enforcing fees and fines. They could also benefit from training in infrastructure maintenance practices.

- Manombo Ranozaza Irrigated Area

The water Federation for the area manages the four canal networks. It has a President, two Vice Presidents, a Treasurer, Advisor, Commissioner, and Secretary. The Federation groups six WUAs where it is the

responsibility of the latter to repair, clean and maintain canals as well as to enforce user rules and penalize infractions.

The six WUAs are grouped under a Union President who monitors the activities of the WUA. The Union, however, has few resources and no office. It would normally receive funding from the WUAs that it uses to fund canal maintenance; however, the system of financing is not functioning properly.

The WUAs themselves are informal. They include Committees that are in charge of managing the use of distribution outlets along the system. In theory, the user for each distribution outlet should pay to be part of the WUA, and the WUA funds in turn would support the Union. In reality, WUAs have significant difficulty enforcing both membership fees and fines for illegal water outlets.

- Bas Mangoky Irrigated Area

The Federation is comprised of 23 WUAs each with 100 to 600 members. WUAs are in charge of cleaning canals in the secondary and tertiary canals. The association collects maintenance fees from users, though members feel that current fees are not high enough to meet maintenance needs.

The WUAs in Bas Mangoky are relatively well-functioning compared the Taheza and Manombo Ranozaza project sites. The WUAs in this area have also received support from AfDB's *Projet de Réhabilitation du Bas Mangoky* (PRBM). The Federation and Associations are currently receiving training.

### Project Partners

- Fofifa is a national research center for rural development housed within the Ministry of Agriculture. It is the largest component to the National Agricultural Research System. It conducts all types of rural development research, creates new rice varieties, and implements new production techniques. FOFIFA will be a partner for GEF funded activities related to producing improved seed varieties.

FOFIFA has developed approximately 17 rice varieties that are adapted to climate change in the region of Atsimo Andrefana, and some of these varieties are also resilient to low irrigation conditions. They also have an agriculture facility in the Bas Mangoky area in Tanandava, though there are no personnel from FOFIFA on the ground in Tanandava. For the Atsimo Andrefana region, the only personnel are one Director and one or two additional staff.

The PRBM project currently has an agreement with FOFIFA to conduct tests and produce new short cycle seeds (70 days). FOFIFA is scheduled to produce 100 kg of basic seed for 5 varieties during the current farming season. The seeds will be resold to farmers/producers who will produce the seeds. The base seeds are sold at 3,000 – 4,000 As/kg. This agreement will be renewed and extended with FOFIFA under PRIASO. The project plans to recruit two technicians per project site to ensure basic seeds are produced and tested. Finally, PRIASO also proposes building a cold room in Tulear so that FOFIFA can store improved seed varieties closer to the project zones.

B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund/NPIF) or adaptation benefits (LDCF/SCCF):

The PRIASO and GEF/LDCF project will be benefiting approximately 105,000 direct beneficiaries, of which half will be women. Beneficiaries by site include:

- Bas Mangoky – target of 55,000 beneficiaries;
- Manombo Ranozaza – target of 30,000 beneficiaries; and
- Taheza – target of 20,000 beneficiaries.

The following specific benefits will be generated, among others:

- Creating a total additional 55,000 tons of rice;
- Increasing the average agricultural revenue; and
- Indirectly improving food security throughout the South-West region.

GEF financing is designed to support building resilient livelihoods for rural communities in the Southwest region of Madagascar. The following sections present the benefits of GEF-funded activities at the regional and site scales.

## **Regional Benefits**

### Socio-Economic Benefits

The main components of the project focus on improving food security and agricultural development in the Southwest. If food production in the three project sites increases, it is possible that these gains will improve food security at the regional level as well. Additionally, project activities related to agricultural markets, such as building storage facilities and renovating rural market places, will facilitate markets that transport the production gains from the project sites to other areas. Finally, market activity in the general sense could also have effects at the regional level by invigorating the local agricultural economy. GEF-LDCF funding will make these elements resilient to climate change adding an important component of sustainability and reduced environmental vulnerability to the baseline development project.

In addition, efforts to research and demonstrate new improved seed varieties that are specifically adapted to the Southwest agro-climatic zones could increase yields in other parts of the region if seeds are sold and used beyond the individual project sites. Using improved seeds is an important characteristic of making farming resilient to climate change.

Finally, the project also entails a number of activities beyond farming. Creation of health centers as well as information campaigns on water-borne illnesses could have positive impacts at the regional level by reducing infection rates and improving local knowledge about disease transmission.

### Governance

The GEF-LDCF project has two links to governance. Firstly, the GEF funded activities include significant support to local communities for updating and climate proofing Local Development Plans. Engaging communities in this process could have wider benefits at the regional level by creating examples of positive community-level governance and organization. Secondly, the PRIASO and GEF-LDCF project include stipulations for managing project procurement procedures, a project element that is especially important given the potentially large number of contractors and consultants needed to perform infrastructure works. GEF-Funding will contribute to M&E activities that act as a complement to demonstrating and enforcing transparent project management. In this way, the project could inspire transparent practices for other procurement activities in the region.

### Regional Knowledge Base

There are a number of project components that could contribute to a regional knowledge base that extends beyond the individual project sites. Trainings and information campaigns on WUA organization, infrastructure maintenance, water management, income-generating activities, and adapted growing practices could be disseminated and used beyond the project sites. GEF-LDCF funding ensures that climate change and adaptation measures are part of the content of these trainings.

Additionally, working closely with government offices to implement the project will produce a knowledge base inside government offices and ministries that could be applied by those staff members to future projects in their areas.

Finally, collecting baseline level data and observing how improvements on irrigation structures affect yields, revenue, and food security for farmers will create an information base with potential conclusions that could be pertinent to other areas in the region. Data and analyses generated from the project M&E activities could be used to inform similar projects in other communities. GEF funds specifically will be used to augment project communication and encourage sharing of lessons learned.

### Environmental

Watershed protection envisioned by the GEF-LDCF project could have positive impacts in other areas of the watershed that extend outside of the specific irrigated areas. Reduced soil erosion and increased infiltration of ground water are both positive environmental outcomes with positive effects that could benefit the larger region.

## Gender

Several of the GEF funded project components have specific elements designed to empower female farmers both in their individual activities and in community-wide activities. Increasing women's independence through income-generating activities and raising women's social status by incorporating them into community water management structures will ideally engender transformative social change by shifting the current community practices that leave women disproportionately vulnerable. This type of change could be influential at the regional scale by influencing practices in surrounding areas.

Together the AfDB PRIASO and GEF-LDCF projects propose identifying and monitoring gender disaggregated indicators to track project results in gender equality. These include:

- The percentage of women in each of the beneficiary associations;
- Participation of women in the WUA committees and in the management of infrastructures like bore holes, markets etc.;
- The number of land titles delivered to women (PRIASO project activity);
- A reduction in the amount of time women spend on chores related to providing potable water; and
- Disaggregated socio-economic indicators of project impacts (food security and poverty).

## Site-Specific Benefits

The site specific benefits for project correspond to the project outputs that are detailed above.

B.3.Explain how cost-effectiveness is reflected in the project design:

### Project Cost Benefit Analysis

The following statistics were calculated during the cost analyses conducted as part of the infrastructure construction works design studies:

- Return on Investment (RoI): 20.3%
- Net Present Value: 100.2 thousand Ariary
- Opportunity cost of capital: 12%
- Sensibility analysis on RoI: The project is more sensitive to a reduction in production and an increase in investment costs. A 10 % decrease in production results in an RoI of 16.8%, while an increase in 10 % of investment costs yields a RoI of 17.2%. A decrease of 10% in production alongside an increase in investment costs of 10% yields a Return on Investment of 13.8% which is still above the capital opportunity cost.

### Effectiveness of chosen project activities

PRAISO and GEF-LDCF project activities were informed by past experiences from AfDB in working with agricultural infrastructure and rural development. PRIASO incorporates the following lessons learned from past projects into its design.

It is necessary to put in place an appropriate institutional framework to manage and maintain irrigated areas. PRIASO will support using contracts to solidify management and maintenance responsibilities between the DRDR, municipalities, Federations, and WUAs.

WUAs must be strong to guarantee maintenance of infrastructures. PRIASO and GEF funded project will prepare water management manuals and provide support to WUAs.

Ongoing financing for maintenance of infrastructures is important. PRIASO will conduct a study on making FERHA more operational, particularly at the regional scale. It will also assist WUAs in how to collect fees from users.

Agricultural infrastructure design should take climate change into consideration. Technical studies for designing

this project included climate change predictions. GEF financing will be used for these improvements.

Watershed protection infrastructure degrades quickly. PRIASO and GEF-LDCF projects will engage in important watershed protection and anti-erosion activities.

Technical studies are necessary to inform infrastructure decisions. Detailed pre-project studies were carried out to identify specific construction works that will be supported by PRIASO and GEF-LDCF project.

Reducing procurement delays has been the largest challenge for AfDB in execution projects in Madagascar. PRIASO will recruit a procurement specialist to work with the DRDR.

Weak M&E system prevent adaptive management. A defined baseline, an M&E manual, and external evaluations inform management choices and project progress towards meeting its impact.

Finally, alternative activities to improve socio-economic conditions and rice production in the region were considered in the design of this project. The proposed activities were chosen over the alternatives based on weaknesses in each of the alternative approaches. They include:

- Using motorized pumps to irrigate the area – pumps are expensive and have high maintenance costs compared to the solutions chosen.
- Reinforce rain-fed rice production –expected changes in climate, including unpredictable and erratic rain patterns, do not indicate that rain-fed production will be a reliable way of growing rice. Irrigation also has the important benefit of making two growing seasons possible per year.
- Creation of a state-administered management structure led by a government institution – such a top-down approach will hamper local ownership by farmers and limit their commitment to performing the maintenance required on infrastructures.

#### Procurement Arrangements

The DRDR in Tulear will be in charge of procurement procedures for goods, work, and services of consultants. Current resources at the DRDR are considered insufficient to fulfil procurement tasks, however, and the PRIASO plans to recruit a specialist in procurement for this purpose. A project plan for procurement procedures prepared by the DRDR will be submitted to AfDB for review and approval.

#### Sustainability

PRIASO and the GEF-LDCF project integrate sustainability of project results into a number of activities. As a first step to conducting activities with the local governments and WUAs, the project will conduct climate sensitization activities to improve local understanding amongst farmers and administrative officials on the potential effects of climate change and different types of adaptive measures. The project's interaction with WUAs and their Federations, as well as local governments has been designed precisely to ensure that there is community ownership of irrigation structures *and* understanding of how best to manage these structures in the face of climate change.

Capacity building and support to WUAs will directly enhance the likelihood that irrigation infrastructures are maintained and their benefits sustainable. Following the project, WUAs and Federations will have an understanding of how watershed management relates to sedimentation and ground water levels, how increased incidence of flood is likely to necessitate stronger irrigation systems, and how changes in water timing throughout the agricultural calendar will necessitate a different type of foresight in arranging distribution of water amongst users. These activities are simultaneously related to improving local knowledge about climate change, integrating that knowledge into resource management systems, and enabling the ongoing application of those systems beyond the project end. In addition, climate change topics will be delivered alongside issues of inclusiveness, particularly relating to gender.

Additionally, PRIASO will study and make recommendations on a financing mechanism for FERHA that can be used to pay for maintenance in times of large need. Finally, PRIASO and the GEF-LDCF project include strengthening infrastructure works so they will withstand higher flood levels and be less likely to need costly repairs in the future.

In the case of other project activities, PRIASO and GEF-LDCF project will work with communities, municipal

councils, and farmer cooperatives to establish ownership and management of works including bore holes, storage facilities, and rural markets.

### **C. DESCRIBE THE BUDGETED M &E PLAN:**

#### **M&E Overview**

The project will be monitored through the following M& E activities. The M&E budget is provided in the table below. The M&E framework set out in the Project Results Framework in Annex A of this Request for CEO Endorsement is aligned with the AMAT tool.

**Project start:** A Project Inception Workshop will be held within the first two months of project start with those with assigned roles in the project organization structure, AfDB country office and, where appropriate/feasible, regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership of the project results and to planning the first year's Annual Work Plan.

The Inception **Workshop** should address a number of key issues including:

- Assist all partners to fully understand and take ownership of the project: detail the roles, support services and complementary responsibilities of the AfDB Country Office vis-à-vis the project team; discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms; discuss the Terms of Reference for project staff again as needed.
- Based on the Project Results Framework and the LDCF related AMAT set out in the Project Results Framework in Annex A of this request for CEO Endorsement: finalize the first Annual Work Plan; review and agree on the indicators, targets and their means of verification; and recheck assumptions and risks.
- Provide a detailed overview of reporting, M&E requirements: agree on and schedule the M&E Work Plan and budget.
- Discuss financial reporting procedures, obligations, and arrangements for annual audits.
- Plan and schedule Project Steering Committee (PSC) meetings: clarify the roles and responsibilities of all individuals in the project organisation structure and plan meetings; preferably hold the first PSC meeting within the first 12 months following the Inception Workshop.

An Inception **Workshop Report** is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided upon during the meeting.

**Baseline:** a baseline study will be conducted during the first year of project implementation to refine the M&E Framework, develop a strong Performance Measurement Framework, collect baseline data regarding selected indicators, and define roles and responsibilities in conducting monitoring activities throughout the lifespan of the project. This study will also lead to the development of a specific M&E Manual.

**Quarterly:** Based on the initial risk analysis submitted in this Request for CEO Endorsement, the risk log shall be regularly updated. Risks become critical when the impact and probability are high.

**Annually:** The Annual Project Review (APR) is a key report and will be prepared to monitor progress made since project start and, in particular, for the previous reporting period.

The APR will include, but will not be limited to, reporting on the following:

- Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative);
- Project outputs delivered per project outcome (annual);
- Lessons learned/best practices;
- Annual Work Plan and other expenditure reports; and
- Risk and adaptive management.

**Periodic Monitoring** through site visits: The AfDB Country Office will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the PSC may also join these visits. A Field Visit Report will be prepared by the AfDB country office and will be circulated to the project team and PSC members no less than one month after the visit.

**Mid-term of project cycle:** The project will undergo an independent Mid-Term Evaluation at the mid-point of project implementation (expected to be in June 2016). The Mid-Term Evaluation will determine progress being made toward the achievement of outcomes and will identify course corrections if needed. It will focus on the effectiveness, efficiency, and timeliness of project implementation; highlight issues requiring decisions and actions; and present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the Mid-Term Evaluation will be decided after consultation between the parties of the project document. The Terms of Reference for this Mid-term evaluation will be prepared by the AfDB Country Office. The LD/FC/SCCF AMAT will also be completed during the mid-term evaluation cycle.

**End of Project:** An independent Terminal Evaluation will take place three months prior to the final closure of the project. The terminal evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the Mid-Term Evaluation, if any such correction took place). The Terminal Evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the AfDB Country Office.

The Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response.

**Learning and knowledge sharing:** Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

When relevant, the project will identify and participate in scientific, policy-based roundtables as well as any other networks that may benefit project implementation through lessons learned. Likewise, the project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

There will be a two-way flow of information between this project and other projects of a similar focus.

**Audit:** The project will be audited in accordance with AfDB Financial Regulations and Rules and applicable audit policies.

### Project Monitoring and Evaluation Plan

Type of M&E activity	Responsible Parties	Budget USD <i>Excluding project team staff time</i>	Time frame
Inception Workshop and Report	<ul style="list-style-type: none"> <li>Project Director - DRDR</li> <li>AfDB country office</li> </ul>	Indicative cost: 10,000	Within first two months of project start up
Baseline studies	<ul style="list-style-type: none"> <li>Project Director - DRDR</li> <li>AfDB country office</li> <li>Consultants</li> </ul>	Indicative cost: 30,000	Within first year of project implementation
Measurement of Means of Verification of project results.	<ul style="list-style-type: none"> <li>AfDB country office and Project Director will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members.</li> <li>Project Management Team, esp. M&amp;E expert</li> </ul>	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on <i>output and implementation</i>	<ul style="list-style-type: none"> <li>Oversight by Project Director</li> <li>Project Management Team, esp. M&amp;E expert</li> <li>Implementation teams</li> </ul>	To be determined as part of the Annual Work Plan's preparation.  Indicative cost is 25,000	Annually prior to ARR/PIR and to the definition of annual work plans
ARR	<ul style="list-style-type: none"> <li>Project Director</li> <li>AfDB Country office</li> </ul>	None	Annually
Periodic status/ progress reports	<ul style="list-style-type: none"> <li>Project manager and team</li> </ul>	None	Quarterly
Mid-term Review	<ul style="list-style-type: none"> <li>Project Director</li> </ul>	Indicative cost: 30,000	At the mid-point of

<b>Type of M&amp;E activity</b>	<b>Responsible Parties</b>	<b>Budget USD</b> <i>Excluding project team staff time</i>	<b>Time frame</b>
	<ul style="list-style-type: none"> <li>AfDB Country office External</li> <li>Consultants (i.e. evaluation team)</li> </ul>		project implementation.
Terminal Evaluation	<ul style="list-style-type: none"> <li>Project Director</li> <li>AfDB Country office External</li> <li>Consultants (i.e. evaluation team)</li> </ul>	Indicative cost : 45,000	At least three months before the end of project implementation
Visits to field sites	<ul style="list-style-type: none"> <li>AfDB representatives</li> <li>Government representatives</li> </ul>	For GEF supported projects, paid from IA fees and operational budget	Yearly for ADB country office
<b>TOTAL indicative COST</b> Excluding project team staff time and AfDB staff and travel expenses		USD 140,000 (+/- 2.2% of total LDCF budget)	




**PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)**

- A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT(S) ON BEHALF OF THE GOVERNMENT(S):** (Please attach the [Operational Focal Point endorsement letter\(s\)](#) with this form. For SGP, use this [OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE(MM/dd/yyyy)

**B. GEF AGENCY(IES) CERTIFICATION**

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for CEO endorsement/approval of project.

Agency Coordinator, Agency Name	Signature	Date (Month, day, year)	Project Contact Person	Telephone	Email Address
TOURINO SOTO, Ignacio		02/13/2014	MENG LIHINAG, JEAN-MARIE	216-71103968	J.MENGLIHINAG@afdb.org

**ANNEX A: PROJECT RESULTS FRAMEWORK** (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).

<b>Applicable GEF Strategic Objective and Program:</b> CCA-1: Reduce vulnerability to the adverse impacts of climate change, including variability, at local, national, regional and global level CCA-2: Increase adaptive capacity to respond to the impacts of climate change, including variability, at local, national, regional and global level CCA-3: Promote transfer and adoption of adaptation technology					
<b>Applicable GEF Expected Outcomes:</b> Outcome 1.2: Reduced vulnerability to climate change in development sectors Outcome 1.3: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas Outcome 2.3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at local level Outcome 3.1: Successful demonstration, deployment, and transfer of relevant adaptation technology in targeted areas					
<b>Applicable GEF Outcome Indicators: (following AMAT tool)</b> Indicator 1.2.5. Increase in agricultural productivity in the targeted areas (tons/ha) Indicator 1.2.10. % change in income generation in targeted area given existing and projected climate change (% change in income (US \$)) Indicator 1.2.1.1. Health measures introduced to respond to climate sensitive disease Indicator 1.2.1.3. Climate resilient agricultural practices introduced to promote food security Indicator 1.2.1.5. Sustainable water management practices introduced to increase access to irrigation water under existing and projected climate change Indicator 3.1.1.1. Type of adaptation technologies transferred to targeted groups.					
	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
<b>Project Objective<sup>8</sup></b> <i>To secure and improve rural farmers' livelihoods through water management and health interventions in Southwest Madagascar (equivalent to output in ATLAS)</i>	Food insecurity rate in rural areas (AMAT indicator 2.2.1.)	35 % (2010)	25% (2024)	Survey Interviews APRs/PIR Policy reviews as part of APRs/PIR	Climate change risks, such as exceptionally strong cyclones, high flood water levels, and droughts, will reduce the capacity of infrastructure
	Food insecurity rate within women and children in rural areas	40 % (2010)	25% (2024)	Survey Interviews APRs/PIR Policy reviews as part of APRs/PIR	Political will at the regional, departmental and communal levels does not remain constant throughout the project  Unavailability of requisite human resources and data  Insufficient institutional support and political commitment
<b>Outcome 1<sup>9</sup>:</b> Agricultural water infrastructures as well as water-related and health community	Increase in agricultural productivity in targeted areas (AMAT indicator 1.2.5)	Rice productivity in Bas Mangoky: 4 tons/ha Rice productivity in Taheza and Ranozaza: 2 tons/ha	Rice productivity in Bas Mangoky: 5 tons/ha Rice productivity in Taheza and Ranozaza: 4 tons/ha	Annual regional agriculture statistics	Political will at the municipal and departmental levels is lacking  Coordination between government departments is weak

<sup>8</sup>Objective (Atlas output) monitored quarterly ERBM and annually in APR/PIR

<sup>9</sup>All outcomes monitored annually in the APR/PIR. It is highly recommended not to have more than 4 outcomes.

infrastructures in the irrigated areas of Taheza, Monombo Ranozaz and Bas Mangoky are resilient to climate change <b>(equivalent to activity in ATLAS)</b>	Sustainable water management practices introduced to increase access to irrigation water under existing and projected climate change (AMAT indicator 1.2.1.5)	Bas-Mangoky : Access satisfactory but threatened by expected climate change impacts Taheza: very low access to irrigation water due to the problems at the dam among others Ranozaza: unsatisfactory access to irrigation water"	Bas-Mangoky : irrigation infrastructures resilient to climate change impacts and Mangoky floods Taheza: satisfactory access to irrigation water - dam rehabilitated Ranozaza: satisfactory access to irrigation water"	Survey Interviews APRs/PIR	Capacities of locally elected officials are low  Threats from locust infestations  Unstable land titles for farmers  Weak functionality of the National Irrigation System Maintenance Fund
<b>Outcome 2:</b> Community activities resilient to climate change are implemented in the Rural Communes of Bezaha and Andranomangatsiaka (Taheza), Ankililoaka (Manombo Ranozaza), and Ambahikily (Bas Mangoky), and targeted community and municipal authorities have strengthened capacity to promote a local resilient development <b>(equivalent to activity in ATLAS)</b>	Number of targeted households which have increased their income through supported IGA (AMAT indicator 1.2.10)	Income generation is generally very low, especially within targeted communities which are considered as the most vulnerable to climate change impacts  Average income per household: MGA 1,500,000	Average income per household: MGA 2,500,000	Local assessments at the community level (Questionnaire based appraisal - CBA) APRs/PIR	Farmers do not see the benefit of new practices or social (including gender related ones) conflicts hinder taking up the practices  National service capacities are inadequate to accompany farmers' actions (meteorological services, advices/vulgarization, etc.)
	Number of Local Development Plans including specific actions and budget for climate change adaptation (AMAT indicator 1.1.1.1)	Type and level: 0 At project inception, none of the 4 local development plans take into account climate change aspects	Type and level: 4 Local Development Plans of the 4 targeted municipalities are updated to include climate risks and climate change issues, and to support the implementation of adaptation actions	Review of strategic documents and Local Development Plans APRs/PIR Policy reviews as part of APRs/PIR	Capacities of agencies are not strengthened enough.  Weak functionality of the Water Users Associations
	% of targeted rural population that have adopted adaptation technologies by technology type (AMAT indicator 3.1.1.)	0%( aside already exiting local coping mechanism)	50% of targeted rural population, including at least 50% of women, have adopted and implemented resilient irrigation and rice production techniques	Local assessments at the community level (Questionnaire based appraisal - CBA) APRs/PIR	
<b>Outcome 3:</b> Knowledge and best practices are monitored, evaluated and disseminated	Type and No. of monitoring systems in place (AMAT indicator 2.1.2.1)	None – monitoring system to be developed as part of the project inception	1 complete M&E system in place, including a Performance Measurement Framework and data collection protocols	M&E system	
	Number of contribution to ALM	0	At least 1 contribution per year	ALM	

<b>Component 1: Hydrological, agricultural and social community infrastructures are resilient</b> <b>Outcome 1: Hydrological, agricultural and social community infrastructures in the irrigated areas of Taheza, Monombo Ranozaza and Bas-Mongoky are resilient to climate change</b>	
Outputs	Activities
1.1. Twenty-five km of the protective dike in the Bas Mangoky irrigated area are raised and lengthened to be resilient to floods.	1.1.1. Protection of riverbanks upstream from the village of Ankilimarahatratra – installation of 4 spurs between PM 5785 and PM 6282. 1.1.2. Protection of riverbanks at Ankilimarahatratra – installation of 6 spurs between PM 7037 and PM 8762. 1.1.3. Raising and expanding the banks of the protective dike between PM 19129 and PM 29910. 1.1.4. Treatment of the Betakoana breach between PM 27908 and PM 29508 – extension of the 4 spurs constructed as an emergency to protect the dike as well as construction of a new 260m long spur upstream from the D1 spur. 1.1.5. Strengthening and planting grass seeds on the banks of existing structures: (i) strengthening the head of the spur at Tanandava; (ii) resurfacing the banks and planting grass along the N3 spur; (iii) resurfacing the banks and planting grass along the N4 spur.
1.2. Irrigation works in the Taheza irrigated area are renovated and resilient to climate change.	1.2.1. Reconstruction of the dam at Ambarinako. 1.2.2. Levelling of the 25 km of principle canal. 1.2.3. Renovation of specific canal works: sedimentation bassin, inverted siphons, water flow controls, distribution mechanisms in the secondary canals, zebu crossings, and enabling water supply to the JIRAMA hydroelectricity plant. 1.2.4. Resurfacing of the 25 km of principle canal. 1.2.5. Blueprint study on protecting the Taheza watershed and creation of a water and soil conservation management plan. 1.2.6. Baseline technical study for infrastructure work to protect the Taheza watershed. 1.2.7. Restoration of degraded zones in the Taheza River watershed : (i) reforestation of the watershed with vetiver, acacia, jatropa, and eucalyptus; (ii) planting of sisal in specific places along the water bed to reduce erosion and sediment transport, signing an agreement with the Regional Environment Directorate (DREF).
1.3. Irrigation works in the Manombo Ranozaza irrigated perimeter are renovated and resilient to climate change.	1.3.1. Restoring the Antsakoandahy spillway dam/dike: fill breaches at the intake point, conduct specific restoration works on the spillway dike. 1.3.2. Leveling and surfacing of 5.6 out of 6.6 km of the right canal bank to limit water loss and prevent the creation of illegal water outlets. 1.3.3. Leveling and surfacing of 5.4 out of 17.7 km of the left canal bank. 1.3.4. Leveling and surfacing of 4.6 of 16.1 km along the Saondraza Canal.

	1.3.5. Leveling and surfacing of 3.6 of 6.2 km on the Upstream Vezo canal.
1.4. The irrigated areas of Taheza, Manombo Ranozaza and Bas Mangoky are equipped with community infrastructures that are resilient to climate change.	<p>1.4.1. Construction and installation of management groups for 3 storage facilities with a 100 ton capacity in the Taheza irrigated area as well as 3 facilities in the Monombo Ranozaza irrigated area.</p> <p>1.4.2. Construction of 6 bore holes equipped with a manual pump to supply a drinking trough for livestock and a washhouse in the Bezaha and Andanomanagatsiaka communes, 4 bore holes with manual pumps supplying a drinking trough and a washhouse for the Ankililoaka commune and 3 washhouses in the Bas-Mangoky area to reduce illnesses linked to drinking non-potable water. Signing of an agreement with the Regional Water Direction (Direction Régionale de l'Eau).</p> <p>1.4.3. Construction of a health center in the Ankililoaka commune (Monombo Ranozaza), another in the Ambahikily commune (Bas-Mangoky), and one in the Bezaha and Andranomangatsiaka communes (Taheza).</p> <p>1.4.4. Furnishing of equipment and medicines for the constructed health centers, especially for treating water-borne illnesses.</p> <p>1.4.5. Awareness building campaigns in communities in the 3 areas on hygiene and water-borne illnesses.</p>
<b>Component 2: Resilient livelihoods</b> <b>Outcome 2: Outcome 2: Community activities that are resilient to climate change are implemented in the Rural Municipalities of Bezaha and Andranomangatsiaka (Taheza), Ankililoaka (Manombo Ranozaza), and Ambahikily (Bas Mangoky) and Targeted community and municipal authorities have strengthened capacity to promote a local development that is resilient.</b>	
Outputs	Activities
2.1. Local Development Plans for the four communes are reviewed and updated to integrate effective management of climate risks and provide financing for resilience-building activities.	<p>2.1.1. Update Local Development Plans integrating climate change adaptation for the Ankililoaka, Ambahikily, Bezaha and Andranomangatsiaka Communes.</p> <p>2.1.2. Support implementation of the 4 Local Development Plans, especially activities/infrastructures that effectively strengthen resilience of local residents.</p>
2.2. Women's Groups are strengthened, structured, and supported to implement promising income-generating activities that are resilient.	<p>2.2.1. Analyze the income-generating activities proposed by women for resilience, economic viability, and potential to open markets: (i) gardening, (ii) food crops, (iii) artisan crafts (weaving, basketwork) (iv) small-scale trade (especially rice); and (v) small livestock.</p> <p>2.2.2. Support 40 women's groups to implement income-generating activities identified as resilient.</p> <p>2.2.3. Strengthening and structuring of existing women's groups especially in management skills (basic accounting, etc.).</p>
2.3. Municipality Council members, extension workers for the DRDR, DREF and the DREau, and farmers have the capacity to plan and adapt to	2.3.1. Train 50 workers from the Extension Service (DRDR, DREF, DRE) and 30 members from Municipality Councils in Ankililoaka, Ambahikily, Bezaha, and Andranomangatsiaka on integrating climate change risks into the management and planning of socio-economic activities.

climate change impacts.	<p>2.3.2. Train 50 farmers in each commune (200 total) on climate change risks and adaptation options as well as on integrating resilient practices into their farming techniques. Total target of impacting 1,000 farmers indirectly.</p> <p>2.3.3. Train 200 farmers in agro-forestry and fighting erosion.</p> <p>2.3.4. Conduct awareness building activities with local communities and local authorities on ways to incorporate gender equality into their activities.</p>
2.4. Technical assistance in water management and improvement of the irrigated areas.	<p>2.4.1. Support to restructure the WUAs and Federations in the Taheza, and Manombo Ranozaza areas to improve their functionality.</p> <p>2.4.2. Training on water management and management and maintenance of irrigation structures for 200 members of the WUAs in Taheza, and Manombo Ranozaza.</p> <p>2.4.3. Awareness building campaign with 300 members of the WUAs on climate change in the Taheza, Manombo Ranozaza, and Bas-Mangoky areas.</p>
2.5. A supply chain for producing, storing, and distributing resilient seeds for rice, maize, and lima beans is put in place.	<p>2.5.1. Annual production by FOFIFA of pre-basic and basic seeds for improved varieties of rice (3 tons), maize (1 ton), and lima beans (1 ton).</p> <p>2.5.2. Implementation of a seed production contract between FOFIFA and farmers in the irrigated areas of Taheza, Manombo Ranozaza, and Bas-Mangoky, and training and counseling for farmers so they can train others.</p> <p>2.5.3. Storage and enrichment of phyto-genetic resources for rice, maize and lima bean – various improvements.</p> <p>2.5.4. Testing of new short-cycle rice varieties.</p> <p>2.4.4. Train 20 seed producers in each area, of which 25 % will be women, on producing commercial improved seeds.</p>
<b>Component 3: Knowledge-Sharing and M&amp;E Systems</b>	
<b>Outcome 3: Knowledge and best practices are monitored, evaluated and disseminated.</b>	
<b>Outputs</b>	<b>Activities</b>
3.1. Monitoring and evaluation system	<p>3.1.1. Conduct annual monitoring and evaluation surveys.</p> <p>3.1.2. Ensure environmental monitoring – visits every half year by the Ministry of Agriculture Environment Service.</p> <p>3.1.3. Ensure a mid-term evaluation.</p> <p>3.1.4. Ensure a final evaluation.</p>
3.2. Best practices for adaptation (including gender-specific measures) are identified and diffused. Intercommunity learning on adaptation measures is put in place in the Atsimo Andrefana region	<p>3.2.1. Develop a Communications Plan for the project.</p> <p>3.2.2. Organize exchanges between project sites and amongst farmers to spread best practices and lessons learned.</p>

and in the country to support replication of results in other vulnerable communities.	3.2.3. Distribute lessons learned and best practices at the national and international scale.
---	---

**ANNEX B: RESPONSES TO PROJECT REVIEWS** (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

	Comments at PIF	Actions Taken	Sections in the Document
<b>GEF Secretariat Review</b>			
<b>Project Design:</b> 6. Is (are) the baseline project(s), including problem (s) that the baseline project(s) seek/s to address, sufficiently described and based on sound data and assumptions?	By CEO Endorsement, it is expected that additional details on the baseline project will be available	During the PPG phase the baseline project has been further described. Its linkages with this LDCF initiative have been clearly defined in the baseline and additional cost reasoning sections of this Request for CEO Endorsement	Sections A4 from p5 and A5 from p.14
11. Does the project take into account potential major risks, including the consequences of climate change and provides sufficient risk mitigation measures?	By CEO Endorsement it is expected that full details on the status of this risk (risk related to FERHA) will be updated.	The status of this risk has been updated as part of the section on risk in this Request for CEO Endorsement document. Among the mitigation measures, a specific study related to the Regional FERHA for the Southwest Region of Madagascar, its set-up and operations, and the financial mechanisms available to leverage financial resources for its operations will be conducted as part of the PRIASO project.	Section A6 p.21
12. Is the project consistent and properly coordinated with other related initiatives in the Country or in the Region	By CEO Endorsement, it would be important to demonstrate a project that is fully coordinated with other related initiatives, exploring synergies when possible	Coordination and collaboration with other relevant initiatives have been explored and detailed in this request for CEO Endorsement. This project is closely aligned with the PRIASO and all GEF funded activities will be implemented in close coordination with PRIASO activities. The project management team at the DRDR will ensure the coordination. Synergies and coordination with the first LDCF implemented by UNEP and executed by the Ministry of Environment have also been explored and will be ensured through a collaboration mechanism and regular exchanges between the staff of Ministry of Agriculture and the staff of the Ministry of Environment.	Sections A4 from p5 and A5 from p.14  Section A7 p.23
<b>US Council Member Review</b>			
Expand on how components 1 and 2 of the project will be informed by information about climate variability and change. From where will the information come to make decisions in		A study on climate change aspects has been conducted as part of the design of this project. It included a synthesis of climate projections at the regional level conducted as part of	Sections A4 from p6  And results of



<p>the context of climate variability and change?</p>	<p>the Second National Communication, and the main forecasted climate change impacts on targeted economic sectors of the Southwest Region (Agriculture, Livestock Raising and fisheries). A vulnerability assessment of each of the 3 targeted irrigated areas to projected climate change impacts was conducted as part of the design of this project. The results of this assessment are presented as part of the description of the three project sites p.12-14.</p> <p>Furthermore, a climate change baseline and trend study conducted as part of the Programme on Climate Change Adaptation and Mitigation in the COMESA-EAC-SADC region was released in November 2013. It showed the climate change trends and presented the projected impacts on key economic sectors.</p> <p>Activities and outputs planned under components 1 and 2 of the project were designed based on the results of these two studies, in addition to information from the Second National Communication. Irrigation infrastructures and socio-economic infrastructures planned under component 1 were designed to face stronger floods and droughts, and also stronger cyclones.</p> <p>Projected climate change impacts will be dully taken into account while programming infrastructure renovation works. The project team at the DRDR and the Ministry of Agriculture will link with technical staff at the National Directorate of Meteorology to obtain up to date weather data and climate projections while programming infrastructure renovation works and while organising procurement processes. They will also use data and analysis conducted by the National Directorate for Meteorology, and the results of the Second National Communication and of the climate change baseline and trend study conducted as part of the Programme on Climate Change Adaptation and Mitigation in the COMESA-EAC-SADC region.</p> <p>To conclude, the project team at DRDR will be complemented by a national environment and climate</p>	<p>vulnerability assessments for the three project sites p.10-12</p> <p>Section A5. p.16</p> <p>Section B1. - National Environment and Climate Change expert position</p>
---	---	---

	change expert who will make sure that climate data and trends are fully considered while planning and conducting project activities, including throughout the procurement process.	
Clarify how the health element of component 2 meets the additionality reasoning. Climate change may affect the geographic distribution of vector borne diseases, like malaria. However, the science on these impacts is still uncertain. How has AfDB determined that climate change will require the construction of four primary health centers?	Strengthening access to health centers, alongside the construction of other community infrastructures including boreholes, washhouses, and post-harvest storage facilities, is included in the GEF-LDCF funding under the rationale that resilient livelihoods draw stability from strong human capital that includes physical health. Increasing access to safe drinking water for households, and reducing and treating water-borne illnesses will allow rural households to better capitalize on improvements made to farming infrastructures. Without this component gains in resilience drawn from improved farming practices could be lost to continued vulnerability to water-borne illness.	Section A5, outcome 1 Adaptation Alternative
Provide more information on the methods to be employed by the Ministry of Environment in overseeing the knowledge management process under project component 3, including the sharing of lessons learned.	Detailed activities and methods for a knowledge management process, including identification and sharing of best practices and lessons learned at national and international scales, have been specified in the Project Strategy for project Component 3 p.23-24.	Section A5, Output 3.2,
Expand on how the multi-stakeholder project steering committee mentioned in B.6 will function and its expected deliverables. We appreciate the establishment of such a project steering committee, and also note the challenges related to coordinating between various stakeholders as well as the importance of ensuring ownership of a variety of program activities.	<p>Details about the project steering committee, its functioning and expected deliverables are provided in section B1 p.25.</p> <p>The Committee's main role will be supervising project implementation, and discussing and making recommendations on any necessary reorientation of activities or reallocation of resources based on evaluations, so long as these modifications do not change the project fundamentals or alter the project schedule. It will, among other duties: (i) approve work plans and annual budgets; (ii) approve operational and financial activity reports as well as M&amp;E reports; (iii) consider questions that arise regarding project implementation, such as audit reports, roles and responsibilities of principle actors; and (iv) promote partnerships between all actors. It will be meeting twice a year. It will be chaired by the General Secretary of the Ministry of Agriculture with the project Director acting as Secretary. Meetings will be convened by the General Secretary of the Ministry of Agriculture.</p>	Section B1.

	Its composition is detailed in p.25.	
In addition, we expect that AfDB, in the development of its full proposal, will expand on how it will ensure the sustainability of climate change education.	Trainings on climate change have been integrated into multiple activities in the AfD PRIASO project, as detailed specifically on page 32 of the request for CEO Endorsement as well as in Outputs 2.2, 2.3 and 2.4 Sensitization and training on climate change to WUAs, Federations .and local officials will be a first step to creating water management plans tied to irrigation infrastructure and farming activities in general that explicitly take climate change into consideration. The goal of these project activities is precisely to create strong local knowledge on climate change and adaptation options so that this knowledge will be applied to maintenance of irrigation infrastructure as well as other livelihood activities in an ongoing fashion.	Section B3., sustainability, p.29  Section A5., outputs 2.2, 2.3 and 2.4
In addition, we expect that AfDB, in the development of its full proposal, will clarify how it will communicate results, lessons learned and best practices identified throughout the project to the various stakeholders both during and after the project.	Detailed activities and methods for the knowledge management process, including communicating results, lessons learned and best practices, have been specified in the Project Strategy for project Component 3 p.23-24. Furthermore, the Monitoring and Evaluation plan is provided in section C, including annual reporting and learning and knowledge sharing processes.	Section A5, Output 3.2., Section C p30.
In addition, we expect that AfDB, in the development of its full proposal, will provide more information on how beneficiaries, including women, have been involved in the development of the project proposal and will benefit from this project.	This proposal has been elaborated through a participatory process, and all parties at national, regional and local levels have been duly involved and informed. The Ministry of Agriculture and the Regional Directorate for Rural Development Southwest took the institutional lead on the project document preparation. First consultations were held in Antananarivo, in Tulear, in the three targeted irrigated areas and in selected municipalities in November and December 2013, involving national consultants, in order to meet key local stakeholders such as beneficiaries, communities, civil society, locally elected officials, extension services, regional decision makers, government officers and partners. The project strategy, logical framework, institutional arrangements and budget were presented to and validated by national and local stakeholders during a national workshop held in November 2014. The data collection mission conducted at local, regional and national levels led to the development of an	Section B1., stakeholder involvement in project design, p.23  Specific analysis of gender roles provided in section A4..  Section B2.

	<p>Aide Memoire summarizing contextual data collected and the draft proposed project strategy which was endorsed by the Government. To conclude, the draft project document was finalized and validated by AfDB and the Malagasy Government on February 2014.</p> <p>Women were consulted to understand how their daily lives, responsibilities, and tasks might differ from those of men. They were also consulted to understand how their positioning within the household and within communities affects their own livelihood activities, quality of life, and vulnerability to climate change. Conclusions about women's implication in irrigated farming in turn influenced several specific GEF-LDCF project components.</p> <p>Several of the GEF funded project components have specific elements designed to empower female farmers both in their individual activities and in community-wide activities. Increasing women's independence through income-generating activities and raising women's social status by incorporating them into community water management structures will ideally engender transformative social change by shifting the current community practices that leave women disproportionately vulnerable. This type of change could be influential at the regional scale by influencing practices in surrounding areas.</p> <p>To conclude, socio-economic benefits have been described in section B2. p.28-29, including Regional Benefits and site specific benefits</p>	
In addition, we expect that AfDB, in the development of its full proposal, will ensure coordination between ministries at the national level and Southwest regional rural units.	The Regional Directorates for Rural Development (DRDR) are in charge of implementing the Ministry of Agriculture's policy at the regional level taking into consideration local context. They report monthly to the central level and hold quarterly meetings involving the General Secretary of the Ministry of Agriculture, and the Directors of the DRDR are organized in Antananarivo at the central level. Furthermore, periodic and frequent field missions in the Southwest Region are conducted by technical staff from the General Technical Directorate and the Rural Engineering	Section B1. p.23

	Directorate of the Ministry of Agriculture.	
In addition, we expect that AfDB, in the development of its full proposal, will expand upon how it will engage other development partners, environmental NGOs and civil society organizations in the project. As it stands now in the PIF, no specific organizations have been identified in section B.5.	Section B1 (and to a certain extent Baseline section A4) provide details on how various organizations and institutions will be empowered in project implementation. The DRDR for the Southwest will have a central role in implementing PRIASO and the GEF-LDCF funded project as it is the lead. A MoU between the DRDR and the Regional Directorate of the Environment and Forests will be signed regarding the implementation of all environmental related activities, including reforestation and erosion control activities. AfDB will also work with 5 municipalities, working closely with municipal staff and supporting, among others, the update and implementation of their municipal development plan. In all 3 irrigated areas, Water User Associations and their federation will be associated to all project activities including capacity building. To conclude, the project will also sign a MoU with the national research center for rural development, FOFIFA, for all activities relating to producing and disseminating improved seed varieties.	Section A4. P6 Section B1. p.23

**ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS<sup>10</sup>**

A. DESCRIBE FINDINGS THAT MIGHT AFFECT THE PROJECT DESIGN OR ANY CONCERNS ON PROJECT IMPLEMENTATION, IF ANY:

B. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

PPG Grant Approved at PIF:			
<i><b>Project Preparation Activities Implemented</b></i>	<i><b>GEF/LDCF/SCCF/NPIF Amount (\$)</b></i>		
	<i><b>Budgeted Amount</b></i>	<i><b>Amount Spent Todate</b></i>	<i><b>Amount Committed</b></i>
<b>Total</b>	0	0	0

<sup>10</sup> If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

**ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)**

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/NPIF Trust Fund or to your Agency (and/or revolving fund that will be set up)

## **ANNEX E – DETAILED PROJECT SITES DESCRIPTIONS**

### **Taheza Irrigated Area**

#### Overview

The Taheza irrigated area lies in the Bezaha and Andranomangatsiaka communes in the north of Betioky South district. Rainfall in this area is very low with less than 413 mm average per year and an accentuated dry season. Such low rainfall does not facilitate agriculture; however, the presence of the Onilahy and Taheza Rivers create fertile agricultural land with a strong possibility for productive farming when irrigation is present. The specific project site lies along a narrow, 20 km band of land along the Taheza riverbed and watershed.

Inhabitants of the district include the following three main categories of people. Firstly, the Mahafaly and their subgroup Tanalagna are primarily farmers growing cassava, beans, onions, and peanuts, but are also active in livestock of sheep and cattle. They are seasonal nomads and practice transhumance to find arable lands.

Secondly, the Antanosy are based in the Onilahy valley but have moved south recently and specialize in rice growing. They have more flexible traditional customs that allow male heads of family free decision on how to divide inheritance between children of both sexes. Thirdly, minority groups consist of migrants from higher areas such as the Betsileo, Merina, Antandroy and Tanalana. Along with foreign migrants from India and Pakistan, they are engaged in third party activities such as transport and commerce.

#### Farming Production, Farming Livelihoods, and Needs Stated by Beneficiaries

As it is for the Southwest region, agriculture and livestock are important economic activities for the Taheza irrigated area as well as Betioky South district. Livestock practices tend to be traditional and semi-extensive, and cattle are often an asset that can be sold in cases of need. Fishing exists in the district for those inhabitants along rivers and lakes, and techniques tend to be basic.

In the Taheza irrigated area, rice is the largest crop followed by onion, cassava, and peanuts. Farmers in irrigated areas are able to harvest two rice crops per year in addition to harvesting a cassava crop alongside the rice. Other livelihood activities include growing vegetables for sale at market, engaging in entrepreneurial activities such as buying and selling produce, and doing artisanal activities.

Rice yields are 2.5 tons per ha according to a 2008 survey. Growing practices in the area are mostly traditional, though there is some use of improved seeds as well as SRA (Ameliorated Rice-production system) and SRI (Intensive Rice-production system) growing techniques. There is little or no use of urea, fertilizer, or pesticides, however, and slash and burn practices are common. Farmers report a need to alter their planting schedules due to shifting rain patterns in recent years.

Despite its potential, the Taheza irrigated area is in poor condition, and less than 20 percent of the irrigated area receives the kind of irrigation that permits two rice crops per year. As farming under rain-fed conditions is not viable, twenty-three percent of the land in the area has been completely abandoned due to insufficient irrigation.

Women in the area report working in rice and cassava fields as well as growing some maize, sweet potato, lima beans, and peanuts. Only a small number of women are owners of parcels; out of a total of 1,541 irrigated parcels in 2009 women were owners of 101. In focus groups, women voiced concerns that they are intimidated to approach local authorities because most of the women (95 percent) are illiterate.

Throughout the preparation research for the PRIASO project, beneficiaries in the Taheza irrigated area asked for training on farming techniques such as using SRA and SRI and various harvesting techniques. Women in particular identified literacy training as well as awareness-building to create a more balanced work load between men and women as positive potential actions in the area.

#### Conditions of Irrigation Infrastructure

The Taheza irrigated area was originally outfitted with irrigation facilities in 1958, and includes 2,442 ha. The system underwent a partial renovation in 1991, mostly along the primary canals (the secondary canals were not included despite also needing repairs at the time). In 1993, the system almost came to a halt, and, again in 2001, strong floodwaters caused a rupture 50 meters long and 5 meters deep along the system's dike bringing the system to a near complete halt for two years.



Most recently, the system again stopped functioning in November 2012 due to water damage to the dam at the head of the system. It is worth mentioning, however, that even prior to the point damages that have stopped the system, the network contained serious flaws and often only reliably delivered water to the first eight km on the network, leaving downstream areas without water. The following is a description of the major components to the system along with weaknesses and necessary repairs.

#### *Ambarinakoho Dam*

The Taheza irrigation area water supply comes from a dam at Ambarinakoho. The dam is 42.5 m long and is used by locals to cross the Taheza River. The dam supplies not only the Taheza irrigated area, which is derived from an intake point along the right bank of the river, but also supplies an irrigation network from an intake point on the river's left bank. The system additionally supplies water to the JIRAMA hydroelectricity facility in Bezaha.

The design and structure of the dam at Ambarinakoho contain certain flaws given the dam's location and the frequent environmental strain it experiences. The biggest fault is the mechanism at the head of the system that handles water overflow during floods. The Taheza River at the dam location has a particularly strong current registering 10 meters cubed per second (m<sup>3</sup>/s), but the irrigation structure has only one overflow mechanism to allow water to exit in times of high pressure.

Additionally, a dike was added to the irrigation system departing from the left bank of the river, but this dike forces water over the dam during floods since the water has nowhere else to drain. The constant high currents and the lack of managed overflow points make it difficult to conduct work on the system to repair it since there is effectively no way to stop the water flow to do repairs without stopping the whole system.

#### *Canal Network*

The network stemming from the right bank intake point includes 25 km of earthen canals, and has 45 water distribution points (outlets that allow water to divert into channels leading to fields). In addition to the 45 official distribution outlets, there are several unofficial distribution outlets that have been added to the system illegally. The system also has a number of community facilities such as water troughs for livestock, washhouses, and pathways for cattle, pedestrians, and carts.

The principle canal is heavily affected by sedimentation, since outside water manages to enter the system during floods at places along the network where protective embankments are too low (particularly along certain siphons). Sedimentation problems stem from erosion throughout the watershed that is the result of deforestation, and, despite efforts to clear the canal bed, its level is gradually rising and reducing water flow. Even where protective embankments have been reinforced, they are not high enough to withstand the types of flood levels that the system experiences.

The secondary canals in the network do not create major problems for the system except for two point locations where erosion has damaged the canal. Nonetheless, problems with the primary canal have created downstream areas that for over ten years have lacked sufficient water to farm. The flow of water at the head of the system in theory is sufficient to feed the entire area, and yet distribution problems prevent water from reaching downstream sections.

#### *Repair Needs*

The Taheza system has a number of urgent needs made evident by its current state of non-operation. Firstly, the Ambarinakoho dam is an Achilles heel that needs to be completely rebuilt. Specifically, the design should be reevaluated to include: 1) two overflow mechanisms at the system head, which would make it possible to close one mechanism and perform maintenance on it while leaving the second open; 2) a structure should be built in front of the dam to direct water during the highest floods; and 3) the dam should be resized to meet the 350 year flood line.

In the rest of the network, optimal runoff conditions need to be established to protect the system from outside water flowing in and creating sediment. Certain distribution mechanisms also need renovation, and unofficial distribution outlets should be contained. The primary canal needs to be cleaned and protected with stronger embankments at its weak points. Overall, the system should be renovated so that water flows through the entire system and supplies the hydroelectric station as well.

Finally, the larger watershed area should be regenerated with anti-erosion efforts such as reforestation and planting grasses. This will limit the sediment that flows into the irrigation structures. Currently a blueprint exists for the watershed renovation [is this a project?].

## Social Infrastructure

### *Water Management Structures*

The Taheza irrigated area includes a Federation, called Komity Ny Rano, that was created in 1994 and is in charge of maintaining the primary canals in the irrigation system. The Federation office includes a President who is assisted by 16 technicians, who each represent one Water User's Association. The office includes a Treasurer, a Councilor, and a Commissioner.

The federation conducts work twice a year prior to each transplanting of the rice crops. It does not have its own office facilities or its own materials and machines. The President confirms that the Federation has been ineffective since 2008, and water has not been adequately supplied to farmers. The Federation's weakness, it should be said, lies in many senses in the fact that the irrigation system is not operating. Confidence in the Federation is low amongst farmers, and it has few resources with which to do anything with. The Federation also has difficulty imposing its authority in dealing with unofficial outlets and enforcing communal efforts at maintenance.

The Federation is the agglomeration of 16 WUAs, each with approximately 100 members, and these associations are in charge of the secondary canals. Of the 16, only one could be considered functional currently. The associations are not legally incorporated or formalized, and currently users do not pay fees or participate in communal maintenance. In the downstream section where there is no water, no maintenance work is being performed. Upstream users do organize some work, but the quality and frequency is not sufficient.

Finally those who do not have irrigation water have become so disillusioned with the situation that they have become disinterested in the work and the association. The Federation added that it believes crime in the area has increased since farmers are unable to farm. The Federation feels it now has the added burden of paying for security guards due to the rise in crime. In general, the Federation and WUAs lack training in basic management, as well as how to negotiate water management questions such as enforcing fees and fines. They could also benefit from training in infrastructure maintenance practices.

### *Other Groups and Entities*

Women in this irrigated area have few organized groups, and the level of community organization amongst women can be said to be low even by regional standards.

The DRDR is present and operates a national program to disseminate farming techniques (Programme national de vulgarization agricole – PNVA). The program teaches and develops skill sets for beneficiaries specifically on maintaining the watershed.

### *Vulnerability to Climate Change*

Twice in recent decades the Taheza irrigation network has fallen victim to high floods that damaged the network to the point of ceasing operations, and currently the network is not operating at all. It is evident that the network is not equipped to handle the types of flood events and strong water currents that occur relatively regularly given its location.

In addition to structural weaknesses at the head of the system, deforestation combined with specific weaknesses along the canal system are creating sedimentation in the network that, even in periods where the dam is functioning properly, hinder water delivery to downstream areas of the network.

One of the disconcerting results of the infrastructure state in the area is that the Taheza River is, in theory, capable of supplying enough water to the area to dramatically reduce and even eliminate the risk drought poses to agricultural production. Nonetheless, its current state of disrepair makes local farmers once again vulnerable to drought since irrigation waters are not being delivered.

Finally, the area is also susceptible to cricket infestations that are especially strong as rainfall patterns appear to be changing.

## **Manombo Ranozaza Irrigated Area**

### Overview

The Manombo Ranozaza irrigated area covers 5,190 ha with a total irrigation potential of 4,500 ha. It is located in the district of Tulear II, which has a population of 400,000 people over 7,321 km<sup>2</sup>. The biggest ethnic group is the Masikoro, but there are also foreign immigrants who often engage in non-farm activities.

The Morombe, Fiheremana and Onilahy Rivers flow through the district; however, these rivers can be variable and their unpredictability carries implications for farmers. Manombo Ranozaza in particular is located in the upstream portion of the vast Ankililaoka plain. The climate there is hot, tropical, and semi-arid. Water scarcity is a problem in the district, and only two thirds of arable land is currently farmed due to lack of materials and financing.

### Farming Production and Farming Livelihoods

The most prevalent crops in the district, in order of size, are maize, rice, and legumes (such as lima beans and soy). The potential rice area in Tulear II is estimated to be 1,200 ha; however, only 900 ha are currently farmed while 300 ha remain unexploited due to insufficient irrigation facilities. Farming the additional 300 ha would improve food security in the area.

Average yields across Tulear II are high compared to other regions with rice yielding 3.5 tons per ha and maize yielding 2.5 tons per ha. Livestock rearing in this region is an important livelihood activity, but lack of water is leading to a decrease in livestock numbers. These reductions could affect farming because farmers in the area use livestock manure to fertilize fields.

Focus group participants interviewed reported that rice production could be variable based on rains, and as a consequence farmers often grow complementary food crops in addition to rice, such as cassava and sweet potato. As growing techniques, farmers reported using some types of improved seeds, including different short cycle varieties for rice. Farmers also used manure and urea. In general, provision of inputs was low including availability of tools, seeds, phytosanitary products in addition to post-harvest storage facilities.

Women in the area do not have control over household income or decisions, even if they make large contributions to the family income. Women's focus groups in the area mentioned several needs including better supply of water for domestic uses, training in growing techniques like SRA and SRI, literacy programs and health counseling on sexually transmitted diseases. Women were also eager to learn more income-generating activities that they could do during the dry season.

It is notable that in this area farmers did not tend to engage in complementary activities to rice production making them highly dependent on the irrigation system despite the fact that the system is deteriorating rapidly and has been for some time.

### Conditions of Irrigation Infrastructure

The Ranozaza network was originally created in the 1930s under French colonial rule. The network receives its water supply from the Amboboka River, which is fed by groundwater. An intake point along the Amboboka at Ansakoandahy diverts water into four canals: the right bank canal that is 7.6 km long and irrigates 1,200 ha of land; the left bank canal which is 17.7 km long and irrigates 1,540 ha; the Soandraza canal which is 16.1 km and irrigates 2,220 ha; and the Upstream Vezo canal which is 6.2 km and irrigates 330 ha.

Water currents on the Amboboka are about 1 to 2 m<sup>3</sup>/s and increase to 4 or 5 m<sup>3</sup>/s at certain points along the river bed. The irrigation canals experience dips in current along the canal due to the poor conditions as well as certain inadequate infrastructure works. As an example, certain parts in the left bank canal in the upstream portion become almost swamp like due to the lack of current. There are also many unofficial distribution outlets that have been added illegally to the canals. Their sheer number creates a general loss of water that affects the entire system.

The most substantial problem with the infrastructure network is the insufficiently low water volume in the system. By certain calculations the Amboboka River is simply not a large enough water source to supply water to the size of the Manombo Ranozaza irrigated area. A study in 2010 found that the total area possible to irrigate using the Amboboka intakepoint is a mere 1,750 ha – only 34 percent of the current area connected to the system. In addition, rice growing

upstream of the Manombo Ranozaza intake point has been drawing more water from the Ambooboka, further decreasing the flow to Manombo Ranozaza.

Finally, the unofficial distribution outlets that feed makeshift irrigation canals throughout the system are affecting overall water supply. There are also various repairs that could be made to the system infrastructure to reduce water loss and improve distribution. Resurfacing several places along the canal, for instance, would reduce water loss, increase water current, and also help decrease the unofficial outlets.

### Social Infrastructure

The water Federation for the area manages the four canal networks. It has a President, two Vice Presidents, a Treasurer, Advisor, Commissioner, and Secretary. The Federation groups six WUAs where it is the responsibility of the latter to repair, clean and maintain canals as well as to enforce user rules and penalize infractions.

The six WUAs are grouped under a Union President who monitors the activities of the WUA. The Union, however, has few resources and no office. It would normally receive funding from the WUAs that it uses to fund canal maintenance; however, the system of financing is not functioning properly.

The WUAs themselves are informal. They include Committees that are in charge of managing the use of distribution outlets along the system. In theory, the user for each distribution outlet should pay to be part of the WUA, and the WUA funds in turn would support the Union. In reality, WUAs have significant difficulty enforcing both membership fees and fines for illegal water outlets. Complicating matters, there are reports that large farmers are in fact those who often build the illegal outlets. WUAs are too intimidated by these large farmers, who may be in possession of intimidation tactics, to pursue action against their infractions.

To illustrate the impact of the unofficial/illegal outlet points, along the Saondraza canal there are 100 illegal outlets out of a total of 130; in other words, only 30 – or a mere 23 percent – of outlets are authorized and contributing to the WUA. This is a significant factor in the overall poor management of the network and decreasing availability of water in the system.

Women in the area reported that they have difficulty interacting with the WUAs in addition to the commune and fokontany offices. They are not considered or called upon to participate in meetings.

The Federation voiced a desire to receive training in a number of areas that include how to manage the associations, water conflicts, illegal outlets, low water flow, and how to enforce rules. They recommended awareness raising through the radio to publicize the water user rules in the area.

### Other Actors and Entities

The DRDR has been present in the irrigated area for two to three years, and holds trainings on planting, hoeing, and transplanting techniques for rice as well as counseling on harvesting and storage. Focus group participants in the area reported that these trainings are useful. There are also farmer groups that have access to training on topics such as using short cycle varieties and developing complementary income-generating activities.

### Vulnerability to Climate Change

A relatively unique characteristic of the Manombo Ranozaza area is that it is not particularly vulnerable to the threat of floods the way the other two PRIASO sites and much of the rest of Madagascar are. Because the system draws water from a river with a groundwater source, flooding is much less influential compared to flooding found in other rivers.

Nonetheless, the reduced risks of flooding in the system are accompanied by increased vulnerability to drought. Under normal rainfall conditions, the irrigation system does not have a high enough water load to support the irrigation needs for over half of the area. During drought, the irrigation capacity becomes even less, and much of the area is no longer arable. Rain-fed agriculture is not possible in this area, making the irrigation supply very important.

Deforestation is also a problem in the Ranozaza watershed, as it is in the other two PRIASO project sites. In the case of the Manombo Ranozaza area, however, erosion and sedimentation is not the threat, but rather, deforestation reduces water infiltration across the watershed which reduces the ground water supply of the river. Finally, cricket infestations are also a substantial problem in this area.

## **Bas Mangoky current situation**

### Overview

Morombe district is in the northern area of the Southwest region. The district contains eight communes, of which PRIASO will have activities in the Ambahikily commune. The commune has 64,560 inhabitants and a surface area of 924 km<sup>2</sup>; it is the most populous commune in the Morombe district. The Morombe Plain runs through the district and is a center for agricultural activity.

The Mangoky River is the largest river in Madagascar, and the Bas Mangoky irrigated area holds the distinction of being the only irrigated area in the country equipped with concrete canals that extend to the parcel level of the network. The system also benefits from a dike that runs the length of the network protecting it from flooding on the Mangoky as well as the river's natural movements.

Inhabitants in the area include the Vezo, who are traditional fishermen and have migrated to interior regions out of necessity to have wood with which to construct their boats; the Antandroy who are agro-pastoral farmers, and the Besileo and Merina immigrants. This latter group has the unique practice of dividing inheritances equally between both sexes, a practice which may be influencing the native populations.

Following a high frequency of cyclone events in recent decades, the Bas Mangoky is in danger of collapsing, and the region requires a number of emergency infrastructure works to remove this danger.

### Farming Production and Farming Livelihoods

The Ambahikily commune is the only commune in the district where rice is the largest crop, and it occupies 60 percent of cultivated area in Ambahikily. Other important activities include Cuma, raising livestock, and freshwater fishing. Cassava is a common crop elsewhere in the Morombe district.

It is possible to irrigate 5,820 ha in the area. Two growing seasons are possible: one from July to November and a second from December to April. Currently 3 to 4,500 ha are cultivated in the main season while 2 to 3,000 ha are cultivated in the second season. Average rice yields in the area are particularly high registering 4.5 tons per ha on average.

Farmers tend to use traditional growing practices, including slash and burn. There is a general lack of quality farming materials and little use of credit. At the same time, the area has good access to market due to the proximity to national roads, and there are nine market warehouses. Seed producers are present as well as a number of technical partners. Overall, however, skills related to growing practices as well as market operations are low. Literacy is also low in the area.

Farmers in the region also rely on zebus, both to produce manure for the fields and also to pull ploughs. Zebus, however, are becoming fewer in number. Farmers in the area also reported engaging in small livestock rearing as well as buying and selling agriculture products at market.

Women in the region have the right to a small inheritance from their parents, though land and zebus tend to be given to male children. Women's groups here could be said to be more active than in other areas.

Focus group participants during the studies for PRIASO voiced interest in having trainings on how to fight insect infestations, which they say are increasing, how to manage water levels in the fields, and income-generating activities such as gardening.

### Irrigation Infrastructure

Initial studies to construct the Bas Mangoky irrigated system began in 1952 with original construction taking place from 1961 to 1965. These works included the water intake point at Bevoay, a total of 18.2 km of conveyance canals, and 16.5 km of primary canal from Tanandava to Ambahikily.

Shortly after construction, however, several cyclones affected the network from 1966 to 1970. Repairs were made, and renovations were also carried out in the 1980s. In 1994, the system experienced a partial rupture resulting in flooding in certain parts of the irrigated area. Repairs were made following this rupture, but in 2000 and 2002 strong rains and a cyclone again damaged the infrastructure. In 2004 an additional cyclone passed creating a 25 m breach and necessitating emergency construction to repair it. Once again in 2005, two additional cyclones hit the area reopening the patched

breach. Emergency repairs were again made. As recently as 2013 a cyclone again hit the system threatening to create a new rupture in the dike near Betakoana.

#### *Intake Point at Bevoay*

Water supply for the system is derived from the Mangoky River through an intake point near the village of Bevoay equipped with multiple valves to control water flow. The intake point is on the Mangoky's left bank, or the outer bend of the river, and it was reinforced with extra protection in 2000. Currently there is a problem with the valves that prevents them from closing tightly, and significant leaks occur, especially during floods. Debris from the river is also collecting in the valves, further preventing them from functioning.

Previous construction efforts were essentially carried out as emergency efforts, and they did not completely resolve the extent of the problems with the intake point. Currently, the Bas-Mangoky Rehabilitation Project (Projet Réhabilitation du Bas-Mangoky) has plans to create a new intake point just upstream from the current one.

#### *Canals*

A conveyance canal of 4 km extends to Bereho where it connects to another conveyance canal 14.5 km long. This portion of the system has been recently refinished. The primary canal that follows is 35 km long, and all but the final 4 km are concrete. Within the conveyance canals are a sand removal system that needs to be cleaned regularly using a dredge as well as a bulldozer. These two machines no longer work, and sediment is accumulating in the system, reducing water supply.

At Bereho, a distribution mechanism directs water to the Bas Mangoky irrigated area. There is an AVIO valve which keeps the downstream water level constant and assures regulation of water levels and current. The overflow mechanism at this point, however, does not work which leads to sand accumulation in the conveyance canal. This mechanism needs to be fixed to avoid water backing up in the conveyance canals. The second, longer conveyance canal is in good condition; however, water flow has reduced due to build-up in the first conveyance canal.

The primary, secondary, and other canals in the system are made of concrete, though for some downstream sections these canals are still earthen. There are also a number of devices installed along the network to control water flow and distribution, and these mechanisms are in good condition. While in general the canals are in good condition, downstream portions of the network show signs of inadequate water supply. For instance, there are areas of the primary canal that are dry and have considerable vegetation in them.

The drainage system for the network is in worse condition, with many drainage mechanisms not functioning. The system is also at considerable danger from high flood waters from the Mangoky River. While a protective dike was built to protect the system, the dike as well as the features at the intake point were calibrated to meet 100 year flood levels. Since then, the many cyclones that have hit the area have reduced this capacity. There are parts of the system that remain calibrated only to 10 year flood levels.

#### *Needed Repairs*

While the Bas Mangoky system is one of the most modern across all of Madagascar, the intake point is completely unable to handle the floodwaters produced regularly by the Mangoky River. In fact, designing the system to meet 100 year flood levels was insufficient, hence the large number of repairs and renovations that have been needed over the years. The decision to abandon the current intake point is based on these inadequacies as well as changes in the Mangoky riverbed.

In addition, while the network houses a comparatively sophisticated sediment removal system, difficulties maintaining resources to operate the dredge and bulldozer in the long-term have led to sediment build-up nonetheless.

Finally, the network's water evacuation and drainage system is slow to release water from the system during floods. The protective dike has ruptured several times, and the places where the structure is only effective to the 10 year flood level are so vulnerable that they create an emergency level of risk to the system.

#### Social Infrastructure

The Federation in the irrigated area is in charge of the primary canal; however, the Federation lacks materials as can be seen in its inability to maintain the dredger and bulldozer needed for sediment removal. Purchasing fuel to operate these machines is a large burden for the Federation which is not currently being met.

The Federation is comprised of 23 WUAs each with 100 to 600 members. WUAs are in charge of cleaning canals in the secondary and tertiary canals while individual farmers are responsible for maintenance on canals leading to their individual fields. The association collects maintenance fees from users, though members feel that current fees are not high enough to meet maintenance needs.

The WUAs in Bas Mangoky are relatively well-functioning compared the Taheza and MR project sites. The WUAs in this area have also received support from the PBRM Project. The Federation and Associations are currently receiving training. The structural problems with the intake point at Bevoay are not necessarily within the control of the Federation and WUAs. It is reported, however, that the Federation experiences problems with large farmers not paying for water outlets that they create.

Women in the region complain that they have difficulty interacting with the Federation; when the Federation announces works or meetings women are often excluded. Women are members; however they are a minority. Importantly, Bas Mangoky is the only location in the region where women hold positions in the WUA offices such as Treasurer, Secretary, and Deputy. There are not, however, women staff members at the Federation. Women remark that they have difficulty interacting with administrative offices in the fokontony.

#### Vulnerabilities to Climate Change

As with the other two PRIASO project sites, the Bas Mangoky irrigated area depends on its irrigation network as farming under rain-fed conditions is not possible in this semi-arid environment. The biggest risk to the networks are floodwaters from the Mangoky River and their resulting damage. The irrigated network has witnessed a near constant cycle of cyclones that cause flooding and damage, followed by emergency repairs, followed by new cyclones and more damage.

As with the Taheza region, vulnerability to drought in the area should be considerably if not completely mitigated by the sheer force of the Mangoky River. The current at low water mark for the Mangoky at the Bevoay intake point is a strong 24 m<sup>3</sup>/s, which is capable of meeting twice the irrigation needs of the area. Vulnerability to drought in the area thus arises primarily from the risk that flood waters will degrade the irrigation infrastructure to the point of not operating.

Sediment build-up in the upstream areas of the network is also a concern; however, this is less of an environmental problem and more of a management problem linked to the WUA and Federation operations. Finally, the intake point itself is very vulnerable since the Mangoky River has moved since its creation leading to the construction of the new intake point. If either the intake point stops functioning or the dam structure gives way, 95 percent of inhabitants in the Bas-Mangoky area will have no means of economic activity.

Finally, similarly to the other watersheds concerned with the PRIASO project, Bas Mangoky experiences considerable risk from cricket infestations. Deforestation is also linked to the sediment, erosion, and flooding problems of the network.

### National strategies and plans

#### Climate Change Policies

Madagascar completed its NAPA in 2006. The three strategic axes in the NAPA include: 1) capacity building; 2) political reform; and 3) integration of adaptation into sectoral policy and project activities.

In 2010, the government created a Directorate of Climate Change within the Ministry of Environment and Forests and adopted a National Policy to Fight Climate Change (*Politique nationale de lutte contre le changement climatique – PNLCC*). One of the Policy's five areas of focus is to strengthen adaptation measures to climate change taking into account the real needs of the country.

Madagascar has also adopted a climate change strategy specific to the agriculture sector: National Strategy on Climate Change: Agriculture, Livestock, and Fishing Sectors 2012-2015 (*Stratégie Nationale face au Changement Climatique: Secteur Agriculture, élevage, et pêche 2012-2015*). The strategy aims to sustainably develop the agriculture sector in a way that is resilient to climate change, contributes to GDP, assures food security for rural and urban populations, facilitates exportation, and utilizes techniques that are both modern and respect local environmental and cultural identities.

The project “Enabling Climate Resilience in the Agriculture Sector in the Southwest Region of Madagascar” has overlaps with other national strategies related to poverty reduction, agricultural and rural development, and environmental management. The following list summarizes project alignment with key policies.

#### National Poverty Strategies

- Madagascar Action Plan, 2006  
Madagascar's plan related to the Millennium Development Goals (MDGs), alignment with objectives on food security, preserving natural capital and strengthening the resilience of the agricultural sector, and promoting diversification of agricultural production.
- National Program for Rural Development, 2005 (*Programme National de Développement Rural (PNDR)*)  
Alignment with goals to improve food security, increase production and transformation of agricultural products, value natural resources, and develop markets.
- National Action Plan for Food Security, 2005 (*Plan d'Action National pour la Sécurité Alimentaire (PANSA)*)  
Alignment with goal of improving rural food security.
- Vision Madagascar, Naturally, 2004 –(*Madagascar naturellement*)  
Related to Madagascar's MDGs, alignment on themes related to rural development.
- Policy Letter on Rural Development, 2004 – (*Lettre de Politique de Développement Rural (LPDR)*)  
Alignment with goals to assure food security, reduce poverty, improve rural living conditions, promote natural resource management, and promote practices to improve rural production.

#### Agriculture Policies

- National Strategy on Agricultural and Rural Training, 2012 – (*Stratégie Nationale de Formation Agricole et Rurale (SNFAR)*)  
Alignment with this strategy's emphasis on building skills and knowledge about farming practices and resource management.
- National Rice-Growing Development Strategy, 2009 – (*Stratégie nationale de développement de la riziculture (SNDR)*)  
Alignment with this strategy's objectives to improve food security, improve wealth and living conditions of rice growers, and increase rice production and yields.
- National Seed Strategy, 2008 –(*Document de stratégie nationale semencière (DSNS)*)



Alignment with this document's objectives to promote use of improved seed varieties and professionalize the seed industry to assure availability and use of quality seeds.

- Policy Letter on *Watersheds* and Irrigated Areas, 2006 – (*Lettre de politique Bassins Versants et Périmètres Irrigués (BV/PI)*)

Overlaps with this policy in areas of promoting natural resource management, sustainable intensification of agricultural production, diversification of household income, and increasing infrastructure lifespan.

#### Environmental Policies

- Madagascar Rio+20, 2012  
Overlaps in terms of sustainable development and potential pathways to a green economy.
- Environmental Charter, 1990 with updates in 1997 and 2004 –(*La Charte de l'Environnement*)  
Framework for executing the National Environmental Action Plan, with a revision currently underway.

#### **Alignment with GEF strategies eligibility criteria and priorities.**

In line with the LDCF strategies laid out in document GEF/LDCF.SCCF.9/4/Rev.1, this project addresses adaptation priority needs identified in Madagascar NAPA and the three LDCF objectives set out in the document GEF/LDCF.SCCF.9/4/Rev.1. The project seeks to promote adaptation in the South-West of Madagascar by ensuring that: agricultural water infrastructure planned under a business-as-usual scenario is modified to be resilient to climate change; the vulnerability of the catchment to cyclones and flooding is reduced; and local agricultural livelihoods are adapted to climate change through water management and health interventions. As such it addresses all three LDCF objectives:

- **Objective CCA-1- Reducing Vulnerability:** Reduce vulnerability to the adverse impacts of climate change, including variability, at the local, national, regional, and global level.  
All three indicated outcomes are addressed, though outcomes 1.2 and 1.3 are the focus of the intervention.  
Outcome 1.1: Mainstreamed adaptation in broader development frameworks at country level and in targeted vulnerable areas.  
Outcome 1.2: Reduced vulnerability to climate change in development sectors.  
Outcome 1.3: Diversified and strengthened livelihoods and sources of income for vulnerable people in targeted areas.
- **Objective CCA-2 - Increasing Adaptive Capacity:** Increase adaptive capacity to respond to the impacts of climate change, including variability, at the local, national, regional, and global level.  
The project addresses the third outcome.  
Outcome 2.3: Strengthened awareness and ownership of adaptation and climate risk reduction processes at the local level.
- **Objective CCA-3 - Adaptation Technology Transfer:** Promote transfer and adoption of adaptation technology.  
The project addresses the second outcome.  
Outcome 3.1: Successful demonstration, deployment, and transfer of relevant adaptation technology in targeted areas.

The proposed project is consistent with GEF/LDCF criteria. It has been prepared fully in line with guidance provided by the GEF and the LDCF Trust Fund. It is also fully in line with the guidance of the "Programming Paper for Funding the Implementation of NAPAs under the LDC Trust Fund," and its development followed the overall guidance described in the UNDP/GEF "Adaptation Policy Framework for Climate Change."

Madagascar is party to the UNFCCC and completed its own NAPA in 2006. In line with GEF/LDCF (2006), this project was identified and conceived through the participatory NAPA process in Madagascar. It addresses two out of the three priorities that have been prioritized in the NAPA, water and agriculture.

## Overall GEF Conformity

- **Sustainability**: The project has been designed to have a sustainable impact at the community, sub-national, and national levels. See section on Sustainability below for more details.
- **Monitoring and Evaluation (M&E)**: The project will be accompanied by an effective M&E framework. Lessons learned will also be collected as part of the ongoing process of project implementation so they can be referenced by future similar initiatives.
- **Replicability**: The project has a significant focus on the use of demonstration activities within the three selected areas; this should facilitate the replicability of small-scale investments for alternative, climate resilient livelihoods in other parts of the country.
- **Stakeholder Involvement**: The project will allow for co-ordination amongst various stakeholders at the different levels in areas including environmental and developmental planning.
- 

## **AfDB Comparative Advantage**

AfDB comparative advantage in implementing this project lies in its longstanding experience in working in the Southwest Region of Madagascar in supporting farming activities and especially rice production in irrigated areas. Currently AfDB is currently implementing a second phase of the Bas-Mangoky Rehabilitation Project (*Projet de Réhabilitation du Bas-Mangoky - PRBM*) focusing on rehabilitating the intake point on the Bas-Mangoky river and strengthening to some extent the existent WUAs. A first phase of this project was implemented from 2000 to 2008.

AfDB is also implementing the Project to Rehabilitate the Manombo Irrigated Area (*Projet de Réhabilitation du Périmètre Irrigué de Manombo* (PRPIM)) in the Southwest region. This project is under closure and targeted the Manombo irrigated area which is closed to Ranozaza irrigated area. AfDB is also implementing in the Southwest region the Support Project to Community Fishermen (*Projet d'appui aux communautés des pêcheurs* (PAPCP)) which is also executed by the DRDR Atsimo Andrefana.

AfDB is therefore one of the main partner of the DRDR of Atsimo Andrefana and has already set-up strong coordination mechanisms with the Ministry of Agriculture and the DRDR.

In the field of rice production, AfDB is also implementing the Project to Improve Rice Production in the Central Highlands (*Projet d'amélioration de la productivité rizicole sur les hautes terres centrales* (PAPRIZ)) which is funded by a Japanese corporation and will finance activities to intensify agriculture and distribute technical pamphlets.

The above on-going AfDB supported initiatives are a solid indication of staff capacity in the Madagascar Country Office to support the proposed project. AfDB staff is already engaged in a number of activities of relevance to the proposed project. Moreover, Country Office operations are supported by regional advisory capacity based in the AfDB headquarters in Tunis. AfDB has dedicated Technical Advisers focusing on supporting adaptation programming and implementation in a range of technical areas relevant to this project including disaster management, infrastructure development, ecosystem-based adaptation, capacity development, and local governance reform.

**ANNEX F – DRAFT PROCUREMENT PLAN**

<b>Procurement Package Description</b>	<b>Type</b>	<b>Amount (in USD)</b>	<b>Timeline</b>
Protection of riverbanks upstream from the village of Ankilimarovahatra – installation of 4 spurs between Metric Point (MP) 5785 and MP 6282	Works	105,000.00	2 <sup>nd</sup> semester 2014 – 1 <sup>st</sup> semester 2015
Protection of riverbanks at Ankilimarovahatra – installation of 6 spurs between MP 7037 and MP 8762	Works	320,000.00	2 <sup>nd</sup> semester 2014 – 1 <sup>st</sup> semester 2015
Raising and expanding the banks of the protective dike between MP 19129 and MP 29910	Works	150,000.00	2015-2016
Treatment of the Betakoana breach between MP 27908 and MP 29508 – extension of the 4 spurs constructed as an emergency to protect the dike as well as construction of a new 260m long spur upstream from the D1 spurs	Works	250,000.00	2 <sup>nd</sup> semester 2014 – 1 <sup>st</sup> semester 2015
Resurfacing the banks and planting grass along the N3 spur	Works	30,000.00	2015
Strengthening the head of the spur at Tanandava	Works	10,000.00	2015
Resurfacing the banks and planting grass along the N4 spur	Works	30,000.00	2015
Rehabilitation of the dam at Ambarinako	Works	100,000.00	2015-2016
Levelling of the 25 km of primary canal at Taheza	Works	55,000.00	2016
Renovation of specific canal works at Taheza	Works	45,000.00	2016-2017
Resurfacing of the 25 km of primary canal at Taheza	Works	225,000.00	2016-2017
Blueprint study on protecting the Taheza watershed	Consultant	40,000.00	2016

<b>Procurement Package Description</b>	<b>Type</b>	<b>Amount (in USD)</b>	<b>Timeline</b>
Baseline technical study for infrastructure work to protect the Taheza watershed	Consultant	20,000.00	2017
Restoration of degraded zones in the Taheza River watershed	Works	300,000.00	2016-2017
Restoring the Antsakoandahy spillway dam/dike	Works	20,000.00	2 <sup>nd</sup> semester 2014 – 1 <sup>st</sup> semester 2015
Levelling and surfacing of 5.6 out of 6.6 km of the right canal bank at Ranozaza	Works	300,000.00	2015-2017
Levelling and surfacing of 5.4 out of 17.7 km of the left canal bank at Ranozaza	Works	300,000.00	2015-2017
Levelling and surfacing of 4.6 of 16.1 km along the Saondraza Canal at Ranozaza	Works	210,000.00	2015-2017
Levelling and surfacing of 3.6 of 6.2 km on the Upstream Vezo canal at Ranozaza	Works	75,000.00	2015-2017
Construction of 6 storage facilities	Works	200,000.00	1 <sup>st</sup> semester 2015
Construction of 10 boreholes and of 5 washhouses	Works	120,000.00	2 <sup>nd</sup> semester 2015
Construction of 4 health centers	Works	180,000.00	2015-2016
Equipment for 4 health centers	Goods	30,000.00	2016
Awareness raising campaign on hygiene and waterborne illnesses	Consultant	5,000.00	2016
Update of 4 Local Development Plans	Consultant	15,000.00	1 <sup>st</sup> semester 2015
Implementation of 4 Local Development Plans (include various procurements that will be determined once the 4 local development plans would have been updated)	Works	1,000,000.00	2 <sup>nd</sup> semester 2015 - 2017
Trainings for women groups	Consultant	7,500.00	2015
Trainings on integrating climate change risks into the management and planning of	Consultant	20,000.00	2015

<b>Procurement Package Description</b>	<b>Type</b>	<b>Amount (in USD)</b>	<b>Timeline</b>
socio-economic activities			
Trainings on climate change risks and adaptation options	Consultant	20,000.00	2016-2017
Training on agro-forestry and fighting erosion	Consultant	10,000.00	1 <sup>st</sup> semester 2017
Restructuring of Water Users Associations	Consultant	20,000.00	2015
Training on water management and management and maintenance of irrigation structures	Consultant	15,000.00	2016
Awareness raising campaign on climate change aspect	Consultant	30,000.00	2015-2016
Baseline study	Consultant	25,000.00	2 <sup>nd</sup> semester 2014
Mid-term evaluation	Consultant	25,000.00	2 <sup>nd</sup> semester 2016
Terminal evaluation	Consultant	40,000.00	1 <sup>st</sup> semester 2018
Study on adaptation best practices and lessons learned based on project activities	Consultant	30,000.00	1 <sup>st</sup> semester 2018